Big South Fork National River and Recreation Area and Obed Wild and Scenic River

Draft Non-Federal Oil and Gas Management Plan / Environmental Impact Statement

National Park Service
U.S. Department of the Interior

Big South Fork National River and Recreation Area and Obed Wild and Scenic River

DRAFT NON-FERDERAL OIL AND GAS MANAGEMENT PLAN / ENVIRONMENTAL IMPACT STATEMENT

2011

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UNITED STATES DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE
DRAFT NON-FEDERAL OIL AND GAS MANAGEMENT PLAN / ENVIRONMENTAL IMPACT STATEMENT

Big South Fork National River and Recreation Area / Obed Wild and Scenic River

Lead Agency: National Park Service (NPS), U.S. Department of the Interior

This draft *Oil and Gas Management Plan / Environmental Impact Statement* (plan/EIS) was prepared for Big South Fork National River and Recreation Area (NRRA) and Obed Wild and Scenic River (WSR). At this time, while the National Park Service (NPS) has comprehensive regulations governing nonfederal oil and gas development in parks, the Service does not have a comprehensive plan guiding oil and gas activities within the parks and limited ability to proactively communicate and enforce applicable regulations. Operators may be uncertain of the requirements and areas of the parks having special resource values may not be clearly identified to operators or the public. Existing and future oil and gas operations in the parks have the potential to impact resources and values. Because of the proximity of the two units, and their similar attributes and issues relating to oil and gas operations (such as similar geography and other natural resource conditions), the NPS decided to develop a draft plan/EIS for both units together to assist in the effective regulation and management of non-federal oil and gas operations.

This plan/EIS evaluates the impacts of a range of alternatives, analyzes alternative approaches, clearly defines a strategy, and provides guidance to ensure that activities undertaken by owners and operators of private oil and gas rights, as well as activities undertaken by the NPS, are conducted in a manner that protects the resources, visitor use and experience, and human health and safety in the park units. The document presents and analyzes the potential impacts of three alternatives: current management (the no action alternative) and two action alternatives for managing non-federal oil and gas in these units. The plan/EIS analyzes impacts of these alternatives in detail for geology and soils; water resources; floodplains, wetlands; vegetation, wildlife and aquatic species, federally listed threatened and endangered species, species of special concern; cultural resources; soundscapes, visitor use and experience; and park management and operations. Upon conclusion of the plan/EIS and decision-making process, one of the alternatives would become the Oil and Gas Management Plan for the units and guide future actions for a period of 15 to 20 years. Alternative C is the environmentally preferred alternative and the NPS preferred alternative.

The review period for this document will end 60 days after publication of the U.S. Environmental Protection Agency Notice of Availability in the Federal Register. Comments will be accepted during the 60-day comment period electronically through the NPS Planning, Environment and Public Comment website listed below or in hard copy delivered by the U.S. Postal Service or other mail delivery service or hand-delivered to the address below. Comments will also be accepted during public meetings on the plan/EIS. Comments will not be accepted by fax, email, or in any other way than those specified above. Bulk comments in any format (hard copy or electronic) submitted on behalf of others will not be accepted. Before including your address, telephone number, electronic mail address, or other personal identifying information in your comments, you should be aware that your entire comment (including your personal identifying information) may be made publically available at any time. While you can ask us in your comments to withhold your personal identifying information from public review, we cannot guarantee that we will be able to do so. After public review, the document will be revised in response to public comments. A final version of the document will then be released, and a 30-day no-action period will follow. Following the 30-day period, the alternative or actions constituting the approved plan will be documented in a record of decision that will be signed by the Regional Director of the NPS Southeast Region.

For further information, visit http://parkplanning.nps.gov/biso or contact:

Superintendent
Big South Fork National River and Recreation Area
4564 Leatherwood Road
Oneida, Tennessee 37841
423-569-9778

National Park Service
U.S. Department of the Interior

Big South Fork National River and Recreation Area
Obed Wild and Scenic River
Kentucky and Tennessee

Big South Fork National River and Recreation Area and Obed Wild and Scenic River

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EXECUTIVE SUMMARY

PURPOSE AND NEED FOR THIS PLAN

Big South Fork National River and Recreation Area (NRRA) encompasses approximately 125,000 acres on the Cumberland Plateau in Tennessee and Kentucky, approximately 70 highway miles northwest of Knoxville, Tennessee. The Obed Wild and Scenic River (WSR) encompasses approximately 5,056 acres in Morgan and Cumberland Counties in Tennessee on the Cumberland Plateau, approximately 20 to 30 miles south and west of the Big South Fork NRRA.

The enabling legislation for the Big South Fork NRRA prohibits oil and gas extraction and development within the park's designated gorge area, but allows for development in the adjacent areas outside the gorge. Currently, there are more than 300 oil and gas wells within the Big South Fork NRRA, although no new wells have been drilled in the Big South Fork NRRA since about 1990. Active oil and gas production at Big South Fork NRRA occurs primarily in the south end of the unit, on both deferred properties (fee simple private property within the legislative boundary), as well as on property owned by the United States government. Wells with an "inactive" status are candidates to become either actively producing wells or plugged and abandoned wells. Within the Obed WSR, oil and gas exploration is limited, by deed restrictions, to directional drilling from outside the boundary. However, there are seven oil and gas wells in Obed WSR, including two plugged and abandoned wells. The plugged and abandoned wells may be in need of additional surface reclamation, and three of the five other wells may have leases that have expired, and would thus be required to be plugged and abandoned under state regulations. All of the operations inside the park unit are subject to existing rights.

At this time, while the National Park Service (NPS) has comprehensive regulations governing nonfederal oil and gas development in parks, the Service does not have a comprehensive plan guiding oil and gas activities within the parks and limited ability to proactively communicate and enforce applicable regulations. Operators may be uncertain of the requirements and areas of the parks having special resource values are not clearly identified to operators or the public. Existing and future oil and gas operations in the parks have the potential to impact resources and values. Because of the proximity of the two units, and their similar attributes and issues relating to oil and gas operations (such as similar geography and other natural resource conditions), the NPS decided to develop a draft Oil and Gas Management Plan / Environmental Impact Statement (plan/EIS) for both units together to aid in the effective regulation and management of non-federal oil and gas operations.

Purpose of and Need for the Plan

The purpose of the plan/EIS for Big South Fork NRRA and Obed WSR is to analyze alternative approaches, clearly define a strategy, and provide guidance to ensure that activities undertaken by owners and operators of private oil and gas rights, as well as activities undertaken by the NPS, are conducted in a manner that protects the resources, visitor use and experience, and human health and safety in the park units. This plan/EIS presents and analyzes the potential impacts of three alternatives: current management (the no action alternative) and two action alternatives for managing non-federal oil and gas in these units. Upon conclusion of the plan/EIS and decision-making process, one of the alternatives would become the Non-Federal Oil and Gas Management Plan for the units and guide future actions for a period of 15 to 20 years.

As noted, there are over 300 private oil and gas operations within Big South Fork NRRA and Obed WSR. Many of the past and existing oil and gas operations in these NPS units are adversely impacting resources and values, human health and safety, and visitor use and experience; most are not in compliance with federal and state regulations, most notably, the NPS 36 Code of Federal Regulations (CFR), Part 9 Subpart B (see appendix A). In addition, future oil and gas operations have the potential to damage park resources and values. The plan/EIS is needed to provide an efficient and effective strategy for park managers to ensure the units are protected for the enjoyment of future generations. There is also a need for park-specific guidance for the planning efforts of oil and gas owners and operators.

This is a programmatic management plan that establishes a general framework for managing oil and gas operations. By itself, it does not authorize any on-the-ground activities, but it does recognize existing operations. The reasonably foreseeable development scenario identified up to 25 wells that would be drilled in Big South Fork NRRA and Obed WSR in the next 15-20 years, and up to 125 wells that could be amended or serviced to restore or improve production. The NPS will authorize specific projects by reviewing and approving operator-submitted plans of operations or special use permit applications. Before doing so, the NPS will conduct further analysis in accordance with the National Environmental Policy Act of 1969 (NEPA), the National Historic Preservation Act of 1966, the Endangered Species Act of 1973, and other applicable federal laws.

PLANNING DIRECTION

This draft plan/EIS has been prepared with guidance provided through special mandates and direction. These include the NPS Organic Act, the parks' establishing legislations, the Service's 36 CFR 9B regulations regulating non-federal oil and gas development, park planning documents, and a variety of existing laws, regulations and policies. These "Current Legal and Policy Requirements" are described in chapter 1, chapter 2 and appendix B.

On May 31, 2006, the NPS published a Notice of Intent to Prepare an Oil and Gas Management Plan/Draft Environmental Impact Statement in the Federal Register. The publication of this notice was followed by the mailing of a Public Scoping brochure and four scoping open houses held in Jamestown, Tennessee on August 7, Huntsville, Tennessee on August 8, Oak Ridge, Tennessee on August 9, Whitely City, Kentucky on August 10. The general public, as well as federal, state, and local government agencies, were invited to identify issues and submit comments regarding the proposed planning effort to the NPS. The planning process continued through 2009, and a draft plan was completed in 2010. The consultation and coordination process is described in chapter 5. Based on internal and public scoping, the interdisciplinary team developed the following planning objectives and a list of resources and concerns to evaluate in this draft plan/EIS.

PLANNING OBJECTIVES

GENERAL

- Identify and protect resources from adverse impacts from oil and gas operations.
- Provide owners and operators of private oil and gas rights reasonable access for exploration, production, maintenance, and surface reclamation.

WATER RESOURCES

- Protect and enhance water resources.

VEGETATION AND WILDLIFE, INCLUDING THREATENED AND ENDANGERED SPECIES

- Protect species of management concern from adverse impacts from oil and gas operations. Protect critical habitat from adverse impacts from oil and gas operations.

VISITOR EXPERIENCE, CONFLICTS, AND SAFETY

- Prevent, minimize, or mitigate conflicts between oil and gas operations and visitor use.
- Protect human health and safety from adverse impacts from oil and gas operations.

CULTURAL RESOURCES

- Protect cultural resources, including those on, or eligible for listing on, the National Register of Historic Places, from adverse impacts from oil and gas operations.

PARK MANAGEMENT AND OPERATIONS

- Provide pertinent guidance to operators to facilitate planning and compliance with NPS regulations.
- Establish an efficient process under the NEPA for plugging wells and reclaiming well sites and access roads.

Resources and concerns evaluated in this draft plan/EIS include:

- Geology and Soils
- Water Resources
- Floodplains
- Wetlands
- Vegetation
- Wildlife and Aquatic Species
- Federally Listed Endangered and Threatened Species
- Species of Special Concern
- Soundscapes
- Cultural Resources
- Visitor Use and Experience
- Park Management and Operations

For each of the resources and concerns listed above, the interdisciplinary team identified the problems or benefits that might occur should oil and gas operations continue. Based on the evaluation of these resources and concerns, and public input received during scoping, the planning team also identified Special Management Areas (SMAs) to protect park resources and values that are most susceptible to adverse impacts from oil and gas operations. The issues and SMAs were used in developing and evaluating alternatives. The issues are discussed in chapter 1. A description of the affected environment is in chapter 3.

PLAN ALTERNATIVES

Forecast of Oil and Gas Activities

The NPS developed a forecast of oil and gas activities that includes a reasonably foreseeable development (RFD) scenario for new development to project future oil and gas development in the parks and an estimate of future well plugging. The purpose of the forecast is to provide a reasonable basis for analyzing the potential effects of oil and gas related operations in the parks among the alternatives presented in this EIS. For Big South Fork NRRA and Obed WSR, the forecast of oil and gas is primarily for plugging of existing wells, as opposed to new drilling and production.

For the RFD scenario, the U.S. Geological Survey (USGS) and the NPS worked together to estimate the remaining hydrocarbon resources in the parks and to develop a projection of the type and level of activities that could occur to develop these resources. The RFD drilling scenario presented in this plan is based on the collaborative work of the USGS and the NPS. Seismic and other proprietary data available only to oil and gas companies was not used in the preparation of the RFD scenario. It is possible that the well spacing may be different than is projected in the RFD scenario, the drilling success rate may deviate from the NPS projection, and it may take fewer or more wells to develop the oil and gas resources underlying the parks. Any of these factors could result in a different development scenario than is presented by the NPS in this draft plan/EIS.

When the NPS acquired lands for Big South Fork NRRA, it inherited a legacy of inactive non-federal oil and gas wells, many without responsible parties. The 2001 well inventory (TDEC 2001) identified 59 inactive wells at Big South Fork NRRA that were considered candidates for plugging, of which over half had no responsible parties. Of these, 54 wells have been or will be plugged within the next few years mainly using funding received through the American Recovery and Reinvestment Act and NPS funding administered through a cooperative agreement with Tennessee Department of Environment and Conservation. However, the NPS and operators are expected to identify additional inactive wells as plugging candidates in the future, and the forecast of oil and gas activity for this plan estimates that about 50 additional wells will need to be plugged over the life of this plan. Additional details about the forecast can be found in chapter 2 of the plan/EIS.

SUMMARY OF PLAN ALTERNATIVES

Three alternatives are presented in chapter 2. These alternatives were developed to meet the stated objectives of this draft plan/EIS to a large degree and provide a reasonable range of options to manage exploration, drilling, production and transportation of nonfederal oil and gas within the parks. The alternatives are described below.

ALTERNATIVE A: NO ACTION

Alternative A—No Action is required by the NEPA and describes the continued management of oil and gas operations in the parks. The NPS would continue to work cooperatively with the state on regulations or enforcement, but would be somewhat limited in its ability to conduct inspections and monitoring of all operations on a regular basis and would defer to the state to notify operators about compliance issues. Compliance for plans of operations related to management of current operations and for new drilling and/or exploration would be conducted on a case-by-case basis in both park units with currently available staff and funding sources. Restrictions and protected areas identified in the current legal and policy requirements (CLPRs) for each park unit (including the NPS 9B regulations) would be applied to new operations. Plugging and reclamation activities would be guided by the 9B or state regulations, as appropriate, and compliance for these operations would be conducted on a case-by-case basis in both park units.

ALTERNATIVE B: COMPREHENSIVE IMPLEMENTATION OF 9B REGULATIONS AND A NEW MANAGEMENT FRAMEWORK FOR PLUGGING AND RECLAMATION

Under alternative B, the NPS would proactively pursue enforcement of the 9B regulations and plans of operations and provide clear communication with the public and operators about CLPRs, including the 9B regulations. For current operations, the NPS would continue to work cooperatively with the state on regulations or enforcement, but would conduct increased inspections and monitoring and identify sites that are found to be impacting, or threatening to impact, park resources beyond the operations area to bring these into compliance. New operations would be reviewed and permitted in accordance with the restrictions and protected areas described in the CLPRs, similar to alternative A. The park would use the oil and gas management planning process to proactively share information with the public about regulatory requirements, to seek out operators to ensure information is communicated clearly and effectively, and to focus staff resources on the implementation and compliance with the regulatory framework. Alternative B also includes a new management framework for efficiently completing compliance processes necessary for plugging and reclamation of wells, which would provide a method for evaluating the environmental compliance needs for future site-specific projects. Priority sites for plugging and reclamation would be identified using criteria developed for this plan/EIS.

ALTERNATIVE C: COMPREHENSIVE IMPLEMENTATION OF 9B REGULATIONS, NEW MANAGEMENT FRAMEWORK FOR PLUGGING AND RECLAMATION, AND ESTABLISHMENT OF SPECIAL MANAGEMENT AREAS

Alternative C would implement the same type of more proactive management described in alternative B, including additional inspections and monitoring of current operations to bring them into compliance, as well as the permitting of new operations. However, under alternative C, “Special Management Areas” or SMAs have been designated to identify and protect those areas where park resources and values are particularly susceptible to adverse impacts from oil and gas development. Specific protections afforded by these SMAs are presented in Table 2; and these operating stipulations would be applied in the designated SMAs to protect the resources and values of the park units unless other mitigation measures were specifically authorized in an approved plan of operations. Similar to alternative B, the park would use the oil and gas management planning process to proactively share information with the public about regulatory requirements, to seek out operators to ensure information is communicated clearly and effectively, and to focus staff resources on the implementation and compliance with the regulatory framework. Alternative C also includes the new management framework for plugging and reclamation of wells as described under alternative B; and the designated SMAs would be considered in setting priorities for plugging and reclamation.

Table ES.1 is a summary of protected areas per CLPRs and per SMAs (alternative C only) under each alternative.

TABLE ES.1. PROTECTED AREAS INCLUDING SMAS AND OPERATING STIPULATIONS[1]

	Alternative A: No Action	Alternative B: Comprehensive Implementation of 9B Regulations and a New Management Framework for Plugging and Reclamation	Alternative C: Comprehensive Implementation of 9B Regulations, a New Management Framework for Plugging and Reclamation, and Establishment of Special Management Areas (SMAs)
Protected Areas Per CLPRs	**Big South Fork NRRA Designated Gorge:** • Exploration, drilling, and production prohibited **Big South Fork NRRA Long-term monitoring plots**[2]: • Avoid impacts; address in plans of operations **Obed WSR Deed Restrictions:** • Some deed restrictions require No Surface Use prohibiting exploration, drilling, and production on federal lands[2] **Visitor Use, Administrative, and Other Use Areas with 500-foot Setback Per 9Bs:** • No Surface Use (exploration, drilling, and production) **Waterways with 500-foot Setback Per 9Bs:** • No Surface Use (exploration, drilling, and production)	Same as alternative A.	Same as alternative A.
Special Management Areas	Not applicable	Not applicable	***<u>Big South Fork NRRA</u>***—**the following would be protected as noted unless other mitigation that protects SMA resources and values is included and authorized in an approved plan of operations.** **Sensitive Geomorphic Feature SMA with 500-foot setback:** • No Surface Use (exploration, drilling, and production) **Cliff Edge SMA with 100-foot setback):** • No Surface Use (exploration, drilling, and production) • Drilling would only be allowed during dry periods

TABLE ES.1. PROTECTED AREAS INCLUDING SMAS AND OPERATING STIPULATIONS[1]

	Alternative A: No Action	Alternative B: Comprehensive Implementation of 9B Regulations and a New Management Framework for Plugging and Reclamation	Alternative C: Comprehensive Implementation of 9B Regulations, a New Management Framework for Plugging and Reclamation, and Establishment of Special Management Areas (SMAs)
			Managed Field SMA with 100-foot setback: • No Surface Use (exploration, drilling, and production) • Setback only applies to drilling and production **SMAs with Setbacks for Visitor Use/ Administrative Areas, and Trails:** • Visitor Use and Administrative Areas: – 500-foot setback for geophysical exploration – 1,500-foot setback for drilling and production • Trails: – 300 foot setback for all operations • All: – No Surface Use (exploration, drilling, and production) in SMA or setbacks – All operations would be limited during high visitor use or visitation periods (generally April through October) – Drilling would only be allowed during dry periods **Cultural Landscapes and Cemetery SMA:** • 100-foot setback from cemeteries for all operations • 1,500-foot setback from cultural landscapes for all operations • No Surface Use (exploration, drilling, and production) in SMA or setbacks • All operations would be limited during high visitor use or visitation periods (generally April through October) • Drilling would only be allowed during dry periods **State Natural Area SMA:** • No Surface Use (exploration, drilling, and production) would be allowed in state natural areas

TABLE ES.1. PROTECTED AREAS INCLUDING SMAS AND OPERATING STIPULATIONS[1]

	Alternative A: No Action	Alternative B: Comprehensive Implementation of 9B Regulations and a New Management Framework for Plugging and Reclamation	Alternative C: Comprehensive Implementation of 9B Regulations, a New Management Framework for Plugging and Reclamation, and Establishment of Special Management Areas (SMAs)
			Special Scenery SMA[2]**:** • Geophysical exploration would be allowed at any time • Drilling activities limited during high visitor use periods (generally April through October) • Requires viewshed analysis for production activities. This would be a GIS analysis that would allow park managers to determine if the site lies within a viewshed that is visually sensitive to changes in the landscape. If so, the proposed location would become part of the Special Scenery SMA. ***Obed WSR*** **Obed WSR SMA:** • No Surface Use (exploration, drilling, and production) would be allowed on any of the federal property within the boundaries of the Obed WSR (per existing deed restriction)

[1]Operating stipulations may be modified if an operator can demonstrate that new technology or site-specific information (such as engineering, geological, biological, or other information or studies) would meet the goals of protecting resources, values, and uses in protected areas or SMAs. Setbacks for visitor use, administrative, and other use areas and waterways would be applied, unless other measures are specifically authorized by an approved plan of operations, as per 36 CFR 9.41(a). There may be surface use allowed if mitigations are approved in a plan of operations. However, while an approved plan of operations could relax SMA restrictions, it would not supersede applicable statutes such as gorge restrictions and deed restrictions.

[2]The area covered by this protected area/SMA has not been mapped and would be determined on a case-by-case basis during scoping and preparation of a plan of operations for specific projects.

Under any alternative:

- The level of development theorized in the forecast of oil and gas activities summarized above, would be the same under all three alternatives.
- If a drilling operation is not permitted in a protected/SMA, the operator could directionally drill a well from a surface location outside the area, or the operator could commit to measures that would mitigate for impacts to the specific resources and values of the SMA. If these are approved and authorized in an approved plan of operations, operations could proceed within SMA boundaries.
- In all areas of the park, CLPRs would be applied and could result in the discovery of previously unknown, important cultural resources, species of special concern, and other resource areas in which No Surface Use, timing stipulations, and other mitigation measures could be applied. The term "Current Legal and Policy Requirements" as used in the description of alternatives means application of all pertinent federal and state laws, regulations, policies, and direction governing oil and gas operations conducted in the park. These include NPS regulations at 36 CFR 9B, which require operators to use technology and methods least damaging to park resources (i.e., performance standards and implementation strategies) while ensuring the protection of human health and safety. The CLPRs are described in "Appendix A: 9B Regulations and Application of the Regulations" and "Appendix B: Summary of Non-federal Oil and Gas Operations Legal and Policy Mandates."

Alternative C is the NPS's preferred alternative and is also the environmentally preferred alternative. Both alternatives B and C were developed to provide consistent oversight of oil and gas operations and ensure protection of park resources and values. The formal designation of SMAs and operating stipulations in alternative C would reduce the level of potential impact or impairment to resources and values particularly susceptible to adverse impacts from oil and gas operations. The implementation of a proactive and comprehensive oil and gas management plan under any of the action alternatives would provide more certainty to oil and gas operators and consistent application of CLPRs. The formal designation of SMAs and operating stipulations under alternative C would provide better assurance for the protection of park resources and values from potential impairment from nonfederal oil and gas operations.

ENVIRONMENTAL CONSEQUENCES

The full impact analysis is in "Chapter 4: Environmental Consequences." A complete summary of impacts of the alternatives can be found in chapter 2, "Table 10. Summary of Environmental Consequences." For all of the alternatives in this draft plan/EIS, impacts from operations in the park would not reach the level of impairment of park resources and values.

Under all three alternatives, impacts from geophysical exploration and new drilling/production are similar because the limited level of exploration and new well development projected under each alternative would be the same as theorized under the forecast and RFD scenario. The key difference between the alternatives and their potential impacts is the impacts of existing operations, especially with regard to well plugging and site restoration, and where impacts could occur. Under alternative A, CLPRs would preclude new operations in protected areas unless otherwise approved in a plan of operations, but existing operations would continue to have adverse effects until operators were found through state or self reporting and brought into compliance with the regulations.

Under alternative B, impacts from new operations would be similar to those under alternative A, but existing operations would be brought under compliance sooner, and well plugging and reclamation would proceed more efficiently, resulting in benefits to resources. Alternative C would have similar effects but add another layer of protection for additional resource areas formally designated as SMAs, where the No Surface Use stipulations in these areas and designated offsets would reduce operations from occurring in an increasingly larger acreage of the park, unless additional mitigation measures to reduce impacts are authorized in approved plans of operations. Alternative C would likely reduce operations in the greatest area of the park, and it is likely that some wells would be directionally drilled to develop hydrocarbons underlying the park and to avoid impacts.

Impairment findings are included in appendix E for the preferred alternative, although each alternative was examined for the potential for impairment. Under all three alternatives, impairment to park resources and values would not occur because current laws, regulations, and policies preclude park resource managers from authorizing nonfederal oil and gas operations that would impair park resources and values.

THE NEXT STEP

The public review and comment period for this draft plan/EIS will be for 60 days. Written comments on the draft plan/EIS will be fully considered and evaluated in preparing the Final Oil and Gas Management Plan/Environmental Impact Statement. A final plan/EIS will then be issued, which will be approved by the NPS after a minimum 30-day no-action period. The final plan/EIS will include agency and organization letters and responses to all substantive comments.

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Appendices

Acronyms

ARD	Air Resources Division
ARRA	American Recovery and Reinvestment Act
ATV	all-terrain vehicle
BCF	billion cubic feet
BLM	Bureau of Land Management
BNGL	barrels of natural gas liquids
BO	barrels of oil
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
cfs	cubic feet per second
CLPRs	current legal and policy requirements
CWA	Clean Water Act
dBA	A-weighted decibel scale
EA	environmental assessment
EIS	environmental impact statement
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
FHWA	Federal Highway Administration
FONSI	Finding of No Significant Impact
FTE	full time employee
GMP	general management plan
LRMP	Land and Resource Management Plan
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NOx	nitrogen oxides
NPS	National Park Service
NRHP	National Register of Historic Places
NRRA	National River and Recreation Area
NVCS	National Vegetation Classification System
ONRW	Outstanding National Resource Water
ORV	off-road vehicle
plan/EIS	Oil and Gas Management Plan / Environmental Impact Statement
PSD	prevention of significant deterioration
PSRPA	Park System Resource Protection Act
RFD	reasonably foreseeable development

SMA	Special Management Area
SO_2	sulfur dioxide
SPCC	Spill Prevention, Control, and Countermeasures
TDEC	Tennessee Department of Environment and Conservation
TMDL	total maximum daily load
TWRA	Tennessee Wildlife Resources Agency
USC	United States Code
USDA	U.S. Department of Agriculture
USFS	United States Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VOC	volatile organic compound
WSR	Wild and Scenic River

CHAPTER 1: PURPOSE OF AND NEED FOR ACTION

INTRODUCTION

This "Purpose of and Need for Action" chapter describes the reasons why the National Park Service (NPS) is taking action at this time. The NPS will evaluate a range of alternatives for the management of non-federal oil and gas operations at Big South Fork National River and Recreation Area (NRRA) and Obed Wild and Scenic River (WSR) (the park units). Over 300 oil and gas wells exist within the Big South Fork NRRA, and another seven wells exist within the Obed WSR, which is located approximately 20 to 30 miles south and west of the Big South Fork NRRA (see figure 1). Because of the proximity of the two units, and their similar attributes and issues relating to oil and gas operations (such as similar geography and other natural resource conditions), the NPS decided to develop a draft Oil and Gas Management Plan / Environmental Impact Statement (plan/EIS) for both units together to aid in the effective regulation and management of non-federal oil and gas operations.

This plan/EIS presents and analyzes the potential impacts of three alternatives: current management (the no action alternative) and two action alternatives for managing non-federal oil and gas in these units. Upon conclusion of the plan/EIS and decision-making process, one of the alternatives would become the Non-Federal Oil and Gas Management Plan for the units and guide future actions for a period of 15 to 20 years.

This plan/EIS is mostly programmatic in nature, which means that the plan provides a framework for taking a range of actions, but that actions, particularly those relating to new oil and gas development, would require more site-specific analyses before they could be implemented. Plugging and reclamation activities would be reviewed using the new management framework (see "Chapter 2: Alternatives"), which would include ensuring that appropriate environmental compliance requirements are met before taking any action. For both new operations and plugging and reclamation, if additional analyses were required, environmental compliance, including an opportunity for public comments, would be completed.

Programmatic*—following a plan, policy, or program.*

PURPOSE OF AND NEED FOR ACTION

As defined by NPS Director's Order 12: *Conservation Planning, Environmental Impact Analysis, and Decision Making* (section 2.2) (NPS 2001), the purpose of an action is a broad statement of goals and objectives that the NPS intends to fulfill by taking action. Need is defined as a discussion of existing conditions that need to be changed, problems that need to be remedied, decisions that need to be made, or policies or mandates that need to be implemented. Need is why action is being taken at this time. The following purpose and need statements were developed by the NPS for this plan/EIS. Additional information that supports the purpose and need is provided throughout the other sections of this chapter.

PURPOSE OF THE PLAN

The purpose of the plan/EIS for Big South Fork NRRA and Obed WSR is to analyze alternative approaches, clearly define a strategy, and provide guidance for the next 15 to 20 years to ensure that activities undertaken by owners and operators of private oil and gas rights, as well as activities undertaken by the NPS, are conducted in a manner that protects the resources, visitor use and experience, and human health and safety in the park units.

NEED FOR ACTION

There are over 300 private oil and gas operations within Big South Fork NRRA and Obed WSR. Many of the past and existing oil and gas operations in these NPS units are adversely impacting resources and values, human health and safety, and visitor use and experience; most are not in compliance with federal and state regulations, most notably, the NPS 36 Code of Federal Regulations (CFR), Part 9 Subpart B (see appendix A). In addition, future oil and gas operations have the potential to damage park resources and values. The plan/EIS is needed to provide an efficient and effective strategy for park managers to ensure the units are protected for the enjoyment of future generations. There is also a need for park-specific guidance for the planning efforts of oil and gas owners and operators.

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OBJECTIVES

Objectives are “what must be achieved to a large degree for the action to be considered a success” (Director’s Order 12 [NPS 2001]). All alternatives selected for detailed analysis must meet all objectives to a large degree, as well as resolve purpose and need for action. Objectives for managing oil and gas operations must be grounded in the enabling legislation, purpose, significance, and mission goals of Big South Fork NRRA and Obed WSR, and must be compatible with direction and guidance provided by the general management plan (GMP) for these NPS units.

The following objectives related to the management of non-federal oil and gas operations at Big South Fork NRRA and Obed WSR were developed with park staff:

GENERAL

- Identify and protect resources from adverse impacts from oil and gas operations.
- Provide owners and operators of private oil and gas rights reasonable access for exploration, production, maintenance, and surface reclamation.

WATER RESOURCES

- Protect and enhance water resources.

VEGETATION AND WILDLIFE, INCLUDING LISTED SPECIES OF MANAGEMENT CONCERN (THREATENED, ENDANGERED, AND SPECIAL STATUS SPECIES)

- Protect species of management concern from adverse impacts from oil and gas operations.
- Protect critical habitat from adverse impacts from oil and gas operations.

VISITOR EXPERIENCE, CONFLICTS, AND SAFETY

- Prevent, minimize, or mitigate conflicts between oil and gas operations and visitor use.
- Protect human health and safety from adverse impacts from oil and gas operations.

Cultural Resources

- Protect cultural resources, including those on, or eligible for listing on, the National Register of Historic Places, from adverse impacts from oil and gas operations.

Park Management and Operations

- Provide pertinent guidance to operators to facilitate planning and compliance with NPS regulations.
- Establish an efficient process under the National Environmental Policy Act of 1969 (NEPA) for plugging wells and reclaiming well sites and access roads.

PROJECT SITE LOCATION

Big South Fork National River and Recreation Area

Entrance sign at Big South Fork NRRA.

Big South Fork NRRA encompasses approximately 125,000 acres of rugged terrain on the Cumberland Plateau in northeastern Tennessee and southeastern Kentucky, approximately 70 highway miles northwest of Knoxville, Tennessee (figure 1). The Big South Fork of the Cumberland River (Big South Fork River) begins within the unit at the confluence of the New River and Clear Fork, and flows northward for approximately 49 miles. It is a free-flowing river for approximately 37 of the 49 miles, until it reaches Lake Cumberland (formed by a dam on the river and managed by the U.S. Army Corps of Engineers). The average annual flow of the river (from a U.S. Geological Survey gauge station near Stearns, Kentucky) is 1,760 cubic feet per second (cfs); the maximum discharge recorded at this location was 93,200 cubic feet per second, while the minimum was 11 cfs.

The focal point of the Big South Fork NRRA is the massive gorge, with its sheer bluffs at the gorge rim towering over wooded talus slopes and naturally fluctuating river (and its tributaries) below. The gorge, as defined by the enabling legislation, represents roughly one-half of the total acreage in Big South Fork NRRA (figure 2). The remaining acreage is considered the “adjacent area.” The landscape is dominated by upland and ravine forest communities, although a wide variety of specialized habitats are supported on floodplains, in protected coves and ravines, on moist, north-facing slopes, and on sandstone glades (sandstone caprock with dry, shallow soils). Several parcels of land within the boundaries of Big South Fork NRRA are owned by private citizens, state agencies, and a non-profit organization. Fee-simple private properties within the legislative boundary of Big South Fork are commonly referred to as “deferred properties,” and are shown on figure 2.

Big South Fork National River and Recreation Area
Kentucky and Tennessee

National Park Service
U.S. Department of the Interior

Legend

Figure 1. Big South Fork National River and Recreation Area and Obed Wild and Scenic River Vicinity Map

Interstate	Park Unit Boundary	Lodge
US Highway	Big South Fork Deferred Properties	Picnic Area
State Highway	County Boundary	Administrative Complex
Roads		Horse Camps
Rivers / Creeks		

N

0 5 10 Miles

For Illustrative Purposes Only

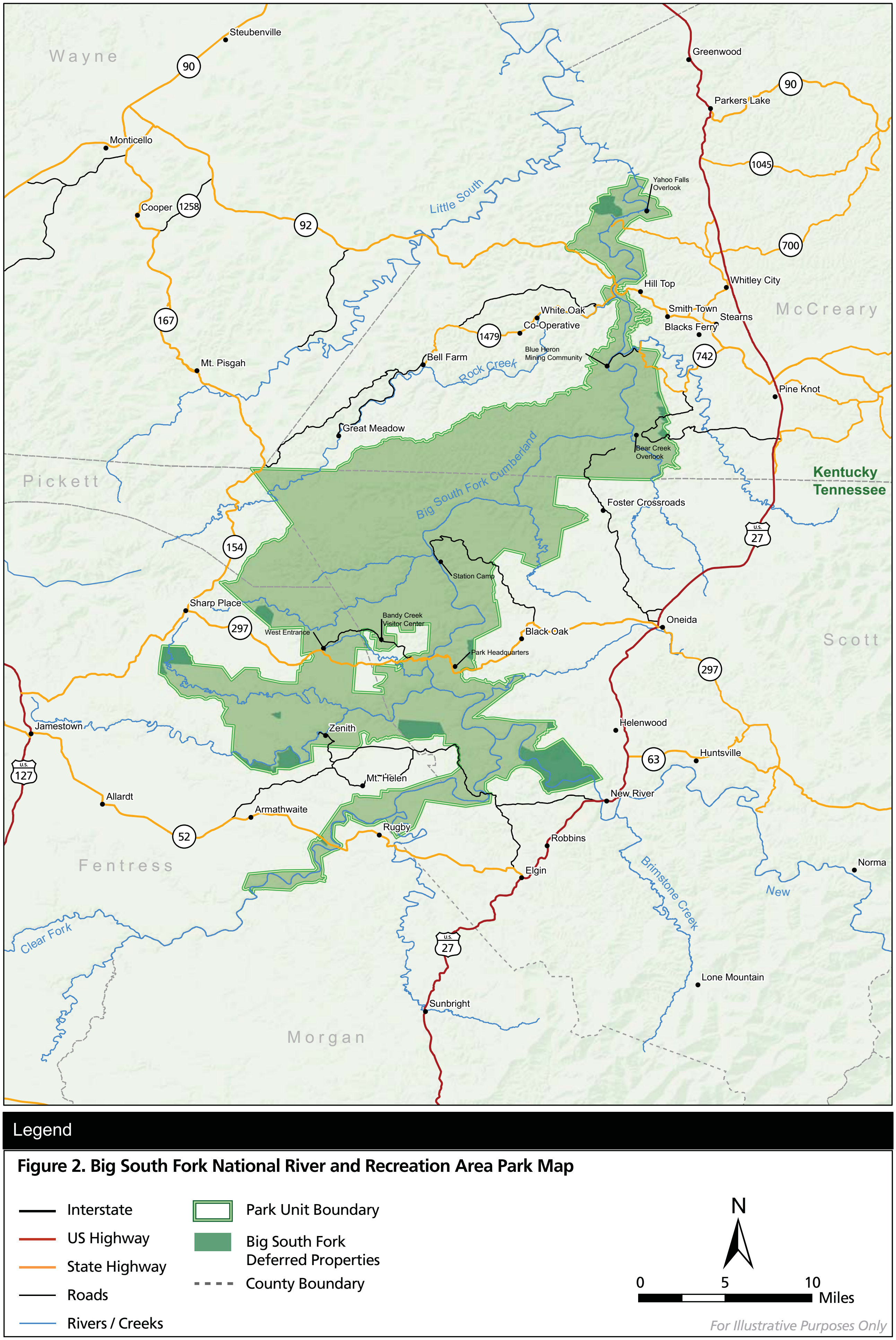
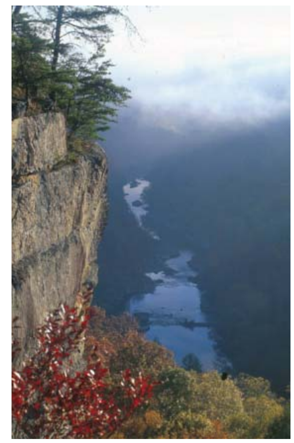


Figure 2. Big South Fork National River and Recreation Area Park Map

OBED WILD AND SCENIC RIVER

The Obed WSR is located in Morgan and Cumberland Counties in eastern Tennessee on the Cumberland Plateau (figure 1). The park encompasses approximately 5,056 acres and includes parts of the Obed River, Clear Creek, Daddy's Creek, and the Emory River (figure 3). Totaling more than 45 miles of surface waters, these rivers and creeks have cut rugged gorges with bluffs as high as 500 feet above the whitewater. The average annual flow of the river (from a U.S. Geological Survey gauge station on the Obed River near Lancing, Tennessee) is 983 cfs; the maximum discharge recorded at this location was 105,000 cfs, while the minimum was less than 1 cubic foot per second. Lands owned by non-profit organizations also occur within the boundaries of Obed WSR.

Water resources and riparian environments are the focal point of the Obed WSR. The quality of the water is considered to be among the best in Tennessee. The terrain of this NPS unit consists of flat to rolling uplands, deep river gorges, and a long line of cliffs. The landscape is dominated by upland and ravine forest communities, although riparian shrub communities, as well as vegetation associated with sandstone glades, cliffs, and rockhouses, are also supported.



View of the Big South Fork of the Cumberland River Gorge.

BACKGROUND

BIG SOUTH FORK NATIONAL RIVER AND RECREATION AREA

The following statements are excerpts from the enabling legislation (Water Resources Development Act of 1974, Public Law (PL) 93-251, 108) and *Final General Management Plan and Environmental Impact Statement* (February 2005) (NPS 2005a) for the Big South Fork NRRA.

Legislative Intent

The Water Resources Development Act of 1974 states that the Big South Fork NRRA was created:

> for the purposes of conserving and interpreting an area containing unique cultural, historic, geologic, fish and wildlife, archeologic, scenic, and recreational values, preserving as a natural, free-flowing stream the Big South Fork of the Cumberland River, major portions of its Clear Fork and New River stems, and portions of their various tributaries for the benefit and enjoyment of present and future generations, the preservation of the natural integrity of the scenic gorges and valleys, and the development of the area's potential for healthful recreation.

When enabling legislation for the Big South Fork NRRA was passed in 1974 (under the Water Resources Development Act of 1974, PL 93-251; 16 United States Code (USC) 460ee), it contained two provisions relating to oil and gas activities within the NPS unit. At 16 USC 460ee (e)(2)(A), Congress stated, "Within the gorge area, no extraction of, or prospecting for minerals, petroleum products, or gas shall be permitted." However, recognizing the importance of oil and gas operations to the local economy, Congress stated (at 16 USC 460ee(e)(3)), "In adjacent areas…prospecting and drilling for petroleum products and natural gas shall be permitted in the adjacent area under such regulations as the Secretary [of the Army] or the Secretary of the Interior…may prescribe to minimize detrimental environmental impact, and such regulations shall provide among other things for an area limitation for each such operation, zones where operations will not be permitted, and safeguards to prevent air and water pollution."

Figure 3. Obed Wild and Scenic River Park Map

For Illustrative Purposes Only

In addition, the enabling legislation for Big South Fork NRRA states that there shall be interagency cooperation related to the protection of water quality:

> …the Secretary of the Interior, after jurisdiction over the National Area has been transferred to him under subsection (b) of this subsection, shall consult and cooperate with other departments and agencies of the United States and the States of Tennessee and Kentucky in the development of measures and programs to protect and enhance water quality within the National Area and to insure that such programs for the protection and enhancement of water quality do not diminish other values that are to be protected under this section.

Purpose and Significance

All units of the national park system were formed for a specific purpose, as well as to preserve significant resources or values for the enjoyment of future generations. The purpose and significance statements identify uses and values that individual NPS plans should support.

Purpose

The purpose of Big South Fork NRRA is stated clearly in its enabling legislation, and includes the following:

- to preserve and interpret the area's cultural, historic, archeological, geologic, fish and wildlife, scenic, and recreational values
- to preserve the free-flowing Big South Fork and portions of its tributaries
- to preserve the natural integrity of the gorge
- to provide healthful outdoor recreation for the enjoyment of the public and for the benefit of the regional economy

Significance

The significance of the Big South Fork NRRA is reflected in the following statements, as presented in the GMP (NPS 2005a) for the unit:

- Dramatic sandstone gorges, imposing bluff lines, some of the nation's largest water-crafted arches, and other notable geologic formations are found throughout the National Area.
- The Big South Fork is a free-flowing river system, flowing unhindered by water development projects except as it enters Lake Cumberland.
- The National Area contains a wide variety of habitats with associated flora and fauna of the Cumberland Plateau in a limited geographic area.
- Extremely large numbers and varieties of archeological, historic, and ethnographic resources, illustrating a long continuum of use, are found in the National Area, including farmsteads eligible for the National Register of Historic Places.

- National Area waters provide habitat for a world-class freshwater mussel assemblage and are an important refuge for many endangered mussel species. Few other river systems support this level of mussel diversity.
- The National Area provides a broad range of natural and cultural resource-based outdoor recreation and educational opportunities.

The Big South Fork River is also significant because it is considered a Tier III Outstanding National Resource Water under the Clean Water Act (CWA). This designation indicates that water quality must be maintained and protected and only short-term changes may be permitted. The Big South Fork River and associated habitats in the river channel support nine endangered species, seven aquatic species and two plants, and the main river and the major tributaries are designated critical habitat for four mussels.

OBED WILD AND SCENIC RIVER

The following statements are excerpts taken from the Wild and Scenic Rivers Act, as well as the *Obed Wild and Scenic River Strategic Plan* (NPS 2005b).

Legislative Intent

The Wild and Scenic River system was established to protect certain selected rivers of the United States, and their immediate environments, that possess outstandingly remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values. In recommending the park unit for inclusion in the National Wild and Scenic Rivers system, the Obed River Wild and Scenic River Study cites the associated rivers as possessing “truly outstanding and remarkable scenic, recreational, geological, and fish and wildlife values” (Bureau of Outdoor Recreation 1976).

Although there are no provisions related to oil and gas operations in the 1976 amendment to the Wild and Scenic Rivers Act that established the Obed WSR (16 USC 1274), the original act (PL 90-542, passed October 2, 1968) does discuss mining and mineral leasing laws. Section 9 of the Wild and Scenic Rivers Act provides for access to valid existing mineral rights “subject to such regulations as the Secretary of the Interior…may prescribe to effectuate the purposes of this Act,” but limits “right or title only to the mineral deposits and such rights only to the use of the surface and the surface resources as are reasonably required to carrying on prospecting or mining operations and are consistent with such regulations as may be prescribed by the Secretary of the Interior…” (§§ 9(a)(i) and 9(a)(ii)).

Purpose

The purpose of this park service unit is to preserve and protect the Obed WSR system and the surrounding area in an essentially primitive condition, with unpolluted waters, for the benefit and enjoyment of present and future generations (NPS 2005b).

Significance

The Obed WSR system is one of the last remaining wild rivers in the eastern United States where high stream gradients are intermingled with quiet, smooth flowing stretches. The system supports ecologically diverse flora and fauna including over two dozen state and federally listed endangered and threatened species, including designated critical habitat for two of the species. It is designated as a Tier III Outstanding Natural Resource Water under the CWA due to its superior water quality, which

Microhabitat*— an extremely localized, small-scale environment, as a cliff ledge or rock overhang.*

supports diverse aquatic and riparian ecosystems (NPS 2005b). The clifflines produce much of the microhabitat for threatened and endangered plants and animals, and they were the selected zones of occupation for prehistoric inhabitants. Today, these clifflines are used as a national destination for climbing and rappelling.

The rivers provide outstanding recreational, educational, and inspirational opportunities for visitors to experience a vestige of primitive America in a unique river gorge environment. Falling steeply off the Cumberland Plateau through pristine narrow and deep gorges, the Obed WSR system provides remarkable scenic vistas. The river gorge encompasses unique Cumberland Plateau geology, including a collection of dramatic sandstone gorges, rock shelters, waterfalls, continuous bluffs, and natural arches (NPS 2005b). The Obed WSR also preserves a number of important archeological sites.

OVERVIEW OF NON-FEDERAL OIL AND GAS MANAGEMENT IN THE NATIONAL PARK SERVICE

Petroleum development in national park units most often occurs where entities other than the federal government own the rights to the oil and gas beneath the surface. Individuals, corporations, state or local governments, Indian tribes, or native corporations may own these "non-federal" rights (NPS 2006a). As of October 2006, approximately 712 non-federal oil and gas wells occurred within 13 national parks in 9 states, with more than 300 in Big South Fork NRRA alone (NPS 2006b). In general, the NPS may permit mineral development in units of the national park system only where: (1) a private mineral right exists (e.g., rights owned by a private individual, corporation, or state) and development of such rights is not specifically prohibited by Congress; (2) actions would not impair park resources, values, or purposes; and (3) the conduct of such activity is performed in accordance with all applicable federal, state and local laws and regulations, and NPS policies (NPS 2006b).

Although these mineral rights fall under the protection of the 5th Amendment of the U.S. Constitution ("No person … shall be deprived of … property without due process of law; nor shall private property be taken for public use without just compensation"), the NPS nonetheless has the authority to regulate these rights to fulfill Congress's mandate to leave park resources and values unimpaired for the enjoyment of future generations (NPS 2006a). To protect park resources, the NPS promulgated regulations for non-federal oil and gas operations on December 8, 1978. The regulations, commonly known as the "9B regulations," are found at 36 CFR 9B. The regulations are presented in appendix A of this plan/EIS.

OPERATORS HANDBOOK FOR NON-FEDERAL OIL AND GAS DEVELOPMENT IN UNITS OF THE NATIONAL PARK SYSTEM

The NPS developed a handbook to assist operators of non-federal oil and gas in units of the national park system. Specifically, the handbook was developed to assist operators in understanding the 9B regulations, preparing a plan of operations or applications required by the 9B regulations, and conducting operations in a manner that protects park resources and values. The handbook is available on the web at http://www2.nature.nps.gov/geology/oil_and_gas/op_handbook.cfm, and provides an overview of the 9B regulations and permitting process, information requirements for each type of oil and gas operation (i.e., exploration, drilling, or production), and sections covering performance bonds, spill control, emergency preparedness plans, as well as operator liability.

NON-FEDERAL OIL AND GAS DEVELOPMENT/MANAGEMENT AT BIG SOUTH FORK NATIONAL RIVER AND RECREATION AREA

Oil and gas fields are located adjacent to and extend into the boundary of Big South Fork NRRA, primarily in the southern portions of the park unit. See figures 4 and 5 for the locations of oil and gas wells within and adjacent to the park units. According to the Big South Fork NRRA GMP, in 1994, 82% of Tennessee's total oil production, and 60% of its total gas production, came from counties within the watershed of the Big South Fork River (Scott, Fentress, Pickett, and Morgan counties) (NPS 2005a). In 2006, 50% of Tennessee's total oil production and 99% of its gas production came from the watershed counties. In 1992, there were 788 actively producing oil wells and 529 actively producing gas wells in this watershed (NPS 2005a). By 2006, there were 829 producing oil wells and 810 producing gas wells in this area (Spradlin, pers. comm., 2007).

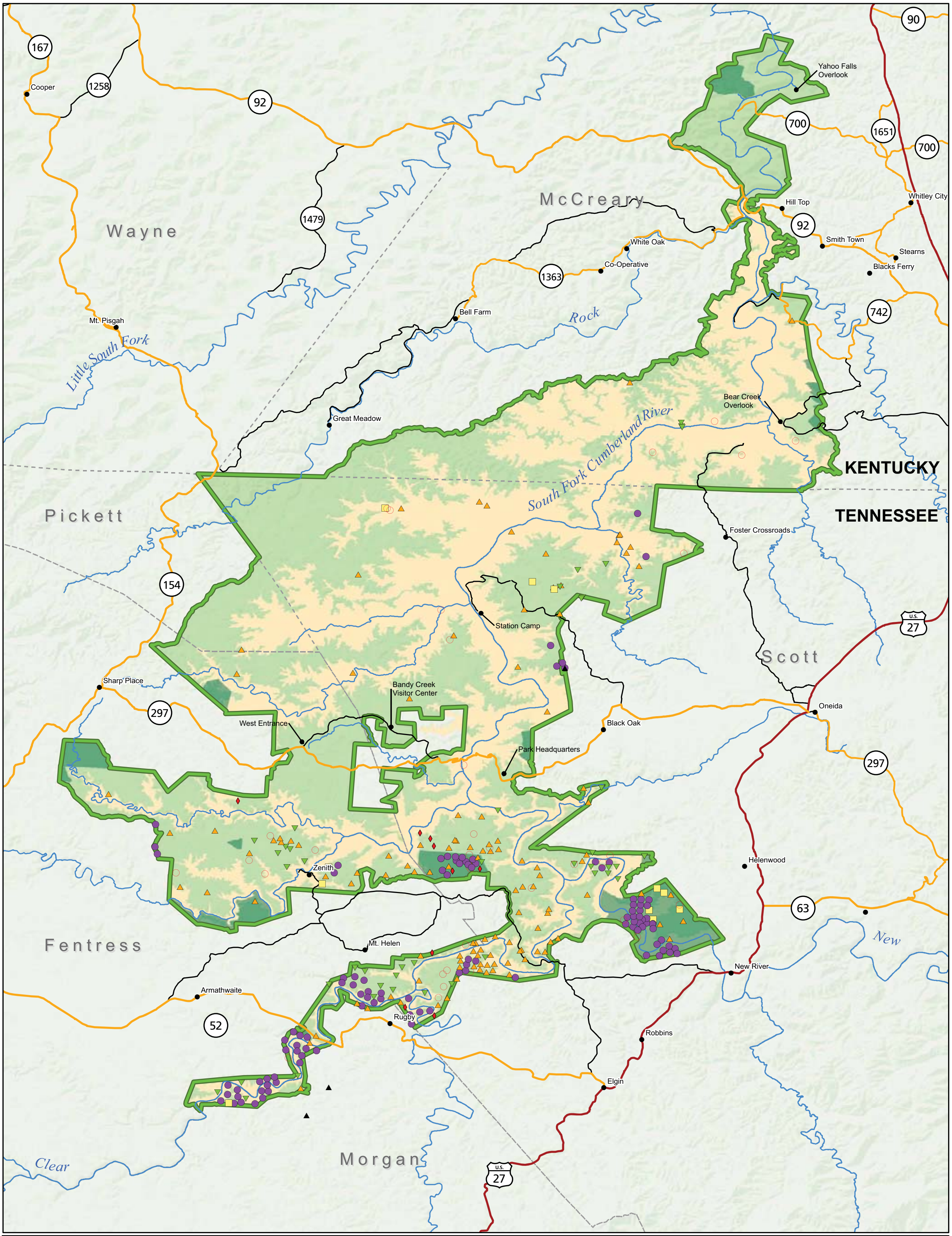
The enabling legislation for the Big South Fork NRRA prohibits oil and gas extraction and development within the designated gorge area, but allows for development in the adjacent areas outside the gorge. Currently, there are more than 300 oil and gas wells within the Big South Fork NRRA (figure 4). The status of these wells has been classified into one of four categories, as follows:

- Unknown: wells for which the NPS does not have sufficient information to verify the location or status
- Actively producing wells: wells that are mechanically capable of being produced and have documented production in the past 12 months
- Inactive wells: wells that have no documented production in the past 12 months
- Plugged and abandoned wells: wells that have been permanently closed by placement of cement plugs
- Orphaned wells: wells that do not have a responsible party

The 12-month timeframe for describing actively producing or inactive wells makes use of the State of Tennessee's requirement for operators to file annual production reports.

No new wells have been drilled in the Big South Fork NRRA since about 1990. Active oil and gas production at Big South Fork NRRA occurs primarily in the south end of the unit, on both deferred properties (fee simple private property within the legislative boundary), as well as on property owned by the United States government. This includes a large, underground natural gas storage operation located in the New River drainage, within one of the largest oil and gas fields in Tennessee (NPS 2005a). Wells with an "inactive" status are candidates to become either actively producing wells or plugged and abandoned wells. NPS records indicate approximately 50 to 60 inactive wells with no responsible party that occur on lands owned by the U.S. government. These wells are candidates for plugging and were recently addressed in a separate action (NPS 2010a).

Some instances of land acquisition at Big South Fork NRRA have resulted in the NPS managing oil and gas wells on lands where both the surface and mineral estate are federally owned but where the petroleum is produced according to an outstanding private lease right. The Bureau of Land Management (BLM) and Minerals Management Service are responsible for collecting any royalties due to the federal government, but are not authorized to issue new federal oil and gas leases. Also, the NPS has become the operator of record for two gas wells as the result of a court decision in a condemnation case.



Legend

Figure 4. Big South Fork National River and Recreation Area Wells

- U.S. Highway
- State Highway
- Roads
- Rivers / Streams
- Park Unit Boundary
- Deferred Properties
- Gorge
- County Boundary

Inventoried Wells

- Active
- Inactive
- Plugged
- Unknown
- Abandoned
- Production Equipment
- Shut-In

N

0 5 10 Miles

For Illustrative Purposes Only

Big South Fork National River and Recreation Area and
Obed Wild and Scenic River
Kentucky and Tennessee

National Park Service
U.S. Department of the Interior

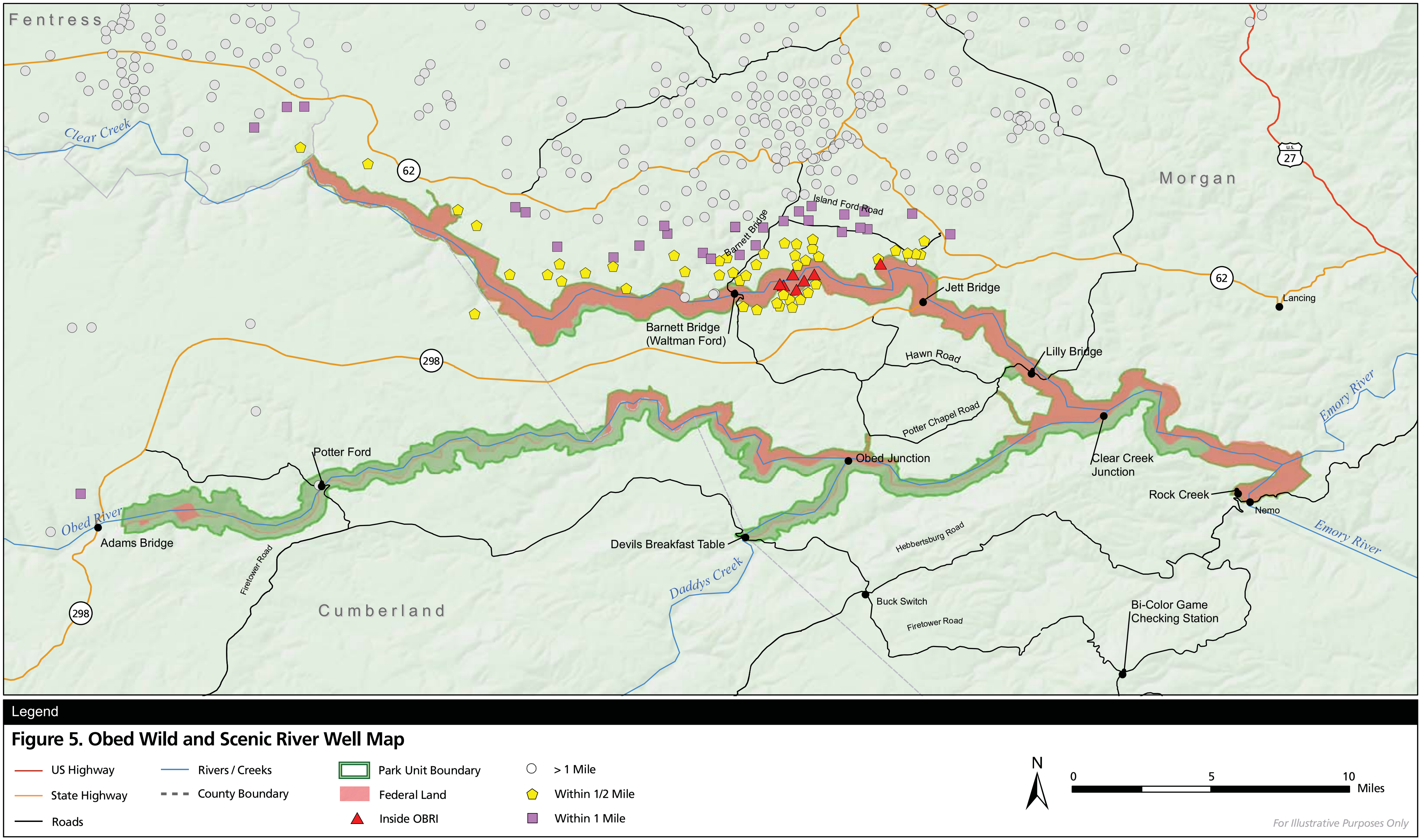


Figure 5. Obed Wild and Scenic River Well Map

NON-FEDERAL OIL AND GAS DEVELOPMENT/MANAGEMENT AT OBED WILD AND SCENIC RIVER

The Obed WSR is located in an area where small accumulations of oil and gas occur at relatively shallow depths. According to the *Water Resources Management Plan* (NPS 1997) for this unit, in 1997 there were 944 oil and gas wells in the Emory River Basin. Although oil and gas exploration in the Obed WSR watershed has declined, there are approximately 71 oil and gas wells located within one mile of the Obed WSR; 44 of these are located less than a half-mile from the unit (figure 5).

Within the Obed WSR, oil and gas exploration is limited, by deed restrictions, to directional drilling from outside the boundary (NPS 1993). However, there are seven oil and gas wells in Obed WSR, including two plugged and abandoned wells. The plugged and abandoned wells may be in need of additional surface reclamation, and for one of the plugged and abandoned wells, only the wellpad is inside the park unit boundary. Three of the five other wells may have leases that have expired, and would thus be required to be plugged and abandoned under state regulations. Two of these five wells are actively producing. All of the operations inside the park unit are subject to existing rights. Existing or new operations inside the Obed WSR can only occur if the rights existed prior to acquisition of the surface estate. Otherwise, these mineral rights may only be exercised through directional drilling, per deed restrictions (NPS 1993), and as a result of the requirements in the 9B regulations (36 CFR 9.41) that call for a 500-foot setback from perennial, intermittent, or ephemeral watercourses.

In 2002, an oil spill and subsequent fire occurred during the exploratory drilling for a well located adjacent to the boundary of the Obed WSR (the Howard/White Unit No. 1 Oil Well). The *Howard/White Unit No. 1 Oil Spill Natural Resources Damage Assessment — Preassessment Phase Report* (NPS 2003a) and a *Damage Assessment Study Plan* (NPS 2004a) have been prepared to address impacts to natural resources within the Obed WSR as a result of the spill and fire. The *Natural Resources Damage Assessment — Preassessment Phase Report* was prepared after collecting ephemeral data that were necessary for determining the fate and effects of the spilled oil, reviewing the results and analyzing the data, compiling the administrative record, and determining that there was injury or potential injury to resources or services potentially affected. Based on the findings presented in these two documents, the Department of the Interior is proceeding with injury quantification and restoration planning to develop alternatives that would restore, replace, or acquire the equivalent of natural resources injured and/or natural resources lost as a result of this incident. The *Damage Assessment Study Plan* (NPS 2004a) outlines the plan to collect the data necessary to conduct an injury assessment in accordance with the Oil Pollution Act.

SCOPING PROCESS AND PUBLIC PARTICIPATION

NEPA regulations require an "early and open process for determining the scope of issues to be addressed and for identifying the significant issues related to a proposed action (40 CFR 1501.7)." To determine the scope of issues to be analyzed in depth in this plan, meetings were conducted with park staff, the public, and other parties with an interest in this plan/EIS. As a result of this scoping effort (see chapter 5 for additional information), several issues were identified as requiring further analysis in this plan.

These issues represent existing concerns, as well as concerns that might arise during consideration and analysis of alternatives. The issues identified during internal and public scoping are presented below.

ISSUES AND IMPACT TOPICS

According to section 2.6 of Director's Order 12, issues describe the relationships between actions and environmental resources (natural, cultural, and socioeconomic). They are usually problems caused by one of the alternatives considered, but can also include questions, concerns, or other relationships, including those that may have benefits. Issues were identified by the NPS through internal, public, and agency scoping. Agencies such as the U.S. Fish and Wildlife Service (USFWS), Kentucky Department for Natural Resources — Division of Oil and Gas Conservation, Tennessee Department of Environment and Conservation — divisions of Water Pollution Control and Natural Areas, as well as tribal entities and members of the public, have provided their input into these issues. A summary of the agency and public scoping activities is available in "Chapter 5: Consultation and Coordination."

Per section 2.9 of Director's Order 12, impact topics are derived from the issues, and should be specific based on the degree to which a resource may be affected. The impact topics derived from the list of issues are discussed in "Chapter 3: Affected Environment," of this plan/EIS. "Chapter 4: Environmental Consequences," examines the extent to which the resources associated with the impact topic would be affected by the actions of a particular alternative.

The following are the issues that have been identified for detailed analysis in this plan/EIS:

Geology and Soils

- Oil and gas activities (including off-road vehicle use; seismic vibrators and detonation; and construction, maintenance, and use of roads, wellpads, production facilities, flowlines, and pipelines) could increase surface runoff; increase soil erosion, rutting, and compaction; and affect the permeability of soils (and other soil characteristics). Poorly maintained wellpads, roads, and other oil and gas operations are currently causing erosion, sedimentation, compaction, and loss of soil productivity.
- The release of hydrocarbons or other contaminating substances from vehicles, equipment, exploration and production operations, flowlines, pipelines, and/or accidental spills during transport could alter the soil's chemical and physical properties. Changes in soil properties could result from direct contact with contaminants or indirectly via runoff from contaminated areas. Poorly maintained wellpads, roads, and other oil and gas operations are currently causing soil contamination in localized areas.
- Use of truck-mounted drill rigs and water trucks could cause compaction and rutting of soils. Incorrect packing and detonation of shotholes can result in blowouts.
- Improperly sited, or poorly maintained or constructed, access roads or pads could result in slope instability or failure.
- Sensitive geomorphic features (such as rock shelters, arches, and chimneys) could be affected by oil and gas operations that involve ground disturbing activities.

Water Resources

- Water quality could be adversely affected by the release of hydrocarbons, produced waters, and/or chemicals from vehicles and equipment, tank batteries, flowlines, and/or pipelines, during construction, exploration and production operations.
- Soil erosion and sedimentation in surface water could be increased by off-road vehicle use, removal or modification of vegetation, construction, and earth moving activities. These

activities could also alter surface or subsurface drainage patterns in the vicinity of operations, which could change streamflow characteristics.

- Oil and gas operations may create a demand for surface water use. Improperly plugged wells or improperly maintained drilling/production operations can lead to contamination of both surface water and groundwater. Both use and contamination of water by oil and gas operations may be in conflict with the demand for available drinking water by nearby towns.

Floodplains and Wetlands

- The siting, maintenance, and use of roads, wellpads, production facilities, tank batteries, flowlines, and/or pipelines in floodplains or wetlands, or the release of hydrocarbons or other contaminants from these operations, would adversely affect floodplain and wetland functions, values and uses (including water quality); groundwater recharge or discharge; fish and wildlife habitat; maintenance of biodiversity; recreational opportunities; and natural beauty. For example, spills and leaks from the Howard/White Unit #1 have caused impacts (e.g., soil and water contamination or harm to vegetation) to floodplains and/or wetlands at Obed WSR.
- In some cases there may be no practicable alternative to locating roads, wellpads, production facilities, and flowlines and pipelines in or across floodplains or wetlands. These activities could potentially harm life; property; floodplain functions, values, and uses; and wetland functions and values (natural moderation of floods, sediment control, maintenance of water quality, groundwater recharge or discharge, habitat for fish and wildlife, maintenance of biodiversity, recreational opportunities, and natural beauty). For example, open drill holes and inactive wells occur in floodplains at Big South Fork NRRA, and some access road crossings occur in the gorge and across upland wetlands. These actions may cause some adverse effects to floodplains or wetlands.
- Reclamation of oil and gas sites (including re-establishing natural contours, surface and subsurface water flow, and natural vegetation communities, as well as controlling non-native vegetation) could restore floodplain and wetland functions and values.

Vegetation, Wildlife and Aquatic Species, Federally Listed Threatened and Endangered Species, and Species of Special Concern (Rare or Unusual Vegetation, Unique or Important Wildlife or Wildlife Habitat, Unique or Important Fish or Fish Habitat, and Species of Special Concern or their Habitat)

- Disturbances and removal of native vegetation associated with oil and gas operations, vehicle use, and surface reclamation could lead to the unintentional spread and establishment of non-native species.
- Disturbance or contamination from oil and gas activities could adversely affect riparian areas and sandstone glades that support rare vegetation and some state-listed species.
- The states of Tennessee and Kentucky have designated rare plant communities that could be adversely affected by oil and gas activities.
- Oil and gas activities (including off-road vehicle use; shothole drilling and detonation; and construction, maintenance, and use of roads, wellpads, production facilities, flowlines, and pipelines) could adversely affect wildlife or wildlife habitat. These activities could increase predation in open areas; increase edge effects and habitat fragmentation; directly harm or kill wildlife; disrupt feeding, denning, or nesting; and increase public access and the associated potential for wildlife poaching.

- Releases of produced waters (brine) generated by oil and gas operations can create salt licks, which may affect the behavior of large mammals such as black bear (*Ursus americanus*) and elk (*Cervus canadensis*).
- Noise from oil and gas operations could adversely affect important wildlife, such as migratory birds.
- Oil spills into the rivers of the Big South Fork NRRA and Obed WSR could adversely impact unique, essential, or important fish or fish habitat, including habitat for host fish that are important in the life cycle of special status mussels found in both NPS units.
- Ongoing oil and gas operations, as well as future oil and gas operations, could adversely affect species of special concern or their habitat, including species federally listed under the Endangered Species Act. Where there is the potential for adverse effects on a species or its habitat, mitigation would be required by the NPS, in consultation with the USFWS and the appropriate state wildlife agencies. Even with these protective measures in place, there is the potential for an incidental take of a federally listed species.
- Changes in hydrologic regime and sedimentation from oil and gas operations could adversely affect the habitats for aquatic species of special concern.
- Brine or hydrocarbon contamination, occurring either on-site or during transportation, has the potential to adversely affect species of special concern or their habitats.
- Reclamation of oil and gas sites could re-establish native vegetation communities and/or drainage patterns that support species of special concern.
- Operational impacts from oil and gas activities could adversely affect riparian areas and sandstone glades that support rare vegetation and some state-listed species.

Cultural Resources (Archeological Resources, Prehistoric/Historic Resources, Cultural Landscapes, and Ethnographic Resources)

- Seismic lines, roads, flowlines, collection lines, and pipeline rights-of-way could increase access to unknown and undiscovered archeological or prehistoric/historic resources, and result in illegal activities such as vandalism, artifact collection, and excavation.
- Ground disturbing activities during seismic exploration, including detonation of seismic explosives; the construction, rehabilitation, and/or use of roads, wellpads, production facilities, tank batteries, and flowlines and pipelines; and containment or cleanup of leaks and spills could alter the distribution of, disturb, or destroy surface or buried archeological materials, and alter the condition of archeological or prehistoric/historic resources.
- Leaks and spills of hydrocarbons or other hazardous and contaminating substances from vehicles and equipment along access roads or from well sites, production sites, or flowlines and pipelines could damage or destroy archeological or prehistoric/historic resources.
- Nine cultural landscapes may be adversely impacted by oil and gas operations.
- Odors, sounds, and visual intrusions from oil and gas operations may adversely affect cultural landscapes and the quality of use of these areas.
- One site, Gun Rock, located at the south end of Big South Fork NRRA, is a local landmark important to the residents of the area. This rock, which has been carved with depictions of various guns over the years, is located near two gas wells. The presence of the gas wells provides access to Gun Rock, which could result in illegal activities such as vandalism.

Soundscapes and Visitor Use and Experience

- Oil and gas operations could pose a threat to human health and safety from a number of sources, including the use of roads by commercial vehicles (particularly vehicles with less maneuverability and visibility); hazardous equipment at wells and production facilities; flowline or pipeline failure; and release of gases from wells (hydrogen sulfide). The spill or release of hydrocarbons or other contaminants could be inhaled, absorbed, or ingested by humans. In addition, people have been known to open the valves on gas wells and light them for a source of heat.
- Oil and gas operations could adversely affect air quality, alter scenic resources, increase background sound levels, and adversely affect water quality. These effects could limit or preclude visitor uses and experiences in certain areas of the park units and create conflicts between recreational users and operators.
- Safety issues arise with oil well pump jacks that are accessible to the public and are started/stopped by an automatic timer.
- Introduced noise from well drilling, compressor stations, well servicing, pump jacks, construction and earth-moving activities, and truck traffic can adversely affect natural soundscapes.

Park Management and Operations

- Additional full-time employees would be required to successfully implement the oil and gas management plan.
- The Special Management Areas (SMAs) proposed as part of some alternatives would create an additional consideration for park management during other planning efforts (e.g., GMP planning, Resource Stewardship planning).

Issues Dismissed from Further Consideration

Issues that are not relevant to this plan/EIS (such as those related to resources that do not occur in the park, or would not be affected by actions proposed in the plan/EIS) were eliminated from further consideration by the planning team. In addition, in some instances park staff considered potential issues for certain resource areas, but because the anticipated impacts were negligible or minor, these topics were also dismissed from further analysis. These issues, and the rationale for dismissing them, include the following:

- **Air Quality**—Congress passed the Clean Air Act in 1970, establishing national policy for preserving, protecting, and enhancing air quality. Also under the Act, Congress mandates the federal land manager to "protect air-quality related values," including visibility, flora, fauna, surface water, ecosystems, and historic resources. It further directs the land manager to "assume an aggressive role in protecting the air quality values of land areas under his jurisdiction… In cases of doubt the land manager should err on the side of protecting the air quality-related values for future generations."

  Both Big South Fork NRRA and Obed WSR are designated Class II air quality areas under the Clean Air Act. Air quality in Class II areas is protected by allowing only limited increases (i.e., allowable increments) over baseline concentrations of pollution for sulfur dioxide, nitrogen dioxide, and particulate matter, provided that National Ambient Air Quality Standards (NAAQS), established by the EPA, are not exceeded. Both Big South Fork NRRA and Obed WSR are located in the Tennessee River Valley-Cumberland Mountains Air Quality Control Region, which is currently in attainment of the NAAQS, but ozone levels are of concern in both parks.

Given the programmatic nature of this plan, the exact locations of future operations are unknown. Therefore, a quantitative screening analysis of impacts was undertaken to determine if air quality impacts would exceed minor levels and if the topic of air quality would be carried forward for further analysis. The NPS Air Resources Division (ARD) has issued guidance for determining the appropriate level of air quality analysis necessary for the proposed action, with appropriate screening levels (NPS 2010c). The screening-level emissions inventory conducted for this plan assumed that the reasonably foreseeable oil and gas activities would occur in a similar distribution as compared to locations of existing activities. All future assumptions were based on the reasonably foreseeable development (RFD) scenario as described in chapter 4 and used throughout the impact analysis.

The screening calculations indicated that expected emissions would be considered minor (>50 and <100 tpy of any pollutant) under the current ARD guidance. Also, all open casing and leaking wells would be eliminated as a result of a current project to plug leaking wells, and similar reductions would occur as other wells are plugged in the future. In addition, all operations under the proposed plan would comply with the recommended mitigation measures contained in appendix B. Since the actions expected under this plan would have a minor or less impact and site-specific mitigations would be included in any plan of operations, air quality was not further analyzed in this EIS.

A detailed description of the air quality background of the parks and the screening analysis can be found in appendix C.

- **Streamflow Characteristics**—Although oil spills and erosion/sedimentation from oil and gas operations could have an effect on streamflow characteristics, the planning team agreed that effects would likely be localized and negligible since spills would be contained and neither sediment entering streams nor releases from sites would be of a volume that would measurably affect water quantity such as stream volume and flow of materials entering streams.
- **Marine/Estuarine Resources**—These resources do not occur at Big South Fork NRRA or Obed WSR.
- **Land Use**—Although oil and gas operations could result in a conversion of some land uses (e.g., the conversion of forested areas to openings associated with a well road and wellpad), these uses would be consistent with the legislative provisions for both NPS units. Another concern was the potential for increased directional drilling from outside the park units, and the potential to affect neighboring land use and private land values surrounding the park units. Land values were addressed in the socioeconomics evaluation discussed later in this section, and any directional drilling outside the park unit boundary would be consistent with similar land uses in the area. Other land use conflicts (e.g., potential noise impacts near visitor use areas) would be mitigated and effects would be negligible, or the impacts would be discussed and analyzed as part of another impact topic, which are summarized in a separate evaluation in “Chapter 4: Environmental Consequences.” Therefore, land use was dismissed from further consideration as an impact topic in this plan/EIS.
- **Unique Ecosystems, Biosphere Reserves, and World Heritage Sites**—There are no Biosphere Reserves or World Heritage Sites within Big South Fork NRRA or Obed WSR. Although the NPS units protect unique ecosystems (including free-flowing rivers) that support habitat for many species of management concern, impacts to these ecosystems would

be discussed and analyzed as part of another impact topic, such as analyzing impacts to species of management concern or their habitats. The alternatives do have the potential to affect those outstandingly remarkable values that were identified in establishing Obed WSR as part of the Wild and Scenic Rivers system. The issues related to natural resources and visitor use and experience described above capture these potential impacts, which are summarized in a separate evaluation in “Chapter 4: Environmental Consequences.”

- **Museum Collections**—The Big South Fork NRRA preserves the fifth largest museum collection in the Southeast Region; however, oil and gas operations would not affect this collection.
- **Socioeconomics**—During internal scoping, the planning team was concerned with the potential effects that implementation of an oil and gas management plan at Big South Fork NRRA and Obed WSR could have on local and regional socioeconomics. In addition to more general concerns about socioeconomics, the planning team sought to address the potential for impacts on local mineral owners and operators and associated businesses that could result from the comprehensive enforcement of federal and state regulatory requirements and other operating stipulations for oil and gas exploration or development in the park units.

  The analysis conducted to determine the potential for impacts to socioeconomics is presented in appendix D. Based on the analysis, which was conducted separately for Big South Fork NRRA and Obed WSR, the planning team concluded that potential adverse impacts to socioeconomics from implementation of this plan/EIS would be long-term and negligible; therefore, this impact topic could be eliminated from further analysis.

  In addition, this plan/EIS should alleviate the potential for delays and associated increases in planning time and costs that come with an operator’s uncertainty regarding applicable legal and policy requirements and mitigation measures. Enforcement of standards, including those for spill prevention and containment as well as roads, would minimize the risk of serious or extensive spills during drilling, production, and transportation that could temporarily affect tourism and the related economy. As a result, implementing the plan could have some long-term beneficial effects.
- **Environmental Justice**—Environmental Justice was eliminated as an impact topic because impacts that may result from oil and gas operations at Big South Fork NRRA and Obed WSR would not disproportionately affect low-income, minority, or special-needs populations.
- **Energy Requirements and Conservation Potential**—Typically, this topic is meant to address construction and maintenance of dwellings or structures for public use, which this plan will not address. However, the plan will have a negligible beneficial effect on energy requirements and conservation potential, both because of the anticipated number of wells that will be plugged, as well as the overall low number of new oil and gas operations that could be developed.
- **Wilderness**—In accordance with NPS *Management Policies 2006* section 6.2.1, the NPS has conducted a wilderness eligibility assessment of all lands within Big South Fork NRRA to determine which areas, if any, meet the criteria for designation as wilderness. Using the NPS’ governing criteria of eligibility, the assessment found that assessed lands in the park: (1) Are not predominantly roadless and undeveloped; (2) are not greater than 5,000 acres in size or of sufficient size as to make practicable their preservation and use in an unimpaired condition; and (3) do not meet the wilderness character criteria listed in the Wilderness Act and NPS *Management Policies 2006*. Based on these findings, the NPS has made a preliminary determination that none of the lands within Big South Fork NRRA warrant further study for possible inclusion in the national wilderness preservation system. This determination will

become final when a Notice of non-eligibility is published in the Federal Register, which is expected to take place in the near future. Given this pending determination of non-eligibility, wilderness character has been dismissed as an impact topic in this document.

- **Wild and Scenic Rivers**—This issue is specific to the Obed WSR, but also applies to Big South Fork NRRA. While the latter is not an officially-designated Wild and Scenic River, the Big South Fork park enabling legislation mimics the Wild and Scenic River designation and requires that impacts as stated under Section "f" of the legislation are addressed. The Wild and Scenic Rivers Act requires, among other things, that outstandingly remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values, shall be preserved in free-flowing condition, and that they and their immediate environments shall be protected for the benefit and enjoyment of present and future generations. Section 7 of the Act is specific to water resources projects; no water resources projects will occur in the Obed WSR or Big South Fork NRRA under this plan. Section 9 of the Act limits mineral extraction activities, subject to valid existing rights. Section 10 of the Act requires that the Obed WSR and Big South Fork NRRA be administered to protect and enhance the values—scenic, recreational, geological, and fish and wildlife—which caused it to be included in the Wild and Scenic River system. These values, called “outstandingly remarkable values,” are inherently included as part of the following impact topics described in chapter 3 and 4: visitor use and experience, geology and soils, water resources, and wildlife and aquatic species. Accordingly, wild and scenic rivers was not included as a separate impact topic.
- **Global Warming**—Climate change is perhaps the most far-reaching and irreversible threat the National Park System has ever faced (NPCA 2007). Climate change in this context refers to a suite of changes occurring in the earth’s atmospheric, hydrologic, and oceanic systems. These changes, including increased global air and ocean temperatures, widespread melting of snow and ice, and rising global average sea level, provide unequivocal evidence that the climate system is warming (IPCC 2007). While the warming trend, commonly referred to as global warming, is discernable over the entire past century and a half, recent decades have exhibited an accelerated warming rate with eleven of the last 12 years ranking among the 12 warmest years on record. Most of the observed temperature increase can be attributed to human activities that contribute heat trapping gases to the atmosphere (IPCC 2007). These “greenhouse gases”, particularly carbon dioxide from the burning of fossil fuels, cause Earth’s atmosphere to act like a blanket and trap the sun’s heat. While the insulating effect (or greenhouse effect) of our atmosphere is important to living systems, the rapid increase in greenhouse gases since the mid 19th century has turned the thermostat up higher than what our systems are adapted to.

  While climate change is a global phenomenon, it manifests itself differently in different places. One of the most dramatic effects of global warming is the impact on extreme weather events. A disrupted climate could affect natural and cultural resources, and is likely to interfere with public use and enjoyment of the park units. Although many places in the world have already observed and recorded changes that can be attributed to climate change, the impacts to Big South Fork NRRA and Obed WSR have not been specifically determined and the actual implications within the lifespan of this plan are unknown. The Intergovernmental Panel on Climate Change affirms that climate change is occurring; however, it is unknown as to the rate and severity of impacts at the park units.

  This plan evaluates climate change in two ways. First, the park has considered the contribution of this plan’s actions to greenhouse gases emissions and because the plan proposes to plug and reclaim far more wells under all alternatives than will be drilled, this plan will have a net beneficial impact on greenhouse gas emissions when compared to the baseline under alternative A. Consequently, the impact of this plan on greenhouse gas contribution and associated climate change has been deemed negligible, and that aspect of climate change is being dismissed. Second, the effects of climate change on park resources are addressed in chapter 3 under the "Vegetation" impact topic.

RELATED LAWS, POLICIES, PLANS, AND CONSTRAINTS

GUIDING LAWS AND POLICIES

NPS Organic Act

By enacting the NPS Organic Act of 1916 (Organic Act), Congress directed the U.S. Department of the Interior and the NPS to promote and regulate the units "to conserve the scenery and the natural and historic objects and wild life therein and to provide for the enjoyment of the same in such a manner and by such a means as will leave them unimpaired for the enjoyment of future generations" (16 USC 1). The Redwood National Park Expansion Act of 1978 reiterates this mandate by stating that the NPS must conduct its actions in a manner that will ensure no "derogation of the values and purposes for which these various areas have been established, except as may have been or shall be directly and specifically provided by Congress" (16 USC 1a-1). Congress further authorized the Secretary of the Interior to "make and publish such rules and regulations as he may deem necessary or proper for the use of the parks…" (16 USC 3).

The Organic Act and its amendments afford the NPS latitude when making resource decisions. Because conservation remains predominant, the NPS seeks to avoid or to minimize adverse impacts on park resources and values. While some actions and activities can cause impacts, the Organic Act prohibits actions that impair park resources unless a law directly and specifically allows for such actions (16 USC 1a-1). An action constitutes an impairment when its effects "harm the integrity of park resources or values, including the opportunities that otherwise would be present for the enjoyment of those resources or values" (NPS 2006c, section 1.4.4). To determine impairment, the NPS must evaluate "the particular resources and values that would be affected; the severity, duration, and timing of the impact; the direct and indirect effects of the impact; and the cumulative effects of the impact in question and other impacts" (NPS 2006c, section 1.4.4; see discussion in "Impairment of National Park Resources," below).

Because park units vary based on enabling legislation, natural resources, cultural resources, and missions, management activities appropriate for each unit and for areas within each unit vary as well. An action appropriate in one unit could impair resources in another unit. Thus, this plan/EIS will analyze the context, duration, and intensity of impacts related to oil and gas operations within Big South Fork NRRA and Obed WSR, as well as the potential for resource impairment, as required by Director's Order 12 (NPS 2001).

IMPAIRMENT OF NATIONAL PARK RESOURCES

In addition to determining the environmental consequences of implementing the preferred and other alternatives, NPS *Management Policies 2006* (section 1.4) requires analysis of management actions to determine whether or not proposed actions would impair a park's resources and values.

The fundamental purpose of the national park system, established by the Organic Act and reaffirmed by the General Authorities Act, as amended, begins with a mandate to conserve park resources and values. NPS managers must always seek ways to avoid, or to minimize to the greatest degree practicable, adverse impacts on park resources and values. However, the laws do give the NPS the management discretion to allow impacts on park resources and values when necessary and appropriate to fulfill the purposes of the park. That discretion is limited by the statutory requirement that the NPS must leave resources and values unimpaired unless a particular law directly and specifically provides otherwise.

An impact on any park resource or value may, but does not necessarily, constitute impairment. An impact would be more likely to constitute impairment to the extent that it affects a resource or value whose conservation is:

- necessary to fulfill specific purposes identified in the establishing legislation or proclamation of the park, or
- key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park, or
- identified in the park's GMP or other relevant NPS planning documents as being of significance.

An impact would be less likely to constitute an impairment if it is an unavoidable result of an action necessary to preserve or restore the integrity of park resources or values and it cannot be further mitigated.

Impairment may result from visitor activities; NPS administrative activities; or activities undertaken by concessioners, contractors, and others operating in the park. Impairment may also result from sources or activities outside the park.

Impairment findings are not necessary for visitor experience, socioeconomics, public health and safety, environmental justice, land use, and park operations, etc., because impairment findings relate back to park resources and values. The determination of impairment for the preferred alternative is found in appendix E.

NPS Management Policies 2006

The NPS *Management Policies 2006* (NPS 2006c) provide the overall foundation, set the framework, and provide direction for management decisions within the NPS. Management policies cover park system planning, land protection, natural resource management, cultural resource management, wilderness preservation and management, interpretation and education, use of the parks, park facilities, and commercial visitor services. The policies guide NPS staff to manage national park system units consistently and professionally to achieve the Congressional mandate of the national park system (NPS 2006c). Adherence to NPS policy is mandatory, unless specifically waived or modified by the Secretary of the Interior, the Assistant Secretary of the Interior, or the Director of the NPS.

Non-Federal Oil and Gas Rights Regulations, 36 CFR 9B

The 36 CFR 9B regulations (see appendix A) govern oil and gas activities that are associated with the exploration and development of non-federal oil and gas rights located within park boundaries where access is on, across, or through federally owned or controlled lands or waters. The legal authority for the 9B regulations stems first from the Property Clause (Art. IV, 3 (2)) and the Commerce Clause (Art. I, 8 (3)) of the U.S. Constitution, and then from the general language contained in sections 1 and 3 of the NPS Organic Act, in which Congress has given the NPS, through the Secretary of the Interior, authority to pass rules and regulations necessary or proper for the use of park units.

Congress's power over federally owned lands is without limitations, and extends to conduct that occurs on or off federal land that affects federal lands. Courts have consistently upheld Congress's broad delegation of authority to federal land management agencies under the Property Clause in a variety of contexts. See Kleppe v. New Mexico, 426 U.S. 526 (1976); Stupak-Thrall v. United States, 70 F.3d 881 (6th Cir. 1995) (upholding Forest Service's authority to regulate privately held surface rights to a lake within a wilderness area); Duncan Energy Co. v. Forest Service, 50 F.3d 584 (8th Cir. 1995) (upholding Forest Service's authority to regulate activities related to private mineral rights underlying national forests); United States v. Vogler, 859 F.2d 638 (9th Cir. 1988) (upholding NPS regulation of access to a private mining claim in a park); Free Enterprise Canoe Renter's Assoc. v. Watt, 711 F.2d 852 (8th Cir. 1983) (upholding NPS regulations requiring permit for canoe rental businesses located outside park); Minnesota v. Block, 660 F.2d 1240 (8th Cir. 1981) (upholding Forest Service regulation of snowmobile activities on state land).

A copy of these regulations is provided in appendix A, which also describes the application of the 36 CFR 9B regulations.

National Environmental Policy Act of 1969, as Amended

NEPA §102(2)(c) requires that an EIS be prepared for proposed major federal actions that may significantly affect the quality of the human environment.

Director's Order 12: Conservation, Planning, Environmental Impact Analysis, and Decision-making

NPS Director's Order 12 and its accompanying handbook (NPS 2001) lay the groundwork for how the NPS complies with NEPA. Director's Order 12 and the handbook set forth a planning process for incorporating scientific and technical information and for establishing an administrative record for NPS projects.

Director's Order 12 follows the Council on Environmental Quality regulations and requires that impacts to park resources be analyzed in terms of their context, duration, and intensity. It is crucial for the public and decision-makers to understand the implications of those impacts in the short- and long-term, cumulatively, and within context, based on an understanding and interpretation by resource professionals and specialists. Director's Order 12 also requires that an analysis of impairment to park resources and values be made as part of the NEPA document.

Global Warming Executive Order and Policies

Executive Order 13423—Issued on January 24, 2007 by President George W. Bush, it requires federal agencies to "conduct their environmental, transportation, and energy-related activities under the law in support of their respective missions in an environmentally, economically and fiscally sound, integrated, continuously improving, efficient, and sustainable manner." It includes requirements for the reduction of greenhouse gases and other energy and water conservation measures. The order requires agencies to reduce greenhouse gas emissions by 3% annually through the end of fiscal year 2015, or 30% by the end of fiscal year 2015, relative to the baseline of the agency's energy use in fiscal year 2003.

Executive Order 13514—The new executive order, signed on October 5 2009, requires agencies to measure, manage, and reduce greenhouse gas emissions toward agency-defined targets. The order also requires agencies to meet a number of energy, water, and waste reduction targets, including:

- 30% reduction in vehicle fleet petroleum use by 2020;
- 26% improvement in water efficiency by 2020;

- 50% recycling and waste diversion by 2015;
- 95% of all applicable contracts will meet sustainability requirements; and
- Implementation of the 2030 net-zero-energy building requirement.

The order institutes a framework for reporting and accountability regarding each agency's sustainability performance starting in 2011.

Department of the Interior (DOI) Secretarial Order 3226—Issued on January 19, 2001, the order ensures that climate change impacts are taken into account in connection with Departmental planning and decision making.

DOI Secretarial Order 3289—On September 14, 2009, Secretary of the Interior Ken Salazar signed Secretarial Order No. 3289, which establishes as priorities the development of environmentally responsible renewable energy on our nation's public lands, and the protection of "our country's water, land, fish and wildlife, and cultural heritage and tribal lands and resources from the dramatic effects of climate change that are already occurring – from the Arctic to the Everglades." In addition, the secretarial order establishes a framework through which Interior bureaus will coordinate climate change science and resource management strategies to address climate change. The newly established framework consists of: a Climate Change Response Council to coordinate DOI's response to the impacts of climate change; eight DOI regional Climate Change Response Centers to synthesize climate change impact data; and a network of Landscape Conservation Cooperatives to engage DOI and federal agencies, local and state partners, and the public to craft practical, landscape-level strategies for managing climate change impacts within the eight regions.

NPS Management Policies 2006—Section 4.7.2 states that "Parks containing significant natural resources will gather and maintain baseline climatological data for reference." Management Policies also state that "The Service will use all available authorities to protect park resources and values from potentially harmful activities…NPS managers must always seek ways to avoid, or minimize to the greatest degree possible, adverse impacts on park resources and values."

Section 9.1.7 requires the NPS to interpret for the public the overall resource protection benefits from the efficient use of energy, and to actively educate and motivate park personnel and visitors to use sustainable practices in conserving energy.

Statutory Provisions for Recovery of Damages

The NPS is responsible under the 1916 NPS Organic Act and a variety of other statutes (see NPS *Management Policies 2006*) for the management, protection, and conservation of park resources and values in a manner that will leave them unimpaired for the enjoyment of future generations. Among these statutes, there are four that specifically allow the NPS to recover civil damages and agency costs from any person who destroys, causes the loss of, or injures any park system resource: (1) The Comprehensive Environmental Response, Compensation and Liability Act as amended, 42 USC 9601 et seq.; (2) The Oil Pollution Act, 33 USC 2701-2761; (3) The Federal Water Pollution Control Act or CWA, 32 USC 1251-1387; and (4) the Park System Resource Protection Act (PSRPA), 16 USC 19jj. The damages recovered are then used to restore, replace, or acquire the equivalent of the resources that were lost or injured.

The NPS authority under these four statutes is derived from the delegated authority of the Secretary of the Interior. The first three statutes authorize the NPS to act as trustee for natural resources injured as a result of releases of hazardous substances or discharges, or threats of discharge of oil affecting the national park system. The Secretary's authority as trustee under these three statutes covers natural resources and natural resource services belonging to, managed by, held in trust by, appertaining to, or otherwise controlled by the Department of the Interior. This authority may be a shared authority. Trusteeship for some resources may overlap with other DOI bureaus, other federal agencies, and states or federally recognized tribes. It is the policy of the Department of the Interior to exercise, as appropriate, its natural resource trusteeship to the fullest extent authorized by law and seek recovery of damages for injury to trust resources in order to accomplish restoration of the resource.

The fourth statute (PSRPA) provides the NPS its own separate authority to collect damages for injury to park resources, which is not restricted to injury to natural resources caused by oil spills or hazardous substance releases. It allows the NPS to seek recovery of damages for injury to any park system resource resulting from any incident caused by a person or instrumentality. PSRPA imposes strict liability (i.e., without fault) on individuals who cause injury to park system resources, and allows the NPS to recover and retain compensation through settlements and/or litigation to protect and restore injured park system resources. In addition, this law allows the NPS to recover its costs for actions taken in responding to incidents that cause injury to park system resources, and actions taken to abate or minimize the imminent risk of injury to park system resources caused by the incident.

Tennessee Statutory Provisions on the Reversion of Mineral Rights Due to Non-Use (TN Code 66-5-108, 67-5-804, 809)

In Tennessee, mineral interests must be "used" during any 20-year period or the rights to the minerals may be relinquished to the surface owners (Tennessee Code Annotated, §66-5-108). There are a number of ways a mineral interest may be considered "used" under Tennessee law. The most apparent use is that there are actually minerals being produced under the interest. But such an interest will also be considered "in use" if: (1) there are operations involving the injection, withdrawal, storage, or disposal of water, gas, or other fluid substances; (2) when rentals or royalties are being paid to the owner for the purposes of delaying or enjoying the use of such rights; or (3) when such activities are carried out on a tract where the interest in question may be "unitized or pooled for production purposes"; or (4) payment of taxes on the right by the possessor, subject to certain caveats (Tennessee Code Annotated, §66-5-108(b)(3). Tax payments must be coupled with the owner's identification and claim of mineral interests at the county level. A statement of claim is a simple affidavit, signed by the mineral rights owner, that contains information on the right and declaration as to his or her interest in it. If a mineral rights owner fails to pay taxes and/or file a timely statement of claim the ownership of the subsurface rights would be relinquished to the surface owners.

Where the mineral estate is not being "used" as defined by Tennessee law, the mineral estate may revert back to the surface owner. The NPS will evaluate mineral estate ownership and the potential for reversion before approving a plan of operations. In addition, the NPS will evaluate the potential for reversion before undertaking restoration and reclamation activities, including when reversion occurs under the authority of 16 USC 19jj. If a mineral interest is acquired by the NPS through this process, the previous owner can no longer use the mineral. In relation to Big South Fork NRRA and Obed WSR, if owners of mineral rights beneath federally owned lands in Tennessee do not use these interests or file a statement of claim, their rights would be forfeited to the NPS.

Tennessee and Kentucky Well Spacing Requirements

Chapter 1040-2-4 of the Rules of the Tennessee State Oil and Gas Board Statewide Order No. 2 requires 10- to 160-acre spacing and 330- to 1,320-foot setbacks from property lines. Title 805, Chapter 1, Sections 100 and 130 of the Kentucky Administrative Regulations require approximately 3- to 574-acre spacing, as well as 400 to 1,000 feet between wells, and 200 to 500 feet from mineral boundaries.

Other Legislation, Compliance, and Policies

Table 1 lists many, but not all, of the other legal and policy mandates governing non-federal oil and gas operations, and the resources and values afforded protection under these statutes, regulations, executive orders, and policies. Many of the legal and policy mandates listed in the following table are summarized in appendix B.

TABLE 1. LEGAL AND POLICY MANDATES PERTAINING TO NON-FEDERAL OIL AND GAS OPERATIONS

Authorities	Resources and Values Afforded Protection
National Park Service Statutes and Applicable Regulations	
National Park System General Authorities Act, 16 USC 1a-1 et seq.	All resources, including air resources, cultural and historic resources, natural resources, biological diversity, human health and safety, endangered and threatened species, visitor use and experience, and visual resources
NPS Omnibus Management Act of 1998, 16 USC 5901 et seq.	Any living or non-living resource
NPS Non-federal Oil and Gas Rights regulations – 36 CFR 9B	All resources, including air resources, cultural and historic resources, natural resources, biological diversity, human health and safety, threatened and endangered species, and visitor use and experience
Park System Resource Protection Act, 16 USC 19jj	Any living or non-living resource that is located within the boundaries of a unit of the national park system, except for resources owned by a non-federal entity
Other Applicable Federal Laws and Regulations	
American Indian Religious Freedom Act, as amended, 42 USC 1996 – 1996a; 43 CFR 7	Cultural and historic resources
Antiquities Act of 1906, 16 USC 431-433; 43 CFR 3	Cultural, historic, archeological, paleontological resources
Archeological Resources Protection Act of 1979, 16 USC 470aa – 470mm; 18 CFR 1312; 36 CFR 296; 43 CFR 7	Archeological resources
Clean Air Act, as amended, 42 USC 7401-7671q; 40 CFR 23, 50, 51, 52, 58, 60, 61, 82, and 93; 48 CFR 23	Air resources
Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended, 42 USC 9601-9675; 40 CFR 279, 300, 302, 307, 355, and 373	Human health and welfare and the environment
Endangered Species Act of 1973, as amended, 16 USC 1531-1544; 36 CFR 13; 50 CFR 10, 17, 23, 81, 217, 222, 225, 402, and 450	Plant and animal species or subspecies and their habitat, which have been listed as threatened or endangered by the USFWS or the National Marine Fisheries Service
Farmland Protection Policy Act, 7 USC 4201- 4209, 7 CFR 658	Prime and unique farmland and soils
Federal Insecticide, Fungicide, and Rodenticide Act, as amended (commonly referred to as Federal Environmental Pesticide Control Act of 1972), 7 USC 136 et. seq.; 40 CFR 152-180, except Part 157	Human health and safety and the environment
Federal Land Policy and Management Act of 1976, 43 USC 1701 et seq.; 43 CFR 2200 for land exchanges and 43 CFR 1700-9000 for all other BLM activities	Federal lands and resources administered by the BLM

TABLE 1. LEGAL AND POLICY MANDATES PERTAINING TO NON-FEDERAL OIL AND GAS OPERATIONS

Authorities	Resources and Values Afforded Protection
Federal Water Pollution Control Act of 1972 (commonly referred to as Clean Water Act), 33 USC 1251 et seq.; 33 CFR 320-330; 40 CFR 110, 112, 116, 117, 122, and 230-232	Water resources, wetlands, and waters of the United States
Fish and Wildlife Coordination Act, 16 USC 661-666c	Water resources, fish, and wildlife
Historic Sites, Buildings, and Antiquities Act (Historic Sites Act of 1935), 16 USC 461-467; 18 CFR 6; 36 CFR 1, 62, 63, and 65	Historic sites, buildings, and objects
Lacey Act, as amended, 16 USC 3371 et seq.; 15 CFR 904; 50 CFR 10, 11, 12, 14, and 300	Fish, wildlife, and vegetation
Migratory Bird Treaty Act as amended, 16 USC 703-712; 50 CFR 10, 12, 20, and 21	Migratory birds
National Environmental Policy Act of 1969, 42 USC 4321 et seq.; 40 CFR 1500-1508	Human environment (cultural and historic resources, natural resources, biodiversity, human health and safety, socioeconomic environment, and visitor use and experience)
National Historic Preservation Act of 1966, as amended, 16 USC 470 et seq.; 36 CFR 18, 60, 63, 78, 79, and 800	Cultural and historic properties listed in or determined to be eligible for listing in the National Register of Historic Places
Native American Graves Protection and Repatriation Act, 25 USC 3001-3013; 43 CFR 10	Native American human remains, funerary objects, sacred objects, and objects of cultural patrimony
Noise Control Act of 1972, 42 USC 4901-4918; 40 CFR 211	Human health and welfare
Oil Pollution Act, 33 USC 2701-2762; 15 CFR 990; 30 CFR 253; 33 CFR 135 and 150; 40 CFR 112	Water resources and natural resources
Pipeline Safety Act of 1992, 49 USC 60101 et seq.; 49 CFR 190-199	Human health and safety and the environment
Resource Conservation and Recovery Act, 42 USC 6901 et. seq.; 40 CFR 240-282; 49 CFR 171-179	Natural resources and human health and safety
Rivers and Harbors Act of 1899, as amended, 33 USC 401 et. seq.; 33 CFR 114, 115, 116, 320-325, and 333	Shorelines and navigable waterways, tidal waters, and wetlands
Safe Drinking Water Act of 1974, 42 USC 300f et seq.; 40 CFR 141-148	Human health and water resources
Wild and Scenic Rivers Act of 1968, 16 USC 1271 et seq.; 36 CFR 297	Water resources, recreational values, geologic resources, fish and wildlife, historic, and cultural and other similar values
Enabling Act for Big South Fork National River and Recreation Area (Water Resources Act of 1974) 16 USC 460ee	Cultural, historic, geologic, fish, wildlife, and archeological resources; scenic and recreational values
Enabling Act for Obed Wild and Scenic River, PL 90-542, 16 USC 1274	Rivers, geologic, fish and wildlife, historic, cultural resources; recreational and scenic values
Executive Orders	
Executive Order No. 11593 – Protection and Enhancement of the Cultural Environment, 36 Fed. Reg. 8921 (1971), 3 CFR 1971 Comp., 36 CFR 60, 61, 63, and 800	Cultural resources

TABLE 1. LEGAL AND POLICY MANDATES PERTAINING TO NON-FEDERAL OIL AND GAS OPERATIONS

Authorities	Resources and Values Afforded Protection
Executive Order No. 11644 – Use of Off-Road Vehicles on the Public Lands, 37 Fed Reg. 2877 (1972) reprinted in 42 USC 4321, as amended by Executive Order No. 11989 (1977), 42 Fed. Reg. 26959; Executive Order No. 12608 (1987), 21, 52 Fed. Reg. 34617	Natural and cultural resources; aesthetic and scenic values
Executive Order No. 11988 – Floodplain Management, 42 Fed. Reg. 26951 (1977), 3 CFR 121 Comp., as amended by Executive Order No. 12148 (1979), 44 Fed. Reg. 43239, 3 CFR 1979 Comp., p. 412	Floodplains, human health, safety, and welfare
Executive Order No. 11990 – Protection of Wetlands, 42 Fed. Reg. 26961 (1977), 3 CFR 121	Wetlands
Executive Order No. 12088 – Federal Compliance with Pollution Control Standards, 43 Fed. Reg. 47707 (1978); as amended by Executive Order No. 12580 – Superfund Implementation, 52 Fed. Reg. 2923 (1987)	Natural resources, human health and safety
Executive Order No. 12630 – Governmental Actions and Interference with Constitutionally Protected Property Rights, 53 Fed. Reg. 8859 (1988)	Private property rights, public funds
Executive Order No. 12898 – Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, amended by Executive Order No. 12948, 60 Fed. Reg. 6379 (1995)	Human health and safety
Executive Order No. 13007 – Indian Sacred Sites, 61 Fed. Reg. 26771 (1996)	Native Americans' sacred sites
Executive Order No. 13112 – Invasive Species, 64 Fed. Reg. 6183 (1999), as amended by Executive Order 13286, 68 Fed. Reg. 10619 (2003)	Vegetation and wildlife
Executive Order No. 13186 – Responsibilities of Federal Agencies to Protect Migratory Birds, 66 Fed. Reg. 3853 (2001)	Migratory birds
Executive Order No. 13212 – Actions to Expedite Energy-Related Projects, 66 Fed. Reg. 28357 (2001), as amended by Executive Order No. 13302, 68 Fed. Reg. 27429 (2003)	Production, transmission, and conservation of energy
Executive Order No. 13352 – Facilitation of Cooperative Conservation, 69 Fed. Reg. 52989 (2004)	Natural resources, property rights, and public health and safety
Federal Policies, Guidelines, and Procedures	
NPS *Management Policies 2006* (NPS 2006c)	All resources including air resources, cultural and historic resources, natural resources, biological diversity, human health and safety, endangered and threatened species, visitor use and experience, and visual resources
Department of the Interior, Departmental Manual, 516 DM 1 -15, NEPA policies (2005)	All resources including cultural resources, historic resources, natural resources, and human health and safety
Department of the Interior, Departmental Manual, 517 DM 1, Pesticides (1981)	Human health and safety and the environment
Department of the Interior, Departmental Manual, 519 DM 1 - 2, Protection of the Cultural Environment (1994)	Archeological, prehistoric resources, historic resources, Native American human remains, and cultural objects

TABLE 1. LEGAL AND POLICY MANDATES PERTAINING TO NON-FEDERAL OIL AND GAS OPERATIONS

Authorities	Resources and Values Afforded Protection
Department of the Interior, Departmental Manual, 520 DM 1, Protection of the Natural Environment – Floodplain Management and Wetlands Protection Procedures (2001)	Floodplains and wetlands
Department of the Interior, Onshore Oil and Gas Order Number 2, Section III, Drilling Abandonment Requirements, 53 Fed. Reg. 46,810 – 46,811 (1988)	Human health and safety
NPS Director's Order 12 and Handbook – Conservation Planning, Environmental Impact Analysis, and Decision Making (NPS 2001)	All resources including natural resources, cultural resources, human health and safety, socioeconomic environment, and visitor use
NPS Director's Order 28 – Cultural Resource Management (NPS 1998c)	Cultural, historic, and ethnographic resources
NPS Director's Order 28A – Archeology (NPS 2004c)	Archeological resources
NPS Director's Order 47 – Soundscape Preservation and Noise Management (NPS 2000)	Natural soundscapes
NPS Director's Order and Reference Manual 53 – Special Park Uses (NPS 2005e)	All resources, including air resources, cultural and historic resources, natural resources, biological diversity, human health and safety, endangered and threatened species, visitor use and experience, and visual resources
NPS Reference Manual 77 – Natural Resources Management (NPS n.d.b)	Natural resources
NPS Director's Order and Procedural Manual 77-1, Wetland Protection (NPS 2002b)	Wetlands
NPS Director's Order and Procedural Manual 77-2, Floodplain Management (NPS 2003d)	Floodplains
Secretary of the Interior's Standards and Guidelines for Archeology and Historic Preservation, 48 Fed. Reg. 44716 (NPS 1983), also published as appendix F of NPS Director's Order 28, Cultural Resource Management	Cultural and historic resources
Government-to-Government Relations with Native American Tribal Governments, Presidential Memorandum (April 29, 1994)	Native Americans – tribal rights and interests
Selected Kentucky and Tennessee Laws and Regulations	
TN Code, Title 60, Oil and Gas (2006)	Permitting and operations – public health and safety
TN Code, Title 68, Health and Safety and Environmental Protection (2006)	Permitting and operations – all resources, public health and safety
TN Code, Title 70, Wildlife Resources (2006)	Plants and wildlife
KY Rev. Stat. Title 28, Mines and Minerals (2005) Title 805 040 – 170	Permitting and operations – public health and safety
KY Rev. Stat. Title 12, Conservation and State Development (2005)	All resources, public health and safety

Both state and federal law govern the conduct of oil and gas operations at Big South Fork NRRA and Obed WSR. The states of Kentucky and Tennessee have such laws, which are listed below and summarized in appendix B. However, to the extent that state laws conflict with the federal statutory and regulatory requirements governing the exercise of non-federal oil and gas rights at the park units, the state law must yield to federal requirements.

Relationship to Planning Documents for Big South Fork National River and Recreation Area

The following plans for Big South Fork NRRA were considered in the development of this plan/EIS.

Big South Fork National River and Recreation Area Final General Management Plan/Environmental Impact Statement (2005)

The purpose of the GMP for Big South Fork NRRA is to provide a clearly defined direction for resource protection and visitor use at the park unit for a period of 15 to 20 years (NPS 2005a). Through the GMP planning process, the NPS reiterated the need for an oil and gas management program, to include developing an oil and gas management plan, completing plans of operations, plugging inactive wells, and reclaiming disturbed lands. Aspects of the plan that relate to oil and gas management are summarized below (for more detail, refer to the GMP (NPS 2005a)).

Management Zones

The GMP delineates several management zones within the park and outlines the desired resource conditions and setting, desired visitor experience, and the kinds/levels of management appropriate in each zone. Oil and gas development is recognized as an allowable activity per the enabling legislation of Big South Fork NRRA in the GMP. While identifying which zones are appropriate for oil and gas operations in the GMP, the NPS acknowledged the potential resource and visitor use conflicts associated with these legitimate operations.

The Natural Environment Recreation Zone, the Sensitive Resource Protection Zone, and the All-Terrain Vehicle Planning Area are the three zones in which the GMP identified the potential for oil and gas activities (NPS 1995a). The general application of these zones and their desired conditions are summarized in table 2. For additional details and maps, refer to the GMP (NPS 2005a).

TABLE 2. GENERAL MANAGEMENT PLAN ZONES FOR BIG SOUTH FORK NATIONAL RIVER AND RECREATION AREA

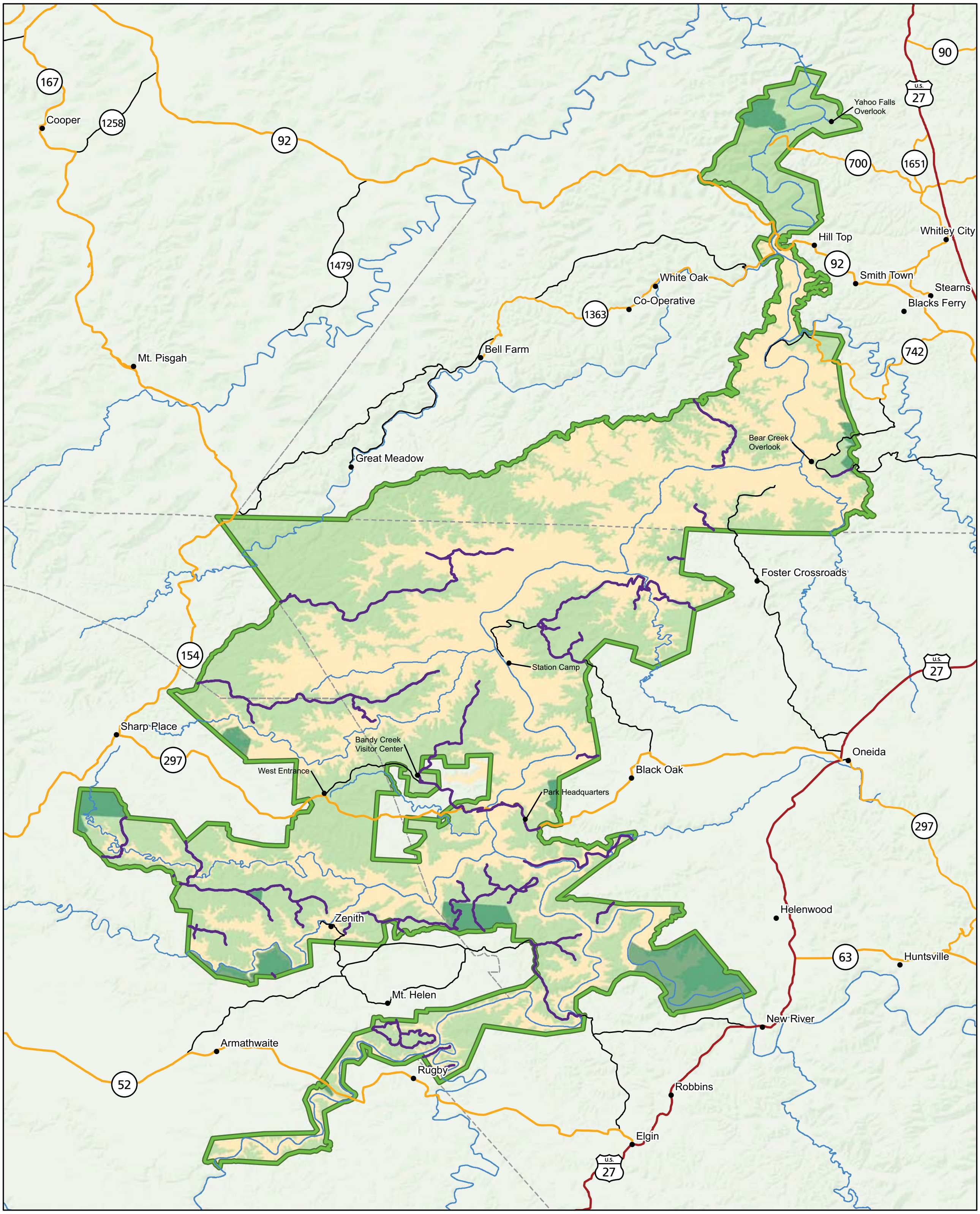
Zone/Planning Area	General Application	Desired Resource Conditions and Setting
Natural Environmental Recreation	This covers most of the park unit and is applied to natural landscape areas suitable for and capable of sustaining dispersed recreation. It includes a variety of environments from ridges to valleys and is typically forested.	Natural processes would be protected within this zone. A predominantly natural condition would be readily apparent to the visitor and would allow natural succession into mature forest. Some areas may be managed to promote certain vegetation types, such as native grasses.
Sensitive Resource Protection	This zone includes natural and cultural areas and features particularly vulnerable or sensitive to damage or deterioration by natural causes or human disturbance, including sensitive resources that have been previously impacted. Specific resource types (such as cliff edges, rock shelters, and threatened or endangered species) that are included within this unit are addressed individually.	Resources in this zone would reflect natural processes and would be carefully protected from unnatural degradation. Cultural resources would reflect specific management objectives or desired treatments. Tolerance for degradation due to human interaction is extremely low.
All-Terrain Vehicle Planning Area	Not really a zone, the GMP designates the All-Terrain Vehicle Planning Area in two locations near Darrow Ridge where specifically designated all-terrain vehicle trails would be considered. Initial trail selection would be considered experimental, with expansion or elimination considered after evaluation.	Because this planning area is a use-oriented overlay on the Natural Environment Recreation Zone, the desired resource conditions would remain the same as described above for that zone. The GMP also acknowledges the need for further planning to address the conflicts between this potential experimental area and oil and gas operations.

Source: NPS 2005a.

Road and Trail Classifications and Standards

While the GMP outlines road and trail classifications and standards (see appendix G) that were incorporated into the plugging and reclamation standards discussed in chapter 2, the classification and application of standards to any roads associated with current or new operations would ultimately be determined during preparation of operation plans.

While this plan/EIS for Big South Fork NRRA addresses the specifics of road standards for non-federal oil and gas operations (see chapter 2), the NPS did address the use of oil and gas roads for recreational purposes in the GMP for the park unit. Currently, many oil and gas access routes are being used as routes by off-highway vehicles and horses where the public has access, creating safety, maintenance, and resource concerns. To address these issues, the NPS identified some recreational routes suitable for public use, as well as access to oil and gas operations, as part of the official roads and trails system at Big South Fork NRRA (see figure 6). These roads are discussed further in the "Road Standards" section of chapter 2, as well as in appendix G.



Legend

Figure 6. Roads and Trails with Recreational Uses that Provide Oil and Gas Access

- U.S. Highway
- State Highway
- Roads
- Rivers / Streams
- County Boundary
- Park Unit Boundary
- Deferred Properties
- Gorge
- Oil and Gas Access Road

For Illustrative Purposes Only

Big South Fork National River and Recreation Area Resource Management Plan (1996)

The Resource Management Plan for Big South Fork NRRA identifies the present status of natural and cultural resources of the park at the time the plan was prepared (NPS 1996), as well as an overview of the resource management programs and needs.

The second highest priority identified for the natural resources management program in the Resource Management Plan is the minerals management program. The Resource Management Plan calls for plan and permit reviews, monitoring of mineral activities, site reclamation work, data maintenance, coordination with various agencies, and investigations of oil spills and other unusual or highly detrimental disturbances. Funding and staff levels were assessed and considered inadequate, especially in light of increased oil and gas activity (NPS 1996).

The Resource Management Plan also identifies goals and issues associated with resource management, including the following that are relevant to oil and gas management:

- developing an action plan and priority list for oil and gas drilling impacts on groundwater
- implementing plugging and reclamation, especially in the gorge
- implementing the 9B regulations
- reviewing all operations in the adjacent area for compliance with the 9B regulations
- determining mineral ownership in the adjacent area and identifying all mineral sites in the gorge
- reviewing plans of operations
- monitoring and ensuring compliance of operations
- setting minimally acceptable standards for oil and gas operations
- conducting a study of cumulative impacts of mineral operations

Many of these goals and issues have been adopted in the range of alternatives in the Big South Fork NRRA and Obed WSR plan/EIS.

Big South Fork National River and Recreation Area Water Resources Management Plan (1997)

The Water Resources Management Plan addresses water quality and quantity issues, and their monitoring and management. The purpose of the plan is to assist Big South Fork NRRA managers in making decisions and establishing priorities for the protection, use, conservation, and management of the waters and water-related resources of the park unit. The plan evaluates the existing conditions of water resources, identifies water resources issues, and guides future management decisions (NPS 1997).

The impacts of oil and gas operations on the water resources of Big South Fork NRRA are identified as one of the issues in the Water Resources Management Plan. Several general objectives that relate to oil and gas activities have been identified in this plan for water resources management, including objectives related to maintaining free-flowing conditions, restoring or maintaining natural aquatic, wetland, and riparian environments, and maintaining and restoring a high level of water quality. In addition, specific objectives for oil and gas include:

- mitigating impacts of past oil and gas activities to both surface water and groundwater
- ensuring that oil and gas exploration and development are accomplished with minimal impact or risk to both surface water and groundwater (NPS 1997)

Big South Fork National River and Recreation Area Fire Management Plan (2006)

The purpose of this plan is to provide details of the actions that will be taken by Big South Fork NRRA in meeting the fire management goals established for the area. While recognizing oil and gas operations as facilities to be protected, the Fire Management Plan also identifies the presence of wells and their associated equipment (such as storage tanks and pipelines) as a concern (NPS 2006e). As a result, the goals and objectives of this plan identify activities relating to oil and gas operations.

For example, the plan calls for preventing wildland fires from igniting oil and gas facilities. It recommends using mechanical means in combination with prescribed fire to reduce hazard fuel accumulations around oil and gas well facilities and aid in fire suppression activities by reducing fire intensity and severity. However, prescribed fire treatment areas would not be designated in areas of the park where there is high potential for fires that may adversely impact oil and gas facilities. The plan also recommends that NPS staff work with petroleum producers to develop and maintain defensible space[1] around well heads and storage tanks and mark feeder and other pipelines at or below the surface (NPS 2006e).

Big South Fork National River and Recreation Area Land Protection Plan Update (1998)

The NPS prepares land protection plans to determine what land or interest in land should be in public ownership and the available means of protection other than acquisition. These plans inform landowners of NPS intentions for buying or protecting land by other means, and help managers identify priorities. They also identify opportunities to work with state government agencies, landowners, and the private sector to protect park units (NPS 1998a).

The Land Protection Plan for Big South Fork NRRA addresses privately owned lands or other interests within the authorized boundary, as well as external conditions with the potential to impact land protection within the park unit. This includes the presence of oil and gas operations, which are identified in the plan as potentially incompatible uses when poorly regulated (NPS 1998a). While these operations have the potential to impact the resources of Big South Fork NRRA, the Land Protection Plan recognizes that, with adequate staff, proper enforcement of the 9B and state regulations, cooperation with the states of Tennessee and Kentucky, and adherence to prohibitions in the enabling legislation, impacts to park resources can be minimized while providing access to non-federal oil and gas rights. However, the Land Protection Plan identifies private oil and gas rights-of-way (for pipelines) and outstanding mineral rights

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[1]. Defined as an area, either natural or manmade, where material (such as flammable brush, vegetation, or other fuels) that could cause a fire to spread, has been treated, cleared, reduced, or changed to act as a barrier between an advancing wildland fire and resources or lives at risk (National Fire Plan 2004).

as the last two priorities for protecting the resources of Big South Fork NRRA. The plan also addresses third-party minerals, or mineral interests under tracts where neither the surface nor subsurface rights have been acquired (NPS 1998a).

In the case of rights-of-way, the plan recommends acquisition and relocation of pipelines out of the park unit. For long-term protection of Big South Fork NRRA, the plan ultimately recommends that outstanding mineral rights should be acquired along with the surface rights when doing so is financially possible and advantageous to the government. The plan also identifies the need for closely monitoring and regulating mineral extraction activities to ensure resources are protected (NPS 1998a).

Big South Fork National River and Recreation Area Business Plan, Fiscal Year 2004 (2005)

The purpose of business planning in the NPS is to improve the abilities of parks to more clearly communicate their financial status with principal stakeholders. The business planning process is undertaken to accomplish three main tasks. First, it provides the park with a synopsis of its funding history. Second, it presents a clear, detailed picture of the state of current park operations and funding. Finally, it outlines park priorities and funding strategies (NPS 2005c).

The Business Plan for the Big South Fork NRRA is designed to identify and document the capabilities and priorities of the park unit. The key findings described in the plan show a gap between current funding of the park's operations and the funds necessary to fulfill the goals and mission of the park. One of the most important challenges the park faces is funding for the oil and gas management program. This business management plan identifies the need for developing a comprehensive approach to managing minerals at Big South Fork NRRA, including an oil and gas program. Through the planning process, recreation area staff also determined that an environmental protection specialist and program manager are needed to oversee the oil and gas program (NPS 2005c).

Big South Fork National River and Recreation Area Fields Management Plan (2006)

Big South Fork NRRA contains 102 field units, totaling approximately 740 acres. Although this represents a very small part (less than 1%) of the park, fields are important components of its natural and cultural landscape. The long-term objectives for this plan are to (1) restore disturbed lands to natural conditions, (2) enhance habitat for game and non-game wildlife, (3) preserve cultural landscapes, and (4) enhance recreational opportunities (NPS 2006d).

The Fields Management Plan identifies desired resource conditions and the kinds/levels of visitor use for each of the fields in the park, depending on the GMP zone in which they fall (e.g., Natural Environment Recreation Zone, Cultural Spaces, First- or Second-Order Development and Visitor Use Zones). The plan also identifies specific vegetation conditions for each field (e.g., native warm season grasses, tall fescue (*Lolium arundinaceum*) mix, turfgrass, grassy woodland, and forest). The desired conditions, uses in each field, and whether or not they are included in designated cultural landscapes were all taken into account when developing the management prescriptions for each field. Although the fields management plan does not specifically address oil and gas operations, the oil and gas management plan has taken into consideration the objectives of this plan and desired conditions for the fields. Additionally, fields are protected as a SMA in alternative C.

Mussel Reintroduction at Big South Fork National River and Recreation Area (2003)

In 2003, the Big South Fork NRRA completed an Environmental Assessment for the restoration of freshwater mussel ecological function and biodiversity to the free-flowing reach of the Big South Fork River of the park unit, as well as to further the recovery of federally endangered mussels. Of the 297 mussel species known in the United States, more than 90% occur in the southeast. Currently, 26 species remain in the National Area including 6 that are federally protected: the Cumberland elktoe (*Alasmidonta atropurpurea*), Cumberland combshell (*Epioblasma brevidens*), Cumberland bean (*Villosa trabalis*), oyster mussel (*Epioblasma capsaeformis*), tan riffleshell (*Epioblasma walkeri*), and little-wing pearlymussel (*Pegias fabula*). Although the decline is considerable, recent mussel surveys indicate that the river is slowly recovering. In addition, opportunities currently exist to begin recovering the mussel fauna in the Big South Fork and assist in the recovery of several federally endangered mussels, including four in addition to those that occur there now (NPS 2003b).

Restoration efforts from the plan include maintaining current efforts that protect and conserve existing mussel populations, augmenting existing federally listed and non-listed mussel populations with juveniles raised from adults collected within the Big South Fork, reintroducing federally listed and non-listed mussel species that were historically reported from the river using adults and juveniles raised from individuals collected outside the river, and monitoring the progress of the project (NPS 2003b). While the Environmental Assessment recognizes oil and gas operations as a potential source of erosion, sedimentation, and other water quality impacts, none of these operations occur near river shoals where mussels would be released. New oil and gas operations are not allowed in the gorge, which protects mussel habitat in the park unit (NPS 2003b). Activities associated with plugging wells in the gorge could have impacts to these mussels and/or their habitat, and would require measures to minimize the potential effects.

RELATIONSHIP TO PLANNING DOCUMENTS FOR OBED WILD AND SCENIC RIVER

The following plans for the Obed WSR need to be considered in the development of this plan.

Obed Wild and Scenic River General Management Plan (1995)

The GMP for Obed WSR was prepared to provide for the protection of the park unit values and address resource management, as well as visitor use. The plan established a management zone system representing area specific applications of management objectives, a resource management strategy that addresses the complexity of issues both inside and outside the boundaries of the park unit, enhanced and expanded visitor oriented programs and facilities to provide opportunities to experience the values of the park unit, and boundary expansion (NPS 1995a).

Although none of the management objectives or zones specifically address oil and gas operations, they guide overall management of the Obed WSR and have been considered in preparing this oil and gas management plan. The resource management strategy does address oil and gas operations, and includes provisions for stabilizing and revegetating inactive oil and gas sites to protect water quality. Visual intrusions and noise from oil and gas development were also identified as issues for maintaining the character of the landscape at Obed WSR. The GMP encourages cooperation with surrounding landowners to implement measures to address impacts from activities on lands surrounding the park unit (NPS 1995a).

Obed Wild and Scenic River Water Resources Management Plan (1998)

This water resources management plan was developed as an action plan to support the decision-making processes related to the protection, conservation, use, and management of the Obed WSR water resources. It is designed to identify and analyze water resource-related issues where the current level of information is minimal or insufficient to meet the management goals and objectives of the National Park (NPS 1998b).

This plan describes general objectives tiered from the GMP for the Obed WSR, but also specifically addresses oil and gas operations. The plan identifies these operations as major land disturbances and uses within and outside the park unit, noting that chemical and petroleum by-products of the production process from active operations, and leakage from inactive wells, could impact water quality. As a result, recommendations are made to monitor and mitigate the impacts of oil and gas operations. As active oil and gas operations both inside and outside Obed WSR pose a threat to the water resources of the park unit, this program requires the NPS to work closely with the oil and gas operators during all exploration, drilling, and production operations to provide an early warning monitoring network of the local water resources (NPS 1998b).

Obed Wild and Scenic River Resource Management Plan (1993)

This plan outlines the present status and baseline information for the natural and cultural resources at the Obed WSR. It gives an overview of the management programs associated with these resources as well as the needs of these programs. The plan recognizes the impacts of oil and gas operations on natural and cultural resources (such as water quality impacts, erosion and sedimentation, and impacts to archeological sites from oil and gas exploration, especially road building), and considers them a priority for management (NPS 1993).

Obed Wild and Scenic River Strategic Plan (2005)

The Strategic Plan for Obed WSR provides mission, purpose, and significance statements for the park unit, based on the legislative intent of the Organic Act and other pertinent legislation that established the park unit. The plan identifies goals for achieving the overall mission of the Obed WSR, as well as appropriate goals that apply to the entire NPS. Although this plan does not specifically address goals for oil and gas management, it does identify the purpose and significance of the park unit, which were considered in developing alternatives. In addition, oil spills from surrounding drilling and production operations are identified as threats to achieving the goals of the plan (NPS 2005b).

Obed Wild and Scenic River Land Protection Plan, 1986 Update (1986)

As described previously for the Big South Fork NRRA, the NPS prepares land protection plans to determine what land or interest in land should be in public ownership and the available means of protection other than acquisition (see previous discussion for more details about why the NPS prepares these plans).

The land protection plan for Obed WSR identifies mineral extraction as an incompatible use on wild, scenic, and recreational lands. The plan also recognizes oil and gas as an external issue for protecting the resource and recreational values of the park unit as a result of sedimentation from clearing and construction for oil and gas operations, the use of contaminating substances that can affect water quality, and the potential for oil spills (NPS 1986).

The land protection plan identifies the protection of lands where oil and gas extraction occurs as a priority for protecting resource and scenic values at Obed WSR. Recognizing the right to access these minerals, the plan recommended obtaining easements on any tracts that overlie private mineral rights, requiring that any oil and gas be extracted from locations outside the boundary of the park unit, prohibiting activities that would adversely affect the natural and cultural resources or scenic values, and allowing limited NPS access and use (NPS 1986).

OTHER FEDERAL AGENCY PLANS, POLICIES, AND ACTIONS

U.S. Forest Service

Daniel Boone National Forest

The Daniel Boone National Forest encompasses over 2,000,000 acres, about one-third of which (nearly 700,000 acres) is federally owned and managed by the U.S. Forest Service (USFS) (USFS 2004a). The national forest boundary totally encompasses the Big South Fork NRRA within Kentucky, although many areas immediately adjacent to the national area are privately owned. Lands administered by the USFS are situated along the western edge of the park unit in Kentucky and also along the eastern side, north of Highway 92. This area is in the Stearns Ranger District and offers campgrounds and trails for recreation, in addition to its other uses of timber, wildlife, and water (NPS 2005a).

Oil and Gas Operations. Mineral extraction occurs throughout the national forest, primarily for coal and natural gas. Of the 179 wells drilled within Daniel Boone National Forest since 1985, only 5 have been for oil (142 were for gas, 13 for oil and gas, and 18 were dry) (USFS 2004b). Minerals underlying national forest system land may be federally owned, “reserved” by the previous surface owners, or “outstanding” in third parties. A total of 110 wells currently occur on USFS lands (USFS 2005). Currently, there are 65 federal oil and gas leases issued on the Daniel Boone National Forest covering approximately 58,988 acres with 42 actively producing wells (USFS 2004b). A total of 47 inactive oil wells have been plugged and abandoned on the forest in the past three years, 32 by the EPA, and 15 by the Kentucky Department of Mines and Minerals (USFS 2005).

The Stearns Ranger district was rated as having moderate oil and gas potential in the RFD scenario prepared for the USFS by the. The RFD scenario is a model or projection of anticipated oil and gas exploration and development (leasing, exploration, development, production, and abandonment) in a defined area for a specific time (usually 10 years). The RFD scenario predicts that, in the next 10 years, 4 wells will be drilled on the Daniel Boone National Forest to recover federally owned minerals, while 12 wells are likely to be drilled for private minerals (USFS 2004b). These developments are likely to occur in the Stearns and Redbird Ranger Districts of the national forest (USFS 2004b).

Land and Resource Management Plan (2004)

The 2004 Land and Resource Management Plan (LRMP) was developed to guide coordination of multiple uses (such as outdoor recreation, minerals extraction, timber operations, watersheds, fish and wildlife, and wilderness) and promote sustained yields of products and services on the Daniel Boone National Forest. As a framework for decision-making, the LRMP does not commit the USFS to any specific project or local action. It describes the general management direction, and incorporates an adaptive approach to resource management where managers will be able to continually appraise results, review assumptions, and adjust management direction in the light of knowledge gained from monitoring. The plan sets up a framework of desired conditions with goals, objectives, and standards for the entire national forest, as well as specific prescription areas (USFS 2004a).

Prescriptions for Oil and Gas Operations in the Land and Resource Management Plan

The desired conditions for the entire Daniel Boone National Forest recognize that oil and gas operations will continue. As a result, specific operating standards were developed that apply to oil and gas operations forest-wide, such as requiring approved operating/reclamation plans and appropriate state and federal permits before the activity begins, no surface occupancy stipulations[2] within 200 feet of caves during development of federally owned oil and gas, no drilling into cave voids where federal leasing is authorized, and the requirement for controlled-use stipulations[3] in specific stream environments (USFS 2004a).

The specific prescription areas identified in the plan are also subject to the no surface use or controlled surface use stipulations. These areas range from general designations, such as Cliffline Community and Riparian Corridor, to more site-specific features, such as wilderness areas and proposed wild and scenic rivers (USFS 2004a).

U.S. Fish and Wildlife Service

Threatened and Endangered Species Recovery Plans and Critical Habitat

There are six recovery plans in place for ten species that have been listed as threatened or endangered under the Endangered Species Act that occur at Big South Fork NRRA or Obed WSR. They include two plants, three fish, and five mussels. Each of these plans identifies risks to the species and objectives for recovery, as summarized below. The plans also provide background information on each species and specific recovery criteria.

New River, Clear Fork, and North White Oak, along with other tributaries and the main stem of the Big South Fork, are listed as designated critical habitat for listed mussel species and should be afforded protection (NPS 2009j). Critical habitat for all listed mussels consists of permanent, flowing stream reaches with a flow regime and water quality necessary for normal behavior, growth, and survival of all life stages of the mussels and their host fish; geomorphically stable stream and river channels and banks; stable substrates; and fish hosts with adequate living, foraging and spawning areas for them. The critical habitat for the spotfin chub in Cumberland County is the Obed River upstream to I-40, Clear Creek upstream to I-40, and Daddys Creek upstream to US Highway 127.

Virginia spiraea (*Spiraea virginiana* Britton) Recovery Plan (1992)

This recovery plan addresses the threatened Virginia spiraea, a plant that occurs in riverine areas of both the Big South Fork NRRA and Obed WSR. The plan identifies impoundments, road-building, poor watershed management, and uncontrolled development of rivers as human-caused threats to this species. The recovery strategy, objectives, and tasks emphasize preserving current populations and potential habitat, knowledge of environmental factors and tolerances that affect survival and reproduction, and maintaining a collection of these plants in an appropriate facility (USFWS 1992).

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2. The LRMP defines no surface use as “a mineral leasing stipulation that prohibits occupancy or disturbance on all or part of the land surface to protect special values or uses” (USFS 2004a).

3. Controlled surface use stipulation is defined in the LRMP as a “minerals leasing stipulation that refers to the special operational constraints that may modify a lessee’s rights when resource values have been identified. Allowed use and occupancy (unless restricted by another stipulation) with identified resource values requiring special operational constraints that may modify the lease rights” (USFS 2004a).

Recovery Plan for Cumberland Rosemary (*Conradina verticillata*) (1996)

Cumberland rosemary is a shrub listed as threatened, that occurs in riverine environments of both Big South Fork NRRA and Obed WSR. The recovery plan lists the creation of reservoirs as the greatest threat to this species, while other concerns include poaching for personal or commercial use, destruction of habitat by recreational activities, and deterioration of water quality as a result of coal mining and oil and gas operations. The recovery strategy and outline of recovery tasks emphasize preserving current populations and potential habitat, searching for new populations, knowledge of the species' biology, maintaining a collection of these plants in an appropriate facility, monitoring, and public education (USFWS 1996).

Duskytail Darter (*Etheostoma (Catonotus) percnurum*) Recovery Plan (1994)

The duskytail darter, listed as endangered, inhabits large creeks and moderately large rivers, including the portion of the Big South Fork River that occurs in the park unit in Scott County, Tennessee. Impoundments, degradation of habitat (especially from siltation), runoff from coal mines, poor land-use practices, road building, and waste discharges (including toxic materials), are all identified as threats to this species. The plan outlines recovery actions, including preserving present populations and habitat, expanding searches for presently unknown populations or habitat suitable for reintroduction, reestablishing populations, and monitoring (USFWS 1994).

Recovery Plan for Cumberland Elktoe (*Alasmidonta atropurpurea*), Oyster Mussel (*Epioblasma capsaeformis*), Cumberland Combshell (*Epioblasma brevidens*), Purple Bean (*Villosa perpurpurea*), and Rough Rabbitsfoot (*Auadrula cylindrica strigillata*) (2004)

This plan covers five mussel species listed as endangered that occur in free-flowing rivers and streams. Impoundments, channelization, pollution, and sedimentation all account for elimination of these species from much of their historical range. Coal mining, gravel mining, reduced water quality below dams, developmental activities, water withdrawal, and the introduction of non-native species are all human-related actions that cause localized impacts to the mussels. The highest priority for recovery is preservation of existing populations and occupied habitats, and ensuring that each population is viable. Reestablishing populations, research into the life history and ecological requirements, and programs to raise more mussels in hatcheries are all part of the recovery strategy for these species (USFWS 2004).

Recovery Plan for Spotfin Chub (*Hybopsis monacha*) (1983)

The spotfin chub, listed as threatened, is known to inhabit the Emory River system within the Obed WSR. The species recovery plan recognizes that the spotfin chub, now known as *Cyprinella monacha*, has reached the threatened status due to impoundments, channelization, pollution, turbidity or siltation, temperature change, inter-specific competition, and possibly overcollecting within their habitat. As a result from coal mining on the Cumberland Plateau, siltation is the main detriment causing habitat loss within the Emory River system. The plan outlines recovery strategies, including preserving present populations and habitats, continuing to utilize present legislation and regulations to protect the threatened species, determining essential ecological elements of the species' habitat, continuing to study detrimental impacts on the species, and cooperating with local, state, and federal agencies to utilize their authority to protect the species and its river habitat (USFWS 1983).

Blackside Dace Recovery Plan (*Phoxinus cumberlandensis*) (1988)

The blackside dace (*Phoxinus cumberlandensis*), which was listed as a threatened species in June 1987, inhabits the Big South Fork River and many of its associated streams within the Big South Fork NRRA.

The primary threats to the blackside dace are siltation and acid mine drainage associated with strip mining, followed by logging, road construction, agriculture, human development, and naturally low streamflows. The recovery outline emphasizes that utilization of existing legislation and regulations to protect this species is paramount to reestablishing its population, as well as coordinating with cooperating agencies to identify and protect critical populations and habitat, developing information and education programs for the public, determining threats to the species and implementing management where needed, and searching for additional populations and/or habitat suitable for reintroduction efforts (USFWS 1988).

2010 Memorandum of Understanding

On April 12, 2010, a memorandum of understanding (MOU) between the NPS and the USFWS was issued that stated the two agencies mutual interests and responsibilities in the conservation and management of America's natural resources. The MOU stated that both parties agree that migratory birds are important components of biological diversity. Further, the parties agreed that it is important to (1) focus on bird populations; (2) focus on habitat restoration where actions can benefit specific ecosystems and the migratory birds dependent upon them; (3) focus on reducing the effects of climate change on migratory birds and their habitats; and (4) recognize that actions that may provide long-term benefits to migratory bird populations as a whole may result in short-term negative impacts on individual birds.

APPLICABILITY OF THE PLAN

BOUNDARY MODIFICATION AND FACILITY CONSTRUCTION

If additional lands or waters are added to the Big South Fork NRRA or Obed WSR in the future, or new facilities are constructed within the park units, management of these areas would be guided by the oil and gas management plan. Several parcels of land within the boundaries of Big South Fork NRRA and Obed WSR are owned by private citizens, state agencies and non-profits (see figure 2, deferred properties). The 9B regulations, as well as this plan, will be applicable if and when the federal government acquires any of these lands. However, the acquisition of new lands outside of the current legislated boundary would require an amendment to the GMP for the park units, and depending on the application of the GMP zones or prescriptions in these new areas, there may be a need to revise this plan/EIS.

CHANGES IN RESPONSE TO DYNAMIC ENVIRONMENTAL PROCESSES

Big South Fork NRRA and Obed WSR are subject to dynamic changes from environmental, climatic, and geologic processes. Storms and other extreme events could change the configuration of resources. If these or other changes were to occur, the provisions outlined in this plan/EIS for the resources in these specific areas would still apply.

CURRENT NON-FEDERAL OIL AND GAS OPERATIONS

Current legal and policy requirements, performance standards, operating stipulations, and mitigation measures presented in this plan would also apply to previously approved non-federal oil and gas operations in Big South Fork NRRA and Obed WSR. Modifications may be necessary for operations that are not in compliance with the requirements of this plan. In addition, all ongoing non-federal oil and gas operations in SMAs would be evaluated to ensure the protection of the resources and values in these areas.

EXEMPTIONS FROM THE PLAN

The designation of protected areas, which is a component of all three alternatives, and the proposal in alternative C to designate SMAs and apply operating stipulations are not intended to result in a taking of private property rights. Regulations at 36 CFR Part 9, Subpart B (9B regulations), were written to encourage technological innovation (§9.37(a)(1)). If an operator can demonstrate that a particular technology could reduce the potential for impact on resources in the park units, the operator may be exempted from specific operating stipulations described in this plan. All requests for an exemption must be presented in a plan of operations and must describe how replacing the plan requirements with a technological innovation would protect park resources and values. Approval of an exemption would be documented in the accompanying NEPA document (Environmental Assessment/Finding of No Significant Impact or Environmental Impact Statement/Record of Decision) for a proposed plan of operations. Therefore, in the event an operator cannot explore for or develop nonfederal oil and gas from a surface location outside of an SMA with the "No Surface Use" stipulation, the NPS will work with the operator, and in consultation with other state and federal agencies as required under applicable laws and regulations, to develop reasonable mitigation measures so as to allow the proposed operations surface use within the SMA. However, if the NPS determines the proposed mineral development would impair park resources, values, or purposes, or does not meet approval standards under applicable NPS regulations and cannot be sufficiently modified to meet those standards, the NPS will seek to extinguish the associated mineral right through acquisition, unless otherwise directed by Congress.

FUTURE MODIFICATIONS TO THE PLAN

New or revised regulations, policies, and approved planning documents may be implemented in the future to protect park resources and values, avoid conflicts with visitor use and enjoyment, and provide for human health and safety. These changes may require updating and supplementing the information presented in this plan. Substantial changes in the information or analysis in this plan would require a supplemental EIS or the preparation of a new plan/EIS.

CHAPTER 2: ALTERNATIVES

INTRODUCTION

This "Alternatives" chapter describes the various actions that could be implemented for current and future management of oil and gas operations in Big South Fork National River and Recreation Area (NRRA) and Obed Wild and Scenic River (WSR) (the park units). The National Environmental Policy Act (NEPA) requires federal agencies to explore a range of reasonable alternatives and to analyze what impacts the alternatives could have on the human environment, which the act defines as "the natural and physical environment and the relationship of people with that environment." The analysis of impacts is presented in "Chapter 4: Environmental Consequences," and is summarized in table 10 at the end of this chapter.

Operations (oil and gas)— *"All functions, work and activities within a unit in connection with exploration for and development of oil and gas resources." (36 CFR § 9.31(c)).*

The alternatives under consideration must include a "no-action" alternative, as prescribed by NEPA regulations at 40 Code of Federal Regulations (CFR) Section 1502.14. The no-action alternative in this document is the continuation of the current oil and gas management actions and policies in both park units – no major changes would be made to current management activities.

In addition, the interdisciplinary planning team developed two action alternatives, taking into consideration feedback obtained from the public and other agencies, during the planning process. These alternatives meet, to a large degree, the objectives developed for this plan, as well as the purpose of and need for action (see "Chapter 1: Purpose of and Need for Action"). Because these action alternatives would be technically and economically feasible, and demonstrate rational thought processes, they are considered "reasonable."

No-action Alternative—*An alternative that maintains current management practices and policies.*

As discussed in chapter 1, this is a largely programmatic management plan that establishes a general framework for taking a range of actions for managing oil and gas operations in the park units. However, the action alternatives also include a new management framework for facilitating the plugging and reclamation of wells. By itself, the Oil and Gas Management Plan / Environmental Impact Statement (plan/EIS) does not necessarily authorize any on-the-ground activities, especially those related to new oil and gas development. The National Park Service (NPS) would authorize specific projects for new oil and gas developments by reviewing and approving operator-submitted plans of operations or special use permit applications. Before any new oil and gas operation is approved, the NPS would conduct further analysis in accordance with NEPA, the National Historic Preservation Act of 1966, the Endangered Species Act of 1973, and other applicable federal laws. Activities proposed specifically as part of the new management framework for plugging and reclamation of wells (discussed later in this chapter), would also require further review prior to taking action to ensure that appropriate environmental compliance requirements are met.

The no-action and action alternatives selected for detailed analysis are briefly described below. This is followed by a discussion of background material that is necessary to understand the alternatives, such as the types of oil and gas operations that could occur in the park units, and a forecast of oil and gas activities, including the reasonably foreseeable development (RFD) scenario. The RFD scenario estimates the extent of the operations that could occur to find and produce the estimated undiscovered non-federal oil and gas resources in the park units and is used, in part, to assess the impacts of each alternative presented in this plan/EIS. The remainder of this chapter provides a detailed description of the alternatives considered, addresses alternatives that were considered but eliminated from detailed analysis, and identifies the agency's preferred alternative, as well as the environmentally preferred alternative.

OVERVIEW OF THE ALTERNATIVES

ALTERNATIVE A: NO ACTION

The no-action alternative is the continuation of current oil and gas management practices and policies, including the current staffing levels that limit full implementation of the 9B regulations. The NPS would continue to work cooperatively with the state on regulations or enforcement, but would be somewhat limited in its ability to conduct inspections and monitoring of all operations on a regular basis and would defer to the state to notify operators about regulatory requirements and issues. Environmental compliance and permitting (NEPA, Endangered Species Act, National Historic Preservation Act) for plans of operations related to management of current operations and for new drilling and/or exploration would be conducted on a case-by-case basis in both park units with currently available staff and funding sources. Restrictions and protected areas identified in the current legal and policy requirements (CLPRs) for each park unit (including the NPS 9B regulations) would be applied to new operations. Plugging and reclamation activities would be guided by the 9B or state regulations, as appropriate, and compliance for these operations would be conducted on a case-by-case basis in both park units.

ALTERNATIVE B: COMPREHENSIVE IMPLEMENTATION OF 9B REGULATIONS AND A NEW MANAGEMENT FRAMEWORK FOR PLUGGING AND RECLAMATION

Under alternative B, the NPS would proactively pursue enforcement of the 9B regulations and plans of operations and provide clear communication with the public and operators about CLPRs, including the 9B regulations. For current operations, the NPS would continue to work cooperatively with the state on regulations or enforcement, but would conduct increased inspections and monitoring and identify sites that are found to be impacting, or threatening to impact, park resources beyond the operations area to bring these into compliance. New operations would be reviewed and permitted in accordance with the restrictions and protected areas described in the CLPRs, similar to alternative A. The park would use the oil and gas management planning process to proactively share information with the public about regulatory requirements, to seek out operators to ensure information is communicated clearly and effectively, and to focus staff resources on the implementation and compliance with the regulatory framework. Alternative B also includes a new management framework for efficiently completing compliance processes necessary for plugging and reclamation of wells, which would provide a method for evaluating the environmental compliance needs for future site-specific projects. Priority sites for plugging and reclamation would be identified using criteria developed for this plan/EIS.

ALTERNATIVE C: COMPREHENSIVE IMPLEMENTATION OF 9B REGULATIONS, NEW MANAGEMENT FRAMEWORK FOR PLUGGING AND RECLAMATION, AND ESTABLISHMENT OF SPECIAL MANAGEMENT AREAS

Alternative C would implement proactive management described in alternative B, with additional inspections and monitoring of current and new operations. In addition, under alternative C, "Special Management Areas" or SMAs would be designated to identify and protect those areas where park resources and values are particularly susceptible to adverse impacts from oil and gas development. Specific protections afforded by these SMAs are presented in table 4 (later in this chapter), and these operating stipulations would be applied in the designated SMAs to protect the resources and values of the park units unless other mitigation measures were specifically authorized in an approved plan of operations. Similar to alternative B, the park would use the oil and gas management planning process to proactively share information with the public about regulatory requirements, to seek out operators to ensure information is communicated clearly and effectively, and to focus staff resources on the implementation and compliance with the regulatory framework. Alternative C also includes the new management framework for plugging and reclamation of wells as described under alternative B; and the designated SMAs would be considered in setting priorities for plugging and reclamation.

TYPES OF OIL AND GAS OPERATIONS

There are four general phases of petroleum development: exploration, drilling, production, and abandonment/reclamation. Appendix H describes the activities associated with each of these phases. However, in Big South Fork NRRA and Obed WSR, most oil and gas activities would likely be part of the production and abandonment/reclamation phases because there is a relatively small potential for new production in the area (see RFD scenario, below). Drilling is expected to occur on a less frequent basis. Although not necessarily expected, geophysical exploration activities are addressed in the event such operations are proposed during the life of this plan (15 to 20 years).

FORECAST OF OIL AND GAS ACTIVITY (INCLUDING UNDISCOVERED OIL AND GAS POTENTIAL AND REASONABLE FORESEEABLE DEVELOPMENT ACTIVITY)

The NPS developed this forecast for Big South Fork NRRA and Obed WSR as a reasonable basis for analyzing the potential impacts of oil and gas activities under the management alternatives presented in this plan/EIS. The projections in this forecast do not represent a benchmark or decision point for acceptable or desired levels of activity. Rather, they are meant to provide the interdisciplinary team, public, and NPS decisionmakers with an understanding of the types and extent of oil and gas exploration, production, and reclamation operations expected during the plan/EIS timeframe.

SUMMARY

The forecast of oil and gas activities for Big South Fork NRRA includes:

- Plugging of up to 50 wells (these are in addition to those that have recently been or are currently being plugged under American Recovery and Reinvestment Act of 2009 (ARRA) and NPS funding administered through the Tennessee Department of Environment and Conservation (TDEC)), and surface reclamation of associated pads and access roads. However, if during the course of operations under this plan, additional wells were to be identified, they would also be incorporated into the scope of this plan.
- Workover or well servicing of up to 125 wells to restore or improve production.
- Very little, if any, geophysical (e.g., seismic) exploration.
- Drilling of between 0 and 20 new wells to produce both resources existing within discovered fields and undiscovered resources estimated to occur beneath nonfederal oil and gas estate acreage in the park.
- No federal surface disturbance associated with gas storage projects.

The forecast of oil and gas activities for Obed WSR includes:

- Plugging of up to 5 wells and surface reclamation of associated pads and access roads.
- Workover or well servicing of 2 wells to restore or improve production.
- Drilling of between 0 and 5 directional wells from surface locations outside the park to bottomhole locations inside or through the park to produce the volume of undiscovered resources estimated to occur beneath the park.

Important aspects of the forecast for both Big South Fork NRRA and Obed WSR are:

- Activities associated with existing operations are not expected to involve any new surface disturbance;
- Disturbance from new wells is expected to be offset by reclamation of existing wellpads and roads by at least a 2:1 ratio and perhaps by as much as a 10:1 ratio; and,
- The overall footprint of oil and gas activities and all the associated impacts is expected to be on a decreasing trend over the planning period.

Reclamation and Maintenance of Existing Operations

Big South Fork NRRA

The majority of oil and gas activity in Big South Fork NRRA is expected to be associated with plugging oil and gas wells, surface reclamation, and production maintenance of existing producers, as opposed to new operations. Fifty-nine wells were recommended for plugging in a 2001 inventory of oil and gas wells at Big South Fork NRRA (TDEC 2001), and at present, funds have been allocated and compliance completed to plug 54 of these wells and reclaim pads and access roads. Fourteen of these wells will be completed using NPS funds through a cooperative agreement with TDEC. Additional funding was received under the American Recovery and Reinvestment Act of 2009 (ARRA) to plug and reclaim 39 others, for which an environmental assessment (EA) / Finding of No Significant Impact was completed in 2009. These wells are expected to be completed over the next few years. One other well was plugged and reclaimed using NPS funds in 2005. These wells are not included as part of the forecast of oil and gas activities in this plan since they are completed and/or are substantially underway, but they are included in the cumulative impact scenario addressed in chapter 4. However, based on the knowledge of the condition and number of other wells in the park gained from the 2001 inventory, the NPS estimates that about 50 additional wells that are inactive and/or have little foreseeable future activity could be plugged and reclaimed during the life of this plan under all alternatives, including additional wells that operators would identify as plugging candidates. Table 3 (later in this chapter) includes an estimate of acreage that would be reclaimed following the plugging of these wells.

The forecast of activity includes workover or well servicing of up to 125 wells to restore or maintain production. The 125 wells consist of 108 wells that were in production at the time of the 2001 inventory and another 17 that appeared capable of production, but were shut-in at the time. The NPS does not anticipate that one workover or well servicing would occur on each well. Rather, some wells would be worked on several times over the 10 to 15-year span of the plan/EIS, and other wells would see no well work activity. Some work would lead to well plugging, which is accounted for in the 50-well estimate.

Though this level of well work activity has not occurred in the past couple of decades, the NPS considered two factors in making the forecast. First, natural gas demand is expected to increase over the planning period with corresponding firmness or increasing pricing. Second, implementation of any of the alternatives under this plan would provide a level of regulatory certainty, which lack thereof may have contributed to operators choosing to avoid conducting work on wells in the park.

Obed Wild and Scenic River

The forecast of oil and gas activities for Obed WSR includes the potential for 5 wells to be plugged and their associated pads and roads to be reclaimed. The 5 wells represent all unplugged wells in the park. If the forecast played out, the footprint of oil and gas operations would be removed from the park.

The forecast does include the possibility for well work on the two producing wells to improve or prolong production.

GEOPHYSICAL EXPLORATION

The forecast of activity does not totally discount the possibility of geophysical exploration, which would most likely take the form of conventional surveys. However, geophysical exploration, especially in the form of 3-dimensional seismic surveys, would be of limited economic value for several reasons. First, there is existing subsurface geologic information available from over 300 existing wells, which provide coverage for the bulk of acreage available for future development. Second, the zones of interest occur at shallow depths generally above 2000 feet. The cost to drill a number of shallow wells would compete with the cost of 3D surveys. Finally, the rugged surface topography further detracts from the economical and logistical feasibility of 3D seismic.

The forecast does include the possibility for conventional seismic lines having limited utility in areas of existing roads where data could be acquired quickly and inexpensively.

Seismic would most likely be in the form of 1- to 3-day surveys using seismic vibrator trucks. Seismic vibrators, commonly known by their trademark name Vibroseis®, impart coded seismic energy into the ground. The seismic waves are recorded via geophones and subsequently subjected to processing applications to produce images of the subsurface rock layers. Today, there are a number of sophisticated vibrator systems – minivibes, truck mount vibes and buggy mount vibes – to provide the best possible solutions to meet specific seismic program needs. It is anticipated that seismic vibrator surveys at Big South Fork NRRA would most likely be in the form of 1- to 3-day surveys along existing roads and trails.

UNDISCOVERED OIL AND GAS POTENTIAL AND REASONABLY FORESEEABLE DEVELOPMENT SCENARIOS

The U.S. Geological Survey (USGS) estimated undiscovered potential hydrocarbon resources. Appendix I is the USGS Open-File Report 2006-1048, An Allocation of Undiscovered Oil and Gas Resources to Big South Fork NRRA and Obed WSR, Kentucky and Tennessee. The USGS estimates provide a basis for developing RFD scenarios. In addition to the USGS allocation of undiscovered oil and gas resources, the NPS considered existing well data, economics, historical trends, and continued development in existing fields in forming the RFD scenarios. The NPS also recognizes that mineral owners and industry may possess confidential information not available to the USGS or NPS, and that this RFD scenario represents only one of many possible development scenarios.

Big South Fork National River and Recreation Area

The RFD scenario for Big South Fork NRRA includes drilling of up to 20 new wells to produce both resources existing within discovered fields and undiscovered resources estimated to occur beneath nonfederal oil and gas estate acreage in the park. Table 3 (later in this chapter) includes an estimate of acreage that may be newly disturbed as a result of new drilling activities.

The Big South Fork NRRA is mostly situated in the southern portion of the USGS Appalachian Basin Province, but a small parcel lies within the USGS Cincinnati Arch Province. The USGS allocated undiscovered resources from 6 geologic assessment units to lands within the park using a simple acreage allotment. The USGS estimates do not include additional development and production from the existing fields. Appendix I provides additional information on the USGS methodology for allocating resources to the parks. For Big South Fork, the NPS used the same methodology to further allocate undiscovered hydrocarbon resources to acreage that is 1) outside of existing oil and gas fields, and 2) is available for oil and gas development by means of nonfederal oil and gas rights. That acreage is approximately 18,000 acres or 15% of the park.

For Big South Fork NRRA, the USGS/NPS estimates there is a 50% probability of 4000 barrels of oil (BO), 3 billion cubic feet (BCF) of natural gas, and 60,000 barrels of natural gas liquids (BNGL) for nonfederal undiscovered hydrocarbon resources. Even at a lower 25% probability of discovering more resources, the estimates increase to 4600 BO, 3.5 BCF, and 70,000 BNGL. Of these estimates, 70% of the gas and 95% of the NGLs are attributed to the Northwest Ohio Shale assessment unit known locally as the Chattanooga Shale.

The estimated resources per acre are very low by exploration standards and do not paint a compelling picture for exploration and production activity even under the best of economical conditions. And in fact, historical data shows that the 10% of the 315 wells in the park drilled outside of defined oil and gas fields were largely unsuccessful.

However, there are valid reasons for not discounting the possibility of future drilling in Big South Fork. These include testing of the Chattanooga Shale, potential for gas storage/secondary recovery projects in existing fields, drilling in areas previously untested.

The RFD scenario includes the possibility for up to 10 Chattanooga Shale wells that could be placed either in or outside of existing fields. Past technology did not provide a means of obtaining commercial production from unconventional reservoirs like the Chattanooga Shale. Today, horizontal drilling and/or fracturing technology have enabled commercial shale gas production, and these technologies continue to improve. In fact, recent drilling activity in the New River drainage east of the park is partially attributable the Chattanooga Shale. Even though the Chattanooga Shale in Big South Fork is thinner and shallower (less volume and pressure) than in the New River drainage, economics and technology may improve such that it could become a viable play. The ownership pattern of nonfederal oil and gas acreage in some areas could somewhat limit the options for long horizontal well completions. Also, horizontal well completions may be made from surface locations outside the park, and the RFD scenario assumes an even mix of horizontal well surface locations inside and outside the park.

The RFD scenario includes the possibility of up to 5 wells to facilitate gas storage/secondary recovery operations. Gas storage projects are being conducted around Big South Fork NRRA and on private lands within the park. Since gas storage is a right that belongs to the surface estate, no lands owned by the federal government would be available for development of gas storage fields. It must be noted however, that some projects conducted in depleted oil reservoirs are characterized as both gas storage and secondary recovery because the gas injection/production process can aid in continued production of oil. The 5 RFD scenario wells may be drilled either on private land inside the park or in conjunction with secondary recovery. The new wells may be necessary because existing wells do not meet mechanical integrity or zone isolation needs for gas injection and production.

The RFD scenario also includes the possibility of up to 5 wells to develop targets (e.g., Monteagle, Warsaw, Fort Payne, etc.) in areas previously not drilled.

Finally, the RFD scenario does not discount to the possibility that no new wells would be drilled in Big South Fork NRRA during the planning time frame. The last well drilled in the park was in 1993, indicating industry has pursued other options throughout times of both low and historically high product prices and drilling activity. The NPS regulatory requirements cannot be the sole reason for a lack of industry interest, as 10 park units servicewide have had active drilling over the years under the NPS regulatory framework. The scenario that no wells would be drilled accounts for the lower range of zero in the RFD scenario.

Obed Wild and Scenic River

The RFD scenario for Obed WSR includes the possibility for drilling between 0 and 5 directional wells from surface locations outside the park to bottomhole locations inside or through the park (horizontal completions) to produce the volume of undiscovered resources estimated to occur beneath the park. As discussed later in this section, NPS regulations and the way in which land was acquired for Obed WSR preclude the probability that new wells would be drilled from surface locations inside the park.

The Obed WSR is entirely within the USGS Appalachian Basin Province. The USGS allocated undiscovered resources from 2 geologic assessment units to lands within the park using the same simple acreage allotment as was done for Big South Fork NRRA.

For Obed WSR, the USGS estimates there is a 50% probability of 600 BO, 0.5 BCF, and 10,000 BNGL of undiscovered hydrocarbon resources. Using a lower 25% probability of discovering more resources, the estimates increase to 700 BO, 0.55 BCF, and 11,500 BNGL. Like Big South Fork, these estimates do not include existing fields and are mostly attributed to the Chattanooga Shale.

All wells in what is now the Wild and Scenic River have been in defined oil and gas fields. The low volume of allocated resources would suggest no drilling outside existing fields, but exploration drilling around Obed WSR is occurring and with some success. Obed WSR consists of narrow river corridors, and acreage beneath the park would almost certainly be developed in conjunction with adjacent acreage outside the park.

Land acquisitions in Obed WSR have included a reservation of oil and gas rights and have also been subject to existing leases. Notwithstanding existing leases, the deeds include a surface use restriction that precludes future oil and gas exploration and production activities inside the park.

The RFD scenario assumes that where an existing lease is held by production of a well, that no additional wells would be drilled inside the park to further develop that lease. This assumption is based on the fact that lease acreage in the park would be a small percentage of total lease acreage. Application of the NPS approval standard of "technologically feasible methods least damaging to [the park]" under the 9B regulations would result in wells being drilled "on lease" but outside the park. This would hold true even if the operator chose to use directional drilling to reach a bottomhole location inside the park. The RFD scenario also assumes that horizontal well completions to develop the estimated resources in the Chattanooga Shale would be accomplished from surface locations outside the park, regardless of lease status.

Since no new drilling is expected to occur from surface locations in Obed WSR, the footprint of oil and gas operations would only diminish as existing wells are plugged and pads and roads are reclaimed.

The lower range estimate of 0 wells drilled within the planning period is based on the same premise as described for Big South Fork NRRA.

TABLE 3. SURFACE DISTURBANCE ASSOCIATED WITH OIL AND GAS ACTIVITY FORECAST

Park	Activity	Factors	Disturbance, Acres		
			Pads	Roads	Total
Big South Fork NRRA	Well Plugging and Surface Reclamation	• 50 wells • Average wellpad = .75 acres • Average road = ½ mile X 14 feet	-38	-42	-80
	Well Workover and Well Servicing	• No new surface disturbance	0	0	0
	Seismic	• Vehicles limited to existing roads • Surface disturbance limited to vegetation trimming	0	0	0
	RFD Scenario Wells	• 0 – 20 wells (5 with surface location outside park) • Average wellpad = 1.5 acres • Average road = ½ mile X 14 feet	0 to 23	0 to 13	0 to 36
		Big South Fork NRRA Totals	-38 to -15	- 42 to -29	-80 to -44
Obed WSR	Well Plugging and Surface Reclamation	• 5 wells • Average wellpad = 1 acre • Average road = ¼ mile X 14 feet	-5	-2	-7
	Well Workover and Well Servicing	• No new surface disturbance	0	0	0
	RFD Scenario Wells	• No surface disturbance	0	0	0
		Obed WSR Totals	-5	-2	-7

Note: Factors from RFD scenario (Appendix I); the acreage of disturbance in the table assumes that all roads would be reclaimed; some may be kept for park purposes. Negative numbers indicate reclamation.

SPECIAL MANAGEMENT AREAS

During internal and public scoping and subsequent analyses, the interdisciplinary planning team identified certain resources and values that are particularly susceptible to adverse impacts from oil and gas operations or are essential to maintain the ecological integrity of Big South Fork NRRA and Obed WSR. These areas, called Special Management Areas (SMAs) in this plan/EIS, have been proposed as a part of alternative C. In some SMAs, oil and gas operations may be permitted with specific operating stipulations to protect park resources and values. In other areas, new operations would not be permitted to use or occupy the land surface, referred to as the "No Surface Use" stipulation, unless other mitigation that would protect the resources and values of the SMA is included in an approved plan of operations. There may be surface use allowed if mitigations are approved in a plan of operations. However, while an approved plan of operations could relax SMA restrictions, it would not supersede applicable statutes such as gorge restrictions and deed restrictions. In some cases where the No Surface Use requirement would apply, there are distance setbacks from the boundary of the SMA. For example, No Surface Use with a 500- to 1,500-foot setback in the visitor use/administrative areas means that surface uses associated with non-federal oil and gas operations would not be permitted within 500 to 1,500 feet of the perimeter of the designated SMA. These setbacks are variable, and are dependent upon the mitigation measures employed to protect resources, values, and human health and safety. Other mitigation measures that could be employed include installation of 10-foot sound walls for compressor sites during production, sound muffling and redirecting of unwanted sounds away from visitor use areas, regular maintenance to eliminate squeaks, and incorporation of newer, quieter pumpjacks that run on electricity. In addition, timing stipulations would be applied to minimize impacts during wet periods and high visitor use/visitation periods (generally April through October) in certain SMAs. Operations may be conducted when the timing stipulations are not in effect, unless an operator can demonstrate a compelling reason why it must conduct their activities when they are in effect. The SMAs, as well as the basis for establishing them, are described in table 4, and the stipulations are listed in table 7 under alternative C. Figures 8 through 10 in this chapter show the Big South Fork SMAs.

TABLE 4. BASIS FOR PROPOSED DESIGNATION OF SPECIAL MANAGEMENT AREAS IN BIG SOUTH FORK NATIONAL RIVER AND RECREATION AREA AND OBED WILD AND SCENIC RIVER UNDER ALTERNATIVE C

Proposed Special Management Areas (SMA)	Resources/Values Protected	Basis for SMA Designation
Big South Fork National River and Recreation Area		
Sensitive Geomorphic Feature SMA includes: • Rock Shelters • Arches • Chimneys • Natural Bridges • Falls • Windows	• Geology • State- and Federally Listed Species • Cultural Resources • Visitor Use and Experience	Sensitive geomorphic features, especially arches and chimneys, were identified as particularly sensitive to non-federal oil and gas operations. Some of these features are in their end stages of existence, are relatively fragile, and are susceptible to erosion. The General Management Plan (GMP) for the park unit includes these resources in a zone that would reflect natural conditions and that would be protected from unnatural degradation (NPS 2005a). In addition to the geology of the Sensitive Geomorphic Feature SMA, these areas are also important because they provide special habitat for certain plant and animal species, including some rare or unusual vegetation (NPS 2005a). The GMP for the park unit includes these resources in a zone that would reflect natural conditions and that would be protected from unnatural degradation (NPS 2005a). Features such as rock shelters in the Sensitive Geomorphic Feature SMA are also important because they provided shelter for humans from pre-Columbian times, and may include associated artifacts that require protection by regulation and/or NPS management policies.

TABLE 4. BASIS FOR PROPOSED DESIGNATION OF SPECIAL MANAGEMENT AREAS IN BIG SOUTH FORK NATIONAL RIVER AND RECREATION AREA AND OBED WILD AND SCENIC RIVER UNDER ALTERNATIVE C

Proposed Special Management Areas (SMA)	Resources/Values Protected	Basis for SMA Designation
Cliff Edge SMA includes: • Areas mapped by the NPS during development of the GMP for Big South Fork NRRA.	• State- and Federally Listed Species • Cultural Resources • Visitor Use and Experience	Cliff edges are defined in the GMP for the park unit as the exposed, rocky, sparsely vegetated, sandstone outcrops along the rim of the gorge. They can be found along the main gorge of the Big South Fork NRRA and up the valleys of many tributaries. They can run for a mile or more or occur in isolated short lengths. Cliff edges are a recognizable physiographic feature and are not necessarily the same as the “gorge” outline as defined in the legislation (NPS 2005a). These areas are home to threatened, endangered, and/or state-listed species and also provide roosting and nesting sites for birds (NPS 2005a). These resources must be protected based on regulatory requirements and/or NPS management policies from all impacts, including non-federal oil and gas operations. The GMP for the park unit includes these resources in a zone that would reflect natural conditions and that would be protected from unnatural degradation (NPS 2005a). Cliff edges are often associated with important archeological resources and sites eligible for listing on the National Register of Historic Places (NRHP) that contribute to the cultural characteristics of the park unit. Protection of the associated resources and values are required both by regulation and/or NPS management policies. Cliff edges provide a prime scenic resource at the park unit and some natural or developed overlooks would be open to visitor access (NPS 2005a). This opportunity is essential to the visitor experience of the gorge at Big South Fork NRRA and must be protected from all potential impacts, including non-federal oil and gas operations.

TABLE 4. BASIS FOR PROPOSED DESIGNATION OF SPECIAL MANAGEMENT AREAS IN BIG SOUTH FORK NATIONAL RIVER AND RECREATION AREA AND OBED WILD AND SCENIC RIVER UNDER ALTERNATIVE C

Proposed Special Management Areas (SMA)	Resources/Values Protected	Basis for SMA Designation
State Natural Area SMA includes: • Honey Creek and Twin Arches Natural Areas.	• State Natural Areas	The 109-acre Honey Creek Natural Area was set aside primarily because of its rich forest communities that have been undisturbed for many years, as well as its numerous geological formations. The area is extremely scenic, with lush vegetation, streams, a waterfall, rock shelters, and picturesque views of the gorge and river. The area contains a high diversity of forest species, rockhouse species, and sandstone barrens species, including federally threatened species. The 1,500-acre Twin Arches Natural Area was set aside primarily to protect the two geological formations that give the area its name. This area protects the largest natural bridge complex in Tennessee, and one of the largest such complexes in the world. A high diversity of forest species, rockhouse species, and sandstone barrens species exists within the area, including federally endangered and state-threatened plants. Scenic views of the surrounding forested upland and creek gorges are common.
Special Scenery SMA includes: • Areas within the park unit that are identified by conducting viewshed analysis as part of plans of operations. • Specific examples of special scenery that could be included in this SMA include Twin Arches, Honey Creek Overlook, Angel Falls Overlook, Maude's Crack, Sawtooth, and Yahoo Falls.	• Viewsheds • Visitor Use and Experience	The park unit GMP identifies areas of special scenery as sites and areas that are either especially scenic themselves or offer prime scenic views (NPS 2005a). Scenic enjoyment is the priority in these areas, and visitors are expected to experience the setting without being unduly disturbed by unrelated human activity. The potential for non-federal oil and gas operations, especially drilling operations and placement of large storage tanks, to affect the special scenery, or the views from these areas, is a concern in meeting the desired conditions. In addition to the views of or across the gorge, there is also some concern that views from the river up to the plateau could be affected by such operations. While some areas of special scenery have been identified as sensitive to drilling and potentially production, the analysis required by an operator would help identify additional areas where viewsheds could be affected.

TABLE 4. BASIS FOR PROPOSED DESIGNATION OF SPECIAL MANAGEMENT AREAS IN BIG SOUTH FORK NATIONAL RIVER AND RECREATION AREA AND OBED WILD AND SCENIC RIVER UNDER ALTERNATIVE C

Proposed Special Management Areas (SMA)	Resources/Values Protected	Basis for SMA Designation
Managed Fields SMA includes: • Managed fields identified in the Fields Management Plan/EA (NPS 2006d) that occur in the vicinity of private mineral interests.	• State-listed Plants • Wildlife • Cultural Resources • Visitor Use and Experience	As described in chapter 1, the Fields Management Plan/EA identifies long-term objectives to (1) restore disturbed lands to natural conditions, (2) enhance habitat for game and non-game wildlife, (3) preserve cultural landscapes, and (4) enhance recreational opportunities. Oil and gas operations in the vicinity of these fields could preclude the NPS from meeting these objectives.
Visitor Use/Administrative Area SMA includes: • Areas identified in the park unit GMP as First Order Development and Visitor Use Zone (readily accessible concentrations of visitor or administrative facilities) • Specific examples include the Bandy Creek, Blue Heron, and Headquarters areas.	• Visitor Use and Experience • Administrative and Other Use Areas	Visitor experiences and values (enjoyment of plant and animal biodiversity, visual quality, natural quiet, night sky, etc.) occurring in visitor use areas, must be protected from all potential impacts, including oil and gas operations. Facilities and private in-holdings within the park unit, as well as health and safety of park visitors and staff, must also be protected from all activities, including non-federal oil and gas operations.
Trails SMA includes: • All designated trails identified in the GMP.	• Visitor Use and Experience	Visitor experiences and values (enjoyment of plant and animal biodiversity, visual quality, natural quiet, night sky, etc.) occurring in visitor use areas, including along trails of the park unit, must be protected from all potential impacts, including oil and gas operations.
Cultural Landscapes and Cemeteries SMA includes: • 56 known cemeteries in the park unit • 19 cultural landscapes including four that are eligible for listing on the NRHP	• Visitor Use and Experience	Facilities and private in-holdings, including cemeteries, within the park unit, must also be protected from all activities, including non-federal oil and gas operations. Cemeteries are important to the local communities and families often visit the graves. Cultural landscapes, including those eligible for listing on the NRHP, must be protected from non-federal oil and gas operations.

TABLE 4. BASIS FOR PROPOSED DESIGNATION OF SPECIAL MANAGEMENT AREAS IN BIG SOUTH FORK NATIONAL RIVER AND RECREATION AREA AND OBED WILD AND SCENIC RIVER UNDER ALTERNATIVE C

Proposed Special Management Areas (SMA)	Resources/Values Protected	Basis for SMA Designation
Obed Wild and Scenic River		
Obed WSR SMA includes: • All federally owned land within the boundaries of the park unit.	• Wild and Scenic River Outstandingly Remarkable Values	Because the Obed WSR was established as a narrow corridor centered around surface waters, there is the potential for non-federal oil and gas operations to impact the outstandingly remarkable values identified when the park unit was included in the Wild and Scenic Rivers system. Currently, most deeds restrict non-federal oil and gas operations to areas outside the park unit. However, establishing all federally owned lands within Obed WSR as an SMA with No Surface Use stipulations provides upfront guidance to operators with mineral rights below these lands.

In recognition of the broad-scale information used in this document, and the surface and subsurface complexities of the park units, a modification of any SMA operating stipulation may be considered by the NPS if site-specific information (such as engineering, geological, biological, or other studies) warrant the change, or if an operator can demonstrate that their proposed operation would meet the goals of protecting resources and values in the SMA. SMAs would apply to all new operations unless an operator demonstrates this would entirely prevent reasonable access to a mineral estate. The NPS would require an operator to provide information to support such a conclusion, and would evaluate the application of the SMAs relative to the proposed operation on a case-by-case basis.

DEVELOPMENT OF NEW MANAGEMENT FRAMEWORK FOR PLUGGING AND RECLAMATION OF WELL SITES

When the NPS acquired lands for Big South Fork NRRA, it inherited a legacy of inactive non-federal oil and gas wells; many without responsible parties. The 2001 well inventory (TDEC 2001) identified 59 inactive wells at Big South Fork NRRA that were considered candidates for plugging, of which over half had no responsible parties. Of these, 54 wells have been or will be plugged within the next few years mainly using funding received through the ARRA and administered through TDEC. However, the NPS and operators are expected to identify additional inactive wells as plugging candidates in the future, and the forecast of oil and gas activity for this plan estimates that about 50 additional wells will need to be plugged over the life of this plan. These wells pose environmental risks and public safety threats in park units with visitation by diverse user groups. Primary threats consist of resource damage from surface release of petroleum products as deteriorating pressure control equipment fails; subsurface contamination of groundwater absent proper well plugging; personal injury and property damage from spontaneous release of pressurized and highly flammable well fluids; and continued disruption of natural conditions from unreclaimed non-federal oil and gas development. These risks increase with time as does the cost to address them through proper plugging and reclamation. Resource managers at both park units have made it a high priority to remove these hazards by plugging wells and reclaiming the sites and to protect resources and provide for a safer visitor experience.

During internal scoping, the interdisciplinary team for the plan/EIS considered establishing a new management framework that would provide an efficient process to expedite the plugging and reclamation of abandoned or inactive wells, while providing for protection of resources and values and review of potential impacts. The intent was to describe and analyze the components of plugging/reclamation activities, analyze the impacts in this plan/EIS, and enable subsequent environmental compliance for these wells by using the analysis in the EIS in a streamlined process. This approach would avoid repetitive planning, analysis, and discussion of the same issues each time a well is to be plugged and the site reclaimed, and would expedite the removal of the threats described above. This became the basis of action to plug wells under ARRA, and an EA for the plugging and capping of several wells at Big South Fork NRRA was completed in 2010.

Those projects that would be conducted under the new management framework would be designed to meet the reclamation standards of 9B regulations. Project design would be driven by reclamation goals, and well plugging actions would be planned to minimize or avoid situations that would make surface reclamation more difficult or costly. Basically, equipment and methods for well plugging would be selected to meet job requirements, while minimizing the amount of re-disturbance necessary.

The goals for activities associated with access, plugging, and reclamation under the new management framework are described for both alternatives B and C. The description also provides detailed information on actions that would be required at Big South Fork NRRA and Obed WSR to meet these goals. The interdisciplinary team developed a process for evaluating the appropriate level of environmental compliance documentation that would be required for future well plugging and reclamation projects. This process is also described in detail for alternatives B and C.

Current Legal and Policy Requirements

In addition to the 9B regulations, all non-federal oil and gas operations in national park system units are subject to other CLPRs based on federal and state laws, regulations, federal executive orders, NPS policies, and applicable direction provided in NPS planning documents. Appendix B provides an overview of these other CLPRs.

Performance Standards

Performance standards are resource protection goals that have been identified for each resource topic described in this plan/EIS. These standards are based largely on the NPS *Management Policies 2006*, as well as resource-specific regulations, and are included in appendix F. The performance standards described would apply to all current and future non-federal oil and gas operations in the park units. Where a current operation does not comply with these standards, the operation would need to be modified or mitigation measures implemented.

Statutory and Regulatory Requirements and Mitigation Measures for Non-federal Oil and Gas Operations

To help provide guidance to non-federal oil and gas operators at Big South Fork NRRA and Obed WSR, the NPS has developed tables of statutory and regulatory requirements (referred to as operating stipulations), as well as recommended mitigation measures. These tables are presented in appendix B, and address all phases of non-federal oil and gas operations, including geophysical exploration, drilling and production operations (including measures that would apply to roads, drilling, production, or flowlines and pipelines), plugging, abandonment, and reclamation requirements. The tables also specify which resource(s) would be protected by the particular operating stipulation or mitigation measure.

The operating stipulations focus on the NPS's Non-federal Oil and Gas regulations at 36 CFR Part 9 Subpart B. Many, but not all of the operating stipulations required under other federal and state laws and regulations are also listed. To ensure compliance with all applicable legal and policy mandates, it is the operator's responsibility to consult with the appropriate federal, state, and local agencies prior to conducting operations in the park units.

Many of the mitigation measures listed are derived from environmental guidelines and publications developed by the oil and gas industry and environmental professionals. These measures may not address every environmental topic or risk that may be encountered during oil and gas operations, but provide potential options for consideration.

ALTERNATIVE A: NO ACTION (CURRENT MANAGEMENT CONTINUED)

The Council on Environmental Quality (CEQ) requires that alternatives analysis in an EIS "include the alternative of no action" (40 CFR 1502.14(d)). The no-action alternative "sets a baseline of existing impact continued into the future against which to compare impacts of action alternatives" (Director's Order 12, section 2.7 (NPS 2001)). The no-action alternative is a continuation of existing oil and gas management practices and assumes no new management actions where environmental impacts would be implemented beyond those available when the oil and gas management planning process started.

CURRENT OPERATIONS

In the past, there has been no formalized, comprehensive management plan to guide non-federal oil and gas operations in either park unit. Oil and gas operations have been managed on a case-by-case basis based on availability of staff and funding sources. Under alternative A, current operations would continue to be managed in this manner, including site-by-site enforcement of the 9B regulations and other CLPRs, given current levels of staffing. The NPS would continue to work cooperatively with the state on regulations or enforcement, but would be somewhat limited in its ability to conduct inspections and monitoring of all operations on a regular basis and would defer to the state to notify operators about compliance issues. If any operations are found to pose a significant threat to federally owned or controlled lands or waters, the superintendent may suspend the operations until the threat is removed or remedied (see 36 CFR 9.33 and 9.51).

Based on the forecast of oil and gas activity, it is assumed that 125 wells at Big South Fork NRRA and two wells at Obed WSR could be worked over or serviced under this alternative, as staffing limitations and resources allow for review of the proposed projects.

NEW OPERATIONS

The RFD scenario presented in this plan/EIS would apply to alternative A, as new operations would be allowed under the no action alternative. Geophysical exploration (2-D seismic surveys) could be conducted as described above, and up to 25 wells (0 to 20 in Big South Fork NRRA; 5 with surface locations outside the park; and 0 to 5 directionally drilled beneath Obed WSR from locations outside the park unit) could be drilled in the park units over the next 15 to 20 years.

New operations would be subject to CLPRs, including 9B regulations and the requirements for a plan of operations. Proposals for new operations would continue to be evaluated on a case-by-case basis. New surface disturbances in Big South Fork NRRA and Obed WSR would be minimized by using directional drilling techniques and by conducting operations on previously disturbed areas if feasible.

Operations associated with geophysical exploration, drilling, and production could be allowed in all areas of the park units where nonfederal oil and gas rights exist, with the exception of protected areas identified by CLPRs, unless otherwise approved in a plan of operations. This would include provisions in the enabling legislation for Big South Fork NRRA that prohibit oil and gas operations in the designated gorge area, as well as deed restrictions at Obed WSR that require no surface occupancy and the use of technically feasible methods that are least damaging, such as directional drilling. As required in the 9B regulations (36 CFR 9.41), a 500-foot setback from visitor use and administrative areas, as well as perennial, intermittent, or ephemeral watercourses, would apply to all non-federal oil and gas operations, unless specifically authorized in an approved plan of operations. As a result, drilling, production, and geophysical operations would not be permitted on approximately 72,549 acres at Big South Fork NRRA at any time of the year (this number could be higher as it does not account for the land area that overlies mineral estates owned by the NPS). Approximately 52,600 acres of this are within the gorge, where oil and gas operations are prohibited by the enabling legislation for Big South Fork NRRA. There are approximately 17,477 private mineral acres present at Big South Fork NRRA, of which 8,413 acres are protected from development under the 9B regulations described above, unless mitigations were developed and approved in a plan of operations. At Obed WSR, the 9B regulations and deed restrictions would prohibit oil and gas operations on nearly all federal lands within the boundary of the park unit (approximately 3,712 acres) at any time of year.

In addition, provisions identified in GMPs for the park units would have to be considered. At Big South Fork NRRA, these include the road and trail standards (see discussion below and appendix G); as well as the desired conditions and setting identified for each GMP zone (see chapter 1). At the Obed WSR, consistency with the general provisions in the GMP related to non-federal oil and gas operations would be addressed, including stabilizing and revegetating inactive oil and gas sites to protect water quality; considering visual intrusions and noise from oil and gas development; and encouraging cooperation with surrounding landowners to implement measures to address impacts from activities on lands adjacent to the park unit.

Operators would also have to consider the location of long-term monitoring plots at Big South Fork NRRA during planning for new non-federal oil and gas operations. The purpose of these monitoring plots is to observe changes in natural resource conditions over time. The NPS would address the provisions needed to avoid impacts to long-term monitoring plots with operators during the development of plans of operations.

The acreage of protected areas under this alternative is approximate and does not include consideration of GMP provisions or long-term monitoring plots, both of which would be addressed on a case-by-case basis during the preparation of plans of operations. Operating stipulations could be modified, and protected areas could be larger or smaller, if site-specific information (such as engineering, geological, biological, or other studies) warrant the change, or if an operator can demonstrate that their proposed operation would meet the goals of protecting resources and values in the park units.

Plugging and Reclamation

Plugging and reclamation activities would be guided by the 9B or state regulations, as described later in this section, and environmental compliance for these operations would be conducted on a case-by-case basis in both park units. Priorities for plugging and reclamation would be determined based on certain criteria, such as environmental/health and safety issues, and access to the site.

When an operator or the NPS is responsible for plugging and reclamation activities, they would be carried out in accordance with NPS and state standards and 9B plan of operations, if applicable. In both of these cases, the NPS would provide on-site oversight to ensure plugging and reclamation standards are met.

Most operations exempted from 9B regulations under 36 CFR 9.33 (see appendix A) would likely encounter a circumstance (e.g., change in operator, new surface disturbance) that would cause loss of exempt status and would thus be plugged and reclaimed to NPS requirements. In the less likely case where grandfathered status is maintained through plugging and reclamation, the activities would be performed to state requirements only.

As described in the "Forecast of Oil and Gas Activities" it is assumed that approximately 50 wells at Big South Fork NRRA and 5 wells at Obed WSR would be plugged and reclaimed under this alternative.

ROAD STANDARDS

Under alternative A, road standards would be developed on a case-by-case basis depending on the activity. Appendix G outlines road and trail classifications and standards.

The GMP also identifies recreational/administrative routes used by oil and gas operators that are considered suitable for public use at Big South Fork. These roads (shown on figure 6 of chapter 1), the preferred recreational uses, and the associated classifications/standards are identified in appendix G. The standards applied to these roads also serve as examples of what may be required for new nonfederal oil and gas operations should the associated access routes be deemed appropriate for particular recreational or administrative uses. Use and maintenance of these roads would be addressed through discussions with the oil and gas operators during the development of plans of operations to ensure an equitable, cooperative management strategy. Warning signs could be posted to help minimize user conflicts and associated safety issues, including speeding. If an operator needs to improve any of the oil and gas access roads open for public use above the NPS road standards (e.g., to accommodate larger equipment), the operator would be responsible for all costs associated with these changes and their maintenance. All other oil and gas access roads would not be open for recreational uses and NPS would require that roads are constructed to meet the operational needs for oil and gas development or access, including appropriate erosion control and routine maintenance by the operator (NPS 2005a).

Although the standards were developed for Big South Fork, they would also be applied at Obed WSR. However, considering deed restrictions that would likely require directional drilling from outside the park unit, new access routes are not expected within Obed WSR.

INSPECTIONS AND MONITORING

Site inspections and monitoring would continue to be limited to base duties, with priority given when problems or emergencies are reported or if there are information requests from operators. Where sites are found to be impacting, or threatening to impact, park resources beyond the operations area, the NPS would enforce the 9B regulations and/or contact the state to enforce applicable regulations. If any operations, within or outside a park unit, are found to pose a significant threat to federally owned or controlled lands or waters, the superintendent may suspend the operations until the threat is removed or remedied (see 36 CFR 9.33 and 9.51).

ACQUIRING MINERAL RIGHTS ON A CASE-BY-CASE BASIS

Per section 8.7 and 8.7.3 of the NPS *Management Policies 2006*, the NPS may seek to acquire non-federal mineral rights on a case-by-case basis. Under the no-action alternative, acquisition of mineral rights at Big South Fork NRRA would continue to be based on the Land Protection Plan for the park unit (NPS 1998a). Of the 16 priority tracts or interests to be acquired per this plan, outstanding mineral rights are considered the lowest. The Land Protection Plan for Obed WSR (NPS 1986) recommends, as a minimum, NPS easements on lands that overlay oil and gas resources, which would also continue under this alternative.

Park Operations and Management

An equivalent of 3.6 full time employees (FTEs) would conduct activities associated with management of the nonfederal oil and gas operations in Big South Fork NRRA and Obed WSR under alternative A. This includes three positions (3 FTE) dedicated specifically to oil and gas management, including a geologist, oil and gas technician, and a physical science technician. In addition, part-time support is received from a biotech, wildlife biologist, archeologist, community planner, botanist, and resource management chief. These staff also assist with management of oil and gas operations at Obed WSR. The NPS Geologic Resources Division also provides support equivalent to that of approximately 0.4 FTEs. Staff activities include inspections/monitoring; response to emergency situations (see appendix J for details on emergency response procedures); review of plans of operations; preparation of environmental compliance documents for plans of operations, as well as plugging and reclamation activities; coordinating plugging and reclamation activities and providing oversight during such operations; and other miscellaneous activities (e.g., coordinating with the state and non-federal oil and gas operators).

Implementation Costs

The costs associated with alternative A would primarily include staff time for oversight of the non-federal oil and gas operations in the park as described above. Based on input from park staff, the estimated cost of this staff time and other miscellaneous costs are shown in table 5.

Table 5. Cost Estimate Alternative A

Action	Assumptions	Annual Cost	Cost for the 15-Year Planning Period
Big South Fork NRRA Staff Time	An equivalent of approximately 3.6 full-time employees.	$276,697	$4,150,455
Obed WSR Staff Time	Covered by Big South Fork NRRA staff.	$0	$0
Geologic Resources Division Staff Time	An equivalent of approximately 0.4 full-time employees, plus 35% for administrative and benefits overhead costs.	$48,000	$720,000
Miscellaneous Costs	Include equipment, vehicle, fuel, etc.	$10,000	$150,000
Total		**$334,697**	**$5,020,455**

ALTERNATIVE B: COMPREHENSIVE IMPLEMENTATION OF 9B REGULATIONS AND A NEW MANAGEMENT FRAMEWORK FOR PLUGGING AND RECLAMATION

Under alternative B, an oil and gas management plan that clearly articulates the CLPRs applicable to the exploration, production, and transportation of nonfederal oil and gas resources in Big South Fork NRRA and Obed WSR would be implemented to help ensure the long-term protection of the resources and values in these park units. Park staff would proactively pursue enforcement of the 9B regulations and plans of operations and provide clear communication with the public and operators about CLPRs, including the 9B regulations.

CURRENT OPERATIONS

Under alternative B, the NPS would proactively pursue 9B enforcement and plans of operations from current operators in both park units, and would plan to hire additional seasonal or term employees to accomplish this. Priorities for enforcement would be set considering (in no particular order):

- environmental/health and safety issues at well sites;
- the presence of abandoned wells;
- the extent of an operator's property interest in the park units;
- the location of a well relative to producing areas;
- road conditions; and
- status of compliance with state regulations

The NPS would continue to work cooperatively with the state on regulations or enforcement, but increased inspections and monitoring would proactively identify sites that are found to be impacting, or threatening to impact, park resources beyond the operations area (see section on "Inspections and Monitoring" for this alternative). The 9B regulations would be enforced at any such sites, and operations found to pose a significant threat to federally owned or controlled lands or waters shall be suspended by the superintendent until the threat is removed or remedied (see 36 CFR 9.33 and 9.51).

It is assumed that 125 wells at Big South Fork NRRA and two wells at Obed WSR could be worked over or serviced under this alternative, as staffing limitations and resources allow for review of the proposed projects.

NEW OPERATIONS

The RFD scenario presented in this plan/EIS would apply to alternative B. Geophysical exploration (seismic surveys) could be conducted as described above, and up to 25 wells (0 to 20 in Big South Fork NRRA, 5 with surface locations outside the park, and 0 to 5 directionally drilled beneath Obed WSR from locations outside the park unit) could be drilled in the park units over the next 15 to 20 years.

As with alternative A, new operations would be subject to CLPRs, including 9B regulations and the requirements for a plan of operations. The park would use the oil and gas management planning process to proactively share information with operators about regulatory requirements and to focus staff resources on the implementation and compliance with the regulatory framework. The park would share information with the operators such as example plans of operation and EAs, which should help facilitate the process.

New surface disturbances in Big South Fork NRRA and Obed WSR would be minimized by using directional drilling techniques and by conducting operations on previously disturbed areas if possible.

Under alternative B, operations associated with geophysical exploration, drilling, and production could be allowed in all areas of the park units, with the exception of protected areas identified by CLPRs, as described for alternative A. This includes prohibitions on oil and gas operations in the designated gorge area (Big South Fork NRRA); deed restrictions that require no surface occupancy and the use of technically feasible methods that are least damaging, such as directional drilling (Obed WSR); and 500-foot setbacks from visitor use and administrative areas, as well as perennial, intermittent, or ephemeral watercourses, unless specifically authorized in an approved plan of operations (as required by 36 CFR 9.41). Operators would also have to consider provisions in the GMPs for the park units, as well as the location of long-term monitoring plots at Big South Fork NRRA, during planning for new nonfederal oil and gas operations, as described for alternative A.

In addition, because deed restrictions prevent new drilling on federal surface in Obed WSR, there would be No Surface Use (i.e., new operations would not be permitted to use or occupy the land surface) of the gorge at the Obed WSR. The Obed WSR contains an outstanding example of a deep, sandstone gorge that lines much of the river system and generally stretches from the river bed to the bluff tops. This gorge is identified in the GMP for the park unit as part of the natural resources interpretive theme for Obed WSR (NPS 1995a). This area possesses great ecological diversity with a variety of habitats for many species of flora and fauna, including a number of endangered and threatened species. Although the 9B regulations require a 500-foot setback from the banks of any watercourse (36 CFR 9.41(a)) that likely encompasses all of the gorge, the planning team applied the no surface use provision under this alternative to ensure the important values of this area are protected from occupancy and disturbance of surface resources. Directional drilling to reach mineral rights beneath the gorge would still be an available option.

Based on current legal and policy restrictions, drilling, production, and geophysical operations would not be permitted on approximately 72,549 acres at Big South Fork NRRA at any time of the year (approximately 52,600 acres of this are within the gorge), unless specifically authorized in an approved plan of operations. There are approximately 17,477 private mineral acres present at Big South Fork NRRA, of which 8,413 acres would be protected from development under the 9B regulations described above. At Obed WSR, oil and gas operations would be prohibited on all federal lands within the boundary (approximately 3,712 acres). None of the area where exploration, drilling, or production may be limited includes private lands found within the boundary of Big South Fork NRRA or Obed WSR. Also, the acreage of protected areas under this alternative is approximate and does not include consideration of GMP provisions or long-term monitoring plots, both of which would be addressed on a case-by-case basis during the preparation of plans of operations. Finally, operating stipulations could be modified, so protected areas could be larger or smaller, if site-specific information (such as engineering, geological, biological, or other studies) warrant the change, or if an operator can demonstrate that their proposed operation would meet the goals of protecting resources and values in the park units and the appropriate mitigations are included in an approved plan of operations.

As with current operations, the NPS would continue to work cooperatively with the state on regulations or enforcement, but increased inspections and monitoring would proactively identify sites that are found to be impacting, or threatening to impact, park resources beyond the operations area (see section on "Inspections and Monitoring" for this alternative). The 9B regulations would be enforced at any such sites, and operations found to pose a significant threat to federally owned or controlled lands or waters shall be suspended by the superintendent until the threat is removed or remedied (see 36 CFR 9.33 and 9.51).

PLUGGING AND RECLAMATION

Generally, plugging and reclamation activities would be guided by the 9B or state regulations, as described later in this section, and environmental compliance for these operations would be conducted on a case-by-case basis in both park units. However, alternative B includes a new management framework to efficiently complete the compliance process for the plugging and reclamation of inactive wells that represent potential threats to park resources and values; this framework is described in detail below.

For existing operations exempted from the 9B regulations (see 36 CFR 9.33 in appendix A), plugging and reclamation would be conducted per state regulations, although many wells will have new surface disturbance associated with the action or some other action that will trigger the 9B regulations and the new management framework (see 36 CFR 9.33 in appendix A).

Existing operations that do not have the grandfathered exemption would be plugged and reclaimed in accordance with the 9B regulations, regardless of whether or not the operator or NPS plugs the well. These operations would also be subject to the provisions of an approved plan of operations or special use permit, as appropriate. In all circumstances, the NPS would provide on-site oversight to ensure plugging and reclamation standards are met.

It is assumed that about 50 wells at Big South Fork NRRA and five wells at Obed WSR would be plugged and reclaimed over the life of this plan under this alternative.

New Management Framework

As described previously in the section on “Development of New Management Framework for Plugging and Reclamation of Well Sites” the intent of the new management framework is to describe and analyze the components of plugging/reclamation activities, analyze the impacts in this plan/EIS, and enable subsequent environmental compliance for these wells by using the analysis in the EIS in a streamlined process. The following describes steps that would be taken to implement site-specific projects, as well as the activities that would be undertaken as part of plugging and reclamation, under the new management framework. This includes a discussion of criteria that would be used to prioritize sites identified as candidates for plugging, as well as the details of each component of the process, including gaining access, plugging, and reclaiming a site. Information is provided on equipment that would be needed for each component and standards for specific activities associated with each component. Detailed information and some examples that provide guidance for managers of proposed plugging and reclamation activities are provided in appendix K.

Implementation of Site-Specific Plugging and Reclamation Projects

A number of steps would be implemented under this alternative to determine the appropriate approach to the components of the plugging and reclamation activities under the new management framework. These steps are:

1. Identify wells for plugging and reclamation
2. Prioritize wells for plugging and reclamation
3. Site survey or assessment for sensitive resources

4. Determine appropriate access, well plugging, and reclamation activities
    a. Tailor desired condition and the reclamation requirements to the site
    b. Prepare site-specific monitoring program
    c. Determine subsequent compliance needs

A number of these steps have been completed or are supported by information developed as part of the new management framework and the EA completed in 2010 for oil and gas well plugging and restoration. The 2001 well inventory at Big South Fork NRRA was used to identify well sites that are candidates for plugging and reclamation (step 1). Preliminary assessments of resources at each site have been conducted using available data, and would be used in conjunction with guidance developed to prioritize wells for plugging and reclamation (see following section) (steps 2 and 3).

General guidelines for access, plugging and reclamation activities are also described in this plan/EIS, and include goals or desired conditions related to each of these (steps 4 and 4a). When a project is proposed, a survey of the site, including surveys for sensitive species and cultural resources, would be conducted to refine the resource information and the access, plugging, and reclamation activities that would be implemented. After a well site has been surveyed, park unit resource managers would collaborate to determine specific desired conditions that are to be achieved when plugging and reclaiming the particular site (e.g., specific goals related to access, plugging, and reclamation).

Once decisions have been made on the appropriate actions to be taken for gaining access, plugging, and reclaiming a site, park unit managers must then determine the appropriate compliance pathway. This alternative also provides guidance to help staff of Big South Fork NRRA and Obed WSR determine the compliance requirements for each plugging and reclamation project (step 4c).

Guidance for Prioritizing Well Sites for Plugging and Reclamation

Park staff would evaluate all wells that are candidates for plugging and reclamation to determine their potential for impacts on park unit resources and values. Sites would be prioritized for plugging and reclamation based on (in no particular order):

- environmental threats (including contamination);
- health and safety issues;
- access;
- mechanical conditions (deterioration and subsidence);
- proximity to the gorge;
- desired conditions and settings in GMP zones;
- cost;
- funding availability; and
- responsible party information.

The NPS does not expect to plug and reclaim all candidate wells during the 15- to 20-year period of this plan.

Access, Well Plugging, and Reclamation Activities

Access Roads—There are four goals for developing access roads during plugging and reclamation activities.

1. Provide access to well site for crews to disassemble and remove production equipment, debris, etc.
2. Provide access to well sites for plugging equipment, materials, and personnel.
3. Create no more re-disturbance (vegetative removal and road repair) than is necessary to achieve goals 1 and 2.
4. Secure access to authorized use by project personnel only.

Naturally reclaimed oil and gas access road.

The following actions would be required when developing access roads. Ultimately, the requirements for developing access roads would be driven by plugging equipment needs, primarily the plugging rig and cementing equipment.

Vegetation Trimming/Removal—Much of the network of oil and gas access roads is still in place, and the road base is serviceable for access needs associated with plugging and reclamation. Gas-powered chainsaws would be used for trimming vegetation along the road sides. A small vehicle with a chipper/shredder attachment or tractor with a brush hog may be used to clear low-growing plants, small woody shrubs, and /or small trees. Small bulldozers or the front bucket of a backhoe may be used to clear vegetation within the roadway or remove large downed woody debris. Some access has been blocked by mature trees that have fallen across established routes. These tree trunks would be cut into sections and removed. Cut vegetation would be dispersed into the woods in a manner that still provides reasonable ingress/egress for foot traffic and wildlife.

Earthwork—In most cases, it would be possible to limit road widths to 12 feet total disturbance (including road base and side ditches), which is consistent with original construction techniques. Therefore, little, if any, new disturbance would be required. Mudholes and road washouts would need to be repaired for rig access and larger equipment. The material for road repair (including improving the crown and filling in holes) would generally be obtained from clearing/establishing ditches. In some cases, temporary drainage would be established to empty mudholes. In a few cases, there may be sections of road that are excessively eroded. Park managers would evaluate whether altering the route or repairing the existing route is best in terms of 1) meeting access needs, and 2) minimizing impacts.

Erosion Control—Staked straw bales and sediment traps would be used at mudhole drainages and steep slopes in excess of 3%, as well as along areas of new disturbance. Water bars would be used to divert runoff to drainages on slopes greater than 3%.

Use of Gravel or Other Road Base Materials—Road base materials may be removed or left in place, depending on the future desired conditions of the site. Gravel or red dog (a local material that can be used in place of gravel to stabilize sections of road) would be used as road base material for access routes, where necessary. Gravel would be screened to minimize the amount of limestone sand present that could contribute to impacts on water-quality parameters such as pH. Larger (3 inches or more) material would often be necessary in filling in mudholes or at the base of jump up rocks. Smaller gravel would be used for traction on steeper slopes.

Currently operational oil and gas access road.

Equipment—Typical equipment used in opening up and repairing access roads includes a small dozer, small backhoe, hand tools (gas-powered chainsaw, hand saws, axes, shovels, etc.). Personal vehicles (typically four-wheel drive pickup trucks or sport utility vehicles) would be used to transport both people and supplies/equipment.

Well Plugging

The NPS goals and objectives in plugging a well, which have been refined for Big South Fork NRRA and Obed WSR, are:

1. To protect the zones of usable quality water and the surface by preventing the escape of oil, gas, or other fluids. To accomplish this
    a. Set cement plug(s) to isolate all formations bearing oil, gas, geothermal resources, and other prospectively valuable minerals from zones of usable-quality water.
    b. Set cement plug(s) to isolate all formations bearing usable-quality water.
2. To leave the surface in a clean and safe condition that sets the stage for surface reclamation. To accomplish this
    a. Set a cement plug to isolate the surface or intermediate casing from open hole below the casing shoe.
    b. Set a cement plug to seal the well at the surface.
    c. Remove surface casing below grade and cap the well.

Well with plug in place.

In accomplishing well plugging, standards including the use of methods that would not hamper or expand the subsequent site reclamation process would be required when conducting surface operations.

Design—Primarily, plugging activities would include re-disturbing only those areas along the access road and at the well site which are necessary to gain access for equipment and materials to complete the plugging. The NPS has adopted the minimum standards of the *Department of Interior's Onshore Oil and Gas Order Number 2, Section III.G, Drilling Abandonment* for plugging wells in parks (appendix L). The plugging requirements of Onshore Order No. 2 were written specifically for plugging newly drilled wells. However, the NPS has applied the same standards to the permanent abandonment of exhausted producers or service wells.

General Cementing Requirements—The plugging operation needs to include the general NPS requirements that are explained in appendix K for cement quality, cement volumes, cement placement, plugging fluids, static hole and testing plugs, and uncemented annular space. When NPS standards differ from state requirements, the stricter requirement to meet both state and federal standards would apply. The NPS may use or approve variations from these standards if the intent of a standard would be achieved to the degree that mechanical conditions of the well would allow. "A number of wells in the parks have missing or incomplete records and may require placement of continuous cement plugs over the upper portion of the well to ensure isolation and protection of usable quality water zones."

Public Health and Safety—Public health and safety concerns are limited to park visitors coming on location while plugging activities are ongoing. The NPS intends to close areas associated with the well site that are accessible to visitors while well plugging is ongoing. However, if people not associated with the well work should come on the location, workers/supervisors would direct them away.

Duration of Activities—A typical well plugging operation would last two to five days depending on equipment in the well, wellbore conditions, whether casing recovery is involved in the procedure, and number of plugs that need to be set. Most plugging jobs would be in the two to three day range from rig up to rig down.

Other Well Plugging Considerations—Precautions would be taken to prevent oil, brine, chemicals, cement, and other materials from contaminating the area and would include the effective use of plastic liners beneath the workover rig, pipe racks, fuel storage, and other equipment as necessary. All fluids and solids returned to the surface from the wellbore would be collected in tanks and disposed of back down the well (fluids only) or at an approved disposal site outside of the park. No water would be obtained from sources within the NPS property. Water needed during plugging would be transported to the site by a water truck.

Equipment— Equipment and materials to be used during the plugging operations consist of the following:

- Small pulling rig – typically one capable of only pulling single joints
- Cement mixing/pumping truck or trailer
- Bulk or sacked cement
- Water truck
- Tubing basket
- Winch truck

Heavy equipment used during oil and gas plugging operations.

- Personal vehicles
- Tanks for handling fluids/solids returned from the well

Reclamation

For surface reclamation, the 9B regulations state that the operator shall at a minimum return the area to natural conditions and processes, providing for safe use of the area by wildlife and park visitors, reestablishment of native vegetative communities, and normal surface and subsurface water flow (see 36 CFR 9.39(b)) The 9B regulations identify specific actions that need to be completed to satisfy the standard. These are:

1. Remove all above ground structures, equipment, and roads no longer needed for future operations.
2. Remove all other man-made debris that resulted from operations.
3. Remove or neutralize contaminating substances.
4. Restore the natural contour of the land.
5. Replace the natural soils needed for vegetation.
6. Reestablish native vegetative communities.

These actions provide an outline for a reclamation procedure. The reclamation procedure would further describe the methods and equipment that would be used to accomplish each of the required actions once a site-specific project is identified.

Contamination—If there is reason to suspect soils (or groundwater) have been contaminated, the NPS would require an operator to use site investigation methods to identify the area of contamination and associated concentrations of contaminants. Removal is usually a preferred method, but remediation on site can also be evaluated. Post cleanup work would typically involve obtaining and testing samples to verify that contaminating substances have been removed or neutralized (see appendix M, “Guidelines for Detection and Quantification of Contamination at Oil and Gas Operations”). Neutralization of contamination means that contaminant concentrations would be reduced in soils (or groundwater) to a condition that would not adversely affect, injure, or damage federally owned or controlled lands and waters; provides for the safe movement of native wildlife; and does not jeopardize visitor health and safety.

Restoring Natural Conditions—Pre-disturbance conditions would most often not be known with certainty; however, cut and fill areas of original road and pad construction would often be readily apparent. Surrounding plant communities are strong indicators of pre-disturbance vegetation conditions. Decisions on trying to return to original contours would take into consideration current conditions of plant communities and soils/slope stability and mineral ownership. If the access road may be needed for future private mineral access the road would be left in place, stabilized to prevent erosion, and re-seeded with native vegetation. Most well sites are in heavily forested areas where aesthetics would play a secondary role to functions and natural processes. If wetland areas have been directly or indirectly affected by operations, sites would be returned to their preexisting elevations. Soil, hydrology, and native vegetation communities would be restored as soon as practicable after completion of the plugging operation. Projects would implement Best Management Practices for wetlands as identified in NPS Procedures Manual 77-1, Appendix 2.

The reestablishment of native vegetative communities would generally be accomplished by seeding with native grasses and using straw mulch to help stabilize soils and retain moisture until grasses can become established. The grasses provide the early succession stage for native plant communities that surround the roads and pads. For smaller reclamation efforts, the NPS could blow leaf litter from the adjacent forest into disturbed areas to encourage the reintroduction of native plant seeds and supplement the mulch needed.

The reclamation procedure described previously would include provisions (methods and frequency) for monitoring, to determine success of revegetation efforts (e.g., species survival, native vegetation density and diversity, percent cover, etc.). Monitoring would identify problem areas which may require additional actions. Due to the likelihood of exotic plants becoming established in the reclamation areas, site monitoring would include monitoring for exotic species and in some cases follow-up treatment or control may be required.

Equipment—Typically, small earthmoving equipment (small dozer or backhoe) would be used to restore contours, remove pit contents if necessary, etc. Hand tools (shovels, rakes, etc.) would be used to finish the detail or work in areas where larger equipment would unnecessarily disrupt/damage existing vegetation. Seed and straw mulch would be distributed by hand within the pad and access routes. Personal vehicles (typically four-wheel drive pickup trucks or sport utility vehicles) would be used to transport both people and supplies/equipment. A small dump truck maybe be required if reclamation involves removal of contaminated soils. Access for monitoring would be by truck or off-road vehicle to the point where vehicles would negatively affect reclamation efforts (i.e., along roads and trails not being reclaimed), and then by foot.

Pulling rigs used during well reclamation activities.

Alternative Uses—Park managers may also identify alternative uses for the site that conform to parks' purposes and goals. For example, an access road and wellpad may be retained for administrative or recreational use. Different land uses would necessarily alter reclamation needs.

For Big South Fork NRRA, there are two instances where part or all of an access road may not be reclaimed following a specific plugging project. The road may be left in place as provided for in the GMP (see "Big South Fork National River and Recreation Area General Management Plan" section and figure 6 of chapter 1, as well as appendix G), or to provide access to additional wells that are either active or need to be plugged. In the latter case, these roads would eventually be reclaimed per the 9B regulations.

Determination of Subsequent Compliance Requirements

A decision tree (figure 7) would be used to confirm that future well plugging and reclamation projects comply with NEPA and other regulatory requirements (e.g., the *Endangered Species Act* and the *National Historic Preservation Act*). Park unit staff would confirm that a proposed plugging/reclamation project, and the associated effects have been considered by reviewing site-specific conditions and the impacts analyses in this plan/EIS. The park unit staff would also confirm whether environmental conditions have or have not changed from what is presented in the plan/EIS. If a new method of plugging or reclamation (such as modified equipment needs or site preparation for reclamation) were developed and considered for use, the NPS must also determine whether these new methods are similar to ones already addressed in the plan/EIS and that the effects would also be similar. To assist project managers in determining the appropriate compliance needs a new environmental screening form would be filled out that is tailored to the site-specific well plugging and reclamation phase of these projects.

If a well plugging and reclamation project and its effects are determined to have been adequately addressed in this plan/EIS, the site-specific NEPA compliance document could be a memo to file. The memo would describe the site-specific impacts and explain why they are within the scope of impacts considered in this plan/EIS. If it is determined that a proposed well plugging and reclamation project and its effects are not addressed in this draft plan/EIS, preparation of an EA or EIS (depending on the extent of the impacts) would be required.

Other federal, state, and local laws may also have information requirements that overlap with NEPA. The compliance review would also confirm that the proposed project has addressed these other requirements. For example, when plugging and reclamation of a site is proposed in areas where sensitive species or their critical habitat is known to be present, criteria would be used to assist in selecting the appropriate actions and mitigation measures. The presence of state-listed species at well-plugging/reclamation sites would require consultation with the state, per NPS *Management Policies 2006*.

If plugging or reclamation activities could impact a federally listed species or its critical habitat, the NPS must comply with Section 7(a)(2) of the Endangered Species Act, which requires federal agencies to ensure their actions do not jeopardize the continued existence of federally listed species or adversely modify any critical habitat. Compliance with section 7(a)(2) requires consultation with the U.S. Fish and Wildlife Service (USFWS), during which the NPS must make an effects determination. This process involves an evaluation of the impacts to listed species and concludes with a determination of “no effect,” “not likely to adversely affect,” or “may affect.” The length and requirements of consultation may vary depending on the magnitude or complexity of the project (see “may affect” determinations below). Regardless of this fact, proposed activities cannot proceed until all consultation requirements have been met and the USFWS concurs, in writing, with the effects determination. A more detailed explanation of the Section 7 process can be found at the following website:
http://www.policyarchive.org/handle/10207/bitstreams/1560.pdf

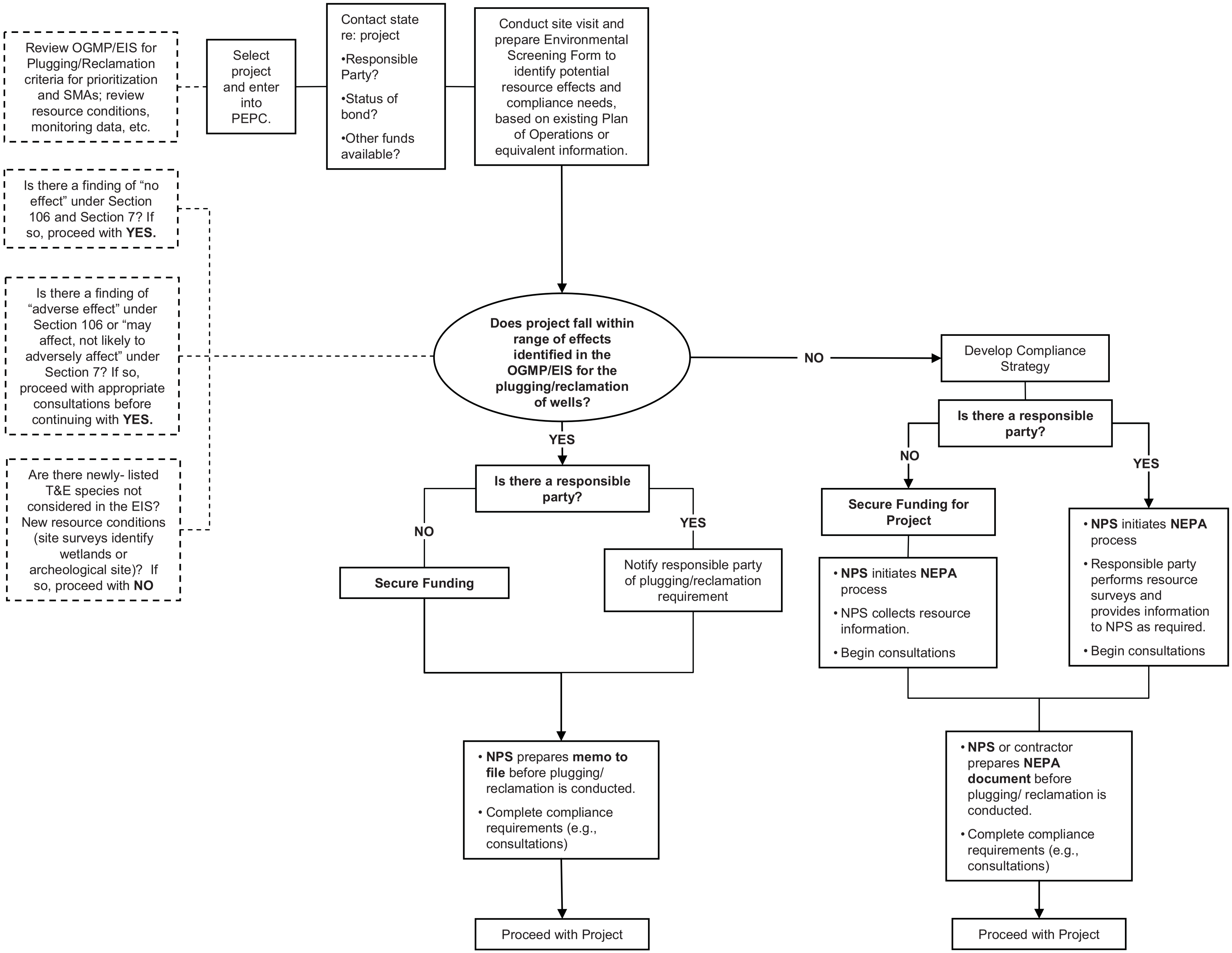


FIGURE 7. NEW MANAGEMENT FRAMEWORK DECISION TREE

For projects that meet the "no effect" or "not likely to adversely affect" determinations for federally listed species detailed in this document, the NPS could seek to establish a programmatic consultation agreement between the park units and the USFWS to address the requirements of Section 7 of the *Endangered Species Act*. Such an agreement would outline specific measures to protect listed species or their critical habitat (e.g., establishing buffers during sensitive times of the year to ensure protection of these species) and could act to expedite or streamline the Section 7 process. Ultimately, once the USFWS issues their concurrence on these determinations, these plugging and reclamation activities would not require further consultation, unless the review of site-specific projects identify changes that warrant further coordination (e.g., new species not detailed in this plan/EIS are present or the effects of the methods proposed are not covered). If a programmatic consultation agreement cannot be completed, the section 7 compliance requirements would be met on a case-by-case basis.

Determinations of "may affect" for plugging and reclamation activities require formal consultation with the USFWS. Plugging and reclamation activities that require formal consultation would be addressed individually, and will require the preparation of a biological assessment if the NPS considers the proposed project a "major construction activity." The purpose of a biological assessment is to evaluate the effects of the proposed action on listed species or their critical habitat and this analysis will assist the NPS in making its effects determination. Should additional studies or research be required to complete the assessment, and that fieldwork have the potential to take a listed species, an Endangered Species Act, Section 10(a)(1)(A) recovery permit will be required.

If cultural resources are present, and could be affected by activities associated with plugging and reclamation, collaboration would occur between oil and gas program staff, cultural resource specialists, and other agencies (e.g., the State Historic Preservation Office), to determine the appropriate actions and mitigation measures to minimize, to the extent possible, any adverse impacts to those resources. As provided for in the implementing regulations (36 CFR 800) of the *National Historic Preservation Act,* a programmatic memorandum of agreement could also be developed among the park units, and other appropriate entities, such as Tribal Historic Preservation Officers, State Historic Preservation Offices, and the Advisory Council on Historic Preservation. This agreement would be consistent with the provisions of the 2008 Programmatic Agreement among the NPS, the Advisory Council on Historic Preservation, and the National Conference of State Historic Preservation Officers (NPS 2008e). It would define specific types of undertakings that the signatories of the agreement mutually concur would be excluded from further review beyond the park unit level. These stipulations would be based on information adequate to identify and evaluate affected cultural resources. Decisions regarding these undertakings would be made and carried out in conformity with applicable NPS policies, standards, and guidelines. This agreement would outline specific mitigation measures to ensure the identification, evaluation, and protection of National Register-eligible properties that would potentially be affected by future plugging and reclamation projects. The programmatic agreement would also identify special circumstances under which further compliance with section 106 would be necessary. If a programmatic memorandum of agreement cannot be completed, the section 106 compliance requirements would be met on a case-by-case basis.

Road Standards

As noted for alternative A, road standards would be developed on a case-by-case basis with the operator. Minimum standards have been developed under alternative B and would be applied to existing and new roads, as well as roads developed for access to plug and reclaim a site. Depending on whether or not these roads are dedicated to oil and gas operations, or provide some sort of recreational or administrative access, the standards can differ substantially (see appendix G).

At a minimum, existing and future roads that only serve producing wells (i.e., no recreational or administrative access), or that would only provide access for future drilling operations, would be 8- to 18-foot wide "one-lane" roads with a 12- to 30-foot right-of-way. Surfaces would be dirt or gravel; shoulders would be no more than 1-foot (dirt or gravel); and the cleared height would be between 12 and 20 feet. Crowning, slopes, and ditches could be required on some roads as well. These roads would be equipped with locking gates to protect public health and safety. The NPS would be responsible for enforcing unauthorized use on these roads.

Road standards based on the Big South Fork GMP were also developed for the plugging and reclamation new management framework discussed under alternative B. In most cases, roads developed to provide access for plugging and reclamation (including road base and side ditches) would be limited to a width to accommodate the plugging equipment required, with adequate cleared height (based on the minimum standards) to allow equipment access.

If any of these routes are proposed for recreational uses, they would ultimately need to meet the standards described in the GMP for the proposed use (either during or after the operation) (see appendix G). Requirements for the use and maintenance of these roads would be the same as those identified under alternative A.

The minimum standards developed for Big South Fork NRRA would also be applied at Obed WSR. However, new access routes are not expected within Obed WSR under this alternative, taking into account current regulations, deed restrictions, and prohibitions within the gorge area.

Increased Inspections and Monitoring

Site inspections and monitoring would be expanded beyond those activities conducted when problems and emergencies are reported, or when there are requests from operators. Current operations as well as new drilling, production, plugging, and reclamation activities would be more frequently monitored for compliance with the 9B regulations; consistency with the RFD scenario; compliance with the standards in the new management framework for plugging and reclamation activities; compliance with road standards; as well as other miscellaneous inspections (e.g., periodic stormwater testing and surveys for invasive plant species).

Acquiring Mineral Rights on a Case-by-Case Basis

As mentioned under the no-action alternative, alternative A, per sections 8.7 and 8.7.3 of the NPS *Management Policies 2006*, the NPS may seek to acquire non-federal mineral rights on a case-by-case basis. Under the action alternatives, alternatives B and C, the NPS would amend the land protection plans for both park units to initiate a program to acquire funding for purchasing mineral rights from willing sellers in Big South Fork NRRA and Obed WSR.

Park Management and Operations

Administrative and Planning Responsibilities

It is expected that implementation of a comprehensive non-federal oil and gas management program under alternative B would enhance the ability of the Big South Fork NRRA and Obed WSR staff to respond to requests from operators, increasing their administrative and planning responsibilities. These responsibilities include providing guidance to operators developing plans of operations; reviewing plans of operations and preparing environmental compliance documents; reviewing proposed plugging and reclamation activities per the new management framework and subsequent environmental compliance;

coordinating plugging and reclamation activities and providing oversight during such operations; and identifying responsible parties. To the extent possible, the NPS would use information presented in this plan/EIS, as well as the operators handbook for non-federal oil and gas development in units of the national park system (available on the web at http://www2.nature.nps.gov/geology/oil_and_gas/op_handbook.cfm), to minimize the administrative and planning responsibilities of both operators and the NPS. In addition, staff activities would include increased inspections/ monitoring and response to emergency situations.

Outreach and Education

Under alternative B, outreach and education related to non-federal oil and gas operations would be increased for operators at Big South Fork NRRA and Obed WSR. The NPS would offer training and workshops; provide information and helpful tools to operators by disseminating brochures and conducting presentations; as well as increase coordination and collaboration with the state, oil and gas associations, and operators, by working with them to integrate NPS-specific requirements into their training programs, and jointly participating in public and other meetings.

Staffing

Additional seasonal or term employees may be added to the current 3.6 FTEs to conduct activities associated with management of the nonfederal oil and gas operations in Big South Fork NRRA and Obed WSR under alternative B. Current positions include three positions (3 FTE) dedicated specifically to oil and gas management, including a geologist, oil and gas technician, and a physical science technician. In addition, part-time support is received from a biotech, wildlife biologist, archeologist, community planner, botanist, and resource management chief. These staff also assist with management of oil and gas operations at Obed WSR. The NPS Geologic Resources Division also provides support equivalent to that of approximately 0.4 FTEs. The additional seasonal or term staff could be added as needed to expand the inspection and monitoring program beyond the base operations level and would consist, for estimation purposes, of 1 FTE.

IMPLEMENTATION COSTS

The costs associated with alternative B would primarily include staff time for oversight of the non-federal oil and gas operations in Big South Fork NRRA and Obed WSR as described above. Based on input from park staff, the estimated costs of this staff time as well as miscellaneous costs are shown in table 6.

TABLE 6. COST ESTIMATE ALTERNATIVE B

Action	Assumptions	Annual Cost	Cost for the 15-Year Planning Period
Big South Fork NRRA Staff Time	An equivalent of approximately 3.6 full-time employees (current staff) plus an equivalent 1 FTE seasonal or term employee.	$276,697 plus $72,500 for seasonal or term employee(s) = $349,197	$5,237,955
Obed WSR Staff Time	Covered by Big South Fork NRRA staff.	$0	$0
Geologic Resources Division Staff Time	An equivalent of approximately 0.4 full-time employees, plus 35% for administrative and benefits overhead costs.	$48,000	$720,000
Miscellaneous Costs	Include equipment, vehicle, fuel, etc.	$10,000	$150,000
Total		**$407,197**	**$6,107,955**

ALTERNATIVE C: COMPREHENSIVE IMPLEMENTATION OF THE 9B REGULATIONS, A NEW MANAGEMENT FRAMEWORK FOR PLUGGING AND RECLAMATION, AND ESTABLISHMENT OF SPECIAL MANAGEMENT AREAS

Alternative C is similar to alternative B, but adds designated SMAs and associated restrictions to provide additional protection to sensitive areas. SMAs would be applied to non-federal oil and gas operations as described in the following sections.

SPECIAL MANAGEMENT AREAS

In addition to the protected areas described under alternatives A and B, SMAs would be formally designated under alternative C. These include areas of Big South Fork NRRA and Obed WSR where resources and values would be particularly susceptible to adverse impacts from oil and gas operations, or areas where certain resources are important to maintaining the ecological integrity of the park units. SMA boundaries are illustrated in figures 8, 9 and 10. Under this alternative, surface use and timing stipulations have been developed for the SMAs for different types of non-federal oil and gas operations, as follows. These stipulations would be followed unless mitigation that specifically addresses the resource or value identified in the SMA and that would protect and enhance the resource or value is authorized in an approved plan of operations.

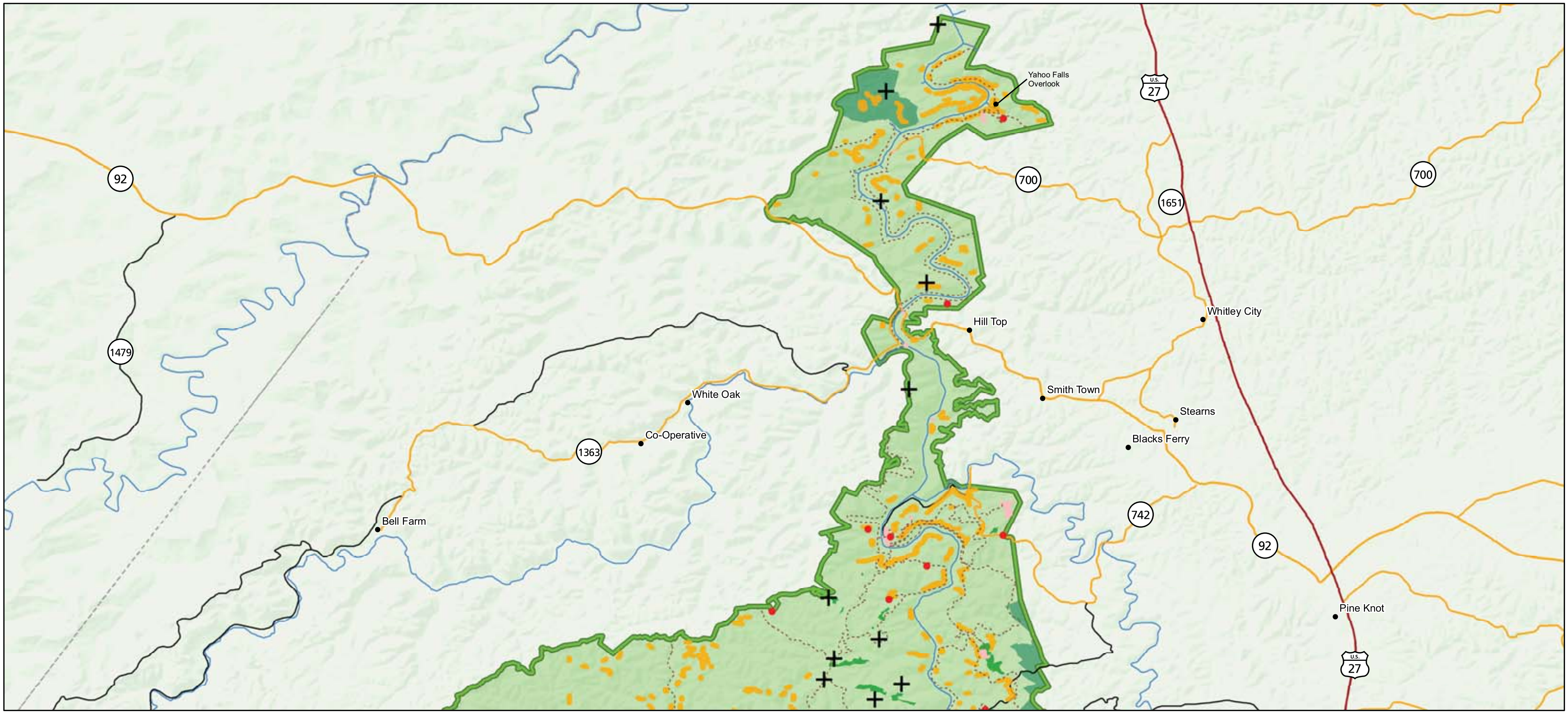
- **Sensitive Geomorphic Feature SMA**—With the exception of plugging and reclamation activities, there would be No Surface Use in this SMA, which includes features such as arches, chimneys, natural bridges, falls, and windows (unless mitigations are approved in a plan of operations). A 500-foot setback would be required for geophysical exploration, drilling and production operations based on the sensitivity of the resource and the potential impacts from vibrations associated with proposed operations.
- **Cliff Edge SMA**—As with sensitive geomorphic features, there would be No Surface Use in this SMA with the exception of plugging and reclamation activities (unless mitigations are approved in a plan of operations). Generally, a 100-foot setback would be required for all oil and gas operations (exploration, drilling, or production) unless an operator can demonstrate that these activities would not negatively impact the associated resources (federally threatened, endangered, candidate and/or state-listed species); archeological resources; sites eligible for listing on the NRHP; and/or visitor experience at the location. Timing restrictions may be applied to drilling operations to minimize impacts to species of special concern, and to avoid impacts to soils from rutting.
- **Managed Fields SMA—**With the exception of geophysical exploration and plugging and reclamation activities, there would be No Surface Use in this SMA, which includes managed fields in the vicinity of private mineral interests (unless mitigations are approved in a plan of operations). Generally, there would be no setback for geophysical exploration. There would be a 100-foot setback for drilling and production.
- **SMAs for Visitor Use Areas, Administrative Areas, and Trails**—Although these SMAs were established for differing reasons (refer to table 4 earlier in this chapter), the stipulation assigned would be the same. With the exception of plugging and reclamation activities, No Surface Use would be allowed in these areas, and setbacks would be required from the outer boundary of the SMA for geophysical exploration (500 feet) as well as drilling and production (1,500 feet) for visitor use and administrative areas and 300 feet for trails (unless mitigations are approved in a plan of operations). Even if operations are allowed in these areas through plans of operation, all

operations would be limited during high visitor use or visitation periods (generally April through October) to minimize impacts to visitors, and drilling would only be allowed during dry periods to minimize impacts to soils from rutting.

- **Cultural Landscape and Cemeteries SMA**—With the exception of plugging and reclamation activities, No Surface Use would be allowed in these areas, and setbacks would be required from the outer boundary of the SMA (unless mitigations are approved in a plan of operations). A 100-foot setback from cemeteries and a 1,500-foot setback from cultural landscapes would be required for all operations. All operations would be limited during high visitor use or visitation periods (generally April through October) to minimize impacts to visitors. Drilling would only be allowed during dry periods to minimize impacts to soils from rutting.
- **State Natural Area SMA**—No Surface Use would be allowed in the Honey Creek and Twin Arches state natural areas, with the exception of plugging and reclamation activities (unless mitigations are approved in a plan of operations). This would apply to exploration, drilling, and production operations.
- **Special Scenery SMA**—Park staff visited areas included in this SMA to evaluate the potential for impacts (specific examples of special scenery that could be included in this SMA include Twin Arches, Honey Creek Overlook, Angel Falls Overlook, Maude's Crack, Sawtooth, and Yahoo Falls). They determined that some of these areas could be affected by drilling and production operations, and that a viewshed analysis should be conducted during preparation of the plan of operations to evaluate the potential. The analysis would involve visiting and documenting a site proposed for oil and gas development with photographs, as well as recording the location using global positioning system (GPS) equipment. The location information would be entered into a geographic information system (GIS) database and evaluated electronically using a tool that would allow park managers to determine if the site lies within a viewshed that is visually sensitive to changes in the landscape. If so, the proposed location would become part of the Special Scenery SMA.

  Geophysical exploration would be allowed in this SMA at any time, while drilling activities in these areas would be limited during high visitor use periods (generally April through October). Production operations would be allowed in this SMA if the viewshed analysis indicates it would not impact the special scenery of an area.
- **Obed WSR SMA**—No Surface Use, with the exception of plugging and reclamation activities, would be allowed on any of the federal property within the boundaries of the Obed WSR.

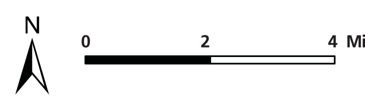
These features are shown on figures 8 through 10 for Big South Fork NRRA. Federal lands within Obed WSR are shown on figure 5 in chapter 1.

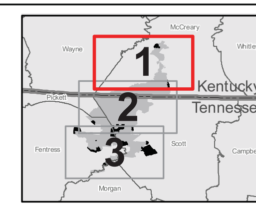


Legend

Figure 8. Special Management Areas in Big South Fork National River and Recreation Area (Map 1)

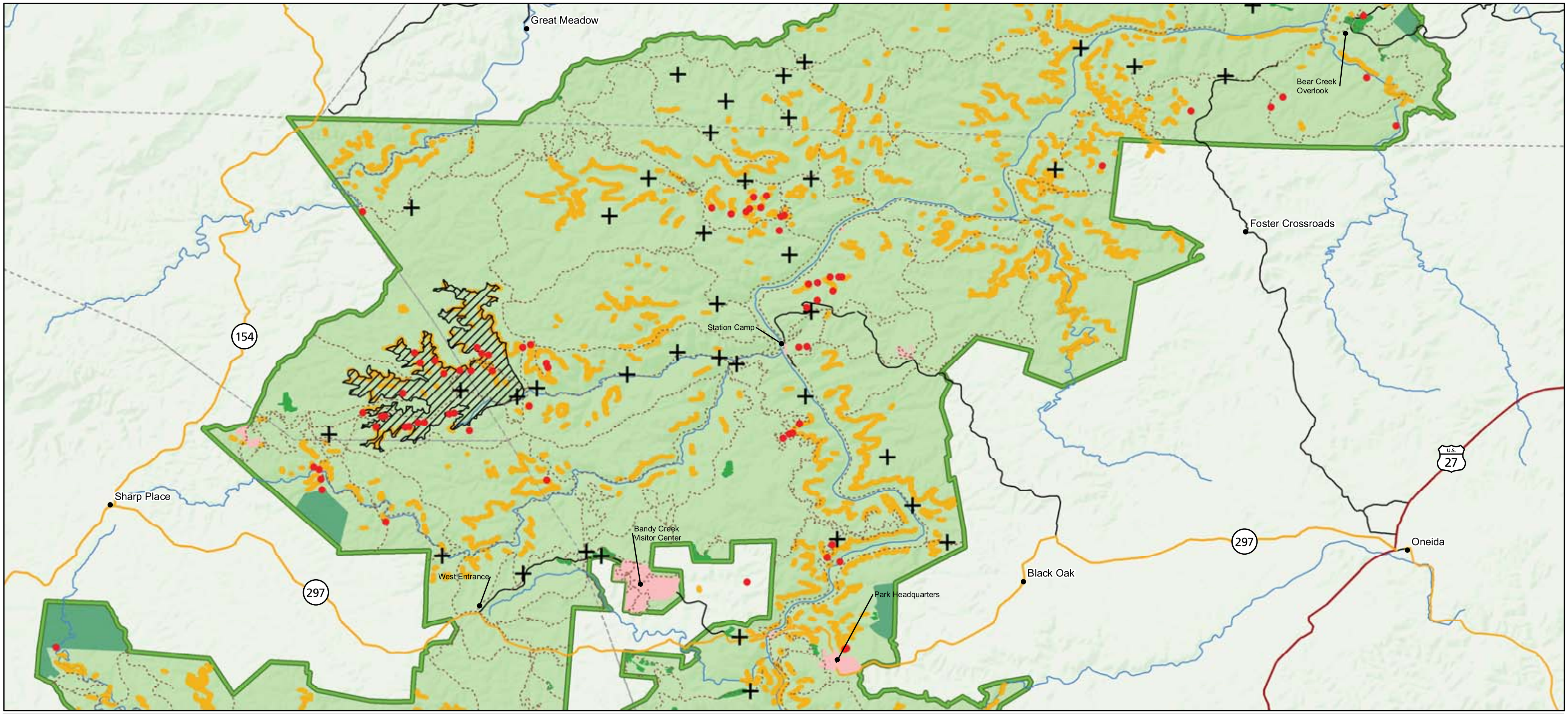
- U.S. Highway
- State Highways
- Roads
- Trails
- Sensitive Geomorphic Feature
- Park Boundary
- BISO Deferred Property
- Visitor Use / Administration Area
- Cemeteries
- County Boundary
- Managed Field
- Cliff Edge
- State Natural Area





Big South Fork National River and Recreation Area
Kentucky and Tennessee

National Park Service
U.S. Department of the Interior



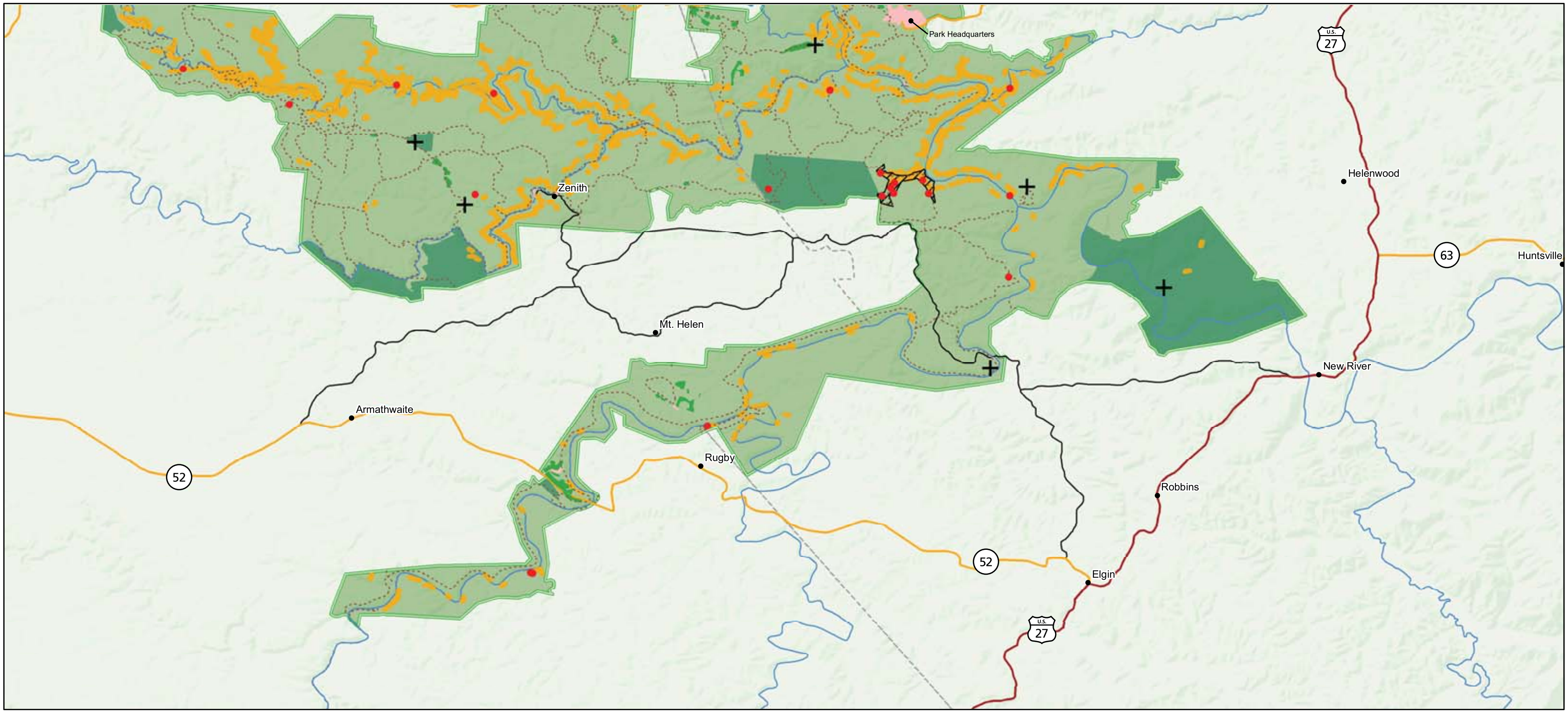
Legend

Figure 9. Special Management Areas in Big South Fork National River and Recreation Area (Map 2)

- U.S. Highway
- State Highways
- Roads
- Trails
- Sensitive Geomorphic Feature
- Park Boundary
- BISO Deferred Property
- Visitor Use / Administration Area
- Cemeteries
- County Boundary
- Managed Field
- Cliff Edge
- State Natural Area

Big South Fork National River and Recreation Area
Kentucky and Tennessee

National Park Service
U.S. Department of the Interior



Legend

Figure 10. Special Management Areas in Big South Fork National River and Recreation Area (Map 3)

- U.S. Highway
- State Highways
- Roads
- Trails
- Sensitive Geomorphic Feature
- Park Boundary
- BISO Deferred Property
- Visitor Use / Administration Area
- Cemeteries
- County Boundary
- Managed Field
- Cliff Edge
- State Natural Area

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CURRENT OPERATIONS

Under alternative C, the NPS would proactively contact current operators and pursue 9B enforcement and plans of operations as described for alternative B. Priorities for enforcement would be set considering (in no particular order)

- environmental/health and safety issues at well sites;
- the presence of abandoned wells; the extent of an operator's property interest in the park units;
- the location of a well relative to producing areas;
- road conditions;
- proximity to an SMA; and
- status of compliance with state regulations.

The NPS would continue to work cooperatively with the state on regulations or enforcement, but increased inspections and monitoring would proactively identify sites that are found to be impacting, or threatening to impact, park resources beyond the operations area (see section on "Inspections and Monitoring" for this alternative). The 9B regulations would be enforced at any such sites, and operations found to pose a significant threat to federally owned or controlled lands or waters shall be suspended by the superintendent until the threat is removed or remedied (see 36 CFR 9.33 and 9.51).

It is assumed that 125 wells at Big South Fork NRRA and two wells at Obed WSR could be worked over or serviced under this alternative, as staffing limitations and resources allow for review of the proposed projects.

NEW OPERATIONS

As with alternative A, the RFD scenario presented in this plan/EIS would apply to alternative C. Geophysical exploration (2-D seismic surveys) could be conducted as described above, and up to 25 wells (0 to 20 in Big South Fork NRRA, 5 with surface locations outside the park, and 0 to 5 at Obed WSR directionally drilled from locations outside the park unit) could be drilled in the park units over the next 15 to 20 years. New operations would be subject to CLPRs, including 9B regulations and the requirements for a plan of operations. The park would use the oil and gas management planning process to proactively share information with operators about regulatory requirements and to focus staff resources on the implementation and compliance with the regulatory framework. The park would share information with the operators such as example plans of operation and EAs, which should help facilitate the process. New surface disturbances in Big South Fork NRRA and Obed WSR would be minimized by using directional drilling techniques and by conducting operations on previously disturbed areas if possible.

In addition to the protected areas identified by CLPRs for the Big South Fork NRRA and Obed WSR, as described for alternatives A and B, new operations would require consideration of the SMAs listed previously. SMAs could apply to all new operations unless an operator demonstrates this would prevent reasonable access to a mineral estate. The NPS would require an operator to provide information to support such a conclusion, and would evaluate the application of the SMAs relative to the proposed operation on a case-by-case basis. Operating stipulations described below could be modified, and protected areas could be larger or smaller, if site-specific information (such as engineering, geological, biological, or other studies) warrant the change, or if an operator can demonstrate that their proposed operation would meet the goals of protecting resources and values in the SMA. Mitigation that would specifically address and protect the resource and/or value of the SMA would be included and authorized in an approved plan of operations. Also, the acreage of private mineral rights affected by protected areas, including SMAs, under this alternative is approximate. The totals do not include any areas deemed eligible for the Special Scenery SMA or potential modifications to other SMAs, both of which would be addressed on a case-by-case basis during the preparation of plans of operations.

Geophysical exploration would not be allowed in any of the SMAs, or the associated setbacks, at Big South Fork NRRA, with the exception of the Special Scenery SMA, unless authorized in an approved plan of operations. However, while an approved plan of operations could relax SMA restrictions, it would not supersede applicable statutes such as gorge restrictions and deed restrictions.

Timing stipulations for geophysical operations would apply in the SMAs for visitor use/administrative areas, trails, and cemeteries. At Obed WSR, all federal property within the boundaries of the park unit would be subject to No Surface Use at all times of the year. As a result, SMAs could prohibit exploration operations on up to approximately 10,943 acres of minerals at Big South Fork NRRA and 3,712 acres at Obed WSR. This total does not include any areas deemed eligible for the Special Scenery SMA which would be addressed on a case-by-case basis during the preparation of plans of operation.

Drilling and production would not be allowed in any of the SMAs or the associated setbacks at Big South Fork NRRA, unless authorized in an approved plan of operations. However, while an approved plan of operations could relax SMA restrictions, it would not supersede applicable statutes such as gorge restrictions and deed restrictions. As with geophysical exploration, timing stipulations for drilling and production would apply in the SMAs for visitor use/administrative areas, trails, and cemeteries at this park unit. Timing stipulations would also apply in the Special Scenery SMA for drilling operations. Production activities would be allowed in the Special Scenery SMA based on the outcome of the viewshed analysis required under this alternative. At Obed WSR, all federal property within the boundaries of the park unit would be subject to No Surface Use at all times of the year. As a result, SMAs could protect approximately 11,587 acres of private mineral lands present at Big South Fork NRRA and 3,712 acres at Obed WSR. It should be noted, however, that this acreage number does not include the contribution from Special Scenery SMAs, as these would need to be evaluated on a case-by-case basis for each proposed operation. None of the area where exploration, drilling, or production may be limited occurs on private lands found within the boundary of Big South Fork NRRA or Obed WSR.

As with alternative B, the NPS would continue to work cooperatively with the state on regulations or enforcement, but increased inspections and monitoring would proactively identify sites that are found to be impacting, or threatening to impact, park resources beyond the operations area (see section on “Inspections and Monitoring” for this alternative). The 9B regulations would be enforced at any such sites, and operations found to pose a significant threat to federally owned or controlled lands or waters shall be suspended by the superintendent until the threat is removed or remedied (see 36 CFR 9.33 and 9.51).

PLUGGING AND RECLAMATION

Plugging and reclamation activities under alternative C would be the same as those described for alternative B, using the new management framework as a tool to streamline the process (see discussion of framework, decision tree, and compliance under alternative B). It is assumed that about 50 wells at Big South Fork NRRA and 5 wells at Obed WSR would be plugged and reclaimed under this alternative. The activities that would be undertaken as part of plugging and reclamation under the new management framework would be the same as those described for alternative B. This includes the criteria that would be used to prioritize sites identified as candidates for plugging, as well as the details of each component of the process, including gaining access, plugging, and reclaiming a site. However, under alternative C, the NPS would also consider the proximity of a well site to an SMA when prioritizing those for plugging and reclamation. Equipment needs and standards for specific activities associated with each component would be the same. Please see the discussion in alternative B, as well as the detailed information and examples provided in appendix K for more specific information.

ROAD STANDARDS

Minimum standards under alternative C would be the same as those described for alternative B. The minimum standards developed for Big South Ford NRRA would also be applied at Obed WSR. However, new access routes are not expected within Obed WSR under this alternative, taking into account current regulations, deed restrictions, prohibitions within the gorge area, as well as establishment of the unit as a SMA with no surface use allowed under alternative C.

INCREASED INSPECTIONS AND MONITORING

The monitoring approach described under alternative B would also guide increased inspections and monitoring activities under alternative C.

ACQUIRING MINERAL RIGHTS ON A CASE-BY-CASE BASIS

The acquisition of mineral rights under alternative C would include initiation of a program to acquire funding for purchasing mineral rights, as described for alternative B. In addition, the NPS would create a priority order of which rights to acquire based on:

- willing sellers
- sensitivity of resources
- size of the area
- economic feasibility
- available funding.

PARK MANAGEMENT AND OPERATIONS

Administrative and Planning Responsibilities

Administrative and planning responsibilities under alternative C would be the same as those described for alternative B.

Outreach and Education

Outreach and education programs under alternative C would be the same as those described for alternative B.

Staffing

Staffing under alternative C would be the same as described for alternative B, and would include approximately 3.6 FTEs at Big South Fork NRRA and the equivalent of approximately 0.4 FTEs at the NPS Geologic Resources Division to manage oil and gas operations at both park units, plus additional seasonal or term staff could be added as needed to expand the inspection and monitoring program beyond the base operations level. The additional staff would consist, for estimation purposes, of 1 FTE.

IMPLEMENTATION COSTS

The costs associated with alternative C would primarily include staff time for oversight of the non-federal oil and gas operations in the park as described above. The estimated cost of this staff time and other miscellaneous costs would be the same as described for alternative B and are shown in table 7.

TABLE 7. COST ESTIMATE ALTERNATIVE C

Action	Assumptions	Annual Cost	Cost for the 15-Year Planning Period
Big South Fork NRRA Staff Time	An equivalent of approximately 3.6 full-time employees (current staff) plus an equivalent 1 FTE seasonal or term employee.	$276,697 plus $72,500 for seasonal or term employee(s) = $349,197	$5,237,955
Obed WSR Staff Time	Covered by Big South Fork NRRA staff.	$0	$0
Geologic Resources Division Staff Time	An equivalent of approximately 0.4 full-time employees, plus 35% for administrative and benefits overhead costs.	$48,000	$720,000
Miscellaneous Costs	Include equipment, vehicle, fuel, etc.	$10,000	$150,000
Total		**$407,197**	**$6,107,955**

HOW ALTERNATIVES MEET OBJECTIVES

As stated in the “Purpose of and Need for Action,” all action alternatives selected for analysis must meet all objectives to a large degree. The action alternatives must also address the stated purpose of taking action and resolve the need for action; therefore, the alternatives were individually assessed in light of how well they would meet the objectives for this plan and EIS (refer to “Chapter 1: Purpose of and Need for Action”). Alternatives that did not meet the objectives were not analyzed further (see the “Alternatives Eliminated from Further Consideration” section in this chapter).

Table 8 compares the alternatives by summarizing the elements being considered, and table 9 compares how each of the alternatives described in this chapter would meet the plan objectives. Table 10 presents a brief summary of the impacts of each alternative by impact topic. These impacts, including an analysis of impairment, are more thoroughly described in “Chapter 4: Environmental Consequences.”

TABLE 8. COMPARISON OF ALTERNATIVES

	Alternative A: No Action	Alternative B: Comprehensive Implementation of 9B Regulations and a New Management Framework for Plugging and Reclamation	Alternative C: Comprehensive Implementation of 9B Regulations, a New Management Framework for Plugging and Reclamation, and Establishment of Special Management Areas
General			
Current Legal and Policy Requirements	All non-federal oil and gas operations in national park system units are subject to CLPRs that are based on federal and state laws, regulations, federal executive orders, NPS policies, and applicable direction provided in NPS planning documents.	Same as alternative A, but with proactive management including increased/enhanced enforcement and inspections /monitoring.	Same as alternative B.
Forecast of Oil and Gas Activities			
Geophysical Exploration	Small-scale, occasional geophysical surveys.	Same as alternative A.	Same as alternative A.
Drilling and Production	Big South Fork NRRA: 0-20 wells (5 with surface locations outside the park). Obed WSR: 0-5 wells directionally drilled from outside the park unit.	Same as alternative A.	Same as alternative A.
Well Workover/ Servicing	About 125 wells	Same as alternative A.	Same as alternative A.
Plugging and Reclamation	Big South Fork NRRA: approximately 50 additional wells Obed WSR: 5 wells	Same as alternative A.	Same as alternative A.
Approximate Area of Disturbance	Geophysical Exploration: none Drilling and Production: • Big South Fork NRRA: 0 -36 acres inside the park • Obed WSR: 0 acres inside the park	Same as alternative A.	Same as alternative A.
Approximate Area Reclaimed	Big South Fork NRRA: 80 acres Obed WSR: 7 acres	Same as alternative A.	Same as alternative A.

TABLE 8. COMPARISON OF ALTERNATIVES

	Alternative A: No Action	Alternative B: Comprehensive Implementation of 9B Regulations and a New Management Framework for Plugging and Reclamation	Alternative C: Comprehensive Implementation of 9B Regulations, a New Management Framework for Plugging and Reclamation, and Establishment of Special Management Areas
Totals	Big South Fork NRRA: disturbances reduced by 44 to 80 acres Obed WSR: disturbances reduced by 7 acres	Same as alternative A	Same as alternative A.
Designated Areas / Operating Stipulations[1]			
Protected Areas Per CLPRs	**Big South Fork NRRA Designated Gorge:** • Exploration, drilling, and production prohibited **Big South Fork NRRA Long-term monitoring plots[2]:** • Avoid impacts; address in plans of operations **Obed WSR Deed Restrictions:** • Some deed restrictions require No Surface Use prohibiting exploration, drilling, and production on federal lands[2] **Visitor Use, Administrative, and Other Use Areas with 500-foot Setback Per 9Bs:** • No Surface Use (exploration, drilling, and production) **Waterways with 500-foot Setback Per 9Bs:** • No Surface Use (exploration, drilling, and production)	Same as alternative A.	Same as alternative A.

TABLE 8. COMPARISON OF ALTERNATIVES

	Alternative A: No Action	Alternative B: Comprehensive Implementation of 9B Regulations and a New Management Framework for Plugging and Reclamation	Alternative C: Comprehensive Implementation of 9B Regulations, a New Management Framework for Plugging and Reclamation, and Establishment of Special Management Areas
Special Management Areas	Not applicable	Not applicable	**Big South Fork NRRA—the following would be protected as noted unless other mitigation that protects SMA resources and values is included and authorized in an approved plan of operations.** **Sensitive Geomorphic Feature SMA with 500-foot setback:** • No Surface Use (exploration, drilling, and production) **Cliff Edge SMA with 100-foot setback):** • No Surface Use (exploration, drilling, and production) • Drilling would only be allowed during dry periods **Managed Field SMA with 100-foot setback:** • No Surface Use (exploration, drilling, and production) • Setback only applies to drilling and production **SMAs with Setbacks for Visitor Use/ Administrative Areas, and Trails** • **Visitor Use and Administrative Areas:** - 500-foot setback for geophysical exploration - 1,500-foot setback for drilling and production • **Trails:** - 300 foot setback for all operations • **All:** - No Surface Use (exploration, drilling, and production) in SMA or setbacks - All operations would be limited during high visitor use or visitation periods (generally April through October) - Drilling would only be allowed during dry periods

TABLE 8. COMPARISON OF ALTERNATIVES

	Alternative A: No Action	Alternative B: Comprehensive Implementation of 9B Regulations and a New Management Framework for Plugging and Reclamation	Alternative C: Comprehensive Implementation of 9B Regulations, a New Management Framework for Plugging and Reclamation, and Establishment of Special Management Areas
Special Management Areas (continued)			**Cultural Landscapes and Cemetery SMA:** • 100-foot setback from cemeteries for all operations • 1,500-foot setback from cultural landscapes for all operations • No Surface Use (exploration, drilling, and production) in SMA or setbacks • All operations would be limited during high visitor use or visitation periods (generally April through October) • Drilling would only be allowed during dry periods **State Natural Area SMA:** • No Surface Use (exploration, drilling, and production) would be allowed in state natural areas **Special Scenery SMA[2]:** • Geophysical exploration would be allowed at any time • Drilling activities limited during high visitor use periods (generally April through October) • Requires viewshed analysis for production activities. This would be a GIS analysis that would allow park managers to determine if the site lies within a viewshed that is visually sensitive to changes in the landscape. If so, the proposed location would become part of the Special Scenery SMA. **Obed WSR** **Obed WSR SMA:** • No Surface Use (exploration, drilling, and production) would be allowed on any of the federal property within the boundaries of the Obed WSR (per existing deed restriction)

TABLE 8. COMPARISON OF ALTERNATIVES

	Alternative A: No Action	Alternative B: Comprehensive Implementation of 9B Regulations and a New Management Framework for Plugging and Reclamation	Alternative C: Comprehensive Implementation of 9B Regulations, a New Management Framework for Plugging and Reclamation, and Establishment of Special Management Areas
Total Acreage of Private Mineral Rights with Operating Stipulations[3]	Big South Fork NRRA: 8,413 acres (all operations) Obed WSR: 3,712 acres	Big South Fork NRRA: 8,413 acres (all operations) Obed WSR: 3,712 acres	Big South Fork NRRA: • Geophysical – 10,943 acres • Drilling and production – 11,587 acres • Obed WSR: 3,712 acres
Current Operations			
Management	As staffing allows, current non-federal oil and gas operations managed on a case-by-case basis per 9B regulations and other CLPRs.	Proactively pursue 9B enforcement and plans of operations from current operators; seek out operators and proactively provide information and clearly communicate regulatory requirements.	Same as alternative B.
Inspections/ Monitoring	Limited to base workload and focused on when problems are identified or emergencies are reported.	Site inspections and monitoring would be increased to more proactively assess problem areas.	Same as alternative B.
Enforcement	NPS enforces 9B regulations, or requests state enforcement of the State's regulations, where sites are found to be impacting, or threatening to impact, park resources beyond the operations areas.	The NPS would continue to work cooperatively with the state on regulations or enforcement, but increased inspections and monitoring would proactively identify sites that are found to be impacting, or threatening to impact, park resources beyond the operations area during inspections and monitoring. Priorities for enforcement would be set considering environmental/health and safety issues at well sites; the presence of abandoned wells; the extent of an operator's property interest in the park units; wells located in producing areas; road conditions; and status of compliance with state regulations.	Same as alternative B.

TABLE 8. COMPARISON OF ALTERNATIVES

	Alternative A: No Action	Alternative B: Comprehensive Implementation of 9B Regulations and a New Management Framework for Plugging and Reclamation	Alternative C: Comprehensive Implementation of 9B Regulations, a New Management Framework for Plugging and Reclamation, and Establishment of Special Management Areas
New Operations			
Management	New non-federal oil and gas operations managed on a case-by-case basis per 9B regulations and other CLPRs, including requirements for a plan of operations.	The park would use the oil and gas management planning process to proactively share information with operators about regulatory requirements and to focus staff resources on the implementation and compliance with the regulatory framework. The park would share information with the operators such as example plans of operation and EAs, which should help facilitate the process.	Same as alternative B.
Inspections/Monitoring	Limited to base workload and focused on when problems are identified or emergencies are reported.	Site inspections and monitoring would be increased to more proactively assess problem areas.	Same as alternative B.
Enforcement	NPS would enforce 9B regulations, or request state enforcement of their regulations, where sites are found to be impacting, or threatening to impact, park resources beyond the operations areas.	The NPS would continue to work cooperatively with the state on regulations or enforcement, but increased inspections and monitoring would proactively identify sites that are found to be impacting, or threatening to impact, park resources beyond the operations area during inspections and monitoring.	Same as alternative B.
Plugging and Reclamation			
Standards	Guided by the 9B or state regulations, as appropriate, as well as an approved plan of operations, if available.	Same as alternative A, plus substantial numbers of wells could be plugged and reclaimed based on the standards associated with the new management framework.	Same as alternative B.

TABLE 8. COMPARISON OF ALTERNATIVES

	Alternative A: No Action	Alternative B: Comprehensive Implementation of 9B Regulations and a New Management Framework for Plugging and Reclamation	Alternative C: Comprehensive Implementation of 9B Regulations, a New Management Framework for Plugging and Reclamation, and Establishment of Special Management Areas
Management	Priorities for plugging and reclamation would be determined based on certain criteria, such as environmental/health and safety issues, and access to the site. NPS would provide onsite oversight to ensure standards are met. Administrative processes applied on case-by-case basis.	• Sites would be prioritized for plugging and reclamation based on environmental threats (including contamination); health and safety issues; access; mechanical conditions (deterioration and subsidence); proximity to the gorge; desired conditions and settings in GMP zones; cost; funding availability; and responsible party information. • NPS provides on-site oversight to ensure standards are met. • Administrative burden reduced by new management framework.	Same as alternative B, plus SMAs would be considered when prioritizing wells for plugging and reclamation.
Compliance	Environmental compliance for these site-specific operations would be conducted on a case-by-case basis in both park units.	As part of new management framework: • Complete a new environmental screening form for the site-specific well plugging and reclamation phase of these projects, and confirm if they are considered, along with potential impacts, in the OGMP/EIS. • Review site specific conditions and confirm if they are considered, along with potential impacts, in the OGMP/EIS. • Confirm whether environmental conditions have or have not changed from what is presented in the OGMP/EIS. • Assess whether or not new methods and their effects are similar to ones already addressed in the OGMP/EIS and determine appropriate NEPA pathway.	Same as alternative B.

TABLE 8. COMPARISON OF ALTERNATIVES

	Alternative A: No Action	Alternative B: Comprehensive Implementation of 9B Regulations and a New Management Framework for Plugging and Reclamation	Alternative C: Comprehensive Implementation of 9B Regulations, a New Management Framework for Plugging and Reclamation, and Establishment of Special Management Areas
Park Operations and Management			
Staffing	Approximately 3.6 FTEs at Big South Fork NRRA would cover oil and gas management at both park units. NPS Geologic Resources Division support equivalent to that of approximately 0.4 FTEs.	Same as alternative A, plus additional seasonal or term staff equivalent to 1 FTE.	Same as alternative B.
Program Activities	Inspections/monitoring; response to emergency situations; review of plans of operations; preparation of environmental compliance documents for plans of operations, as well as plugging and reclamation activities; coordinating plugging and reclamation activities and providing oversight during such operations; and other miscellaneous activities (e.g., coordinating with the state and non-federal oil and gas operators).	Same as alternative A, plus increased monitoring.	Same as alternative B.

[1]Operating stipulations may be modified if an operator can demonstrate that new technology or site-specific information (such as engineering, geological, biological, or other information or studies) would meet the goals of protecting resources, values, and uses in protected areas or SMAs. Setbacks for visitor use, administrative, and other use areas and waterways would be applied, unless other measures are specifically authorized by an approved plan of operations, as per 36 CFR 9.41(a). There may be surface use allowed if mitigations are approved in a plan of operations. However, while an approved plan of operations could relax SMA restrictions, it would not supersede applicable statutes such as gorge restrictions and deed restrictions.

[2]The area covered by this protected area/SMA has not been mapped and would be determined on a case-by-case basis during scoping and preparation of a plan of operations for specific projects.

[3]The total area with operating stipulations excludes overlap between protected areas and/or SMAs.

TABLE 9. SUMMARY OF HOW ALTERNATIVES MEET PROJECT OBJECTIVES

Objective	Alternative A: No Action	Alternative B: Comprehensive Implementation of 9B Regulations and a New Management Framework for Plugging and Reclamation	Alternative C: Comprehensive Implementation of 9B Regulations, a New Management Framework for Plugging and Reclamation, and Establishment of Special Management Areas
General			
Identify and protect resources from adverse impacts from oil and gas operations.	Partially meets objective. Resources are not specifically identified until a plan of operations is submitted, and protection is dependent on reporting by the state and resolution of problems as they arise, not regular monitoring and enforcement.	Meets objective to a large degree. Proactive management would identify resources and clearly communicate resource conditions and protection requirements to the operators.	Fully meets objective. Same as alternative B plus early identification of and specified protection for sensitive areas identified as SMAs.
Provide owners and operators of private oil and gas rights reasonable access for exploration, production, maintenance, and surface reclamation.	Fully meets objective. Oil and gas operators may conduct operations in accordance with CLPR.	Fully meets objective. Oil and gas operators may conduct operations in accordance with CLPR.	Meets objective to a large degree. Oil and gas operators may conduct operations in accordance with CLPR and also SMA restrictions, although directional drilling or additional mitigation may be required.
Water Resources			
Protect and enhance water resources.	Partially meets objective. Water resources are protected in accordance with CLPRs, but no proactive monitoring or improved plugging approval process; would not enhance current conditions.	Meets objective to a large degree. Same as alternative A, plus proactive management would identify problems and possible releases before substantial damage occurs; well plugging would remove potential source of contamination.	Fully meets objective. Same as alternative B, with potential added protection for sensitive water resources that may fall in SMAs such as State Natural Areas SMA and protection of cliff edges that prevents runoff into streams below.

TABLE 9. SUMMARY OF HOW ALTERNATIVES MEET PROJECT OBJECTIVES

Objective	Alternative A: No Action	Alternative B: Comprehensive Implementation of 9B Regulations and a New Management Framework for Plugging and Reclamation	Alternative C: Comprehensive Implementation of 9B Regulations, a New Management Framework for Plugging and Reclamation, and Establishment of Special Management Areas
Vegetation/Wildlife/Species of Special Concern			
Protect species of management concern and critical habitat from adverse effects of oil and gas operations.	Partially meets objective. These resources would be protected by compliance with CLPR on a case-by-case basis, but the lack of inspections and enforcement and existing abandoned wells and roads present risks to wildlife and have adversely affected site vegetation.	Meets objective to a large degree. Same as alternative A, plus proactive management would identify problems and possible impacts before substantial damage occurs; well plugging would remove potential source of contamination.	Fully meets objective. Same as alternative B, with potential added protection for sensitive species in SMAs such as Cliff Edge SMA (harbors sensitive species), Sensitive Geomorphic Feature SMA (rare vegetation locales), Managed Field SMA.
Visitor Experience, Conflicts, and Safety			
Prevent, minimize, or mitigate conflicts between oil and gas operations and visitor use.	Partially meets objective. Mitigation would be provided on a case-by-case basis based on CLPRs.	Meets objective to a large degree. Proactive management would identify and mitigate conflicts and clearly communicate requirements to the operators.	Fully meets objective. Same as alternative B, with potential added mitigation to protect SMAs and buffers (e.g., Visitor Use and Trails SMAs) and to identify these up front.
Protect human health and safety from oil and gas operations.	Partially meets objective. Health and safety would be protected by compliance with CLPR on a case-by-case basis, but the lack of inspections and enforcement and existing abandoned wells and roads present risks to visitors.	Fully meets objective. Same as alternative A, plus proactive management would identify problems and possible leaks or unsafe conditions; well plugging would remove potential source of contamination and gases, and hazardous wellhead equipment.	Fully meets objective. Essentially same as alternative B, with slightly more protection due to segregation of operations from visitors in certain areas (buffers).
Cultural Resources			
Protect cultural resources, including those on/or eligible for listing on the NRHP.	Partially meets objective. Mitigation would be provided on a case-by-case basis based on CLPRs and all operations would go through Section 106 compliance, but some damage could result from existing operations.	Partially meets objective. Proactive management would identify and mitigate potential impacts and clearly communicate requirements to the operators; well plugging would remove potential source of contamination and visual blight.	Meets objective to a large degree. Same as alternative B, with potential added mitigation to protect SMAs and buffers associated with cultural landscapes.

TABLE 9. SUMMARY OF HOW ALTERNATIVES MEET PROJECT OBJECTIVES

Objective	Alternative A: No Action	Alternative B: Comprehensive Implementation of 9B Regulations and a New Management Framework for Plugging and Reclamation	Alternative C: Comprehensive Implementation of 9B Regulations, a New Management Framework for Plugging and Reclamation, and Establishment of Special Management Areas
Park Management and Operations			
Provide pertinent guidance to operators to facilitate planning and compliance with NPS regulations.	Partially meets objective. Guidance and information is provided to operators on a case-by-case basis when plans of operations are submitted or problem is reported; there is no comprehensive management plan to facilitate dissemination of information and, and protection is dependent on reporting by the state and resolution of problems as they arise, not regular monitoring and enforcement.	Fully meets objective. Proactive management would identify resources and clearly communicate resource conditions and protection requirements to the operators. Management plan would provide operators with up front and consistent guidance prior to project planning.	Fully meets objective. Same as alternative B.
Establish an efficient process under the NEPA for plugging wells and reclaiming well sites and access roads	Does not meet objective. There is no new management framework for well plugging under the no action alternative.	Fully meets objective. Includes a new management framework for well plugging and reclamation that is designed to streamline the process and make plugging more efficient for NPS staff and operators.	Fully meets objective. Same as alternative B.

TABLE 10. SUMMARY OF ENVIRONMENTAL CONSEQUENCES

Impact Topic	Alternative A: No Action	Alternative B: Comprehensive Implementation of 9B Regulations and a New Management Framework for Plugging and Reclamation	Alternative C: Comprehensive Implementation of 9B Regulations, a New Management Framework for Plugging and Reclamation, and Establishment of Special Management Areas
Geology and Soils Direct/indirect effects	**Geophysical** – localized, short-term negligible adverse impacts from soil compaction and vibration. **Drilling and production** (in park and directionally drilled wells) – localized short- and long-term minor to moderate adverse impacts from possible release of hydrocarbons, produced waters, or treatment chemicals and pad construction; possible major adverse impacts in the unlikely event of a well blowout, fire, or major release. **Plugging and reclamation** (all wells) – short-term negligible to minor adverse impacts from ground disturbance with long-term beneficial impacts from site reclamation, removal of contamination, and erosion control.	**Geophysical** – same as alternative A. **Drilling and production** – localized short- and long-term minor adverse impacts; reduced chance of major adverse impacts due to increased monitoring and inspections. **Plugging and reclamation** – same as alternative A with greater chance of completion sooner due to new well plugging management framework.	**Geophysical** – same as alternative A; more upfront protection in certain SMAs. **Drilling and production** – localized short- and long-term negligible to minor adverse impacts; similar to alternative B but with SMA recognition and protection. Plugging and reclamation – same as alternative B.
Cumulative effects	**Cumulative impacts** – short- and long-term minor to moderate adverse impacts from various sources; alternative A would contribute minimally to overall adverse cumulative impacts.	**Cumulative impacts** – similar to alternative A but with long-term cumulative benefits due to proactive management and expedited well plugging.	**Cumulative impacts** – same as alternative B but with additional SMA recognition and protection.

TABLE 10. SUMMARY OF ENVIRONMENTAL CONSEQUENCES

Impact Topic	Alternative A: No Action	Alternative B: Comprehensive Implementation of 9B Regulations and a New Management Framework for Plugging and Reclamation	Alternative C: Comprehensive Implementation of 9B Regulations, a New Management Framework for Plugging and Reclamation, and Establishment of Special Management Areas
Water Resources Direct/indirect effects	**Geophysical exploration** – localized short-term negligible adverse impacts from erosion and runoff. **Drilling and production** (in park and directionally drilled wells) – short- and long-term minor to moderate adverse impacts from the construction of well pads, access roads, flow lines and pipelines, and possible release of hydrocarbons, produced waters or treatment chemicals; possible major adverse impacts in the unlikely event of a well blowout, fire, or major release. **Plugging and reclamation** (all wells) – localized, short term, negligible to minor, adverse impacts with long-term beneficial impacts from reclamation.	**Geophysical** – same as alternative A. **Drilling and production** (in park and directionally drilled wells) short-term to long-term negligible to moderate adverse impacts on water resources related to site and access road clearing and construction and the associated ground disturbance, compaction, and/or erosion, leaks and spills; reduced chance of major adverse impacts due to increased monitoring and inspections. **Plugging and reclamation** (all wells) same as alternative A, with greater chance of completion sooner due to new well plugging management framework.	**Geophysical** – same as alternative A. **Drilling and production** (in park and directionally drilled wells) – localized short-term to long-term negligible to mostly minor adverse impacts; similar to alternative B but with SMA recognition and protection. **Plugging and reclamation** (all wells) same as alternative B.
Cumulative effects	**Cumulative impacts** – short- and long-term minor to moderate adverse cumulative impacts. The actions under alternative A would contribute minimally to overall cumulative impacts.	**Cumulative impacts** – same as alternative A but with long-term cumulative benefits due to proactive management and expedited well plugging.	**Cumulative impacts** – same as alternative B, but with additional SMA recognition and protection.

TABLE 10. SUMMARY OF ENVIRONMENTAL CONSEQUENCES

Impact Topic	Alternative A: No Action	Alternative B: Comprehensive Implementation of 9B Regulations and a New Management Framework for Plugging and Reclamation	Alternative C: Comprehensive Implementation of 9B Regulations, a New Management Framework for Plugging and Reclamation, and Establishment of Special Management Areas
Floodplains Direct/indirect effects	**Geophysical –** localized, short-term negligible adverse impacts from increased road runoff and crossing of small areas of floodplains along tributary streams. **Drilling and production** (in park and directionally drilled wells) – short- to long-term negligible to minor adverse impacts, since new oil and gas operations would not be permitted in floodplains unless there was no practicable alternative, floodplains could likely be avoided, and mitigation for flood proofing would be required. **Plugging and reclamation** (all wells) - localized, short-term, negligible to minor and adverse, with long-term beneficial impacts from site reclamation.	**Geophysical** – same as alternative A. **Drilling and production** (in park and directionally drilled wells) – short- to long-term negligible adverse impacts; inspections preventing floodplain impacts. **Plugging and reclamation** (all wells) – same as alternative A, but with a greater chance of completion sooner due to the new well plugging management framework.	**Geophysical** – same as alternative A. **Drilling and production** (in park and directionally drilled wells) – localized, short- to long-term, negligible and adverse similar to alternative B but with SMA recognition and protection. **Plugging and reclamation** (all wells) – same as alternative B.
Cumulative effects	**Cumulative impacts** – short- and long-term minor adverse cumulative impacts from various sources; alternative A would contribute minimally to overall adverse cumulative impacts.	**Cumulative impacts** – similar to alternative A, but with long-term cumulative benefits due to its proactive management and expedited well plugging.	**Cumulative impacts** – similar to alternative B but with additional SMA recognition and protection.

TABLE 10. SUMMARY OF ENVIRONMENTAL CONSEQUENCES

Impact Topic	Alternative A: No Action	Alternative B: Comprehensive Implementation of 9B Regulations and a New Management Framework for Plugging and Reclamation	Alternative C: Comprehensive Implementation of 9B Regulations, a New Management Framework for Plugging and Reclamation, and Establishment of Special Management Areas
Wetlands Direct/indirect effects	**Geophysical** – localized short-term negligible adverse impacts from disturbance of existing unpaved surfaces and resultant road runoff or from the crossing of small areas of wetlands along tributary streams. **Drilling and production** (in park and directionally drilled wells) – short- to long-term negligible to moderate adverse impacts from vegetation clearing, ground disturbance or rutting, erosion, runoff, and possible spills and leaks going undetected; however, new oil and gas operations would not be permitted in wetlands unless there was no practicable alternative, and wetlands could likely be avoided; possible major adverse impacts in the unlikely event of a well blowout, fire, or major release. **Plugging and reclamation** (all wells) – localized, short term, negligible to minor, adverse impacts with long-term beneficial impacts from site reclamation.	**Geophysical** – same as alternative A. **Drilling and production** (in park and directionally drilled wells) – short-term to long-term negligible to minor adverse impacts; reduced chance of major adverse impacts due to increased monitoring and inspections. **Plugging and reclamation** (all wells) – same as alternative A, with greater chance of completion sooner due to the new well plugging management framework.	**Geophysical** – same as alternative A. **Drilling and production** (in park and directionally drilled wells) – localized short- to long-term negligible to negligible to minor adverse impacts; similar to alternative B, but with SMA recognition and protection. **Plugging and reclamation** (all wells) – same as alternative B.
Cumulative effects	**Cumulative impacts** – short- and long-term minor to moderate adverse cumulative impacts from various sources; alternative A would contribute minimally to overall cumulative impacts.	**Cumulative impacts –** similar to alternative A, but with long-term cumulative benefits due to its proactive management and enforcement and expedited well plugging.	**Cumulative impacts** – similar to alternative B, but with additional SMA recognition and protection.

TABLE 10. SUMMARY OF ENVIRONMENTAL CONSEQUENCES

Impact Topic	Alternative A: No Action	Alternative B: Comprehensive Implementation of 9B Regulations and a New Management Framework for Plugging and Reclamation	Alternative C: Comprehensive Implementation of 9B Regulations, a New Management Framework for Plugging and Reclamation, and Establishment of Special Management Areas
Vegetation Direct/indirect effects	**Geophysical** – localized, short-term negligible adverse impacts due to vegetation clearing and effects on soils. **Drilling and production** (in park and directionally drilled wells) – localized short-term to long-term minor adverse impacts from the loss of vegetation and ground disturbance/soil erosion and compaction, but with a risk of more severe adverse impacts from leaks and spills that could go undetected or migrate off site, possible major adverse impacts in the unlikely event of a well blowout, fire, or major release. **Plugging and reclamation** (all wells) – localized, short term, negligible to minor, adverse impacts with long-term beneficial effects from site reclamation.	**Geophysical** – same as alternative A. **Drilling and production** (in park and directionally drilled wells) – same as alternative A, reduced chance of spills and leaks and major adverse impacts due to increased monitoring and inspections. **Plugging and reclamation** (all wells) – negligible to minor impacts; similar to alternative A; with a greater chance of completion sooner due to the new well plugging management framework.	**Geophysical** – same as alternative A. **Drilling and production** (in park and directionally drilled wells) – short- to long-term, negligible to minor adverse impacts; similar to alternative B; but with SMA recognition and protection. **Plugging and reclamation** (all wells) – same as alternative B.
Cumulative effects	**Cumulative impacts** – short- and long-term minor to moderate adverse cumulative impacts from various sources. The actions under alternative A would contribute minimally to overall cumulative impacts.	**Cumulative impacts** – same as alternative A, but with long-term cumulative benefits due to proactive management and expedited well plugging.	**Cumulative impacts** – same as alternative B, but with additional SMA recognition and protection.

TABLE 10. SUMMARY OF ENVIRONMENTAL CONSEQUENCES

Impact Topic	Alternative A: No Action	Alternative B: Comprehensive Implementation of 9B Regulations and a New Management Framework for Plugging and Reclamation	Alternative C: Comprehensive Implementation of 9B Regulations, a New Management Framework for Plugging and Reclamation, and Establishment of Special Management Areas
Wildlife and Aquatic Species Direct/indirect effects	**Geophysical –** localized, short-term negligible to minor adverse impacts from habitat removal and disturbance, particularly short-term noise seismic vibrator use. **Drilling and production** (in park and directionally drilled wells) – localized, short- to long-term minor to moderate adverse impacts from loss or disruption of habitat due to vegetation and site clearing, possible injury to or mortality of less mobile species, noise and associated species displacement or stress, and possible spills or releases of harmful substances; possible major adverse impacts in the unlikely event of a well blowout, fire, or major release. **Plugging and reclamation** (all wells) – localized, short-term negligible to minor adverse impacts with long-term beneficial impacts as a result of site reclamation.	**Geophysical** – same as alternative A. **Drilling and production** (in park and directionally drilled wells) **–** localized short- to long-term minor adverse impacts; reduced chance of injury and major adverse impacts due to increased monitoring and inspection. **Plugging and reclamation** (all wells) – same as alternative A; with a greater chance of completion sooner due to the new well plugging management framework.	**Geophysical** – same as alternative A. **Drilling and production** (in park and directionally drilled wells) **–** short- to long-term negligible to minor; similar to alternative B; but with SMA recognition and protection. **Plugging and reclamation** (all wells) – same as alternative B.
Cumulative effects	**Cumulative impacts** – short- and long-term minor to moderate adverse cumulative impacts from various sources. The actions under alternative A would contribute minimally to overall cumulative impacts.	**Cumulative impacts –** similar to alternative A, but with long-term cumulative benefits due to its proactive management and expedited well plugging.	**Cumulative impacts –** similar to alternative B, but with additional SMA recognition and protection.

TABLE 10. SUMMARY OF ENVIRONMENTAL CONSEQUENCES

Impact Topic	Alternative A: No Action	Alternative B: Comprehensive Implementation of 9B Regulations and a New Management Framework for Plugging and Reclamation	Alternative C: Comprehensive Implementation of 9B Regulations, a New Management Framework for Plugging and Reclamation, and Establishment of Special Management Areas
Federally Listed Threatened and Endangered Species Direct/indirect effects	**Geophysical** – localized short-term negligible adverse impacts from vegetation trimming, disturbance and noise/seismic vibrator use. **Drilling and production** (in park and directionally drilled wells) – short-term negligible to minor adverse impacts, primarily from the noise and disturbance related to construction of new well pads, access roads, flowlines, and pipelines and possible major adverse impacts from leaks and spills that could go undetected and could reach listed species; possible major adverse impacts in the unlikely event of a well blowout, fire, or major release. **Plugging and reclamation** (all wells) – localized, short term to long term, negligible to minor, adverse impacts with long-term beneficial impacts on listed species from site reclamation.	**Geophysical** – same as alternative A. **Drilling and production** (in park and directionally drilled wells) – short- to long-term, negligible to minor, adverse impacts; reduced chance of major adverse impacts due to increased monitoring and inspections. **Plugging and reclamation** (all wells) – localized, short-term negligible to minor adverse impacts, with a greater chance of completion sooner due to the new well plugging management framework.	**Geophysical** – same as alternative A. **Drilling and production** (in park and directionally drilled wells) – localized short- to long-term negligible and adverse; similar to alternative B, but with SMA recognition and protection. **Plugging and reclamation** (all wells) – same as alternative B.
Cumulative impacts	**Cumulative impacts** – short- and long-term minor to moderate adverse cumulative impacts from various sources. The actions under alternative A would contribute minimally to overall cumulative impacts.	**Cumulative impacts** – similar to alternative A, but with long-term cumulative benefits due to proactive management and expedited well plugging.	**Cumulative impacts** – same as alternative B, with additional SMA identification and protection.

TABLE 10. SUMMARY OF ENVIRONMENTAL CONSEQUENCES

Impact Topic	Alternative A: No Action	Alternative B: Comprehensive Implementation of 9B Regulations and a New Management Framework for Plugging and Reclamation	Alternative C: Comprehensive Implementation of 9B Regulations, a New Management Framework for Plugging and Reclamation, and Establishment of Special Management Areas
Species of Special Concern Direct/indirect effects	**Geophysical** – localized, short-term negligible adverse impacts from vegetation trimming, disturbance and noise/seismic vibrator use. **Drilling and production** (in park and directionally drilled wells) – short- to long-term negligible to minor adverse impacts, primarily from the noise and disturbance related to construction of new well pads, access roads, flowlines, and pipelines and possible moderate or major adverse impacts from leaks and spills that could go undetected or migrate off site; Possible major adverse impacts in the unlikely event of a well blowout, fire or major release. **Plugging and reclamation** (all wells) – localized, short-term, negligible to minor, adverse; impacts with long-term beneficial impacts from site reclamation.	**Geophysical** – same as alternative A. **Drilling and production** (in park and directionally drilled wells) – same as alternative A, but with reduced chance of major adverse impacts due to increased monitoring and inspections. **Plugging and reclamation** (all wells) – same as alternative A, but with greater chance of completion sooner due to new well plugging management framework.	**Geophysical** – same as alternative A. **Drilling and production** (in park and directionally drilled wells) – long-term negligible to minor adverse impacts; similar to alternative B but with adequate setback and SMA recognition and protection. **Plugging and reclamation** (all wells) – localized short- to long-term minor adverse impacts, similar to alternative B.
Cumulative effects	**Cumulative impacts** – short- and long-term minor to moderate adverse cumulative impacts from various sources; alternative A would contribute minimally to overall cumulative impacts.	**Cumulative impacts** – same as alternative A, but with long-term cumulative benefits due to proactive management and expedited well plugging.	**Cumulative impacts** – same as alternative B, but with additional SMA recognition and protection.

TABLE 10. SUMMARY OF ENVIRONMENTAL CONSEQUENCES

Impact Topic	Alternative A: No Action	Alternative B: Comprehensive Implementation of 9B Regulations and a New Management Framework for Plugging and Reclamation	Alternative C: Comprehensive Implementation of 9B Regulations, a New Management Framework for Plugging and Reclamation, and Establishment of Special Management Areas
Soundscapes Direct/indirect effects	**Geophysical –** localized short-term negligible to minor adverse impacts from noise related to work crews and the use of seismic vibration technology. **Drilling and production** (in park and directionally drilled wells) – short-term to long-term minor to moderate adverse impacts from equipment and vehicles. Long-term adverse impacts would arise from continuous production at existing wells until the wells are depleted; noise would be sporadic over the course of production, occurring during workovers and servicing operations, as well as continuous from existing motors and pumpjacks. **Plugging and reclamation** (all wells) – short term, minor to moderate, adverse impacts, with long term beneficial impacts from re-vegetation of site reclamation.	**Geophysical** – same as alternative A. **Drilling and production** (in park and directionally drilled wells) – same as alternative A, but with increased certainty that mitigation measures would be implemented to ensure protection of park resources, including the natural soundscape, due to increased inspections and management. **Plugging and reclamation** (all wells) – same as alternative A, with a greater chance of completion sooner as well as simultaneous plugging operations due to new well plugging management framework.	**Geophysical** – same as alternative A. **Drilling and production** (in park and directionally drilled wells) – same as alternative B, but with a greater chance of directional drilling with SMA recognition and protection. **Plugging and reclamation** (all wells) – same as alternative B.
Cumulative effects	**Cumulative impacts** – short- and long-term minor to moderate adverse cumulative impacts from various sources; alternative A would contribute minimally to the overall cumulative impacts.	**Cumulative impacts** – short-term and long-term negligible to moderate adverse cumulative impacts; similar to alternative A, but with long-term cumulative benefits due to proactive management and expedited well plugging.	**Cumulative impacts** – same as alternative B, but with additional SMA recognition and protection.

TABLE 10. SUMMARY OF ENVIRONMENTAL CONSEQUENCES

Impact Topic	Alternative A: No Action	Alternative B: Comprehensive Implementation of 9B Regulations and a New Management Framework for Plugging and Reclamation	Alternative C: Comprehensive Implementation of 9B Regulations, a New Management Framework for Plugging and Reclamation, and Establishment of Special Management Areas
Cultural Resources Direct/indirect effects	**Geophysical** – localized, short- and long-term negligible to minor adverse impacts as a result of soil disturbance and vibration, with offsets and mitigation as needed to reduce impacts. **Drilling and production** (in park and directionally drilled wells) – short-term and long-term negligible to minor adverse impacts as a result of impacts on soils, historic artifacts, and cultural landscapes; possible major adverse impacts in the unlikely event of a well blowout, fire, or major release. **Plugging and reclamation** (all wells) – localized short-term and long-term negligible to minor adverse impacts and long-term minor beneficial impacts on cultural resources.	**Geophysical** – localized, long-term negligible to minor adverse impacts, similar to alternative A. **Drilling and production** (in park and directionally drilled wells) – same as alternative A; reduced chance of major adverse impacts due to increased monitoring and inspections. **Plugging and reclamation** (all wells) – same as alternative A; with a greater chance of completion sooner due to the new well plugging management framework.	**Geophysical** – same as alternative A; more upfront protection in certain SMA's. **Drilling and production** (in park and directionally drilled wells) – similar to alternative B; but with reduced chance of impacts due to SMA recognition and protection and possible directional drilling. **Plugging and reclamation** (all wells) – same as alternative B.
Cumulative effects	**Cumulative impacts** – long-term minor adverse cumulative impacts from various sources. The actions under alternative A could contribute moderately to both adverse and beneficial cumulative impacts.	**Cumulative impacts** – same as alternative A.	**Cumulative impacts** – same as alternative A, but with additional SMA recognition and a No Surface Use stipulation.

TABLE 10. SUMMARY OF ENVIRONMENTAL CONSEQUENCES

Impact Topic	Alternative A: No Action	Alternative B: Comprehensive Implementation of 9B Regulations and a New Management Framework for Plugging and Reclamation	Alternative C: Comprehensive Implementation of 9B Regulations, a New Management Framework for Plugging and Reclamation, and Establishment of Special Management Areas
Visitor Use and Experience Direct/indirect effects	**Geophysical –** localized, short-term negligible to minor adverse from temporary access restrictions and effects on visual quality, noise, odors, and human health and safety. **Drilling and production** (in park and directionally drilled wells) – short- and long-term minor to moderate adverse impacts on access, visual quality, noise, and health and safety. Possible major adverse impacts in the unlikely event of a well blowout, fire, or major release. **Plugging and reclamation** (all wells) – localized long-term beneficial impact on visitor use and experience. Temporary effects on access, visual quality, noise, odors, and human health and safety would be short term, minor to moderate, and adverse.	**Geophysical** – same as alternative A **Drilling and production** (in park and directionally drilled wells) – short- and long term mostly minor adverse impacts, similar to alternative A; reduced chance of major adverse impacts due to increased monitoring and inspections. **Plugging and reclamation** (all wells) – Temporary effects on access, visual quality, noise, odors, and human health and safety would be short term, negligible to moderate, and adverse, similar to alternative A, with greater chance of completion sooner due to new well plugging management framework.	**Geophysical** – localized, short-term negligible adverse, similar to alternative A. **Drilling and production (**in park and directionally drilled wells) – localized short-term negligible to mostly minor adverse impacts; similar to alternative B, but with SMA recognition and protection. **Plugging and reclamation** (all wells) – Temporary effects on access, visual quality, noise, odors, and human health and safety would be short term, negligible to minor, and adverse, similar to alternative B.
Cumulative effects	**Cumulative impacts** – short- and long-term minor adverse cumulative impacts from various sources. The actions under alternative A would contribute moderately to both adverse and beneficial cumulative impacts.	Cumulative impacts – same as alternative A.	**Cumulative impacts –** short-and long-term negligible to minor, similar to alternative A.

TABLE 10. SUMMARY OF ENVIRONMENTAL CONSEQUENCES

Impact Topic	Alternative A: No Action	Alternative B: Comprehensive Implementation of 9B Regulations and a New Management Framework for Plugging and Reclamation	Alternative C: Comprehensive Implementation of 9B Regulations, a New Management Framework for Plugging and Reclamation, and Establishment of Special Management Areas
Park Management and Operations Direct/indirect effects	**Geophysical** – short-term negligible to minor adverse impacts from a slight increase in costs and staff time needed to oversee operations. **Drilling and production** (in park and directionally drilled wells) – localized short-term minor to moderate adverse impacts, from site inspections; possible major adverse impacts in the unlikely event of a well blowout, fire, or major release. **Plugging and reclamation** (all wells) – short-term minor to moderate adverse impacts that would be spread out over time from increasing the work load of NPS staff; with long-term beneficial impacts from site reclamation.	**Geophysical** – same as alternative A. **Drilling and production** (in park and directionally drilled wells) – similar to alternative A, but with a reduced chance of major adverse impacts due to increased monitoring and inspections; will require additional staff resources and effort. **Plugging and reclamation** (all wells) – short term minor adverse, with a greater chance of reducing staff through the proposed management framework.	**Geophysical** – same as alternative A. **Drilling and production** (in park and directionally drilled wells) – similar to alternative B, but with additional staff time needed to identify and delineate SMAs to be avoided or mitigated. **Plugging and reclamation** (all wells) – same as alternative B.
Cumulative effects	**Cumulative impacts** – short- and long-term minor to moderate adverse cumulative impacts from various sources. The actions under alternative A would contribute moderately to both adverse and beneficial cumulative impacts.	**Cumulative impacts** short and long-term minor adverse cumulative impacts, similar to alternative A.	**Cumulative impacts** – same as alternative B.

ALTERNATIVES ELIMINATED FROM FURTHER CONSIDERATION

In developing alternatives for this plan/EIS, several alternatives or elements of alternatives, were initially considered by the planning team as a result of internal and external scoping. Several of these were eliminated from further detailed evaluation as standalone alternatives, but were incorporated as elements common to the alternatives as described previously in this chapter (such as acquiring mineral rights on a case-by-case basis). Others did not meet the stated objectives of the plan to a large degree; could not be implemented for technical or logistical reasons; did not meet park mandates; or were outside the scope of this planning effort. The alternatives and the reasons why they were dismissed are described below.

NO SURFACE OCCUPANCY AT BIG SOUTH FORK NATIONAL RIVER AND RECREATION AREA

This alternative would allow for continued development of private mineral rights within Big South Fork NRRA, but would require all associated activities be conducted from outside the park boundary using directional drilling. This was considered but dismissed because the enabling legislation for the park unit allows for oil and gas operations at the park, and the 9B regulations provide adequate protection to park resources when implemented comprehensively.

ACQUIRING ALL MINERAL RIGHTS WITHIN THE PARK UNITS

Although this alternative would protect park resources and values, and avoid conflicts with visitor use, enjoyment, and human health and safety, it would create substantial conflicts with private property rights. In the event that there were unwilling sellers, this alternative would possibly require condemnation of mineral rights. This would contradict provisions in the legislation for both Big South Fork NRRA and Obed WSR. As described in the “Background” section of chapter 1, the enabling legislation for Big South Fork NRRA permits prospecting and drilling for petroleum products and natural gas in the adjacent area (16 USC 460ee(e)(3)). Although there are no provisions related to oil and gas operations in the 1976 amendment to the Wild and Scenic Rivers Act that established the Obed WSR (16 USC 1274), the original act (PL 90-542, passed October 2, 1968) does discuss mining and mineral leasing laws and allows for access to valid existing mineral rights (section 9(a)(i) and 9(a)(ii)). This alternative would also be inconsistent with the objective of providing owners and operators of private oil and gas rights reasonable access for exploration, production, maintenance, and surface reclamation, as identified in chapter 1. NPS regulations at 36 CFR Part 9B, governing non-federal oil and gas operations in park units, provide for reasonable controls on non-federal oil and gas exploration, production, and transportation to assure park resource and visitor protection, and acquisition of all rights would be unnecessary to achieve these goals. The NPS also has the authority to purchase the non-federal mineral rights on a case-case basis, and it would likely be cost prohibitive to purchase all of the mineral rights throughout Big South Fork NRRA and Obed WSR. Therefore, this alternative was eliminated from further detailed analysis.

SUBSIDIZING PLUGGING OPERATIONS

During development of the alternatives for this plan/EIS, the interdisciplinary planning team considered the idea of the NPS paying for operations associated with plugging and reclaiming wells. In essence, the NPS would pay for the plugging and reclamation to ensure that it is conducted in a timely manner. This alternative was dismissed from further consideration because it provides little benefit to taxpayers, given that high priority wells are already targeted for plugging and reclamation, and could create a financial burden for the NPS. Increased inspections, monitoring, and enforcement of the 9B regulations, as well as implementation of the new management framework, described for the action alternatives, would result in more timely plugging and reclamation of well sites.

Closing Wells in Violation of 9B regulations or within 500 feet of Watercourses or Recreation Resources at Big South Fork National River and Recreation Area

During public scoping, commenters suggested the NPS enact regulations to close all wells in violation of the 9B regulations or within 500 feet of watercourses and recreational resources (trails) at Big South Fork NRRA. As described previously, new regulations are not needed as protection afforded by existing legal mandates is adequate when enforced properly. The 9B regulations provide the superintendent of a park unit the authority for suspending operations found to be impacting, or threatening to impact, park resources beyond the operations area (see 36 CFR 9.33 and 9.51). As a result, even if wells within 500 feet of a watercourse or trails are allowed in an approved plan operations, the superintendent can suspend such operations if there is the potential for a serious impact to land or water resources. If circumstances occur that cause the superintendent to suspend the operation, an operator would have the chance to remedy the situation. Because the superintendent has this suspension authority, this idea was dismissed from further consideration as a stand-alone alternative.

Limit Number of Wells and Associated Area of Disturbance at Big South Fork National River and Recreation Area

During public scoping, it was suggested that the NPS enact regulations to limit the number of wells allowed in Big South Fork NRRA to 350 or less, and limit the disturbance associated with wells to one acre or less. However, density of wells is currently limited by state spacing requirements for oil and gas operations. As described previously, new regulations are not needed as protection afforded by existing legal mandates is adequate when enforced properly. Chapter 1040-2-4 of the Rules of the Tennessee State Oil and Gas Board Statewide Order No. 2 requires 10- to 160-acre spacing and 330- to 1,320-foot setbacks from property lines, while Title 805, Chapter 1, Sections 100 and 130 of the Kentucky Administrative Regulations require approximately 3- to 574-acre spacing, as well as 400 to 1,000 feet between wells, and 200 to 500 feet from mineral boundaries. In addition, the 9B regulations require an operator take steps to insure that surface disturbance is minimized during nonfederal oil and gas operations (see 36 CFR 9.36(a)(16)(iii)). Big South Fork NRRA also seeks to limit new surface disturbance during an operator's development of plans of operations. There was also concern that limiting the number of wells could result in a taking of private property rights, which would contradict provisions in the legislation for the park units that allows for nonfederal oil and gas operations to exercise private mineral rights. Therefore, this alternative was dismissed from further consideration.

Enact New Regulations for Permitting, Operating, and Prohibiting Oil and Gas in Big South Fork National River and Recreation Area

Comments received during scoping recommended that the NPS enact specific regulations for nonfederal oil and gas operations in Big South Fork NRRA in accordance with the enabling legislation for the park unit. Upon further review of the enabling legislation, Congress provides that "prospecting and drilling for petroleum products and natural gas may be permitted in the adjacent area under such regulations as the Secretary or the Secretary of the Interior…may prescribe to minimize detrimental environmental impacts…" (16 USC 460ee(e)(3)). Although this provides the NPS the opportunity to pass such park-specific regulations, they are not required. In addition, after reviewing the regulations proposed (including those related to protection of water quality/quantity, geologic formations/topography, rare or endangered plants/animals, recreational opportunities, health or safety, and air quality, establishing public notice, comment, and hearing requirements, and requiring development of an EIS for plans of operations) the planning team felt that existing provisions of 36 CFR Part 9B, the NEPA, the Clean Water Act, the Clean Air Act, etc., provided appropriate regulatory protection. In addition, the provisions provided in the action alternatives of this plan/EIS include protected areas and SMAs that were identified or developed to further protect these resources and values. Finally, the servicewide 36 CFR 9B regulations are currently being evaluated by the NPS for revision. Therefore, this was dismissed from further consideration as a stand-alone alternative.

Phase Non-federal Oil and Gas Operations in Zones at Big South Fork National River and Recreation Area

Public comment received during scoping suggested the NPS consider dividing the park unit into sections, and staggering development of private mineral rights over time in each zone. This alternative was dismissed from further consideration because the NPS cannot preclude an operator from accessing their mineral rights except under circumstances described in the 9B regulations, enabling legislation for Big South Fork NRRA, or other pertinent laws or regulations. Establishing these zones and only allowing development in some sections could therefore be considered a taking of private property rights.

CONSISTENCY WITH THE PURPOSES OF THE NATIONAL ENVIRONMENTAL POLICY ACT

The NEPA requires an analysis of how each alternative meets or achieves the purposes of the act, as stated in Section 101(b). Each alternative analyzed in a NEPA document must be assessed as to how it meets the following purposes:

1. fulfill the responsibilities of each generation as trustee of the environment for succeeding generations;
2. assure for all Americans safe, healthful, productive, and esthetically and culturally pleasing surroundings;
3. attain the widest range of beneficial uses of the environment without degradation, risk of health or safety, or other undesirable and unintended consequences;
4. preserve important historic, cultural, and natural aspects of our national heritage and maintain, wherever possible, an environment that supports diversity and variety of individual choice;
5. achieve a balance between population and resource use that would permit high standards of living and a wide sharing of life’s amenities; and
6. enhance the quality of renewable resources and approach the maximum attainable recycling of depletable resources.

The CEQ has promulgated regulations for federal agencies’ implementation of the NEPA (40 CFR Parts 1500–1508). Section 1500.2 states that federal agencies shall, to the fullest extent possible, interpret and administer the policies, regulations, and public laws of the United States in accordance with the policies set forth in the act (sections 101(b) and 102(1)); therefore, other acts and NPS policies are referenced as applicable in the following discussion.

Alternative A: No Action

Alternative A would meet the purpose of the NEPA to a small degree because the NPS would continue to manage non-federal oil and gas operations at less than an optimum level. By requiring plans of operations for new activities, this alternative would help preserve important historic, cultural, and natural aspects of our national heritage, and would maintain an environment that supports diversity and variety of individual choice by allowing access to non-federal mineral rights (purpose 4). However, undesirable consequences associated with current non-federal oil and gas operations (e.g., spills) could cause degradation of the environment (purpose 3) that goes unnoticed in the absence of a more enhanced inspection and monitoring program. This alternative would do little to attain a wide range of beneficial uses of the environment (purpose 3) or help achieve a balance between population and resource use (purpose 5) as non-federal oil and gas operations could occur in areas particularly susceptible to adverse impacts from these operations. Possible lack of inspections, monitoring, and enforcement of regulations under this alternative would not ensure healthful, productive, or esthetically pleasing surroundings (purpose 2). As a result, this alternative would only partially fulfill the responsibilities of each generation as the trustee of the environment for succeeding generations, and in preserving important aspects of our national heritage (purpose 1).

Alternative B: Comprehensive Implementation of the 9B Regulations and a New Management Framework for Plugging and Reclamation

This alternative would fulfill most of the purposes of NEPA to a moderate or large degree. Once the plan was implemented, inspections and monitoring would be increased, and the NPS would pursue plans of operations for current activities. The NPS would continue to work cooperatively with the state on regulations or enforcement, but increased inspections and monitoring would proactively identify sites that are found to be impacting, or threatening to impact, park resources beyond the operations area during inspections and monitoring. Enforcement of NPS regulations at current operations would be prioritized by site conditions, which would minimize the potential for impacts from both current and new oil and gas operations. The new management framework for plugging and reclamation would establish standards and a process for compliance that would facilitate this phase of oil and gas operations and expedite the plugging and reclamation of potentially hazardous well sites. As result, alternative B would do a better job of preserving important historic, cultural, and natural aspects of our national heritage in the long term (purpose 4) and helping to ensure safe, healthful, productive, and esthetically pleasing surroundings (purposes 2 and 3). Continued access to non-federal oil and gas rights under this comprehensive plan would provide for a wide range of uses of the environment while minimizing the potential for environmental degradation or other undesirable or unintended consequences (purpose 3). Providing this access under a comprehensive plan would also help achieve a balance between population and resource use (purpose 5). However, there is some risk to health and safety associated with non-federal oil and gas operations that cannot be eliminated (purposes 2 and 3). Overall, this alternative would go further than alternative A towards fulfilling the responsibilities of each generation, as a trustee of the environment, for succeeding generations (purpose 1).

Alternative C: Comprehensive Implementation of the 9B Regulations, a New Management Framework for Plugging and Reclamation, and Establishment of Special Management Areas

Much like alternative B, this alternative would fulfill most of the purposes of NEPA to a moderate or large degree. The comprehensive management plan, including the inspections, monitoring, and enforcement of regulations for both current and new operations, as well as the new management framework for plugging and reclamation, would minimize the potential for impacts from non-federal oil and gas operations to historic, cultural, and natural aspects of our national heritage in the long term (purpose 4). Establishing SMAs under this alternative would provide the greatest opportunity to preserve important natural aspects in the long term. The presence of SMAs would also go the farthest towards minimizing the potential for environmental degradation or other undesirable or unintended consequences, while still achieving a wide range of uses of the environment, by providing access to private mineral rights (purpose 3). Providing this access under a comprehensive plan would also help achieve a balance between population and resource use (purpose 5). As a result, alternative C would also do a better job of helping to ensure safe, healthful, productive, and esthetically pleasing surroundings (purposes 2 and 3). However, there is some risk to health and safety associated with non-federal oil and gas operations that cannot be eliminated. Overall, this alternative would give the NPS the best chance for fulfilling the responsibilities of each generation, as a trustee of the environment, for succeeding generations (purpose 1).

ENVIRONMENTALLY PREFERRED ALTERNATIVE

The NPS is required to identify the environmentally preferred alternative in its NEPA documents for public review and comment. Guidance from the CEQ states that the environmentally preferred alternative means it is “the alternative that causes the least damage to the biological and physical environment; it also means the alternative which best protects, preserves, and enhances historic, cultural, and natural resources” (CEQ 1981).

Alternative C has been selected as the NPS environmentally preferred alternative. Compared to alternatives A or B, alternative C provides additional protection to park resources through identification of SMAs and protection of these resources through either avoidance of SMAs or additional mitigation in approved plans of operations. As described above, establishing SMAs under this alternative would provide the greatest opportunity to preserve important natural aspects in the long term. Although the types of impacts expected under alternative C are similar to those expected under alternative B, they would likely occur at a reduced intensity because of SMA recognition and protection. Like alternative B, alternative C also includes the new management framework for plugging of abandoned wells, resulting in an expedited process for well site cleanup and reclamation. Alternative A (no action) was not considered environmentally preferred because of its lack of proactive enforcement, and lack of a comprehensive plan and plugging protocol. Overall, alternative C would result in the least damage to the biological and physical environment and protect the parks’ valuable cultural resources.

NATIONAL PARK SERVICE PREFERRED ALTERNATIVE

To identify the preferred alternative, the planning team evaluated each alternative based on its ability to meet the plan objectives (see table 9), considering potential impacts on the environment and on existing and future operations. Alternative C was selected as the NPS preferred alternative.

Alternative C fully meets seven of the nine planning objectives (table 9) and meets the other two to a large degree. Alternative B fully meets three of the nine objectives and meets the others to a large degree, while the no-action alternative fully meets only one objective (hence the need for the plan). With the addition of SMAs, alternative C best identifies and protects resources from adverse effects of oil and gas operations, including protection of water resources, species of management concern, and cultural resources. It also best minimizes or mitigates conflicts between oil and gas operations and visitor use by buffering some visitor use areas from operations and identifying regulatory and other requirements up front with SMA designations. It is equivalent to alternative B in protecting human health and safety, providing guidance to operators, and establishing an efficient well plugging process, as it includes the new management framework for well plugging and reclamation. Although alternative B ranks higher in providing owners and operators with reasonable access, alternative C also provides reasonable access since it has provisions for addressing resource concerns as additional mitigation in approved plans of operation (or using directional drilling) in lieu of limiting surface use entirely in SMAs, where appropriate.

NPS will consider comments on this draft plan/EIS and may modify or adjust the preferred alternative accordingly. Any modification of adjustments will be disclosed in the published final EIS. A Record of Decision will follow the final EIS and will be made available to the public.

CHAPTER 3: AFFECTED ENVIRONMENT

INTRODUCTION

This “Affected Environment” chapter describes existing conditions for those elements of the natural and cultural environments at Big South Fork National River and Recreation Area (NRRA) and Obed Wild and Scenic River (Obed WSR) that would be affected by implementing the actions considered in this Oil and Gas Management Plan / Environmental Impact Statement (plan/EIS). The natural environment components that are addressed include air quality, geology and soils, water resources (surface and ground water), vegetation, wildlife and wildlife habitat, federally listed threatened and endangered species, species of special concern, and soundscapes. The cultural components include archeological, historic, and ethnographic resources, as well as cultural landscapes. Visitor use and experience and park operations and management are also addressed.

GEOLOGY AND SOILS

Both the Big South Fork NRRA and Obed WSR are located on the Cumberland Plateau. The U.S. Geological Survey (USGS) categorizes physiographic divisions based on Fenneman and Johnson’s (1946) *Physical Divisions of the United States*, which is based on eight major divisions, 25 provinces, and 86 sections representing distinctive areas having common topography, rock types and structure, and geologic and geomorphic history. Within this classification system, the Cumberland Plateau is a physiographic section of the larger Appalachian Plateau province, which in turn is part of the larger Appalachian physiographic division (USGS 2009a). The following description of general geologic features in the region is taken from Harris (pers. comm., 2009) unless otherwise noted.

GEOLOGY OF THE CUMBERLAND PLATEAU

The Cumberland Plateau is characterized by flat or rolling upland areas, deeply incised river gorges, and a long line of cliffs that separate it from the lower elevations of the Ridge and Valley Province, which begins at the Cumberland Plateau’s eastern escarpment (NPS 1998b). It is along this eastern escarpment, particularly in northern Tennessee and southern Kentucky, where the development of several structural folds and fault systems has had a pronounced effect on local topography. In this region, a great block fault forms the structural basis for the Cumberland Mountains, an area of pronounced elevation and relief. Major drainage systems of the Plateau may be divided into two principal groups, consisting of those that are tributary to the Cumberland River system and those that are tributary to the Tennessee. The Big South Fork is tributary to the Cumberland River system. The Obed River becomes the Emory River which empties into the Clinch River which is part of the Upper Tennessee River Basin.

The sedimentary rocks that comprise the Cumberland Plateau are of the Pennsylvanian (280 to 320 million years ago) and Mississippian periods (320 to 360 million years ago), which together comprise the Carboniferous period. These rocks are composed of near shore sediments transported westward from the old Appalachian Mountains. The Pennsylvanian rocks consist of shale, siltstone, and sandstone and are coal-bearing (NPS 2005a). Some rock layers, including bituminous coal seams, were laid down in swampy environments. These are interlaced with delta deposits of cross-bedded sandstones and occasional conglomerates.

Big South Fork National River and Recreation Area

Big South Fork NRRA encompasses approximately 125,000 acres (including deferred properties) of rugged terrain on the Cumberland Plateau in northeastern Tennessee and southeastern Kentucky, consisting of prominent rock formations, as well as the massive gorge and accompanying bluffs. The topography at Big South Fork NRRA is characterized by a dendritic drainage pattern and narrow, V-shaped gorges. Valleys are dotted with huge boulders that have broken off from the rock face. Prominent rock formations, as well as the massive gorge and accompanying bluffs, form the basis for the Sensitive Geomorphic Features (Special Management Area) described for alternative C in chapter 2 and illustrated in figure 11.

The specific geologic units found at Big South Fork NRRA are summarized in table 11 and shown on figure 11.

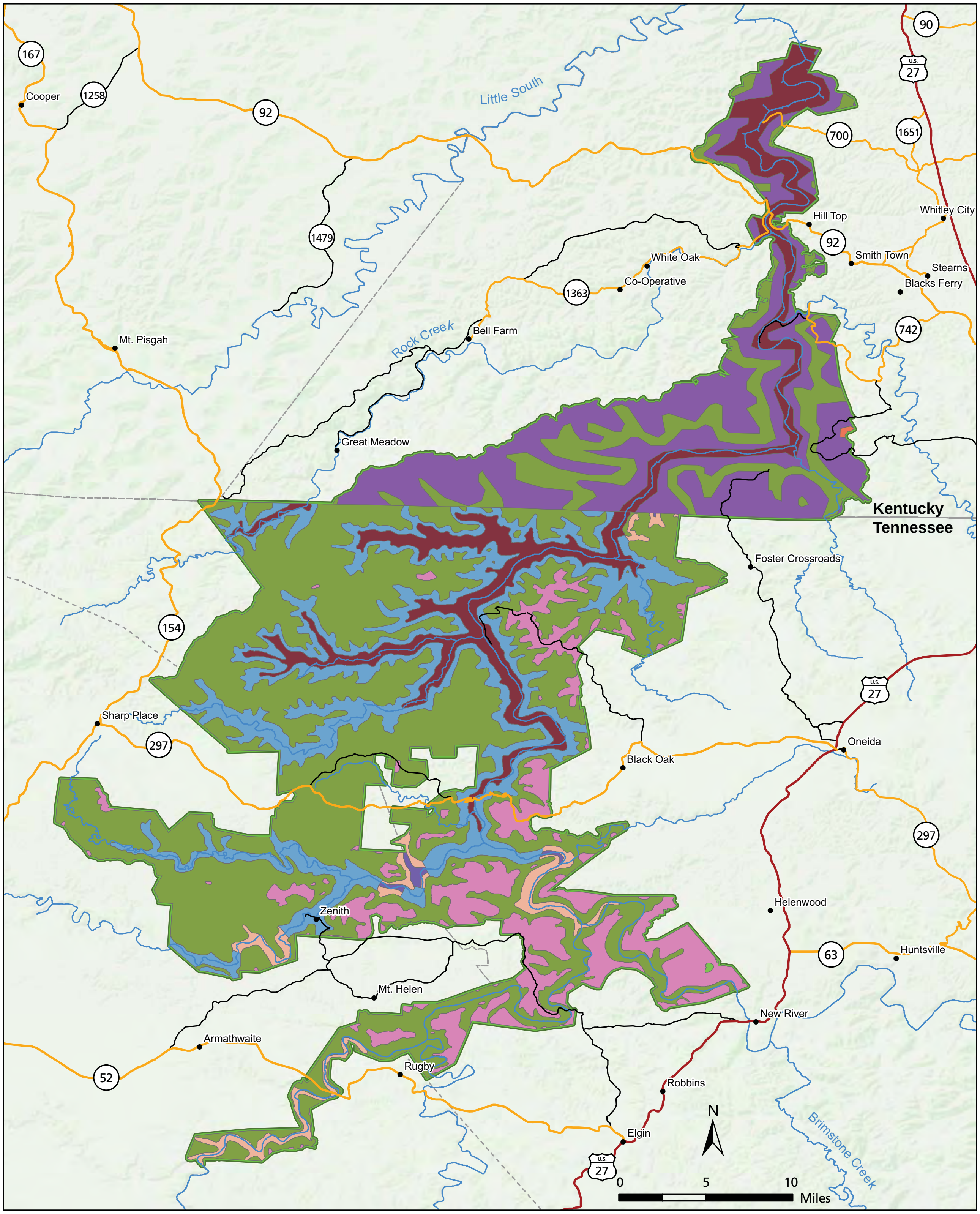
TABLE 11. GEOLOGIC UNITS OF BIG SOUTH FORK NATIONAL RIVER AND RECREATION AREA

Name	Age	Rock Types
Tennessee		
Crooked Fork Group	Pennsylvanian	Shale, sandstone, siltstone, and thin coal beds; thickness 200 to 450 feet
Crab Orchard Mountain Group	Pennsylvanian	Conglomerate sandstone with thin zone of quartz and shale-pebble conglomerate at base; maximum preserved thickness 35 feet.
Gizzard Group	Pennsylvanian	Sandstone, conglomeratic sandstone, siltstone, shale, and minor coal; thickness 100 to 200 feet.
Pennington Formation	Mississippian	Highly variegated clay shale contains siltstone and locally fine-grained sandstone; thickness 400 to 700 feet.
Kentucky		
Breathitt Formation, lower part	Pennsylvanian	Shale, siltstone, sandstone; coal; conglomerate.
Lee (and Breathitt) Formation (Corbin Sandstone)	Pennsylvanian	Sandstone, conglomerate.
Lee Formation (Rockcastle Conglomerate)	Mississippian to Pennsylvanian	Conglomerate, sandstone, siltstone; shale; coal.
Pennington (Paragon) Formation	Mississippian	Limestone, shale, sandstone.

Source: Nicholson et al. 2007.

Obed Wild and Scenic River

Obed WSR encompasses approximately 5,195 acres of rolling uplands underlain by Pennsylvanian sandstones, siltstones, shales, some conglomerates, and coals. These rocks have a thickness of about 1,500 feet. The resistant nature of the capping sandstone that underlies and maintains the flat to rolling plateau topography is important in determining the landforms that characterize much of the Obed WSR drainage area. Where rivers have eroded through the sandstone caprock, continued erosion of the Pennsylvanian shales has produced the long narrow gorges of the Obed River and its tributaries (Schmalzer et al. 1985).



Legend

Figure 11. Bedrock Geology of Big South Fork National River and Recreation Area

Legend

- U.S. Highway
- State Highway
- Roads
- Park Unit Boundary
- Rivers / Streams
- County Boundary

Geology

Tennessee

- Crooked Fork Group
- Rockcastle Conglomerate
- Crab Orchard Mountain Group
- Fentress Formation
- Grizzard Group (incl. Warren Pt. Sandstone and Raccon Mt. Formation)
- Pennington Formation

Kentucky

- Breathitt Formation, lower part (incl. Livingston Cgl)
- Lee (& Breathitt) Formation (Corbin Sandstone)
- Lee Formation (Rockcastle Conglomerate)
- Pennington Formation, Bangor Ls, Hartselle Fm, and Monteagle Limestone (Kidder Mbr)

For Illustrative Purposes Only

The specific geologic units found in Obed WSR are the Crooked Fork Group, Crab Orchard Mountains Group, and Rockcastle Conglomerate, which are summarized in table 11 for Big South Fork NRRA, and shown on figure 12.

SOILS

The soils of the Cumberland Plateau, which are predominantly loamy with moderate infiltration rates, are weathered from the broad area of sandstone caprock. Some soils are also formed with additions from acidic shales and siltstone, or combinations of these rock types. The depth of the soil to bedrock ranges from about one foot on steep hillsides to about four to five feet on broad, smooth interstream divides. The soil characteristics for both Big South Fork NRRA and Obed WSR are described in detail in the following sections.

Big South Fork National River and Recreation Area

Big South Fork NRRA is located within the Tennessee counties of Scott, Morgan, Fentress, and Pickett, and the Kentucky county of McCreary. A soil survey of the Big South Fork NRRA categorized soils into 19 map units (see figure 13). These soils identified within the recreation area and, where available, the hydrologic soil groups associated with them (described later in this section) are provided in table 12.

TABLE 12. SOIL ASSOCIATIONS WITHIN BIG SOUTH FORK NATIONAL RIVER AND RECREATION AREA

Soil Map Unit	Hydrologic Soil Group[1]
Atkins loam	—
Atkins-Lily complex	B
Atkins-Skidmore complex	B
Gilpin silt loam	C
Gilpin-Bouldin complex	B
Gilpin-Bouldin-Petros complex	B/D
Gilpin-Petros complex	D
Gilpin-Sequoia complex	C
Itmann very parachannery loam	C
Lily loam	B
Lily-Gilpin complex	B
Lily-Ramsey complex	B
Lonewood silt loam	B
Pope-Skidmore complex	B
Ramsey-Rock outcrop complex	D
Shelocta silt loam	B
Shelocta-Bouldin complex	B
Skidmore very gravelly sandy loam	—
Wernock silt loam	B

Source: USDA 2009a, 2009b.

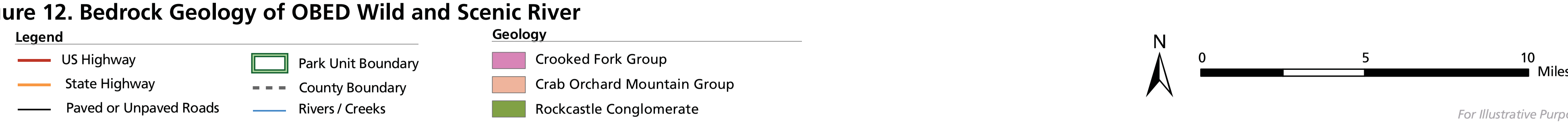
[1]Classifications are based on the hydrologic soil groups as assigned by the Natural Resources Conservation Service and are provided where available for specific soils contained in the map unit.

Big South Fork National River and Recreation Area and
Obed Wild and Scenic River
Kentucky and Tennessee

National Park Service
U.S. Department of the Interior

Legend

Figure 12. Bedrock Geology of OBED Wild and Scenic River



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Big South Fork National River and Recreation Area
Kentucky and Tennessee

National Park Service
U.S. Department of the Interior

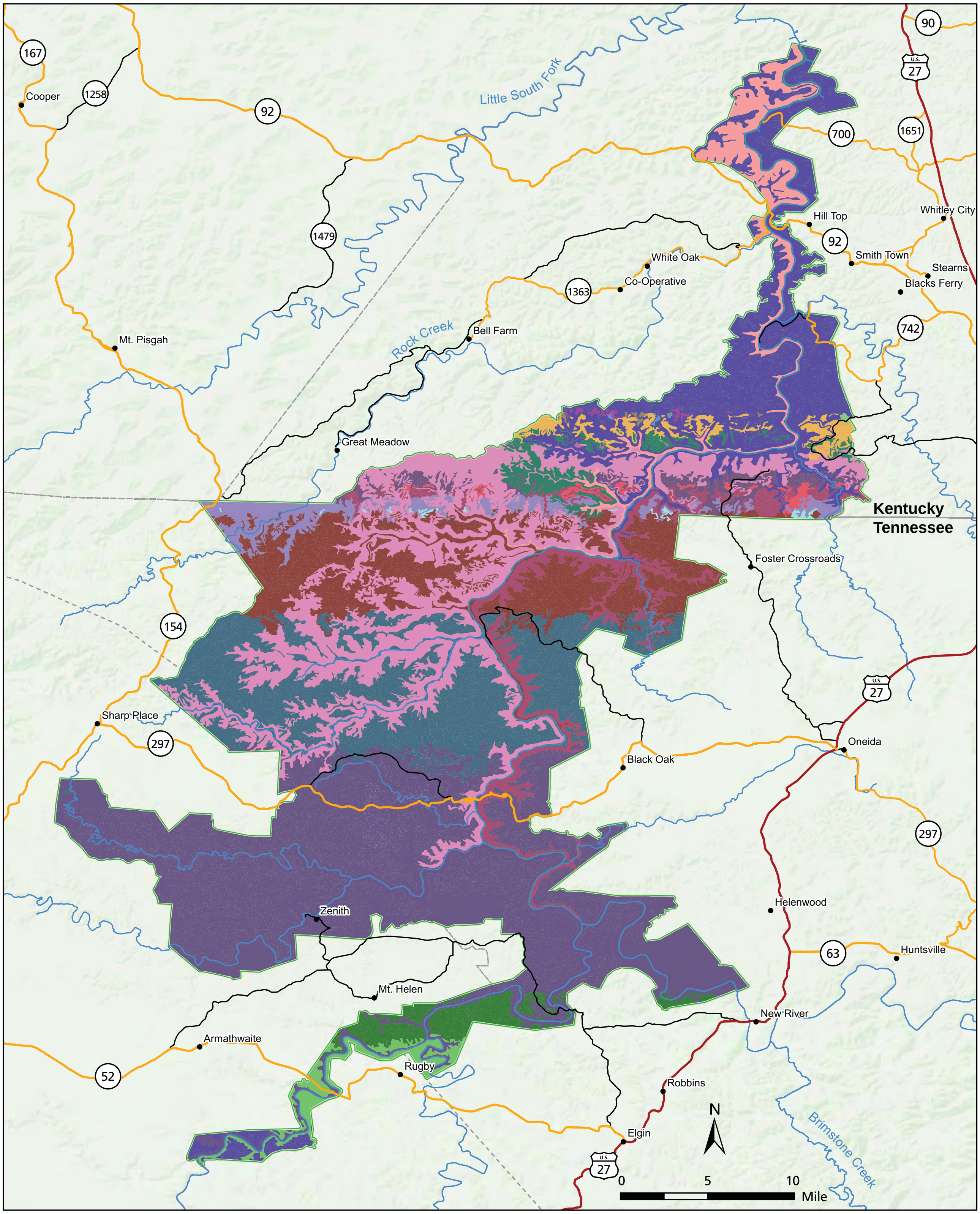

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Figure 13. Soils of Big South Fork National River and Recreation Area

U.S. Highway
State Highway
Roads
Rivers / Streams
County Boundary

Legend

Atkins loam, ponded
Atkins-Lily complex
Atkins-Skidmore complex
Gilpin silt loam
Gilpin-Bouldin complex
Gilpin-Bouldin-Petros complex
Gilpin-Petros complex
Gilpin-Sequoia complex
Itmann very parachannery loam
Lily loam
Lily-Gilpin complex
Lily-Ramsey complex
Lonewood silt loam
Pope-Skidmore complex
Rock outcrop-Ramsey complex
Shelocta silt loam
Shelocta-Bouldin complex
Skidmore very gravelly sandy loam
Water
Wernock silt loam

For purposes of describing the hydrologic characteristics of the soil and evaluating the potential impacts of oil and gas operations, soil associations within the recreation area have been combined into four major classifications based on their infiltration/runoff potential or hydrologic group. Hydrologic group refers to a group of soils having similar runoff potential under similar storm and cover conditions. These classifications are assigned by the Natural Resources Conservation Service (NRCS). The four hydrologic soil groups are A, B, C, and D, where soils in group A generally have the smallest runoff potential, while those in group D have the greatest runoff potential. Table 13 describes common characteristics of these hydrologic groups.

TABLE 13. COMMON CHARACTERISTICS OF HYDROLOGIC SOIL GROUPS

Hydrologic Soil Group	A Soils	B Soils	C Soils	D Soils
Composition	Thick, well to excessively drained, moderately coarse textures (sands, loamy sands, and sandy loams)	Moderately thick, well to excessively drained, moderately fine to moderately coarse textured (silt loams and loams)	High clay content, water retardant layer, moderately fine to fine textured (sandy clay loams)	Fine textured, thin clayey soils with claypan or clay layer near surface
Location	Generally found in upland areas	Generally found in upland areas	Generally found in wetlands and floodplains	Generally found in wetlands and floodplains
Permeability	High	Moderate	Low	Very Low
Erodibility	Low to Moderate	Low to Moderate	Moderate to High	Moderate to High
Compaction	Low	Low	Moderate	High
Shrink/Swell Potential	Low	Low	Moderate	High
Runoff Potential	Low	Low	Moderate	High
Infiltration Rate	High	Moderate	Low	Low

Source: USDA 2009b; NPS 2005d

Soil characteristics that are important in assessing the potential impacts of oil and gas operations include the following:

Soil Erodibility—Most of the soils in classes A and B are low to moderately erodible, while soils in classes C and D are moderately to highly erodible. Erosion also depends on the rainfall energy, slope length, vegetative cover, and site conservation or management practices. Slopes within Big South Fork NRRA are variable, and soil erosion control may be necessary whenever vegetative cover is removed or when water is concentrated and flow velocities are high.

Soil Compaction—Typically, soils with a high clay content are most subject to compaction. Soil compaction resulting from foot travel or vehicle use reduces the pore spaces in the soil and impedes the penetration of rainfall and plant roots (Meek et al. 1992). Even though drying and shrinking of the soils and subsequent wetting and expansion will tend to negate some of the adverse impacts over time, clayey soils should not be traversed when saturated. Vehicular travel on clayey soils under saturated conditions will form compacted tracks. These tracks will have the effect in flat topography of changing surface drainage patterns by forming small drainage channels that can locally affect the hydroperiod (frequency and duration of saturation) of a site. Compaction will also tend to severely reduce the permeability of the soil. Soils within class D are most prone to compaction.

Shrink/Swell Potential—Clayey soils that are composed of expansive clays will tend to expand and contract with seasonal moisture variations. The combined effects of shrink/swell and compaction make road construction difficult in areas where there are clayey soils. Typically, soils in class D are more prone to shrink and swell.

Prime or Unique Farmland Soils—The Farmland Protection Policy Act was passed in order to minimize the amount of land irreversibly converted from farmland due to federal actions. Prime farmland, as defined by the U.S. Department of Agriculture (USDA) National Resources Conservation Service, is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops, and is available for these uses. It could be cultivated land, pastureland, forestland, or other land, but it is not urban or built-up land or water areas. Big South Fork NRRA contains seven soil associations that have been identified as prime farmland soils. They are: Allegheny-Grigsby, Lily Loam, Lonewood Clarkrange, Sequoia Silt Loam, Sequoia-Wernock, Sewanee Loam, Wernock Silt Loam (USDA 2009b).

Obed Wild and Scenic River

The Obed WSR is located within Cumberland and Morgan counties. Soil composition characteristics for the Obed WSR are representative of the Cumberland Plateau and similar to those of Big South Fork NRRA. The 18 soils found within the recreation area and the hydrologic soil classes associated with them are illustrated in figure 14 and listed in table 14.

TABLE 14. SOIL ASSOCIATIONS WITHIN OBED WILD AND SCENIC RIVER

Soil Map Unit	Hydrologic Soil Group
Bethesda-mines pit complex	C
Ealy-Craigsville complex	B
Gilpin silt loam	C
Gilpin-Bouldin-Petros complex	C
Gilpin-Petros complex	C
Jefferson-Varilla-Shelocta complex	B
Lily Loam	B
Lily-Gilpin complex	B
Lily-Ramsey complex	B
Lonewood Silt Loam	B
Pope-Philo complex	B
Ramsey-Rock outcrop complex	D
Shelocta Silt Loam	B
Wernock Silt Loam	B

Source: USDA 2009a; 2009b

Big South Fork National River and Recreation Area and
Obed Wild and Scenic River
Kentucky and Tennessee

National Park Service
U.S. Department of the Interior

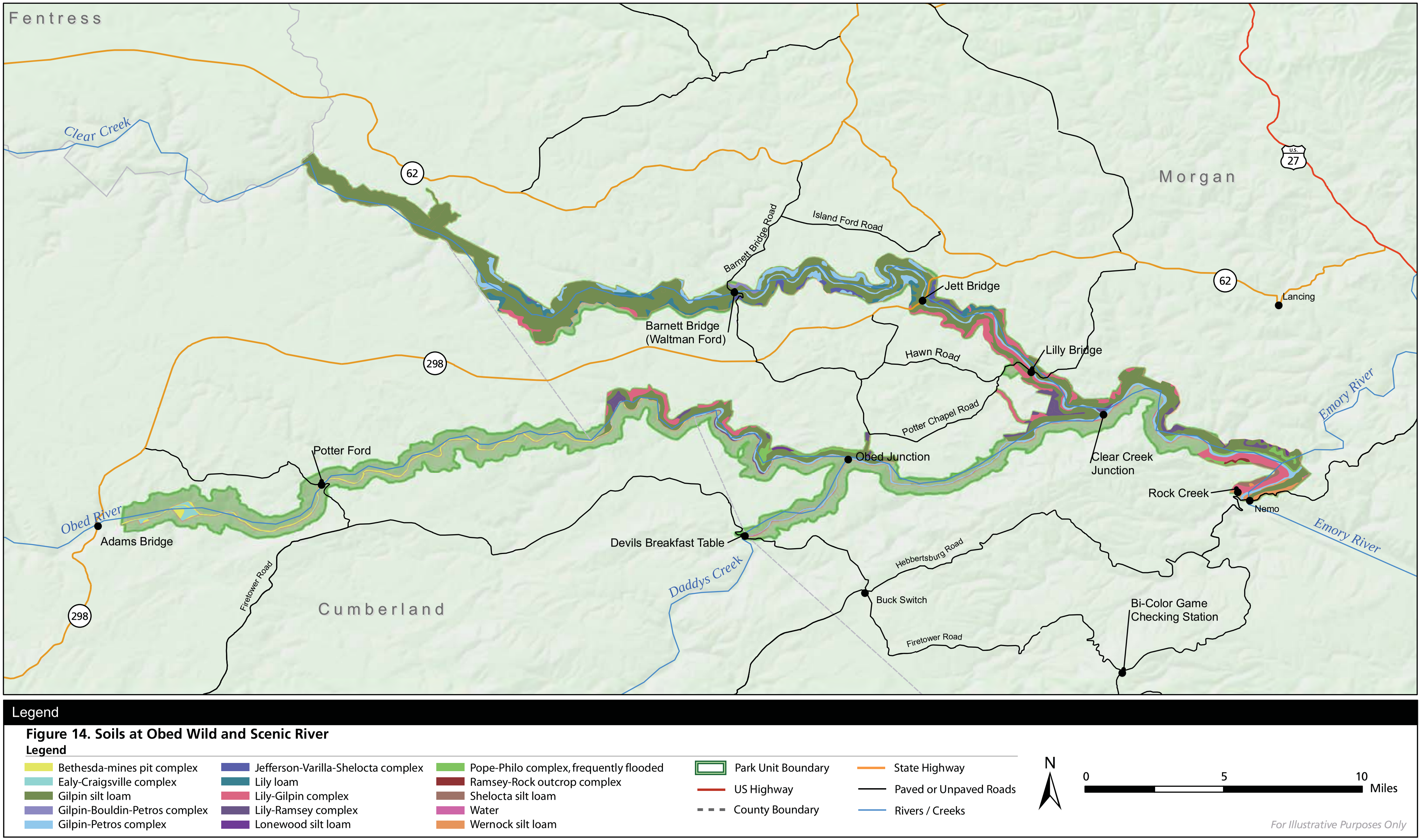


Figure 14. Soils at Obed Wild and Scenic River

Prime or Unique Farmland Soils—Obed WSR contains five soil types that have been identified as prime farmland soils. These are: Lily Loam, Lonewood Loam, Lonewood Silt Loam, Pope Philo, and Wernock Silt Loam (USDA 2009b).

WATER RESOURCES

BIG SOUTH FORK NATIONAL RIVER AND RECREATION AREA

One of the primary reasons the Big South Fork NRRA was established was to preserve the Big South Fork of the Cumberland River as a natural, free-flowing stream for the benefit and enjoyment of present and future generations. The Big South Fork River is formed by the New River and the Clear Fork, and drains the northern portion of the Cumberland Plateau in Tennessee. As the Big South Fork flows from south to north, it is fed by a variety of sources ranging from perennial streams, such as North White Oak Creek, to many ephemeral creeks. Flooding is common during the winter months (December – March) when soils are saturated, frozen, or covered with snow. Springs and ponds can be found scattered throughout the Big South Fork NRRA. Enhancing the water quality of the Big South Fork is an important management concern. The following sections generally describe surface and ground water at the park unit. A complete overview of the management of the water resources is contained in the Big South Fork NRRA Water Resources Management Plan (NPS 1997).

Surface Water

The Big South Fork (also known as the Big South Fork of the Cumberland) River originates at the confluence of the Clear Fork and New River in the southern portion of the Big South Fork NRRA. Other major tributaries include North White Oak Creek, Pine Creek, Bear Creek, Station Camp Creek, Williams Creek, Roaring Paunch Creek, and Rock Creek. Major tributaries to the Big South Fork are shown on figures 15, 16, and 17. Table 15 provides the area drained by these major tributaries as well as several smaller tributaries to the river.

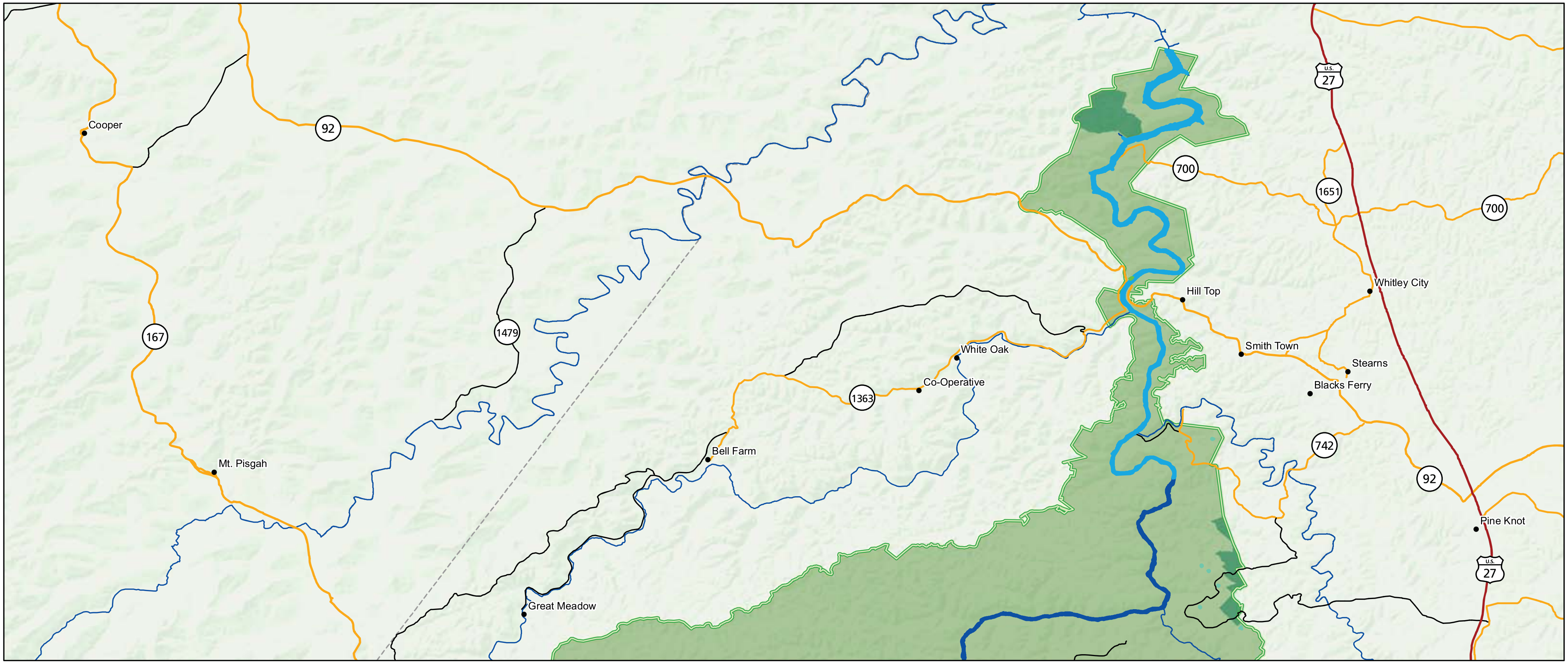
TABLE 15. SUB-WATERSHEDS IN THE BIG SOUTH FORK NATIONAL RIVER AND RECREATION AREA

Sub-watershed River	Sub-watershed Area mi^2	Location Counties
New River	396	Scott, Anderson, Campbell, Morgan
Clear Fork River	283	Scott, Fentress, Morgan
North White Oak Creek	88	Scott, Fentress
Pine Creek	27	Scott
Station Camp Creek	132	Scott, Pickett, Fentress
Bear Creek	23	Scott, McCreary
Williams Creek	24	Scott
Roaring Paunch Creek	50	Scott, McCreary
Rock Creek	163	Scott, Pickett, McCreary

Source: NPS 1997.

Big South Fork National River and Recreation Area
Kentucky and Tennessee

National Park Service
U.S. Department of the Interior



Legend

Figure 15. Wetlands and Surface Water of Big South Fork National River and Recreation Area (Map 1)

Legend

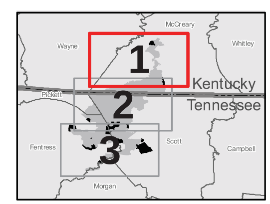
- U.S. Highway
- State Highway
- Roads
- Park Unit Boundary
- Rivers / Streams
- County Boundary

Wetlands and Surface Water

- Freshwater Forested / Shrub Wetland
- Freshwater Pond
- Lake
- Riverine
- Reservoirs and Impoundments

N

0 2 4 Mi.



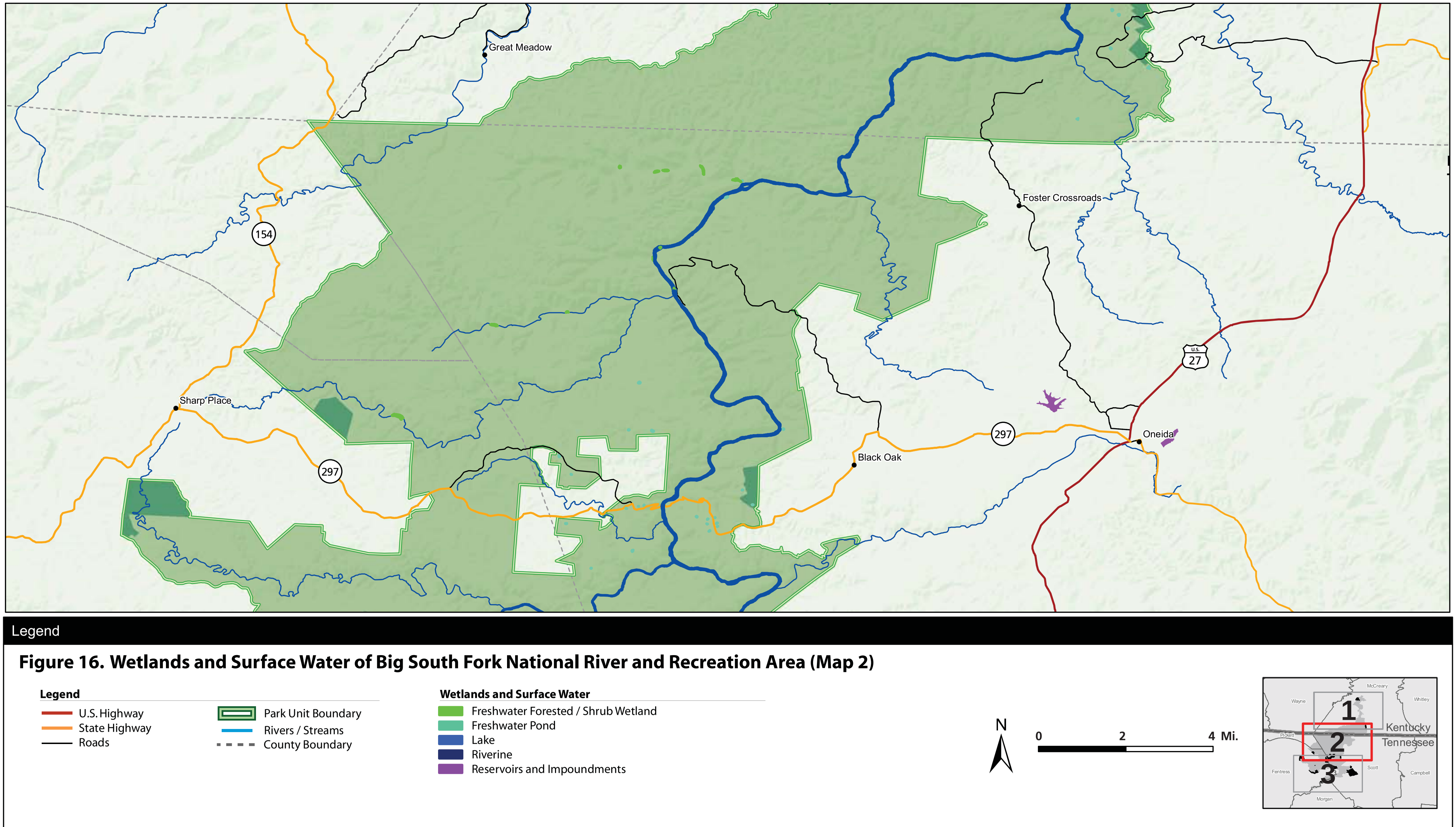
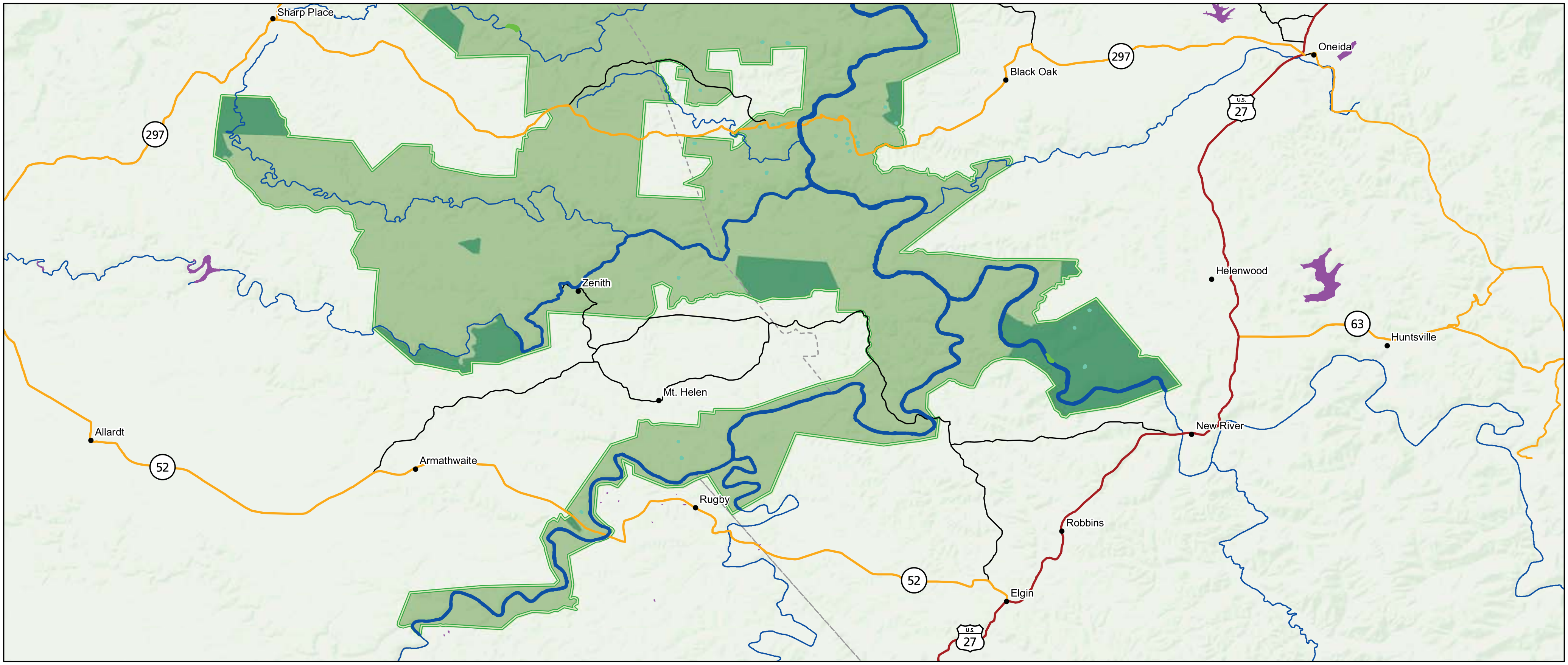


Figure 16. Wetlands and Surface Water of Big South Fork National River and Recreation Area (Map 2)



Legend

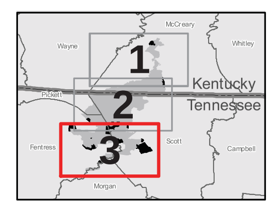
Figure 17. Wetlands and Surface Water of Big South Fork National River and Recreation Area (Map 3)

Legend
- U.S. Highway
- State Highway
- Roads
- Park Unit Boundary
- Rivers / Streams
- County Boundary

Wetlands and Surface Water
- Freshwater Forested / Shrub Wetland
- Freshwater Pond
- Lake
- Riverine
- Reservoirs and Impoundments

N

0 2 4 Mi.



The Big South Fork River flows northward through the Big South Fork NRRA for approximately 49 miles and joins the Cumberland River 28 miles north of the Big South Fork NRRA's northern boundary at Burnside, KY (NPS 1997). The Big South Fork River watershed, combined with the New River and Clear Fork watersheds, drain approximately 1,123 square miles within the Cumberland Plateau (NPS 2009a). Roughly six miles of the Big South Fork River within the Big South Fork NRRA boundaries are part of Lake Cumberland at normal pool levels.

A unique feature of surface waters in the Big South Fork NRRA is their low ionic strength. Ion content of streams and rivers is related to several other potential stressors, including temperature, sediment, pH, metals, other toxic chemicals, and flow alteration. Insofar as conductivity may be taken as an indicator of ionic strength, clean streams in the Big South Fork NRRA would have an electrical conductivity of 60 microSiemens per centimeter (µS/cm) or less in watersheds with limestone, or 30 µS/cm or less in watersheds without limestone. When conductivity exceeds 60 µS/cm, this is an indication that the stream is polluted (Rikard et al. 1986). For this reason, brine discharges associated with oil and gas activities should not be allowed to raise the conductivity of the surface water above these acceptable levels. While some surface waters of the Big South Fork River system are contaminated by oil and gas activities (as detailed below), overall surface water quality, as measured by ionic strength, is good.

Streamflow—There are three USGS stream gauge stations within the Big South Fork NRRA. One is on the Big South Fork River in Kentucky (station no. 03410500), one is on the Clear Fork near Burnt Mill Bridge (station no. 03409500), and the other is on the Big South Fork River in Tennessee (station no. 03410210).

The Adams Bridge Stream Gage located on the Obed River.

Data is available for streamflow measurements reported for 2004 at station no. 03410600 on the Big South Fork Cumberland River at Yamacraw in Kentucky. Statistics from this reporting year indicate that average daily flow, measured in cubic feet per second (cfs), ranges from 222 to more than 43,500 cfs. Flows are highest during the months from January through April, with peak flows occurring somewhere during this period. Flows during this period average approximately 3,940 cfs. During the May through December period, flows are lower, and average approximately 1,970 cfs (USGS 2004).

Streamflow measurements from the station no. 03409500 on the Clear Fork near Robbins in Tennessee indicate that average flow is from 2 to 3,420 cfs. Flows are highest during the months of January, February, March, and April. During this period, flows average approximately 900 cfs. During the period from May through December, flows are lower and average approximately 260 cfs (USGS 2009b).

Streamflow measurements from the station no. 03410210 on the Big South Fork Cumberland River at Leatherwood Ford in Tennessee indicate that average flow is from 26 to 6,370 cfs. Flows are highest during the months of January, February, March, and April. During this period, flows average approximately 2,300 cfs. During the period from May through December, flows are lower and average approximately 800 cfs (USGS 2009b).

Intakes—There are four public water supply intakes that withdraw water from streams that fall within the Big South Fork River watershed (table 16). The McCreary County intake is located within the Big South Fork NRRA boundary; the other three intakes are outside of the park (NPS 2005a).

TABLE 16. INTAKES IN THE BIG SOUTH FORK NATIONAL RIVER AND RECREATION AREA

Public Water Supply	Year Operation Began	Source	Average Pumpage (10^6 gal/day)	Population Served
McCreary County Water District[a]	2002	Lake Cumberland and Big South Fork River	2.2	18,000
Huntsville Utility District (in Scott County, TN; includes the Sunbright Utility District of Morgan County, TN)[b]	Intermittently Operational (as needed)	New River (Pumped to Huntsville Utility District Reservoir on Flat Creek)	1.3	13,000
City of Oneida, TN	1963	North Fork Pine Creek	1.5	11,000
City of Jamestown (also serves Fentress County Utility District, TN, and the Town of Allardt, TN)	1969	North White Oak Creek	1.6	18,000

Sources: Hench, pers. comm., 2009a, 2009b; Elliston, pers. comm. 2009; Dean, pers. comm., 2009; Keaton, pers. comm., 2009; McCoy, pers. comm., 2009; and Owens 2009.

[a]Figures include the Laurel Creek reservoir intake, which supplements the intake at Big Creek.

[b]This intake is not currently in use, and has not been used since 2002.

Impoundments—The northernmost reach of Big South Fork River, approximately 37 miles from the confluence of New River and Clear Fork River, is not free-flowing. It is affected by the levels of Lake Cumberland. This USACE reservoir is formed by the Wolf Creek Dam on the Cumberland River, which was built in 1950 and is outside of the park unit (NPS 1997).

Flat Creek, which is a tributary to the New River, has a large reservoir called the Huntsville Utility District Reservoir. This is approximately 1.6 miles from the confluence with the New River, and approximately 4 miles from the Big South Fork NRRA boundary.

There are two reservoirs on North White Oak Creek. However, they are located several miles to the west of the Big South Fork NRRA boundary. A small reservoir called Old Jamestown Reservoir, having a total area of 4.9 acres, is approximately 2.5 miles upstream of Jamestown Reservoir, which is a larger reservoir with an area of approximately 60.8 acres. Jamestown Reservoir is approximately 3.1 miles to the west of the Big South Fork NRRA boundary.

Surface Water Quality—The states of Kentucky and Tennessee have each declared their portions of the Big South Fork River as an Outstanding National Resource Water (ONRW) (NPS 2005a). An ONRW is a river that is “of exceptional recreational or ecological significance,” per EPA water quality standards at 40 CFR 131.12. The entire length of the Big South Fork River is included in this designation as an ONRW.

Chapter 4 of the Big South Fork NRRA General Management Plan (NPS 2005a, p. 159) describes the water quality classification process in the following way:

> Kentucky and Tennessee have stream use classification systems to protect surface water quality. Water quality criteria values are specified for each stream use. Tennessee has classified all streams within the [Big South Fork NRRA] for primary contact recreation and fish and aquatic life. Kentucky classifies all [Big South Fork NRRA] streams for primary contact recreation and for either warmwater or coldwater aquatic habitat. A number of streams in the [Big South Fork NRRA] do not meet standards, primarily due to acid mine drainage and/or sediment. Some of the streams have been identified as impaired streams, pursuant to the Clean Water Act [CWA].

The report (NPS 2005a) continues to describe the state of water quality within the Big South Fork NRRA:

> [Big South Fork] waters are generally considered good quality; however, acid mine drainage and excessive sediment from logging, substandard road construction, and other past and present ground disturbing activities significantly affect certain tributary streams and to a lesser extent the Big South Fork [River]. Agricultural chemicals also contribute negatively to water quality. In general, streams in the western portion of [Big South Fork] are less disturbed than streams in the eastern and southeastern portions. Impacts in the eastern and southern areas are more frequent and severe because coal mining, logging, and stormwater runoff are concentrated in these areas (NPS 1986). The Big South Fork River has nearly twice the dissolved solids and suspended solids, and 2.5 times greater sulfate yield as a comparable unmined river basin (Evaldi and Garcia 1991 in NPS 2005a). Acid mine drainage impacts are most notable in Bear Creek and Roaring Paunch Creek. Sediment impacts are evident in these streams, New River, and several others (pp. 158–159).

The CWA requires each state in the United States to compile a list of streams that are failing to meet one or more of the "uses" for which they have been designated due to water quality problems. Such a list is called the 303(d) list, named for the section of the CWA that requires these lists to be written. Streams on this list are deemed "impaired" as defined by the CWA, and not by the regulations and policies of the National Park Service (NPS). In the 303(d) lists for Kentucky and Tennessee for the year 2008, there are a total of four impaired streams that fall within the Big South Fork NRRA (table 17).

TABLE 17. IMPAIRED STREAMS IN THE BIG SOUTH FORK NATIONAL RIVER AND RECREATION AREA

Stream Name (and Miles)	State	Impairment	Cause	Source
Bear Creek (0.0 to 3.3)	KY, TN	Aquatic habitat, primary contact recreation, secondary contact recreation	pH, loss of biological integrity due to siltation	Subsurface mining, surface mining
Pine Creek (three segments, 10.3 miles)	TN	Water contact advisory	E. coli	Municipal point source collection system failure
Roaring Paunch Creek (0.0 to 7.8)	KY	Aquatic life, primary contact recreation, secondary contact recreation	pH	Acid mine drainage, coal extraction
Rock Creek (0.0 to 4.3)	KY	Fish consumption (partially supports)	Methyl mercury	Source unknown

Source: Based on KY EPPC 2008 and TDEC 2008a.

Surface coal mining does not currently occur inside the Big South Fork NRRA; however, past coal mining has affected water quality within the area. Degraded water used in past mining efforts re-enters the system and degrades water quality. Mining also has disrupted the flow of underground aquifers. Mining wastes also contribute various elements into the flow of Big South Fork NRRA streams that negatively impact water quality (NPS 1997).

Seeps and springs, occurring where the groundwater table intersects the land surface, are common in the Big South Fork NRRA, particularly at the base of ledges and bluff shelters. Springs of moderate yield occur at the base of the Hartsell Formation in Kentucky; other low-yield springs occur at the base of thick sandstone beds and along coal bed horizons (NPS 1997).

Groundwater Quantity—Lack of reliable groundwater in the watershed has resulted in a search for other options of water supply for surrounding communities. This search has included consideration of upstream impoundments (man-made lakes, ponds, or reservoirs) and also direct withdrawals.

There is no published inventory of the Big South Fork NRRA groundwater resources. The Cumberland Plateau’s major regional aquifer is the Cumberland Plateau aquifer, formerly known as the Pennsylvanian sandstone aquifer. This is composed of Pennsylvanian-aged sandstone, shale, and conglomerate. These rocks are not porous, and so groundwater is mostly found in bedrock fractures and faults (NPS 1997). As a result, confined groundwater is under sufficient pressure to rise above the surface of the aquifer where breaks in the upper confining unit occur. The water level rises above the top of the aquifer. Perched aquifers, which are aquifers that are located above the water table, are common. The weathered rock material over most of the plateau surface is too thin to be a substantial aquifer (NPS 1997).

In general, groundwater quantity is variable. Wells in the Cumberland Plateau generally yield 5 to 50 gallons per minute, but can yield more than 300 gallons per minute. Records on 376 wells in the region show that 62% of these wells produce an average yield of 10 to 25 gallons per minute. Water wells generally do not yield enough water to be used for public water supply (NPS 1997).

Groundwater in this system is discharged into streams and also into springs. Recharge occurs primarily via precipitation on the outcrops of sandstones and conglomerates. Estimated mean recharge rate for the Cumberland Plateau is 6.5 inches per year. Groundwater flow in the system is shallow-flow. For most of the aquifer’s area, the water level in wells rises to within a few feet of the land surface (NPS 1997). It is not known how the typical depth to groundwater varies within the park.

Groundwater Quality—There is no published data describing the water quality of the groundwater in the Big South Fork NRRA. NPS (1997) gives the following general description: “moderately mineralized, slightly acidic, and may have high concentrations of iron, sulfate, chloride, and hydrogen sulfide when it flows through sandstone or shale containing pyritic or ferrous compounds.” As with the surface waters at the park unit, groundwater also has low ionic strength and low conductivity. Oil, gas, brine, or chemicals associated with the oil and/or gas extraction processes can influence groundwater quality. NPS (1997) notes that groundwater quality has potentially already been affected by contaminated mine drainage and oil and/or gas operations.

OBED WILD AND SCENIC RIVER

Surface Water

The Obed River, Daddys Creek, and Clear Creek have a combined total drainage area of 520 square miles, and comprise a total of 144 miles of mountain streams flowing northeast then east into the southbound Emory River, which joins the Tennessee River system (Bureau of Outdoor Recreation 1976).

The Obed River flows east for approximately 45 miles to its junction with the Emory River, of which it is the largest tributary (NPS 1998b). The Obed River drains approximately 520 square miles at its mouth (NPS 1998b). The two principal tributaries of the Obed River—Clear Creek and Daddys Creek—join the Obed River within the Obed WSR area. These water bodies are shown on figure 18.

Clear Creek drains 173 square miles in the northwest portion of the watershed. The stream flows northeast to a point near the Fentress-Cumberland-Morgan county line, then southeast to its junction with the Obed River approximately 4 miles above the junction of the Obed and Emory rivers (NPS 1998b).

Daddys Creek is the largest tributary of the Obed River, and drains 175 square miles. The creek flows northeast to its junction with the Obed River, approximately 9 miles above the Obed River mouth (NPS 1998b).

Only a short reach of the Emory River is located within the Obed WSR boundary. This extends from the Emory River confluence with the Obed River at mile 28.4 to Nemo Bridge, mile 27.7. Above mile 28.4, the Emory River drains an area of 91 square miles (NPS 1998b).

As described in the Big South Fork NRRA “Surface Water” section, the waters of this park have low ionic strength and must be protected from brine discharge impacts associated with oil and gas activities. Surface waters with limestone are polluted when conductivity exceeds 60 umhos/cm, or 30 umhos/cm in waters lacking limestone (Rikard et al. 1986).

Streamflow—There are two USGS stream gage stations within the Obed WSR. One is on the Obed River (Obed River near Lancing, station no. 03539800) and the other is on the Clear Creek River (Clear Creek at Lilly Bridge, station no. 03539778). There is also a third gage located approximately 7 miles upstream of the park boundary on Daddys Creek (Daddys Creek near Hebbertsburg, station no. 03539600). As of December 2009, there are plans to install a new gage on the Obed River which is expected to be operational in the near future. The new gage will be installed at Adams Bridge, just upstream from the park boundary.

Streamflow measurements from station no. 03539800 on the Obed River (USGS 2009b) indicate that average flow, measured in cfs, ranges from 66 to more than 3,300 cfs. Flows are highest during the months from January through May, with peak flows occurring somewhere during this period (typically during the winter months). Flows during this period average approximately 1,600 cfs. During the June through December period, flows are lower, and average approximately 530 cfs.

Streamflow measurements from the station no. 03539778 on Clear Creek (USGS 2009b) indicate that average flow is from 10 to 2,270 cfs. Flows are highest during the months of January, February, March, and April. During this period, flows average approximately 500 cfs. During the period from May through December, flows are lower and average approximately 140 cfs.

Big South Fork National River and Recreation Area and
Obed Wild and Scenic River
Kentucky and Tennessee

National Park Service
U.S. Department of the Interior

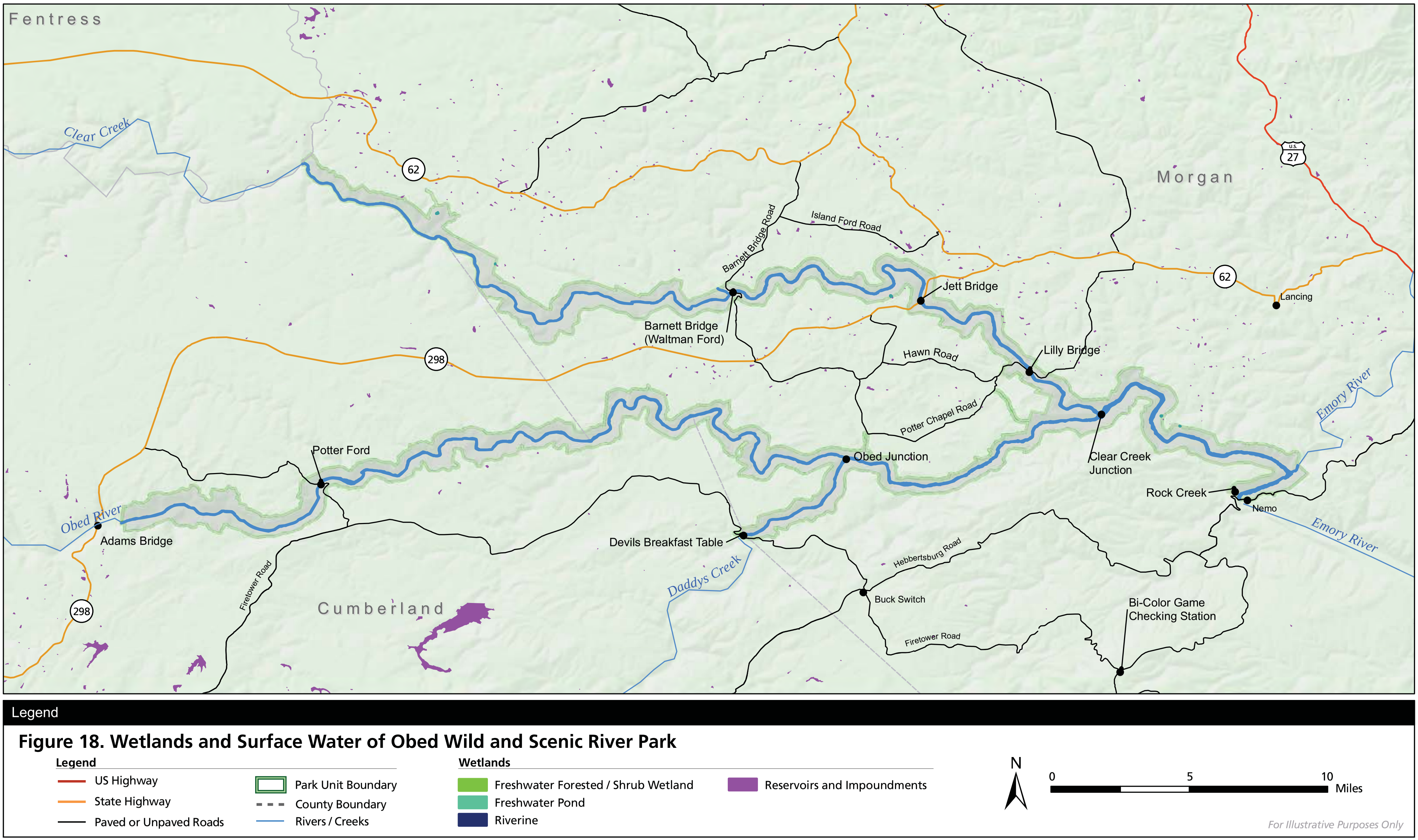


Figure 18. Wetlands and Surface Water of Obed Wild and Scenic River Park

Impoundments—According to NPS (2007a), there are over 3,500 impoundments within the Obed WSR watershed. Although these are mostly no larger than 1 acre in size, they may have a cumulative impact on water quality and/or quantity, and this impact is uncertain.

Intakes—There is one intake in the Obed River watershed that would affect surface water flows in the Obed WSR. It is on the Holiday Hills Lake, which is a reservoir on the Obed River.

Surface Water Quality—On June 22, 1999, portions of the Obed River were designated as Tier III Outstanding Natural Resource Waters (ONRWs) under the CWA, due to their high water quality. This includes portions of the Emory River. It also includes Clear Creek and Daddys Creek, although Daddys Creek is designated as Tier II. There are numerous upstream threats to the Obed River's water quality. Currently, the Cumberland Plateau Regional Water Authority is considering using the Obed River as a source for regional water supply. If it can be found that such a use is necessary, the Obed River would be treated as an "Exceptional Tennessee Water" and designated Tier II. Any permit issued for the river would thereafter be considered under guidance for a Tier II, rather than Tier III, classification.

One water body within the Obed WSR, Clear Creek, was listed in the 303(d) report for the state of Tennessee in 2008, and is described in table 18, below.

TABLE 18. IMPAIRED STREAMS IN THE OBED WILD AND SCENIC RIVER

Impacted Waterbody	County	Miles/Acres Impaired	Cause	Comments
Clear Creek	Morgan	1.41	Oil from Petroleum Activities	Serious oil spill in this section in the Obed WSR. This stream is Category 5, impaired for one or more uses. The stream provides habitat for the listed spotfin chub (*Cyprinella monacha*) and tangerine darter (*Percina aurantiaca*).

Source: TDEC 2008a

This stream is listed impaired as a result of an oil spill that occurred on July 19, 2002 when an oil well blew out and released an undetermined amount of crude oil into the stream. Oil began to spill around the well and outside of the containment area at an estimated 200–500 barrels per hour, and flowed downhill from the wellhead into White Creek—at approximately 0.21 miles above its confluence with Clear Creek—and into Clear Creek—at approximately 0.37 miles above Barnett Bridge (OWSRNRTC 2008). The well also caught fire, which followed both oiled paths, burning the vegetation, oil-soaked soils, and oil adjacent to the banks in both creeks. After the initial spill, oil continued to seep from the creek bank into Clear Creek through 2007, with higher rates of release during periods of low river flow (OWSRNRTC 2008). As of 2008, this water body was listed as "Category 5, impaired for one or more uses."

All of Clear Creek, Daddys Creek, the Emory River, and some sections of the Obed River within the Obed WSR are designated for the following uses: recreation, fish and aquatic life, livestock and wildlife watering, and irrigation (NPS 1998b). The Obed River from river mile 40.1 (near Crossville) to its origin is also designated for domestic and industrial water supply.

The Obed River land base is relatively small considering the size of its watershed. For this reason, water quality is substantially affected by activities occurring on the land outside of the protected area. Principal water quality concerns include alteration of flows, high levels of siltation and suspended solids, contamination by fecal bacteria, low dissolved oxygen content, high nutrient levels, oil and gas spills, and disturbance of acidic strata. These threats result from activities such as coal mining, oil and gas exploration, quarrying, sewage discharge, agriculture and forestry practices, some residential development, garbage disposal, and construction of numerous water supply ponds and impoundments on tributaries of the Obed and Emory rivers (NPS 1998b). The Crossville sewage treatment plant (STP) discharges treated effluent to the Obed WSR. During extended dry periods, the only flows into the Obed River at Crossville come from the drinking-water plant filter backwash, limited baseflow, and the Crossville STP. During these periods, discharges from the Crossville STP approach or exceed 50% of measured flow in the Obed River near Lancing located about 30 miles downstream (Law et al. 2010).

As shown in table 18, the only river that is impaired for multiple uses is Clear Creek, wherein the impairments have been attributed to oil activities and an oil spill. The Obed River has impairments on one segment in Cumberland County, where a total maximum daily load (TMDL) has already been approved by the EPA. Another Cumberland County section of the Obed River is threatened (not impaired) for multiple uses (TDEC 2008a). None of the Morgan County length of the Obed River is threatened or impaired (TDEC 2008a). Daddys Creek is not threatened or impaired. The Emory River is impaired due to mercury pollution, and a fishing advisory has been enacted. No total maximum daily load has been written for this river as of 2008. The impaired length of the Emory River crosses into Morgan County from Roane County, and does not enter into the Obed WSR (TDEC 2008a).

Groundwater

The Water Resources Management Plan, Obed WSR states that “The Obed River watershed is located in the Cumberland Plateau physiographic province of Tennessee’s Cumberland Plateau” (NPS 1998b, p. 50). Beneath the watershed are “gently dipping Pennsylvanian sandstones, siltstones, shales, some conglomerates, and coals” (NPS 1998b, p. 50). These rocks extend for 1,500 feet beneath the surface.

The Pennington Formation of Mississippian age is a transition from the basal Pennsylvanian sandstone and shale to underlying Mississippian carbonate rocks that are less resistant to weathering. These carbonate rocks are predominantly limestones, calcareous shales, and siltstones, with a maximum thickness of about 1,000 feet. The Devonian Chattanooga shale and Rockwood Formation of Silurian age underlie the Mississippian rocks (NPS 1998b).

The soil over most of the plateau is too thin to be of any regional significance as an aquifer, although soil thickness and permeability at specific locations can produce ample groundwater supplies for domestic purposes. Aquifers within the Obed WSR watershed area include shallow aquifers (<200 feet) within Pennsylvanian sandstone and conglomerates; deeper aquifers (>200 feet) within Pennsylvanian sandstone and conglomerates (and Mississippian rocks); shallow karstic aquifers in cove areas along the Cumberland Plateau; shallow/colluvium and underlying karstic aquifers at the base of the Cumberland Plateau escarpment (NPS 1998b).

Recharge is an important consideration in the potential development of groundwater supplies in the watershed area. The recharge rate for the shallow and deeper sandstone/conglomerate aquifer of the Cumberland Plateau ranges from ~ 4 to 9 inches per year and averages 6.5 inches per year (NPS 1998b).

The primary aquifer system resides within shallow Pennsylvanian sandstones and conglomerates. However, certain Pennsylvanian rock formations are better aquifers than others due to their hydraulic characteristics and recharge attributes. Deeper aquifers also occur within the Obed WSR watershed in Pennsylvanian rocks and Mississippian limestones.

The quality of groundwater from the Pennsylvanian rock aquifers is quite variable, but is generally satisfactory for most purposes or can be made so with minor treatment. Typically, the water is moderately mineralized, slightly acidic, and soft to moderately hard. Most wells and springs in this area exhibit iron concentrations in excess of the recommended limit.

The quality of groundwater from Mississippian rock aquifers is generally good. Characteristically, the water is a calcium bicarbonate type and slightly alkaline. In some areas, hardness may be a problem, and iron and chloride concentrations may exceed the recommended limits. There are reports of hydrogen sulfide gas in the water from some wells in the area (NPS 1998b). As with the surface waters at the park unit, groundwater also has low ionic strength and low conductivity.

FLOODPLAINS

Floodplains are areas next to a river that experience periodic inundation by flooding. These areas provide habitat for plants, fish, and wildlife, and thus are important for ecological reasons as they sustain ecosystem integrity and biodiversity. In addition to their scenic value, floodplains can also be of use for educational and/or recreational activities. They provide groundwater recharge or discharge, and can improve water quality. Floodplains may also benefit agricultural lands, manufacturing, and transportation activities.

BIG SOUTH FORK NATIONAL RIVER AND RECREATION AREA

According to the Final General Management Plan and Environmental Impact Statement, Big South Fork NRRA (NPS 2005a), floodplains have not been delineated in the park unit. However, this plan generally describes the floodplains as narrow in the gorge area, and small throughout the rest of the property. In the headwater areas of the major rivers within the area, slopes are steep, and floodplains are therefore not well-formed. Minor floodplains increase in occurrence farther downstream (NPS 2005a).

OBED WILD AND SCENIC RIVER

As with Big South Fork NRRA, floodplains have not been delineated within Obed WSR. However, the extremely narrow, confined nature of this valley, and the associated high-energy water regimes, place a firm limit on the extent of natural floodplain development within the Obed WSR. Seasonally flooded habitat does exist, but it is on alluvial point bars, rather than on floodplains (USGS 2007).

WETLANDS

Section 404 of the Clean Water Act defines Wetlands as areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas. Important wetland functions and values are provided protection under NPS regulations, orders, and policies (in particular, Director's Order #77-1: Wetland Protection [NPS 2002b]), as well as USACE regulations. In general, wetlands must first be avoided, and then, if no practicable alternatives exist, impacts must be mitigated. This section will describe the wetlands and deepwater habitats found in the Big South Fork NRRA and the Obed WSR, as identified by the U.S. Fish and Wildlife Service (USFWS) National Wetland Inventory Data (USFWS 2009b). All descriptions are based on the Cowardin system of wetlands classification (Cowardin et al. 1979) and provide general information about the wetland types found in each park unit.

BIG SOUTH FORK NATIONAL RIVER AND RECREATION AREA

Table 19 summarizes the wetland and deepwater habitat types in Big South Fork NRRA and their acreage. These types, which are classified as Lacustrine, Palustrine, and Riverine, are described in more detail in the following sections. The Palustrine system, which accounts for a fraction of the wetland/deepwater habitat acreage (less than one-tenth of 1%), only includes wetlands and upland seeps found within the park unit. Most of the wetland and deepwater habitat acreage falls within the Lacustrine type (96%), which is generally associated with the backwaters of Lake Cumberland. The Riverine types (4%) are associated with the rivers/streams of Big South Fork NRRA. The Lacustrine, and much of the Riverine, systems would likely be considered deepwater habitats, which are "permanently flooded lands lying below the deepwater boundary of wetlands. Deepwater habitats include environments where surface water is permanent and often deep, so that water, rather than air, is the principal medium within which the dominant organisms live, whether or not they are attached to the substrate…The boundary between wetland and deepwater habitat in the Riverine and Lacustrine systems lies at a depth of 2 meters (6.6 feet) below low water; however, if emergents, shrubs, or trees grow beyond this depth at any time, their deepwater edge is the boundary" (Cowardin et al. 1979).

TABLE 19. WETLANDS/DEEPWATER HABITATS OF THE BIG SOUTH FORK NATIONAL RIVER AND RECREATION AREA

USFWS Mapping Code	Description	Total Acreage
L1UBHh	Lacustrine, Limnetic, Unconsolidated Bottom, Permanently Flooded, Diked/Impounded	4,483.12
PFO1A	Palustrine, Forested, Broad-leaved Deciduous, Temporarily Flooded	15.45
PFO1Ah	Palustrine, Forested, Broad-leaved Deciduous, Temporarily Flooded, Diked/Impounded	0.83
PFO1C	Palustrine, Forested, Broad-leaved Deciduous, Seasonally Flooded	1.66
PSS1A	Palustrine, Scrub-Shrub, Broad-leaved Deciduous, Temporarily Flooded	3.28
PSS1C	Palustrine, Scrub-Shrub, Broad-leaved Deciduous, Seasonally Flooded	7.01
PUBH	Palustrine, Unconsolidated Bottom, Permanently Flooded	0.97
PUBHh	Palustrine, Unconsolidated Bottom, Permanently Flooded, Diked/Impounded	13.54
PUBHx	Palustrine, Unconsolidated Bottom, Permanently Flooded, Excavated	0.39
R3RB2H	Riverine, Upper Perennial, Rock, Rubble, Permanently Flooded	1,156.15
R3RBH	Riverine, Upper Perennial, Rock, Permanently Flooded	98.28
R3UB1H	Riverine, Upper Perennial, Unconsolidated Bottom, Cobble/Gravel, Permanently Flooded	273.86
R3UBH	Riverine, Upper Perennial, Unconsolidated Bottom, Permanently Flooded	338.87
R3USA	Riverine, Upper Perennial, Unconsolidated Shore, Temporarily Flooded	3.15
R3USC	Riverine, Upper Perennial, Unconsolidated Shore, Seasonally Flooded	6.16
TOTAL		**1,919.60**

Source: USFWS 2009b.

Palustrine Wetlands

Palustrine wetlands are “nontidal wetlands dominated by trees, shrubs, emergents, mosses, or lichens, and all such wetlands that occur in tidal areas where salinity due to ocean-derived salts is below 0.5 ppt” (USFWS 2009b).

The Big South Fork NRRA is a nontidal system; therefore, the classification under this wetland type would be due to the nature of the dominant vegetation. There are three different types of palustrine wetlands that occur within the Big South Fork NRRA:

- **Forested**—Forested palustrine wetlands have woody vegetation that is approximately 20 or more feet tall (USFWS 2009b).
- **Scrub-shrub**—Scrub-shrub wetlands are wetlands that have vegetation that is less than approximately 20 feet tall. Common plants might include shrubs, saplings, or stunted trees (USFWS 2009b).
- **Unconsolidated Bottom**—The unconsolidated bottom wetlands group includes all wetlands and deep-water habitats that have “at least 25% cover of particles smaller than stones (less than approximately 3 inches) and a vegetative cover of less than 30%” (USFWS 2009b).

Palustrine wetlands of various types make up a total of approximately 4.3% of the total areal wetlands in the Big South Fork NRRA. Within this group, some are seasonally flooded, some are temporarily flooded, and some are permanently flooded:

- **Seasonally Flooded**—Seasonally flooded wetlands are those where the surface water extends onto land for long periods of time, particularly during the growing season, but recedes by the end of the growing season in the majority of years (USFWS 2009b).
- **Temporarily Flooded**—In temporarily flooded wetlands, “surface water is present for brief periods during the growing season, but the water table usually lies well below the soil surface” (USFWS 2009b).
- **Permanently Flooded**—In permanently flooded wetlands the entire land surface is covered by water for the entire year, in all years (USFWS 2009b).

Lacustrine, Limnetic Wetlands

These wetlands are located in a “topographic depression or dammed river channel” (USFWS 2009b). They do not have any trees, shrubs, or emergent vegetation that covers more than 30% of the area; the total area of the wetland must be greater than 8 hectares (USFWS 2009b). These systems are typically “bounded by upland or by wetland dominated by trees, shrubs, persistent emergents, emergent mosses, or lichens” (USFWS 2009b).

This is the dominant wetland type within the Big South Fork NRRA, accounting for over 95% of the total park wetlands. The particular type of lacustrine limnetic wetland found within the Big South Fork NRRA is unconsolidated bottom, permanently flooded (as described under the “Palustrine Wetlands” section). It is also described as diked/impounded:

- **Diked/Impounded**—Diked/impounded wetlands are those that are “created or modified by a man-made barrier or dam which obstructs the inflow or outflow of water” (USFWS 2009b).

Riverine, Upper Perennial Wetlands

Riverine wetlands are contained in channels (either natural or artificial), and flow between two bodies of standing water. A riverine system is bounded by upland on the landward side, and the channel bank on the water side. Vegetation may be trees, shrubs, mosses, emergents (persistent), and/or lichens. Riverine upper perennial wetlands are riverine wetlands that have a high gradient, fast water velocity, rocky or gravelly substrate, and little floodplain development (USFWS 2009b).

In the Big South Fork NRRA, there are 1,876.48 acres of riverine upper perennial wetlands. Approximately 99.5% of these are permanently flooded, yet a small proportion is temporarily or seasonally flooded (as described under the "Palustrine Wetlands" section). Approximately 61% of all of the riverine upper perennial wetlands within the Big South Fork NRRA have a rock and/or rubble substrate:

- **Rock**—This is also called "rock bottom." It includes wetlands that have substrates of stones, boulders, or bedrock of more than 75% of their total area, and vegetative cover for less than 30% of their total area (USFWS 2009b).
- **Rubble**—Wetlands that are associated with this type have bottoms that are less than 75% covered by bedrock, but wherein stones and boulders (either alone or in combination with bedrock) cover 75% or more of the surface (USFWS 2009b).

The remainder is unconsolidated bottom substrates (as described in the "Palustrine Wetlands" section), or a cobble/gravel substrate:

- **Cobble/Gravel**—In wetlands with a cobble/gravel substrate, there are particles that are unconsolidated, are smaller than stones, and are predominantly cobble or gravel, although finer sediments may be present (USFWS 2009b).

As part of the recent American Recovery and Reinvestment Act-funded well-capping project undertaken at Big South Fork NRRA, an assessment of wetland functions and values was conducted to facilitate evaluation of the recent well-capping project's potential impacts on wetlands and to determine appropriate actions as required by the USACE for Section 404 permits and by the NPS for compliance with Director's Order #77-1. As a result, a wetland delineation was conducted for Beatty Well A, Beatty Well B, and well site 151-02 to document any wetlands occurring within the project area and to assess wetland functions and values. A detailed description of wetland characteristics for these well sites can be found in the Wetlands section of the Environmental Assessment for Well Plugging and Reclamation; Big South Fork National River and Recreation Area (NPS 2010a).

OBED WILD AND SCENIC RIVER

Table 20 summarizes the wetland types in Obed WSR and their acreage. These types are described in more detail in the following sections.

TABLE 20. WETLANDS OF THE OBED WILD AND SCENIC RIVER

USFWS Mapping Code	Description	Total Acreage
PFO1A	Palustrine, Forested, Broad-leaved Deciduous, Temporarily Flooded	5.53
PSS1A	Palustrine, Scrub-Shrub, Broad-leaved Deciduous, Temporarily Flooded	1.72
PUBHh	Palustrine, Unconsolidated Bottom, Permanently Flooded, Diked/Impounded	2.35
R3RB2H	Riverine, Upper Perennial, Rock, Rubble, Permanently Flooded	855.16
R3RSC	Riverine, Upper Perennial, Rocky Shore, Seasonally Flooded	2.27
TOTAL		**867.03**

Source: USFWS 2009b.

Palustrine Wetlands

In the Obed WSR, palustrine wetlands of various types make up approximately 1.11% of the total areal wetlands. These wetland types are described above in the “Big South Fork National River and Recreation Area” portion of the “Wetlands” section.

Riverine Upper Perennial

Riverine upper perennial wetlands constitute the dominant wetland type within the Obed WSR, where they account for approximately 98.9% of the areal wetlands. Approximately 99.7% of these are rock, rubble, permanently flooded wetlands. The remaining 0.27% of these wetlands are rocky shore, seasonally flooded:

- **Rocky Shore**—Rocky shore wetlands are high-energy shorelines “characterized by bedrock, stones, or boulders which singly or in combination have an areal cover 75% or more and an areal coverage by vegetation of less than 30%” (USFWS 2009b).

VEGETATION

BIG SOUTH FORK NATIONAL RIVER AND RECREATION AREA

Vegetation at Big South Fork NRRA was classified and mapped in October 2006 (NatureServe 2007). Based on the draft data, approximately 35 vegetation types were classified using the National Vegetation Classification System (NVCS); eight land use / land cover types were also identified. For the purposes of this plan/EIS, the vegetation types were grouped into eight broad mapping units, including pine forest, hemlock–white pine forest, lowland/submontane cold deciduous forest, mixed pine–oak forest, temporarily flooded forest, successional forest, shrubland, and herbaceous vegetation. The vegetation types that make up each of these map units are described in the following sections, and distribution is shown in figures 19, 20, and 21. The land use / land cover types have also been grouped for this plan/EIS into three mapping units, including fields/early succession, developed/disturbed areas, and water. Although not described in detail below, these types are graphically depicted in figures 19, 20, and 21.

Timber harvesting, agriculture, coal mining, oil and gas extraction, fire, grazing, exotic forest diseases, recreational activities, and invasive nonnative plants have all shaped or continue to shape the plant communities within Big South Fork NRRA (NPS 2006f). Because of logging in the early to mid-20th century, most of the forest areas are second or third growth, and mature forests are rare. Due to inaccessibility, several small areas containing impressive examples of second growth floodplain, mixed-mesic, and hemlock forests still exist, mostly in the more northern coves of the park unit. Also of note is the widespread damage caused between 2000 and 2002 by pine beetles. Dead standing and fallen trees remain virtually everywhere in Big South Fork NRRA where shortleaf pine (*Pinus echinata*) and Virginia pine (*Pinus virginanus*) stands existed prior to the infestation (NPS 2005a).

Pine Forest

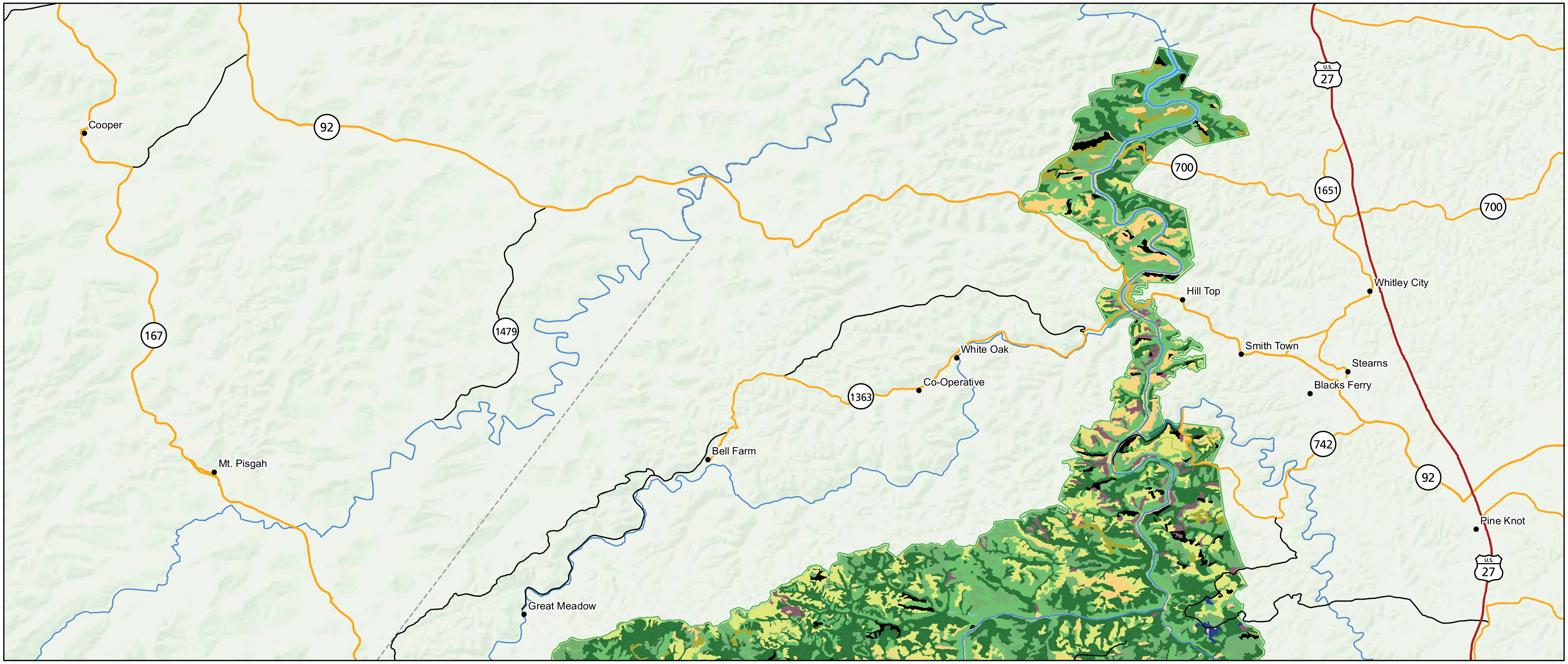
This mapping unit is the most extensive vegetation category present within Big South Fork NRRA and includes two NVCS types: Appalachian Low-elevation Mixed Pine / Hillside Blueberry Forest and Southern Appalachian White Pine Forest. The canopy of the Appalachian Low-elevation Mixed Pine / Hillside Blueberry Forest, which can be open or closed, may contain several pine species (*Pinus* spp.) but is dominated by Virginia pine. Generally, this type is found on narrow ridges and knobs, steep upper slopes, bluff and cliff tops, and other exposed sites (NatureServe 2007). The Southern Appalachian White Pine Forest is dominated by eastern white pine (*Pinus strobus*) and contains other minor canopy species such as pitch pine (*Pinus rigida*), scarlet oak (*Quercus coccinea*), and red maple (*Acer rubrum*). It generally occurs at elevations below approximately 2,900 feet, on upper slopes and ridgetops protected by higher landforms (NatureServe 2007).

Hemlock–White Pine Forest

Two NVCS types make up the hemlock–white pine forest map unit, including the Cumberland / Appalachian Hemlock–Hardwood Cove Forest; and Southern Appalachian Hemlock Forest (White Pine Type). The Cumberland/Appalachian Hemlock–Hardwood Cove Forest typically occurs in coves, valleys, bases of cliffs, and lower slopes. It is dominated by eastern hemlock (*Tsuga canadensis*) and may include mesic deciduous species, such as American beech (*Fagus grandifolia*), American basswood (*Tilia americana* var. *heterophylla*), tuliptree (*Liriodendron tulipifera*), birch (*Betula* spp.), northern red oak (*Quercus rubra*), white ash (*Fraxinus americana*), shagbark hickory (*Carya ovata*), and cucumber-tree (*Magnolia acuminata*) (NatureServe 2007). The Southern Appalachian Hemlock Forest (White Pine Type) is an evergreen forest association typically found on creek and river margins and on lower or protected slopes. The tree canopy is dominated by eastern white pine, which is sometimes codominant with eastern hemlock (NatureServe 2007).

Big South Fork National River and Recreation Area
Kentucky and Tennessee

National Park Service
U.S. Department of the Interior



Legend

Figure 19. Vegetation of Big South Fork National River and Recreation Area (Map 1)

Legend

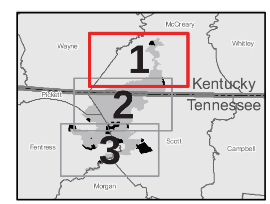
- U.S. Highway
- State Highway
- Roads
- Park Unit Boundary
- Rivers / Streams
- County Boundary

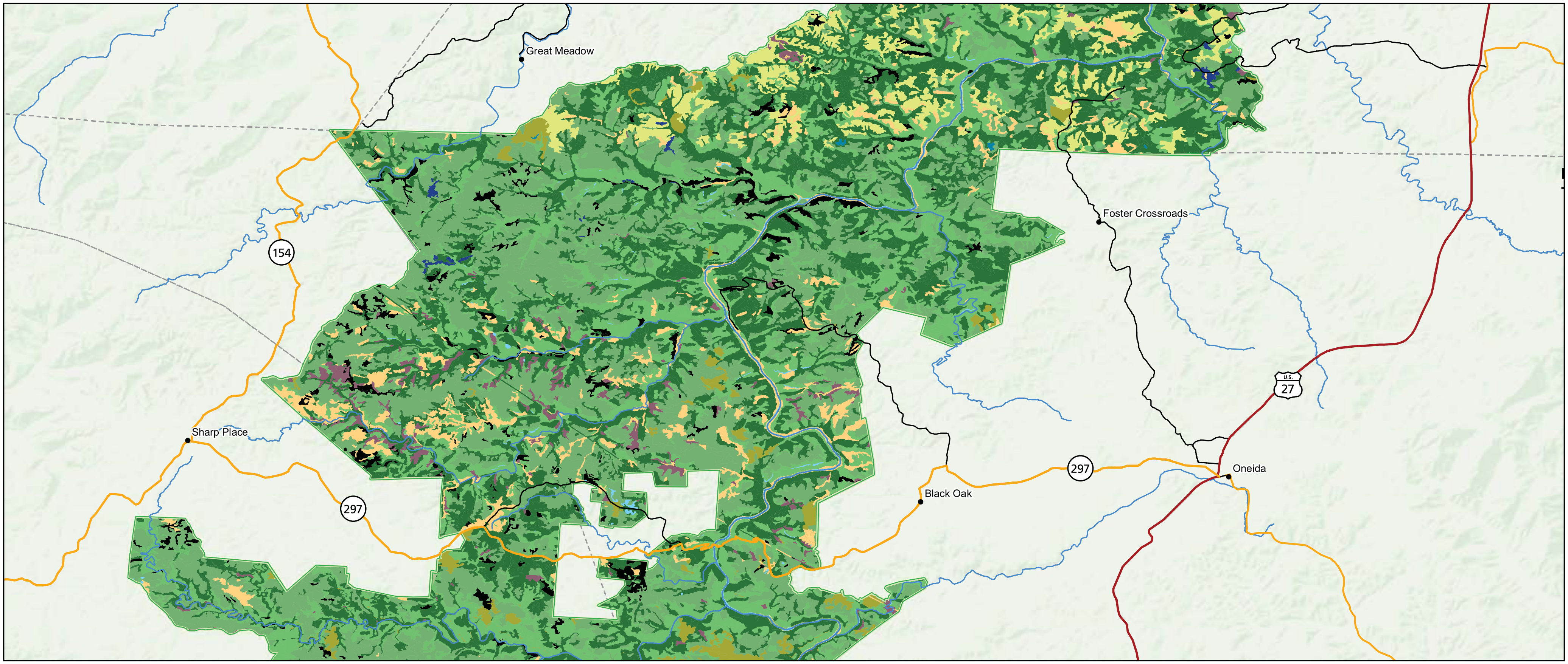
Vegetation

- Agriculture
- Developed or Disturbed
- Hemlock – White Pine Forest
- Herbaceous
- Lowland or Submontaine Cold Deciduous Forest
- Mixed Pine – Oak Forest
- Pine Forest
- River
- Shrubland
- Successional Forest
- Temporarily Flooded Forest
- Water

N

0 2 4 Mi.





Legend

Figure 20. Vegetation of Big South Fork National River and Recreation Area (Map 2)

Legend

- U.S. Highway
- State Highway
- Roads
- Park Unit Boundary
- Rivers / Streams
- County Boundary

Vegetation

- Agriculture
- Developed or Disturbed
- Hemlock – White Pine Forest
- Herbaceous
- Lowland or Submontaine Cold Deciduous Forest
- Mixed Pine – Oak Forest
- Pine Forest
- River
- Shrubland
- Successional Forest
- Temporarily Flooded Forest
- Water

N

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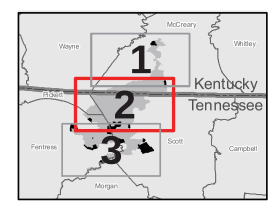
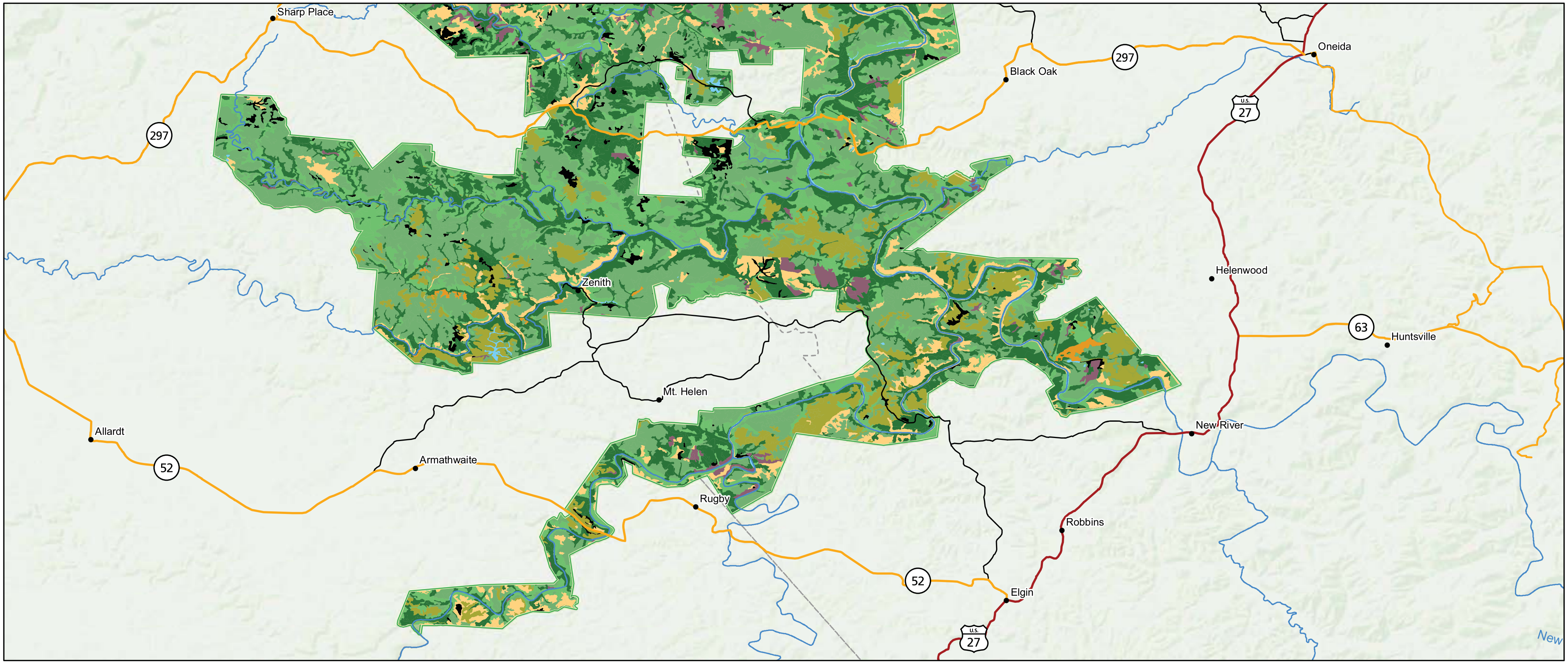




Legend

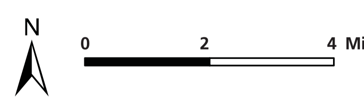
Figure 21. Vegetation of Big South Fork National River and Recreation Area (Map 3)

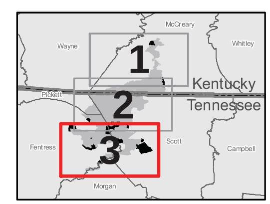
Legend

- U.S. Highway
- State Highway
- Roads
- Park Unit Boundary
- Rivers / Streams
- County Boundary

Vegetation

- Agriculture
- Developed or Disturbed
- Hemlock – White Pine Forest
- Herbaceous
- Lowland or Submontaine Cold Deciduous Forest
- Mixed Pine – Oak Forest
- Pine Forest
- River
- Shrubland
- Successional Forest
- Temporarily Flooded Forest
- Water





Lowland or Submontane Cold Deciduous Forest

This mapping unit is made up of 10 NVCS types. Descriptions of each of these forests follow:

- **Piedmont Rich Cove / Mesic Slope Forest (Twinleaf–Canada Waterleaf Type)**—This forest association is generally found on mesic lower slopes. The moderate to very dense (40%–90% cover) tree canopy contains a mixture of sugar maple (*Acer saccharum*), American beech, tuliptree, and American basswood (NatureServe 2007).
- **Beech–Maple Unglaciated Forest**—This dense hardwood forest is typically dominated by American beech and sugar maple. It generally occurs on unglaciated terraces and mesic slopes of maturely dissected plateaus and submontane regions (NatureServe 2007).
- **Central Interior Beech–White Oak Forest**—This common forest type consists of a moderate to very dense (50%–90% cover) tree canopy dominated by American beech and white oak (*Quercus alba*). It is generally found on mesic mid- to lower slopes in moderately dissected terrain (NatureServe 2007).
- **Southern Ridge and Valley Small Stream Hardwood Forest**—This hardwood forest is generally known to occur along small streams and on small stream terraces. The canopy is generally closed, and at Big South Fork NRRA is dominated by white oak, chestnut oak (*Quercus prinus*), black oak (*Quercus velutina*), and tuliptree (NatureServe 2007).
- **Cumberland Plateau Dry–Mesic White Oak Forest**—This common oak forest generally occurs on all slope positions, but is mostly found on middle to high slopes and ridges. The canopy is always dominated by white oak, with chestnut oak usually codominating or occurring as a prominent canopy tree (NatureServe 2007).
- **Mixed Oak / Heath Forest (Piedmont / Central Appalachian Low-elevation Type)**—This mixed oak association generally occurs between 100–2,300-foot elevation on rolling to sublevel sites of uplands, mountain valleys, and lower mountain slope benches. At Big South Fork NRRA, it contains moderate to moderately dense (50%–70% cover) and variable tree canopy dominated by combinations of white oak, scarlet oak, chestnut oak, black oak, and red maple (NatureServe 2007).
- **Xeric Ridge Top Chestnut Oak Forest**—This dry oak forest is common in the park and is generally found on north- and west-facing high slopes and ridgetops over soils derived from sandstone. This is a closed-canopy forest dominated by chestnut oak and scarlet oak (NatureServe 2007).
- **Ridge and Valley Dry–Mesic White Oak–Hickory Forest**—This dry–mesic late-successional Appalachian forest occurs on slopes with southerly or westerly aspects and well-drained upland soils. At Big South Fork NRRA, the moderate to very dense (60%–90% cover) tree canopy was dominated by white oak, black oak, chestnut oak, and mockernut hickory (*Carya alba*) (NatureServe 2007).
- **Ridge and Valley Limestone Oak–Hickory Forest**—Generally, the few examples of this community exist on south- to east-facing steep slopes underlain by limestone with fairly shallow soils. The sparse to moderate (20%–60% cover) tree canopy at Big South Fork NRRA included white oak, chinquapin oak (*Quercus muehlenbergii*), and eastern red cedar (NatureServe 2007).
- **Rich Appalachian Red Oak / Sugar Maple Forest**—This mixed hardwood forest is generally found at 900–2,000-foot elevations. At Big South Fork NRRA, the canopy was dense (80% cover) and dominated by northern red oak, sugar maple, and tuliptree (NatureServe 2007).

Mixed Pine–Oak Forest

Three forest associations occur within this mapping unit: Southern Blue Ridge Escarpment Shortleaf Pine–Oak Forest, Appalachian White Pine / Mesic Oak Forest, and Appalachian Shortleaf Pine–Mesic Oak Forest. Southern Blue Ridge Escarpment Shortleaf Pine–Oak Forest generally occurs on crests of low-elevation slopes and ridges. Canopies are codominated by shortleaf pine (*Pinus echinata*) and combinations of dry-site oaks that may include southern red oak (*Quercus falcata*), scarlet oak, chestnut oak, post oak (*Quercus stellata*), and black oak (NatureServe 2007). Appalachian White Pine / Mesic Oak Forest is a mixed pine–oak forest typically found below 2,900-foot elevation, on protected ridges, mid- to upper slopes, and in disturbed bottoms. Canopies are dominated by variable mixtures of eastern white pine, white oak, mockernut hickory, and red maple (NatureServe 2007). Appalachian Shortleaf Pine–Mesic Oak Forest is generally found on low to mid-slope positions, on protected to intermediately exposed sites. The canopy is typically dominated by shortleaf pine and white oak, sometimes with substantial contributions from other oaks (NatureServe 2007).

Temporarily Flooded Forest

The forest associations that occur within Temporarily Flooded Forest mapping unit are: Sycamore–Sweetgum Swamp Forest, River Birch Levee Forest, and Montane Alluvial Forest (Small River Type). Sycamore–Sweetgum Swamp Forest is generally found on small to medium-sized streams and on larger streams where flooding is frequent. This forest is typically dominated by sycamore (*Platanus occidentalis*), sweetgum (*Liquidambar styraciflua*), and sometimes red maple (NatureServe 2007). River Birch Levee Forest is typically found on levees along small rivers and streams. It is generally dominated by river birch (*Betula nigra*) but sycamore may be codominant, or at least prominent (NatureServe 2007). Montane Alluvial Forest (Small River Type) is a dense forested alluvial wetland found on temporarily flooded alluvial flats and ravines. It is dominated by eastern hemlock and and/or eastern white pine (NatureServe 2007).

Successional Forest

There are eight forest associations that were mapped as Successional Forest. Descriptions of each of these forest associations follow:

- **Red Cedar Successional Forest**—Stands of this forest association occur in a variety of disturbed areas such as eroded soils on abandoned agricultural land. It is dominated by eastern red cedar (*Juniperus virginiana* var. *virginiana*), and may include a host of other woody species including hickory (*Carya* spp.), eastern redbud (*Cercis canadensis*), and Virginia pine (NatureServe 2007).
- **Walnut Successional Forest**—This forest often occurs on former homesites along streams and is dominated by black walnut (*Juglans nigra*). Tuliptree, butternut (*Juglans cinerea*), sugarberry (*Celtis laevigata*), and yellow buckeye (*Aesculus flava*) may also be dominant or codominant in some examples (NatureServe 2007).
- **Sweetgum Successional Forest**—This early-successional upland forest dominated by sweetgum results from succession following human activities such as logging and clearing.
- **Successional Tuliptree Forest**—This seminatural or successional forest is typically found on disturbed mesic areas (e.g., abandoned farmland and townsites, old strip mines, old clear-cuts, burned areas, and other areas where the canopy was removed or heavily disturbed in the past). Stands are dominated by tuliptree but also include various other species, such as sweetgum, sugar maple, black locust (*Robinia pseudoacacia*), black walnut, white ash, slippery elm (*Ulmus*

rubra), shingle oak (*Quercus imbricaria*), chinquapin oak, and shagbark hickory (NatureServe 2007).

- **Interior Mid- to Late-successional Tuliptree–Hardwood Upland Forest**—This forest has been documented primarily in areas that were clear-cuts, old fields, or cleared by fire or other natural disturbances. It is also found along mesic stream terraces and is dominated by tuliptree. This forest may also include other species such as red maple, oaks, flowering dogwood (*Cornus florida*), and hickory (NatureServe 2007).
- **Successional Sweetgum Floodplain Forest**—This is a successional forest community that is found in old fields, old pastures, clearcuts, and burned or eroded areas along floodplains of major creeks and other temporarily flooded areas. The tree canopy is generally dominated by sweetgum, and sometimes tuliptree, with lesser amounts of red maple (NatureServe 200).
- **Virginia Pine Successional Forest**—This community occurs in areas where canopy removal has created open conditions and bare mineral soil. This forest typically has a very dense canopy of Virginia pine, and may also include loblolly pine (*Pinus taeda*), shortleaf pine, as well as successional deciduous trees (e.g., red maple, sweetgum, tuliptree) (NatureServe 2007).
- **Eastern White Pine Successional Forest**—This wide-ranging successional forest is commonly associated with human-caused disturbances such as agricultural lands and old fields that are no longer intensively mowed, plowed, or managed. The tree canopy ranges from woodland to forest closure, with 25%–85% cover. It is often dominated by monotypic and even-aged eastern white pine. Occasional associates include red maple, eastern red cedar, or scattered oaks (NatureServe 2007).

Shrubland

The NVCS associations that occur within the shrubland map unit at Big South Fork NRRA include Blackberry–Greenbrier Successional Shrubland Thicket, Cumberland Sandstone Glade Heath Shrubland, and Southeastern Smooth Alder Swamp.

Blackberry–Greenbrier Successional Shrubland Thicket is a successional blackberry (*Rubus* spp.) community found in areas that have been cleared but not recently disturbed. Stands of this association are dominated by greenbrier species (*Smilax* spp.), blackberries, and dewberries (also *Rubus* spp.). A variety of tree saplings and other woody species (e.g., oaks, sweetgum, red maple, and winged sumac (*Rhus copallinum*)) also occur (NatureServe 2007). Cumberland Sandstone Glade Heath Shrubland is found on sandstone bedrock exposures. The tallest shrub is farkleberry (*Vaccinium arboretum*), which is seldom over 6 feet in height. Scrubby trees (less than 10 feet in height) may also be present, and usually include scarlet oak and southern red oak, as well as pitch pine and Virginia pine. Southeastern Smooth Alder Swamp is found on muck overlying mineral soils, at the edges of forested swamps, or in other related seasonally flooded situations (e.g., depressions in floodplains, backwaters of lakes, and beaver ponds). The vegetation is dominated by tall shrubs, and is characterized by some combination of brookside alder (*Alnus serrulata*), *Viburnum* spp., dogwoods (*Cornus* spp.), and willows (*Salix* spp.). In addition, saplings of red maple are typical (NatureServe 2007).

Herbaceous Vegetation

Little bluestem
(*Schizachyrium scoparium*).

Four associations occur within the herbaceous vegetation mapping unit. They are Little Bluestem–Broomsedge Grassland, Successional Broomsedge Vegetation, Cultivated Meadow, and Cumberland Riverside Scour Prairie. Little Bluestem–Broomsedge Grassland is an essentially native perennial grassland which is (or has been) human-maintained to some extent. It contains a variable mix of grasses, dominated by little bluestem (*Schizachyrium scoparium*) and a variety of other broomsedges (*Andropogon* spp.). This association may occur on annually mowed power line rights-of-way, mowed successional or abandoned agricultural fields, and pastures (NatureServe 2007). Successional Broomsedge Vegetation is a human-modified, but predominantly native, grassland found on old fields and pastures. The dominant species is common broomsedge (*Andropogon virginicus* var. *virginicus*), with lesser amounts of tall purple-top fluffgrass (*Tridens flavus*), bristly foxtail (*Setaria parviflora*), purple lovegrass (*Eragrostis spectabilis*), and beaked panicgrass (*Panicum anceps*) (NatureServe 2007). Cultivated Meadow includes grassland pastures and hayfields, more or less cultural, though sometimes no longer actively maintained. The dominant species in this association are the European “tall or meadow fescues” (NatureServe 2007). These communities are sometimes nearly monospecific but can also be very diverse and contain many native species of grasses, sedges, and forbs. Cumberland Riverside Scour Prairie is generally found on both gravel and bedrock substrates that are scoured by spring floods. A typical cobble bar site, described from the Clear Fork River and the New River of the Big South Fork NRRA, is dominated by big bluestem (*Andropogon gerardii*), yellow Indiangrass (*Sorghastrum nutans*), and little bluestem (NatureServe 2007).

Non-native Species

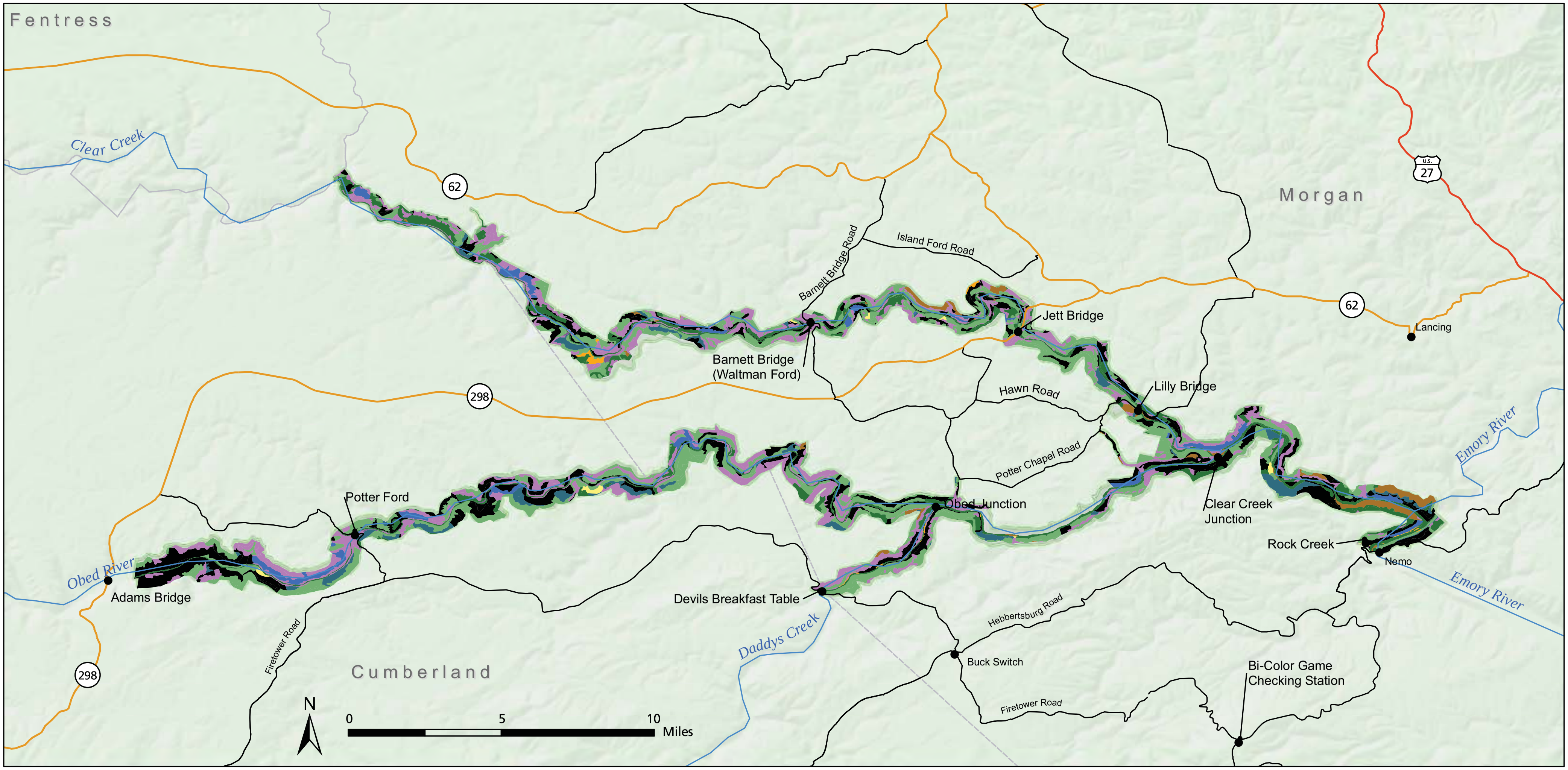
At Big South Fork NRRA, forests along rivers and streams are most susceptible to invasion by nonnative plants, the most invasive of which include Japanese spiraea (*Spiraea japonica*), mimosa (*Albizia julibrissin*), tree-of-heaven (*Ailanthus altissima*), multiflora rose (*Rosa multiflora*), Japanese honeysuckle (*Lonicera japonica*) Japanese knotweed (*Polygonum cuspidatum*) and Nepalese browntop (*Microstegium vimineum*). Efforts are currently underway to remove these exotic plants in a manner that does not damage the sensitive, native floodplain plant community (NPS 2006f). In addition, many of the remaining fields at Big South Fork NRRA are often infested with non-native plants, such as tall fescue (*Lolium arundinaceum*), sericea lespedeza (*Lespedeza cuneata*), multiflora rose, and autumn olive (*Elaeagnus umbellata*). Efforts are currently underway to manage these fields in a way that eliminates exotic species and encourages native grasses, forbs, and shrubs for the benefit of wildlife (NPS 2006f).

OBED WILD SCENIC RIVER

Classification and mapping of vegetation was also recently completed at the Obed WSR by NatureServe and the University of Georgia Center for Remote Sensing and Mapping Science. Based on the draft data, 30 NVCS vegetation associations and nine land use / land cover types were identified in the park (Nordman 2008). For the purposes of this plan/EIS, these vegetation types were grouped into seven broad mapping units, including upland evergreen forest, temporarily flooded evergreen forest, upland deciduous forest, temporarily flooded deciduous forest, upland mixed evergreen/deciduous forest, upland deciduous shrubland, and herbaceous vegetation. The vegetation communities that make up each of these map units are described in the following sections, and distribution is shown in figure 22. The land use / land cover types have also been grouped for this plan/EIS into three mapping units, including agriculture, developed/disturbed areas, and water. Although not described in detail below, these types are graphically depicted in figure 22.

Big South Fork National River and Recreation Area and
Obed Wild and Scenic River
Kentucky and Tennessee

National Park Service
U.S. Department of the Interior



Legend

Figure 22. Vegetation of Obed Wild and Scenic River Area

Legend

- U.S. Highway
- State Highway
- Roads
- Park Unit Boundary
- Gorge
- Rivers / Streams
- County Boundary

Vegetation

- Agriculture
- Developed or Disturbed
- Herbaceous
- Temperate Flooded Deciduous
- Temperate Flooded Evergreen
- Upland Deciduous Forest
- Upland Deciduous Shrubland
- Upland Evergreen Forest
- Upland Mixed Evergreen/Deciduous
- Water

For Illustrative Purposes Only

Due to its rugged terrain, the vegetation of the Obed WSR has not been altered as much by humans as the vegetation at Big South Fork NRRA. However, the southern pine beetle infestation described previously did affect vegetation at Obed WSR (Nordman 2008).

Upland Evergreen Forest

This mapping unit consists of five NVCS types, including four that were described previously for Big South Fork NRRA: Southern Appalachian Eastern Hemlock Forest (White Pine Type), Eastern White Pine Successional Forest, Appalachian Low-elevation Mixed Pine / Hillside Blueberry Forest, Virginia Pine Successional Forest. The fifth association in this mapping unit, the Southern Appalachian Eastern Hemlock Forest (Typic Type), is dominated by eastern hemlock and found on lower or protected slopes, as well as terraces (Nordman 2008).

Temporarily Flooded Evergreen Forest

This mapping unit consists of one NVCS type, the Montane Alluvial Forest (Small River Type), which was described previously for Big South Fork NRRA.

Upland Deciduous Forest

Six NVCS types make up this mapping unit, including five that were described previously for Big South Fork NRRA: Beech–Maple Unglaciated Forest, Interior Mid- to Late-successional Tuliptree–Hardwood Upland Forest, Successional Tuliptree Forest, Cumberland Plateau Dry–Mesic White Oak Forest, and Xeric Ridge Top Chestnut Oak Forest. The sixth type, Interior Low Plateau Chestnut Oak–Mixed Oak Forest, is typically found on dry/xeric upper slopes, mid-slopes, and narrow ridgetops. These forests have canopies that are strongly dominated by chestnut oak, with several other oak species (scarlet, black, northern red, white), blackgum (*Nyssa sylvatica*), red maple, and mockernut hickory also present (Nordman 2008).

Temporarily Flooded Deciduous Forest

This mapping unit is made up of one NVCS type, the River Birch Levee Forest, which was described previously for Big South Fork NRRA.

Upland Mixed Evergreen/Deciduous Forest

Five NVCS types make up this mapping unit, including the Virginia Pine Successional Forest, Appalachian White Pine / Mesic Oak Forest, and Cumberland/Appalachian Hemlock–Hardwood Cove Forest described for Big South Fork NRRA. It also includes the Southern Appalachian Cove Forest, which is generally found in mesic habitats on gentle to steep, lower slopes along creeks in ravines; in coves or gorges; and in depressions on protected slopes with cool aspects and acidic soils. This association encompasses hemlock–hardwood forests and acidic cove forests with eastern hemlock, tuliptree, sweet birch (*Betula lenta*), northern red oak, and red maple (Nordman 2008). The other association is the Appalachian White Pine–Xeric Oak Forest, which typically occurs on exposed upper slopes and ridgetops at elevations below 3,000 feet. This association represents mixed forests with eastern white pine, chestnut oak, and scarlet oak occurring singly or in combination (Nordman 2008).

Upland Deciduous Shrubland

This mapping unit is comprised of three shrubland types, two of which (the Blackberry–Greenbrier Successional Shrubland Thicket and the Cumberland Sandstone Glade Heath Shrubland) were described for Big South Fork NRRA. The third type, the Rocky Bar and Shore (Alder–Yellowroot Type), is found on rocky or gravelly substrates along narrow river margins. Smooth alder (*Alnus serrulata*) and yellowroot (*Xanthorhiza simplicissima*) are common and characteristic but not always dominant, and occur with a variety of other shrubs (Nordman 2008).

Herbaceous Vegetation

This map unit consists of three NVCS types, one of which, the Cumberland Riverside Scour Prairie, was described for Big South Fork NRRA. It also includes the Cumberland Plateau Cliff-top Sandstone Barren association, which is generally found on xeric cliff-tops, exposed slopes, and other rocky areas with patches of vegetation in thin soils. The herbaceous layer is dominated by little bluestem, cypress panicgrass (*Dichanthelium dichotomum*), orangegrass (*Hypericum gentianoides*), and Curtiss' milkwort (*Polygala curtissii*). Scattered trees and shrubs, such as Virginia pine, farkleberry, and white fringetree (*Chionanthus virginicus*), may occur on the margins of the community and in patches of deeper soil (Nordman 2008). The other NVCS type in this mapping unit is the Water-willow Rocky Bar and Shore, which is found on the shoals or bars of rocky streams and riverbeds, where they are subject to frequent high-energy floods. American water-willow (*Justicia americana*) is the dominant, and sometimes the only, species, forming lawn-like stands in shallow reaches of rivers. Lizard's tail (*Saururus cernuus*) is often present and may be codominant (Nordman 2008). This mapping unit also includes other grasslands, fields, meadows, pastures, and areas dominated by forbs that were not described by NatureServe.

Invasive Species

Based on the classification effort by NatureServe (Nordman 2008), at least 9% (69 species) of the plant species in the Obed WSR are not native to the region or continent. Most of these species were plantings or are harmless present day components of the flora that found their way into natural areas from plantings or errant seed mixes. However, some of the 69 exotic species found within the park are considered aggressive invasive species that are severe or significant threats and are actively outcompeting and replacing native species in other parts of the Southeast. The Cumberland Riverside Scour Prairie found at Obed WSR can be prone to invasion by exotic plant species. These species are a threat to the overall ecological health of the park, and may become more troublesome in the future (Nordman 2008).

VEGETATION AND ROLE OF CLIMATE CHANGE

Some parks are already seeing changes to vegetation and wildlife habitat and water resources as a result of climate change, and research predicts that many parks will see changes to these resources in upcoming decades (NPS 2009k). The vegetation has been mapped in both parks as part of the inventory program for the Appalachian Highlands Inventory and Monitoring Network. According to the climate change brief for this network (NPS 2010e), a major issue for Big South Fork NRRA and Obed WSR is water supply, and droughts as well as upstream water withdrawal are of concern regarding potential effects on vegetation communities and aquatic fauna. The two parks contain the best remaining examples of a globally imperiled river scour prairie grassland community, the Cumberlandian cobble, which is dependent upon scouring floods for survival. Extended droughts or any significant disruption of groundwater flow could exterminate this community and affect other vegetation. Climate monitoring in APHN parks is centered on maintaining data collection from historic weather stations, and future plans call for additional measurements in long-term monitoring plots.

WILDLIFE AND AQUATIC SPECIES

BIG SOUTH FORK NATIONAL RIVER AND RECREATION AREA

The terrestrial vegetation types described in the "Vegetation" section of this chapter combine with the terrain and aquatic environments at Big South Fork NRRA to provide diverse habitats for fish and wildlife.

Many studies of specific habitat types and wildlife groups, such as inventories of mammals, mussels, fish and aquatic life, bats, and vegetation have been performed at the park unit over the past century, with many in the last decade.

Mammals

A total of 48 mammals have been documented as being "present in the park," with nine other mammals possibly present at Big South Fork NRRA including 10 species of bats (Britzke 2007).

The most common native large mammal found at the park unit is the white-tailed deer (*Odocoileus virginianus*). Although nonnative, a stable or increasing population of feral hogs (*Sus scrofa*) is also found at Big South Fork NRRA. Outside the park, pigs are hunted year-round and inside the park they can be taken during any big game season when deer are harvested. They were previously monitored through hunting licenses, but the hunting season has been extended, and big game hunters are encouraged to take as many animals as they can. Population estimates can only be estimated based on hunter harvest, but the park is not presently collecting this data.

Black bear (*Ursus americanus*) and elk (*Cervus elaphus*) were released in Tennessee relatively recently (1996/1997 and early 2000s, respectively), and although the programs are considered a success, these species are less common than other large mammals. Although there is a stable bear population, there are no current population estimates available in Big South Fork NRRA. There is currently no population of elk within the park unit. This may be attributed to more suitable habitat found surrounding Big South Fork NRRA, including farms.

Black bear (*Ursus americanus*).

Predators, including coyote (*Canis latrans*), red fox (*Vulpes vulpes*), river otter (*Lontra canadensis*), and bobcat (*Lynx rufus*), also occur at Big South Fork NRRA. Medium sized mammals found at the park unit include beaver (*Castor canadensis*), woodchuck (*Marmota monax*), raccoon (*Procyon lotor*), opossum (*Didelphis virginiana*), mink (*Mustela vison*), muskrat (*Ondatra zibethicus*), gray squirrel (*Sciurus carolinensis*), and skunk (*Mephitis mephitis*). Small mammals are abundant at Big South Fork NRRA and include woodrat (*Neotoma magister*), chipmunk (*Tamias striatus*), deer mouse (*Peromyscus maniculatus*), voles (*Microtus* sp.), moles (*Parascalops breweri*), shrews (*Sorex* and *Blanaria* sp.), various rats and mice, and bats (Britzke 2007).

Birds

Breeding bird surveys have been conducted annually at Big South Fork NRRA from 1994 to 2006 (Stedman n.d.). Approximately 180 species of birds occur within the Big South Fork, and are dominated by those found in the forest interior. Edge species also find some habitat to suit their needs, but birds of open country are largely excluded from the park, and the degree of exclusion increases each year as park forests mature and their open areas diminish (Stedman 2006).

Besides having general characteristics determined by habitat, the bird communities of Big South Fork NRRA are distinct during the various seasons of the year: observers can detect more birds per hour during the spring and early summer than any of the other seasons. As summer proceeds into fall, birdsong decreases and many breeding species begin to migrate south. The detectability and density of birds in the Big South Fork NRRA diminish. During the late winter the detectability and density reach their lowest points; however, by late March, an influx of early migrants swells the numbers and the increase continues until peak numbers are once again recorded in May and June. This is because the park unit provides habitat to a large component of neotropical migrants breeding within or migrating through the area. Almost half of breeding species and most transients found at the park unit belong to this group of New World birds that nest mainly in the temperate or boreal zones of the northern hemisphere during summer, and then spend the winter in the tropics of Central and/or South America. Undeveloped places like Big South Fork NRRA provide breeding habitat and migration stopover points for many such species and are therefore of considerable importance to their survival.

Based on survey data, the red-eyed vireo (*Vireo olivaceus*) is the most common species reported annually at Big South Fork NRRA. Other common species include American crow (*Corvus brachyrhynchos*), ovenbird (*Seiurus aurocapillus*), indigo bunting (*Passerina cyanea*), and hooded warbler (*Wilsonia citrina*) (Stedman n.d.).

Reptiles and Amphibians

Eastern hog-nosed snake (*Heterodon platirhinos*).

A total of 28 reptiles (16 snakes, 6 turtles, and 6 lizards/skinks) and 28 amphibians (16 salamanders, 8 frogs, 2 toads, 1 mudpuppy, and 1 newt) have been documented as present at Big South Fork NRRA (Stephens et al. 2008). Reptiles include the racer snake (*Coluber constrictor*), eastern hog-nosed snake (*Heterodon platirhinos*), rough green snake (*Opheodrys aestivus*), common garter snake (*Thamnophis sirtalis sirtalis*), northern copperhead (*Agkistrodon contortrix mokasen*), timber rattlesnake (*Crotalus horridus*), slender glass lizard (*Ophisaurus attenuatus longicaudus*), fence lizard (*Sceloporus undulates*), five-lined skink (*Eumeces fasciatus*), broadhead skink (*Eumeces laticeps*), common map turtle (*Graptemys geographica*), eastern box turtle (*Terrapene carolina carolina*), and red-eared slider (*Trachemys scripta elegans*). Amphibians at the park unit include spotted salamander (*Ambystoma maculatum*), dusky salamander (*Desmognathus fuscus*), Black Mountain salamander (*Desmognathus welteri*), four-toed salamander (*Hemidactylium scutatum*), northern red salamander (*Pseudotriton ruber ruber*), bullfrog (*Rana catesbeiana*), green frog (*Rana clamitans melanota*), wood frog (*Rana sylvatica*), American toad (*Bufo americanus americanus*), Fowler's toad (*Bufo fowleri*), mudpuppy (*Necturus maculosus*), and red-spotted newt (*Notophthalmus viridescens viridescens*) (Stephens et al. 2008).

Fish

One of the world's richest assemblages of temperate freshwater fish once inhabited the Cumberland River into which the Big South Fork River flows. However, impoundment and coal-mining related impacts have made the Cumberland River one of the nation's most severely altered river systems.

The Big South Fork NRRA encompasses over 138 miles of fishing streams and is home to 79 species of fish considered present in the park, 15 of which are classified as game fish (Scott 2007; NPS 2006g). All together, the fish population contains a total of twelve different families, including lampreys (*Ichthyomyzon* spp.), darters (*Etheostoma* spp., *Percina* spp.), shiners (*Cyprinella* spp., *Notropis* spp.), minnows (*Pimephales* spp.), suckers (*Catostomus* spp., *Hypentelium* spp., *Moxostoma* spp.), and bass (*Micropterus* spp.) (NPS 2006g; Scott 2007).

Mussels

Mussel species are the most jeopardized and rapidly declining faunal group in the United States: 12 of the nation's 300 species are now extinct, and over 67% are listed as endangered, threatened, or special concern, or are being considered for listing (NPS 2006h). Of the nearly 300 recorded species of freshwater mussels in the United States, approximately 130 are or were known to occur within the political boundaries of Tennessee. The Big South Fork currently has 26 documented species, 10 of which are federally listed as endangered and discussed in the "Federally Listed Threatened and Endangered Species" section of this chapter. In the Southeast, only the Duck, Clinch, and Green rivers contain this level of diversity, and only two other NPS units in the country have greater diversity (NPS 2006h).

Big South Fork NRRA staff are working with the USFWS, USGS, Tennessee Wildlife Resources Agency, and two mussel hatcheries (Virginia Tech Mussel Facility and Kentucky Center for Mollusk Conservation), to propagate freshwater mussels and reintroduce them into the wild. This is the first such effort in a national park (O'Connell 2004).

Crayfish

The Big South Fork Crayfish is one of nine crayfish species listed endangered by the Tennessee Wildlife Resources Commission. This species inhabits freshwater creeks of moderate gradient. This species is restricted to a single stream system, with approximately 10 occurrences in an occupied area of less than 100 square kilometers. First identified in the Perkins Creek tributary of the Big South Fork of the Cumberland River, this species is now known to be endemic to the Roaring Paunch Creek System in Scott County Tennessee, and McCreary County, Kentucky. Originating just north-east of Oneida Tennessee, Roaring Paunch Creek flows north along the Cumberland Plateau roughly 23 miles into McCreary County Kentucky before it empties into the Big South Fork Cumberland River. The Big South Fork Crayfish is considered extremely vulnerable to extirpation due primarily to a limited distribution. Individuals are found among vegetation in heavily silted pools and among boulders as well as being found in streams with no vegetation or boulders. Threats to habitat quality exist from urbanization and acid mine runoff (NatureServe 2009; Williams, Bivens, and Carter 2002).

OBED WILD AND SCENIC RIVER

The woodlands that surround the river and the river itself provide important habitats for numerous wildlife and aquatic species.

Mammals

A total of 33 mammal species are considered present at Obed WSR (Schapansky, pers. comm., 2008a) including 9 bat species. White-tailed deer are the only large mammals known to occur in this park unit. Predators are also found and include gray fox (*Urocyon cinereoargenteus*) and bobcat. Medium-sized mammals include beaver, raccoon, opossum, mink, muskrat, and gray squirrel. Small mammals are abundant and include woodrat, chipmunk, mole, and shrews (Schapansky, pers. comm., 2008a).

Birds

A certified list of birds by the NPS documents 159 bird species as present at Obed WSR (Schapansky, pers. comm., 2008b). Common birds include the black-throated green warbler (*Dendroica virens*), downy woodpecker (*Picoides pubescens*), green heron (*Butorides virescens*), red-eyed vireo, white-eyed vireo, yellow-throated vireo, blue-headed vireo (Stedman 2006), American crow, and broad-winged hawk (*Buteo platypterus*). It is speculated that the seasonal changes in bird populations at Obed WSR would be similar to those described for Big South Fork NRRA given that they are relatively close to one another geographically.

Reptiles and Amphibians

A total of 15 reptiles (9 snakes, 1 lizard, 2 skinks, and 3 turtles) and 23 amphibians (7 frogs, 13 salamanders, 2 toads, and 1 newt) are considered present in Obed WSR (Schapansky, pers. comm., 2008b; NPS 2007b). Reptiles include northern black racer (*Coluber constrictor constrictor*), northern ringneck snake (*Diadophis punctatus*), corn snake (*Elaphe guttata guttata*), rough green snake, common carter snake, northern copperhead, timber rattlesnake, common snapping turtle (*Chelydra serpentina serpentina*), common map turtle (*Graptemys geographica*), eastern box turtle, eastern fence lizard (*Sceloporus undulatus*), and five-lined skink (Schapansky, pers. comm., 2008b). Amphibians present include northern red salamander, spotted salamander, green salamander (*Aneides aeneus*), eastern hellbender (*Cryptobranchus alleganiensis alleganiensis*), dusky salamander, eastern American toad (*Bufo americanus americanus*), Fowler’s toad, Northern spring peeper (*Pseudacris crucifer crucifer*), Cope’s gray treefrog (*Hyla chrysoscelis*), bullfrog, green frog, wood frog, and red-spotted newt (NPS 2007b).

Fish

Fish habitat in Obed WSR is somewhat less diverse than that in Big South Fork NRRA, primarily due to the size of the park. Still, over 45 miles of fishable stream are present in Obed WSR in the Obed River, Clear Creek, and Daddys Creek. A total of 50 species of fish are considered present in the park unit, and 13 of these species are considered game fish. The fish population contains a total of 12 different families, including lampreys, darters, shiners, minnows, suckers, and bass (NPS 2007b).

Mussels

A total of ten mussel species, including 585 individual specimens, were found in 2001 at the access points at the upper Emory River, Daddys Creek, Clear Creek, and White’s Creek (Ahlstedt et al. 2001). Species collected on the Obed River included the Tennessee pigtoe (*Fusconaia barnesiana*), Cumberland moccasin shell (*Medionidus conradicus*), spike mussel (*Elliptio dilatata*), wavyrayed lampmussel (*Lampsilis fasciola*), rainbow mussel (*Villosa iris*), plain pocketbook (*Lampsilis cardium*), pink heelsplitter (*Potamilus alatus*), Tennessee clubshell (*Pleurobema oviforme*), and the federally endangered purple bean mussel (*Villosa perpurpurea*). The diversity of mussels appears to be lower in Obed WSR when compared to Big South Fork NRRA. This may be due to the boulder and bedrock substrate and higher gradient of the Obed River and its tributaries, which limit the availability of optimal mussel habitat.

Crayfish

There are over 70 species of crayfish in Tennessee (TDEC 2009). Within the Obed WSR, 16 crayfish species are reported (Schapansky, pers. comm., 2008c).

FEDERALLY LISTED THREATENED AND ENDANGERED SPECIES

Under the *Endangered Species Act* (ESA) of 1973, the NPS has the responsibility to address impacts to federally listed threatened, endangered, and species proposed for listing. The terms “threatened” and “endangered” describe the official federal status of certain species in the park as defined by the ESA. Under the Act, so-called “candidate” species receive no statutory protection under the ESA, but the USFWS encourages cooperative conservation efforts for these species because they are, by definition, species that may warrant future protection under the ESA. The term “candidate” is used officially by the USFWS when describing those species for which it has on file sufficient information on biological vulnerability and threats to support issuance of a “proposed rule to list,” but for which issuance of the proposed rule is precluded due to other higher priority listings. The term “proposed” describes species for which a “proposed rule to list” has been published in the *Federal Register*; however, a finalized rule has not yet been issued.

The ESA also requires the designation of “critical habitat” for listed species when “prudent and determinable.” Critical habitat includes geographic areas that contain the physical or biological features that are essential to the conservation of the species and may need special management or protection, even if the area is not occupied by the species at the time of listing. Critical habitat designations affect only federal agency actions or federally funded or permitted activities. The ESA requires that such actions avoid “destruction” or “adverse modification” of designated critical habitat (USFWS 2009a).

Section 4.4.2.3 of the NPS *Management Policies 2006* (Management of Threatened or Endangered Plants and Animals), moreover, directs the agency to consider federally listed threatened, endangered, and candidate species proposed for listing, as well as state-listed species, to the extent practical in its decision making.

BIG SOUTH FORK NATIONAL RIVER AND RECREATION AREA

The Big South Fork watershed is a national focus for major conservation efforts because of its aquatic and terrestrial features. The Big South Fork River is particularly significant in that it harbors over 20 species of mussels. As many as 10 federally listed or candidate mussel species occur in the river. Three fish, two river-dependent plants, and two upland plants are also federally listed. A single specimen of both the Indiana bat (*Myotis sodalis)* and the gray bat (*Myotis grisecans*) have been found during migration periods.

The species are presented in table 21 and described in detail below. Although the NPS has records of other federally listed species at Big South Fork NRRA—including eastern cougar (*Puma concolor couguar*), red-cockaded woodpecker (*Picoides borealis*), cracking pearlymussel (*Hemistena lata*), catspaw mussel (*Epioblasma obliquata obliquata*), clubshell mussel (*Pleurobema clava*), orangefooted pimpleback mussel (*Plethobasus cooperianus*), and American chaffseed mussel (*Schwalbea americana*)—these species are not known to occur there today and are therefore not considered further in this plan/EIS (Blount, pers. comm., 2009a).

TABLE 21. FEDERALLY LISTED SPECIES OF BIG SOUTH FORK NATIONAL RIVER AND RECREATION AREA

Common Name	Scientific Name	Status	USFWS List	NPS List	Comments
Mussels					
Cumberland elktoe	*Alasmidonta atropurpurea*	Endangered	X	X	
Cumberlandian combshell	*Epioblasma brevidens*	Endangered	X	X	
Cumberland bean	*Villosa trabalis*	Endangered	X	X	
Little-wing pearlymussel	*Pegias fabula*	Endangered	X	X	
Tan riffleshell	*Epioblasma florentina walkeri*	Endangered	X	X	
Dromedary pearlymussel	*Dromus dromas*	Endangered		X	Reintroduced in 2008
Oyster mussel	*Epioblasma capsaeformis*	Endangered		X	Augmented in 2008
Spectaclecase	*Cumberlandia monodonta*	Candidate		X	Reintroduced in 2008
Clubshell	*Pleurobema clava*	Endangered		X	
Fluted kidneyshell	*Ptychobranchus subtentum*	Candidate		X	Augmented in 2008
Fish					
Duskytail darter	*Etheostoma percnurum*	Endangered	X	X	Recently re-described as the tuxedo darter (*Etheostoma lemniscatum*)
Blackside dace	*Phoxinus cumberlandensis*	Threatened		X	
Palezone shiner	*Notropis albizonatus*	Endangered		X	Found in 2008
Plants					
Cumberland sandwort	*Minuartia cumberlandensis*	Endangered	X	X	
Virginia spiraea	*Spiraea virginiana*	Endangered	X	X	
Cumberland rosemary	*Conradina verticillata*	Threatened	X	X	
White fringeless orchid	*Platanthera integrilabia*	Candidate		X	

Source: Widlak, pers. comm., 2009; Blount, pers. comm., 2009a

The river's terrace, floodplain, and boulder-cobble bars host rare plant species including the federally listed Cumberland rosemary and Virginia spiraea. Several of these species are unique to the Cumberland

Plateau. The federally listed Cumberland rosemary is narrowly restricted to the Cumberland River and Tennessee River systems, with a particularly high concentration occurring within Big South Fork.

Federally Listed Mussels

Cumberland bean (*Villosa trabalis*)—This species is a medium-size freshwater mussel or bivalve mollusk with a dingy olive-green shell with numerous faint wavy green lines. It is found in sand, gravel, and cobble substrates in waters with moderate to swift currents and depths less than 3 feet. Mussels are most often observed in clean, fast-flowing water in substrate that contains relatively firm rubble, gravel, and sand swept free from siltation, and are usually buried in shallow riffle and shoal areas (NatureServe 2009).

Freshwater mussels such as the Cumberland bean reproduce when males release sperm into the water column, which are taken in by the females through their siphons during feeding and respiration. The fertilized eggs are retained in the females' gills until the larvae fully develop. The larvae are released into the water where they attach and encyst on the gills or fins of a fish host. When metamorphosis is complete, they drop to the streambed as juvenile mussels (USFWS 1990).

This species was historically known from numerous river systems in the Cumberland region, including the Big South Fork River and Tennessee River basins and is currently reproducing in the Big South Fork River. Although none of the known fish hosts (fantail darter, barcheek darter, striped darter, and Tennessee snubnose darter) are known to occur in the main stem, these fish are known from Big South Fork River tributaries (NPS 2009j). A reduction in range can be attributed to impoundments, channelization, loss of riparian habitat, pollution, and the impacts of silt from poor land management.

Cumberland elktoe (*Alasmidonta atropurpurea*) —This species is a freshwater mussel with a somewhat shiny and black shell with greenish rays. Habitat ranges from small creeks to medium-sized rivers. The mussel is most common in smaller stream habitats. Preferred habitat appears to be shallow flats or pools with slow current and sand substrate with scattered cobble/boulder material, although it will occur in mud or rocky substrates and faster currents. Native host fish include whitetail shiner (*Cyprinella galactura*), northern hog sucker (*Hypentelium nigricans*), rock bass (*Ambloplites rupestris*), longear sunfish (*Lepomis megalotis*), and rainbow darter (*Etheostoma caeruleum*) (NatureServe 2009).

Cumberland elktoe (*Alasmidonta atropurpurea*).

The Cumberland elktoe, endemic to the upper Cumberland River system, continues to survive throughout the Big South Fork River system. This is the only threatened or endangered mussel in the Clear Fork River, New River, North White Oak Creek and the main river. The Cumberland elktoe is distributed throughout the Big South Fork NRRA in these streams. A reduction in range can be attributed to impoundments, channelization, loss of riparian habitat, pollution, and the impacts from poor land use management (NPS 2009j).

Cumberlandian combshell (*Epioblasma brevidens*)—This species is a freshwater mussel that has a yellow to tawny brown shell with narrow green, broken rays. The habitat ranges from large creeks to large rivers, in substrates ranging from coarse sand to mixtures of gravel, cobble, and boulder-sized particles. Cumberlandian combshell is primarily associated with stream sections exhibiting high-energy flows, high water quality, and rocky substrates. The mussel tends to occur at depths of less than approximately 3 feet, although the relict (and presumably nonreproducing) populations now occur in considerably deeper water (NatureServe 2009). This species spawns in late summer and has been observed to release larvae late the following spring (late May and early June). Based on laboratory studies, larval hosts include greenside darter, spotted darter (*Etheostoma maculatum*), redline darter, wounded darter (*Etheostoma vulneratum*), snubnose darter, logperch (*Percina caprodes*), black sculpin (*Cottus baileyi*), mottled sculpin (*Cottus bairdi*), and banded sculpin (NatureServe 2009).

It was historically distributed throughout much of the Cumberland region of the Tennessee and Cumberland River drainages in Alabama, Kentucky, Mississippi, Tennessee, and Virginia. A reduction in range can be attributed to impoundments, channelization, loss of riparian habitat, pollution, and the impacts of silt from poor land management. Other than the Clinch River, the Big South Fork River has the best surviving population. Known fish hosts that occur in the Big South Fork River include the greenside darter (NPS 2009j).

Little-wing pearlymussel (*Pegias fabula*)—This species is a small freshwater mussel or bivalve mollusk that attains an average adult size less than one inch in length. The outer shell is usually eroded away in mature individuals. A few dark rays are apparent along the base of the shell in young individuals. This species is most common at the head of riffles, but is also found in and below riffles on sand and gravel substrates with scattered cobbles. It also inhabits sand pockets between rocks, cobbles, and boulders, and underneath large rocks. It is restricted to small, cool streams. It is usually found lying on top or partially buried in sand and fine gravel between cobbles in only 6 to 10 inches of water. Larval fish hosts include banded sculpin (*Cottus carolinae*), redline darter, emerald darter (*Etheostoma baileyi*), and greenside darter (NatureServe 2009).

The little-wing pearlymussel was historically known from the Cumberland and Tennessee River systems. Currently, it is known from only four rivers in the Tennessee River system and three rivers in the Cumberland River system. Big South Fork harbors the only known reproducing population. The reduction in range can be attributed to impoundments, channelization, loss of riparian habitat, pollution, and the impacts of silt from poor land use management. The Big South Fork River has the best remaining population of this species. Known fish hosts that occur in the Big South Fork River include greenside darter and emerald darter (NPS 2009j).

Tan riffleshell (*Epioblasma florentina walkeri*)—A medium-sized (approximately 3-inch) freshwater mussel with a brown to yellow colored shell with numerous green rays found in headwaters, riffles, and shoals in sand and gravel substrates. Suitable larval hosts include sculpin (*Cottus* spp.), greenside darter (*Etheostoma blennioides*), fantail darter (*Etheostome flabellare*), redline darter (*Etheostoma rufilineatum*), and snubnose darter (*Etheostoma simoterum*) (NatureServe 2009).

Tan riffleshell (*Epioblasma florentina walker*).

The tan riffleshell was historically known from the Cumberland and Tennessee River systems. A reduction in range can be attributed to impoundments, channelization, loss of riparian habitat, pollution, and the impacts of silt from poor land management. The species historically occurs in the Big South Fork River and still occurs there. DNA results have documented this species as a valid taxon (NPS 2009j).

Dromedary pearlymussel (*Dromus dromas*)—This mussel is a riffle-dwelling species that occurs at shoals with sand and gravel and moderate current velocities. It is also found in deeper, slower moving water in Tennessee and is most often observed in clean, fast-flowing water in stable, clean substrates that contain relatively firm rubble and gravel. Females have larvae from October through May, which are released from late March to late April (NatureServe 2009).

This species historically occurred in the Cumberland including the Big South Fork and Tennessee River systems (Bogan and Parmalee 1983) and has been re-introduced. Known fish hosts that occur in the Big South Fork include greenside darter and logperch (Comiskey and Etnier 1972; Jones and Neves 2000; NPS 2009j).

Oyster mussel (*Epioblasma capsaeformis*)—This species is associated with riffle areas exhibiting high-energy flows, high water quality, and rocky substrates. It lives in moderate to swift currents in small to large creeks and rivers, with substrates ranging from coarse sand and gravel to boulder-sized particles, rarely mud. Within the Big South Fork river system, this species is not found in mud, but rather under large slab rocks and underwater ledges formed by large rocks. It may be associated with beds of water willow (*Justicia americana*) bordering the main channel of the riffle, and can be found in pockets of gravel between bedrock ledges in areas of swift current. Spawning probably occurs during late summer, and larvae are released during the late spring and early summer of the following year (NatureServe 2009).

The species was historically distributed throughout much of the Cumberland Region of the Tennessee and Cumberland River drainages. A reduction in range can be attributed to impoundments, channelization, loss of riparian habitat, pollution, and the impacts of silt from poor land management.

Oyster mussels historically occurred in the Big South Fork River and have been reintroduced. Gravid females have been observed from the Big South Fork and are probably reproducing. Known fish hosts for the oyster mussel include bluebreast darter and dusky darter, which occur in the Big South Fork River (NPS 2009j).

Spectaclecase (*Cumberlandia monodonta*)—The spectaclecase, reintroduced to Big South Fork NRRA, occurs in large rivers in substrates ranging from mud and sand to gravel, cobble, and boulders, in relatively shallow riffles and shoals with slow to swift current. It is usually found in firm mud between large rocks in quiet water very near the interface with swift currents. Specimens have also been reported in tree stumps, root masses, and in beds of rooted vegetation. The species appears to spawn twice a year during relatively short periods in the autumn (October and November) and spring (April and May). Little else is known about spectaclecase reproduction, including—despite extensive laboratory testing—the larval host fish (NatureServe 2009).

The spectaclecase, a candidate for federal protection, is a rare, widespread species in the Tennessee River system, but it is possibly extirpated from the Cumberland River. It was known historically from the Big South Fork and has been reintroduced. Fish hosts are unknown (NPS 2009j).

Fluted kidneyshell (*Ptychobranchus subtentum*)—This species inhabits small to medium rivers in areas with swift current or riffles, although a few populations have been recorded from larger rivers in shoal areas. The fluted kidneyshell requires flowing, well-oxygenated waters, and it is often found embedded in sand, gravel, and cobble substrates. Spawning is thought to occur in late summer or early fall, and larvae are released the following spring or early summer. Host fishes include barcheek darter, redline darter, fantail darter, and banded sculpin (NatureServe 2009).

The fluted kidneyshell, a candidate for federal protection, is a rare species endemic to the Tennessee and Cumberland River system. It was known historically and recently collected from the Big South Fork River and has been augmented by adding adults to the population. The reduction in range can be attributed to impoundments, channelization, loss of riparian habitat, pollution, and the impacts of silt from poor land use management (NPS 2009j).

Clubshell (*Pleurobema clava*)—This is a small (up to two inches), thick, freshwater mussel with a tan-colored shell with green rays. It is generally found in clean coarse sand and gravel in runs, often just downstream of a riffle, and cannot tolerate mud or slackwater conditions. Virtually nothing is known about its diet or reproductive habits, although laboratory studies identified the striped shiner, blackside darter, central stoneroller, and logperch as potential fish hosts (NatureServe 2009).

The clubshell historically occurred throughout the Ohio River (including the Big South Fork River) and Lake Erie basins, but it now survives in only a few small, isolated populations in both basins. The current distribution represents a range reduction greater than 95 percent. The reduction in range can be attributed to impoundments, channelization, loss of riparian habitat, pollution, and the impacts of silt from poor land use management. Three live specimens tentatively identified as *P. clava* were found in 1999 in the Big South Fork River. Fish hosts are unknown (NPS 2009j).

Federally Listed Fish

Duskytail darter (*Etheostoma percnurum*)—This darter inhabits pools and riffles of large creeks and small to medium rivers that are approximately 30 to 260 feet wide, of moderate gradient, warm, and usually clear. Young and adults typically are in silt-free rocky pools and slow runs, under or near cover, often among considerable detritus, or among cobbles and small boulders (NatureServe 2009). These fishes occur over heterogeneous mixtures of rock sizes from pea gravel to rubble/cobble, slab-rock, and boulders. They rarely occur in heavily silted areas. Spawning occurs from late April through June. Diet of young mainly consists of microcrustaceans, chironomid larvae, and heptageniid nymphs; larger individuals eat chironomid larvae, mayfly nymphs, microcrustaceans, caddisfly larvae, and sometimes fish eggs (NatureServe 2009).

Duskytail darter (*Etheostoma percnurum*).

The Big South Fork population of the duskytail darter is one of three extant populations described in the Recovery Plan for duskytail darter. The three original populations are all geographically isolated and relatively restricted in size, and all except the Big South Fork population are located in the Tennessee River drainage. Because it differs morphologically from the Tennessee River populations, researchers have determined that the Big South Fork population is a distinct species (Shute et al. 1997). Because of the water quality issues influencing the Big South Fork system, the Big South Fork Duskytail survives under threat of being wiped out by a single pollution event, which would eliminate the only known population. Until relatively recently, duskytail darters had been collected at only one site on the Big South

Fork, at the mouth of Station Camp Creek, and the extent of the population there was unknown. Conservation Fisheries, Inc. was contracted to survey streams within the Big South Fork River NRRA and within the Big South Fork watershed for the presence of duskytail darters. Dr. Brooks Burr (Southern Illinois University, Carbondale) was also contracted by the Kentucky Division of Fish & Game to determine if duskytail darters might occur within Kentucky's portion of the Big South Fork system. During the surveys (Shute et al. 1997), the known range of the duskytail darter was extended into Kentucky approximately as far downstream as the confluence with Bear Creek. Duskytailed darters were subsequently collected as far downstream as Blue Heron (NPS 2009j).

Blackside dace (*Phoxinus cumberlandensis*)—The blackside dace is found in about 30 streams in the upper Cumberland River system, primarily above Cumberland Falls, in southeastern Kentucky and northeastern Tennessee. The species inhabits short stream reaches totaling about 14 stream miles in the following counties: Pulaski, Laurel, McCreary, Whitley, Knox, Bell, Harlan, and Letcher, Kentucky; and Scott, Campbell, and Claiborne, Tennessee. No estimate of total population numbers is available. All but three populations are found in stream reaches less than a mile in length, and some are limited to only a few hundred yards. This fish is found in the Big South Fork NRRA in a small tributary near Yamacraw in Kentucky, but not in the main river.

This fish was not recognized as a distinct species until 1975, and relatively few historic fish collection records exist for the Upper Cumberland River Basin. The blackside dace inhabits small (7 to 15 feet wide) upland streams with moderate flows. The species is generally associated with undercut banks and large rocks and is usually found within relatively stable, well-vegetated watersheds with good riparian vegetation. Stable watersheds help maintain cool temperatures and minimize silt to the benefit of the species. O'Bara (1985) also found that the fish's presence was apparently closely correlated with healthy riparian vegetation where canopy cover exceeded 70 percent and with streamflows of the riffles. The fish was found neither in low gradient silty streams nor in high-gradient mountain tributaries. The status of this species is due primarily to the impacts of siltation, and the effects of acid mine drainage. Based on a survey by O'Bara (1985), the most frequently cited threats were related to coal mining, followed in order of threat by logging, road construction, agriculture, human development, and natural low flows. Controlling siltation, particularly in relation to surface mining, would be necessary to assure that the species suffers no further population losses or potential loss of genetic variation (NPS 2009j).

Palezone shiner (*Notropis albizonatus*)—The palezone shiner inhabits clean, clear waters of flowing pools and runs found over bottoms with fractured bedrock, cobble, and gravel mixed with clear sand. The palezone shiner reaches a maximum length of less than 6 cm. Highly restricted in distribution, the palezone shiner is found only in the Tennessee River drainage in Alabama and Tennessee and disjunctly to the north in the Cumberland River drainage in Kentucky. It is uncommon and localized throughout its range. In Kentucky, for example, it occurs only in the Little South Fork of the Cumberland and also in the Rock Creek system in McCreary County, Kentucky.

This rare species, when found, usually occurs in moderately large, high-gradient, clear streams flowing over bedrock, cobble, or gravel mixed with clean sand; it prefers pools and pool runs below riffles. It is thought that spawning occurs from early June through July in Alabama, but Etnier and Starnes (1993) report that tuberculate individuals have been collected in May and June in Tennessee. Warren et al. (1994) indicate spawning from mid-May to early July, peaking in June, with individuals living between three and four years. Little else is known about the biology of this species (NPS 2009j).

Federally Listed Plants

Cumberland sandwort (*Arenaria cumberlandensis*)—Cumberland sandwort is a perennial herbaceous plant that grows in cool, humid, rockshelters formed through differential weathering of sandstone strata.

This species grows on sandy floors of these rockhouses and in similar situations such as beneath sandstone ledges. The few species that share this habitat with Cumberland sandwort include Lucy Braun's white snakeroot (*Eupatorium luciae-brauniae*) and featherbells (*Stenanthium gramineum*). Cumberland sandwort is narrowly endemic to the Cumberland Plateau of northcentral Tennessee and adjacent Kentucky. There are currently more than 30 occurrences known, but most of them concentrated within a small portion of the overall range, in the Big South Fork watershed. Most of the National Area's populations are located in rockshelters or lower ledges of the sandstone cliffline that rims the Big South Fork River gorge. Additional unmapped populations are likely in the Big South Fork NRRA, particularly west of the Big South Fork River in Scott, Fentress, and Pickett County (NPS 2009j).

Cumberland rosemary (*Conradina verticillata*)—Cumberland rosemary is a low (less than 20 inches), aromatic, perennial evergreen shrub, forming clumps or mats of sprawling branches that root at the nodes. Cumberland rosemary is endemic to the upper Cumberland Plateau in north-central Tennessee and adjacent southeastern Kentucky and restricted there to floodplain habitats. Suitable habitats are full to moderate sunlit gravel bars in floodplains of the Big South Fork and its major tributaries. Substrate can vary from dense deep sands to cobble boulders that are well drained. Populations occur on boulder bars, boulder-cobble-sand bars, sand gravel bars, sand terraces adjacent to the river, and islands with gently sloping sand banks. High quality populations are annually scoured by spring flooding to preserve and restore open conditions. Annual floods also act as a disperser through the transport of viable plant fragments downstream. Common associates include green-headed coneflower (*Rudbeckia laciniata*), along with globally rare plants such as large-flowered Barbara's-buttons (*Marshallia grandiflora*) and Virginia spiraea (*Spiraea virginiana*) (NatureServe 2009).

Cumberland rosemary (*Conradina verticillata*).

As of 1996, 91 occurrences were believed to be extant across the range. Most occurrences are very small and isolated from others. Fewer than 4,000 total individuals were estimated at the known locations. This species' abundance and distribution has probably been reduced by dam construction and by water pollution from nearby coal mining. Habitat destruction due to intensive recreational use also poses a threat (NPS 2009j).

Virginia spirea (*Spiraea virginiana*)—Virginia spiraea is a clonal shrub that grows up to approximately 4 feet high. This species occurs along creek edges with margins of exposed rock and piled detritus, bars of gravel, rubble and/or boulders, and including dolomitic limestone. It occurs in alluvial silt collected within cracks in the bedrock. These sites experience a regime of periodic flooding. Elevations range from 850–1,420 feet (NatureServe 2009).

Virginia spiraea occurs along creek edges with margins of exposed rock and piled detritus, bars of gravel, rubble and/or boulders. It occurs in alluvial silt collected within cracks in the bedrock. These sites experience a regime of periodic flooding. Associated species include *Acer pensylvanicum*, *Alnus*, *Arisaema dracontium*, *Arundinaria gigantean*, *Conradina verticillata*, *Dica palustris*, *Ilex vertifillata*, *Juniperus verginiana*, *Liriodendron tulipfera*, *Orontium aquaticum*, *Osmunda regalis*, *O. cinnamomea*, *Phlow smoena*, *Sailx*, *Senecia aureus*, *Silen virginica*, *Spiraea japonica*, *Toxicodendron radicans*, *Trautvetteria*, *Tsuga*, *Ulmus*, and *Viburnum dentatum*.

Virginia spiraea is intrinsically threatened by its limited range and small number of populations, making it especially vulnerable to land-use conversion and habitat fragmentation. Populations are isolated, consisting of sterile clones, and damming of rivers has increased this isolation. Many sites are threatened by changes in hydrology by impoundment and by impact from recreation use (fishing and boating).

Roadside maintenance, beaver damage, deer browse, all-terrain vehicle users (ATVs), and upslope timbering are noted a potential threats. Exotic species (*Rosa multiflora*, *Elaeagnus umbellata*, *Ailanthus altissima*, *Spiraea japonica*, *Alliarai petiolata*, *Albizia julibrissin*, and *Polygonum cuspidatum*) are also a threat.

White fringeless orchid (*Platanthera integrilabia*)—White fringeless orchid is generally found in wet, flat, boggy areas at the head of streams or seepage slopes. The species is often found in association with *Sphagnum* species and *Osmunda cinnamonea*, *Woodwardia areolata*, and *Thelyptris novaboracensis*, in acidic muck or sand, and in partially shaded, but not fully shaded, areas. Populations of this species are associated with sandstones of the Appalachian Plateaus of Kentucky, Tennessee, and Alabama; the Coastal Plain of Alabama and Mississippi; the Blue Ridge Province of Georgia, North Carolina, and Tennessee; the Ridge and Valley Physiographic Province in Alabama; and the Piedmont of Georgia and South Carolina. White fringeless orchid is currently known from about 50 irregularly scattered occurrences in the southeastern U.S., primarily on the Cumberland Plateau of Tennessee and Kentucky. Many occurrences consist of fewer than 100 plants.

White fringeless orchid (*Platanthera integrilabia*).

Most surviving populations are not vigorous and exhibit very poor seed set and reproduction (reproduction is nearly exclusively sexual). The habitat where this species grows has often been drained or turned into farm ponds or hog lots or has experienced residential and commercial construction. Active management may be required to inhibit woody succession and prevent canopy closure at sites where the species is found; timber harvest must be carried out carefully to protect the species from damage. Development, canopy closure, improper timber harvest techniques, and invasive exotic plants remain threats (NPS 2009j).

Critical Habitat—Critical habitat rules were finalized in the Federal Register, August 31, 2004, 50 CFR 17. New River, Clear Fork and North White Oak, along with other tributaries and the main stem Big South Fork in the National Area are listed as designated Critical Habitat and should be afforded the protection under the new ruling, as applied by the USFWS. Within Big South Fork NRRA, critical habitat is designated for three federally listed mussels including the Cumberland elktoe mussel, oyster mussel, and the Cumberland combshell mussel. The primary constituent elements of critical habitat for all mussel species discussed herein consist of:

1. Permanent, flowing stream reaches with a flow regime (i.e., the magnitude, frequency, duration, and seasonality of discharge over time) necessary for normal behavior, growth, and survival of all life stages of the five mussels and their host fish;
2. Geomorphically stable stream and river channels and banks (structurally stable stream cross section);
3. Stable substrates, consisting of mud, sand, gravel, and/or cobble/boulder, with low amounts of fine sediments or attached filamentous algae;
4. Water quality (including temperature, turbidity, oxygen content, and other characteristics) necessary for the normal, behavior, growth, and survival of all life stages of the mussels and their host fish; and
5. Fish hosts with adequate living, foraging, and spawning areas for them.

All areas designated as critical habitat for the mussels are within the species' historic ranges and contain one or more of the physical or biological features (primary constituent elements) identified as essential for the conservation of these species (NPS 2009j).

OBED WILD AND SCENIC RIVER

The USFWS reports five federally listed species currently within the Obed WSR area: spotfin chub (*Erimonax monachus*), purple bean (*Villosa perpurpurea*), Cumberland bean, Cumberland rosemary, and Virginia spiraea (Widlak, pers. comm., 2009). In addition, the NPS lists the gray bat for Obed WSR (Blount, pers. comm., 2009a).

It is important to note that the Cumberland bean was not documented in a 2001 mussel survey (see "Wildlife and Wildlife Habitat" section for more details), and the NPS considers records of this species at Obed WSR questionable because they can only be separated from purple bean based on the color of the inside of the shell (Ahlstedt et al. 2001). Externally, both species look identical but internally, the Cumberland bean pearlymussel is white and the purple bean is purple. In addition, the Cumberland bean pearlymussel has never been documented in the Emory River drainage. Although Parmalee and Bogan (1998) report these species in the Obed WSR, recent conversations with Dr. Parmalee indicated that only the purple bean exists in the Obed WSR. In addition, although both species are federally listed, there is some question as to whether or not they are both valid species, or if they represent a single species (Ahlstedt et al. 2001).

Regardless, all of these species are considered in detail in this plan-EIS. Please see the Big South Fork NRRA "Special Status Species" for detailed descriptions of the Cumberland bean, gray bat, Cumberland rosemary, and Virginia spiraea. The other species found at Obed WSR are described below.

Fish

Spotfin Chub. This small chub's habitat includes cool and warm, typically clear, large creeks or medium-sized rivers of moderate gradient, in upland and mountain areas, generally in or near moderate and swift currents, over gravel to bedrock, and rarely over sand or silt (NatureServe 2009). Eggs are laid in stone cracks, crevices, or in the narrow interface of two touching rocks. Breeding sites can occur in moderate current of shallow portions of runs, in areas strewn with unsilted rubble and boulders (NatureServe 2009).

Mussels

Purple Bean. A freshwater mussel with a dark brown to black shell with numerous closely spaced fine green rays. Its habitat is creeks to medium-sized rivers and occasionally headwaters. The mussel is generally associated with riffles, but may be out of direct current and in pools or flats in streams with seasonal flows in riffles. It is not found in backwaters. Substrates range from silty–sand to boulder-sized rocks. Currents vary from fast to slight, and water depths are typically shallow (less than 2 feet) (NatureServe 2009).

Critical Habitat

The whole length of Obed WSR has been designated as critical habitat for spotfin chub (USFWS 2009c) and the purple bean is the only mussel species for which critical habitat has been designated in the park. The area in the park designated as critical habitat for the purple bean mussel is a stretch of the Obed River from the Emory River confluence to Adams Bridge (USFWS 2009d).

Primary constituent elements for the spotfin chub have not been identified, and those for the purple bean are the same as described for Big South Fork NRRA.

SPECIES OF SPECIAL CONCERN

NPS policy requires that state-listed species, and others identified as species of management concern by the park, are to be managed in parks in a manner similar to those that are federally listed. NPS is cooperating in the protection and enhancement of species of concern listed by the states (NPS 2005a).

BIG SOUTH FORK NATIONAL RIVER AND RECREATION AREA AND OBED WILD AND SCENIC RIVER

The Tennessee Division of Natural Areas and Kentucky State Nature Preserves Commission maintain county lists of rare species (Tennessee Division of Natural Areas 2007; Kentucky State Nature Preserves Commission 2009). The lists for the counties that encompass the park units were compared with species lists from the NPS (Stedman 2006; Scott 2007; Stephens et al. 2008; Britzke 2007; Schapansky, pers. comm., 2008a, 2008b, 2008c; NPS 2007b) to identify those that are known to occur in Big South Fork NRRA and Obed WSR (listed as “present in the park” on NPS lists). Based on this comparison, 68 state-listed species have been identified for consideration in this plan/EIS. In addition, some state sensitive species known to occur in the park units but not appearing on the county lists are also considered. Table 22 provides a summary of information regarding these species, including the park unit where they are known to occur, and a brief description of their habitat.

TABLE 22. STATE-LISTED SPECIES PRESENT IN BIG SOUTH FORK NATIONAL RIVER AND RECREATION AREA AND OBED WILD AND SCENIC RIVER

Species	Status[1]	Park Unit	Habitat description
Mammals			
Eastern Big-eared Bat *Corynorhinus rafinesquii*	TN – D KY - S	Both	Found in southeastern U.S. Roosts in caves, mines, buildings (TDEC 2009).
Gray Bat *Myotis grisescens*	TN – E KY – T Federal - E	Both	Found in southeastern U.S. Relies on a small number of caves to roost (<8) (TDEC 2009).
Eastern Small-footed Bat *Myotis leibii*	TN – D KY – T	Big South Fork NRRA	Found in eastern U.S. Opportunistic roosting in summer (under loose bark, buildings, hollow trees, crevices, etc.). Winters in caves (TDEC 2009).
Woodland Jumping Mouse *Napaeozapus insignis*	TN - D	Big South Fork NRRA	Prefers boreal spruce–fir and hemlock hardwood forests with thick underbrush. Large range with limited suitable habitat (TDEC 2009).
Eastern Woodrat *Neotoma magister*	TN - D	Both	Has a large habitat ranging from low wetlands and swamps to higher forested areas. Feeds primarily on plant material (TDEC 2009).
Smokey Shrew *Sorex fumeus*	TN - D	Both	Is a northern and mountain species with range that moves south into Appalachia (TDEC 2009).
American Black Bear *Ursus americanus*	KY - S	Big South Fork NRRA	Prefers mixed deciduous–coniferous forests with a thick understory (NatureServe 2009).

TABLE 22. STATE-LISTED SPECIES PRESENT IN BIG SOUTH FORK NATIONAL RIVER AND RECREATION AREA AND OBED WILD AND SCENIC RIVER

Species	Status[1]	Park Unit	Habitat description
Evening Bat *Nycticeius humeralis*	KY - S	Big South Fork NRRA	Prefers deciduous and mixed forest interspersed with cultivated areas. Commonly found along waterways (NatureServe 2009).
Birds			
Peregrine Falcon *Falco peregrinus*	TN - E	Obed WSR	Prefers to nest in cliffs. Large range covering much of western Canada and U.S. down through Central America to South America (TDEC 2009).
Bald Eagle *Haliaeetus leucocephalus*	TN-T	Both	Can live in numerous habitats. Prefers large rivers, lakes, and forests of mixed to uniquely conifer or hardwood (TDEC 2009).
Cerulean Warbler *Dendroica cerulea*	TN - D	Both	Inhabits deciduous forests throughout eastern U.S. Migrates through southern U.S. to South America. Breeding grounds are in north and central part of country (TDEC 2009).
Swainson's Warbler *Limnothlypis swainsonii*	TN - D	Both	Breeds in forests of southeastern U.S. Migratory bird that inhabits understory, hunts in leaf litter, and migrates to Central America and Caribbean (TDEC 2009).
American Coot *Fulica americana*	KY - E	Big South Fork NRRA	Inhabits freshwater lakes, ponds, marshes, and larger rivers; wintering is also on brackish estuaries and bays. Also on land bordering these habitats. Calm open water with plenty of algae and other aquatic vegetation (NatureServe 2009).
Dark-eyed Junco *Junco hyemalis*	KY - S	Big South Fork NRRA	Inhabits coniferous and deciduous forest, forest edge, clearings, bogs, open woodland, brushy areas adjacent to forest, and burned-over lands; in migration and winter, utilizes a variety of open woodland, brushy, and grassy habitats (NatureServe 2009).
Golden-winged Warbler *Vermivora chrysoptera*	KY - T	Big South Fork NRRA	Inhabits deciduous woodland, usually in dry uplands or areas of thick undergrowth in swampy areas; woodland edge with low cover; hillside scrub; overgrown pastures; abandoned farmland; power line right-of-ways; recently logged sites; bogs; forest openings; and in territories usually having patches of herbs and shrubs, sparse tree cover, and a wooded perimeter (NatureServe 2009).
Great Blue Heron *Ardea herodias*	KY - S	Big South Fork NRRA	In freshwater and brackish marshes, along lakes, rivers, bays, lagoons, ocean beaches, mangroves, fields, and meadows. Nests commonly high in trees in swamps and forested areas, less commonly in bushes, or on ground, rock ledges, and coastal cliffs. Often nests with other herons (NatureServe 2009).
Savannah Sparrow *Passerculus sandwichensis*	KY - S	Big South Fork NRRA	Prefers habitat with short to intermediate vegetation height, intermediate vegetation density, and a well developed litter layer. These preferred habitats cover a wide range of vegetation types, including alpine and arctic tundra, coastal salt marshes, sedge bogs, grassy meadows, and native prairie (NatureServe 2009).
Sharp-shinned Hawk *Accipiter striatus*	KY - S TN - D	Both	Found in forest and open woodland, coniferous, mixed, or deciduous, primarily in coniferous in more northern and mountainous portion of range (NatureServe 2009).

TABLE 22. STATE-LISTED SPECIES PRESENT IN BIG SOUTH FORK NATIONAL RIVER AND RECREATION AREA AND OBED WILD AND SCENIC RIVER

Species	Status[1]	Park Unit	Habitat description
Reptiles			
Southeastern Five-lined Skink *Eumeces inexpectatus*	KY - S	Big South Fork NRRA	These skinks often are under or in ground litter, logs, piles of wood, or stumps, which appear to be important elements of the habitat (NatureServe 2009).
Amphibians			
Green Salamander *Aneides aeneus*	TN - D	Both	Found in damp (but not wet) crevices in shaded rock outcrops and ledges. Also found beneath loose bark and in cracks of standing or fallen trees (e.g., in cove hardwoods), and sometimes in or under logs on the ground (NatureServe 2009).
Black Mountain Dusky Salamander *Desmognathus welteri*	TN - D	Both	Is highly aquatic; found in streams and springs in wooded parts of range (TDEC 2009).
Invertebrates			
Cumberland Bean Pearly Mussel *Villosa trabalis*	Federal –E TN-E KY-E	Big South Fork NRRA	Has a limited range in Virginia, Kentucky, N. Carolina, Alabama, Georgia, and Tennessee. Found in water less than 3 ft in swift moving currents and sandy/gravel substrate (TDEC 2009).
Tan Riffleshell *Epioblasma florentina walkeri*	Federal-E, h TN-E KY-E	Big South Fork NRRA	Occurs in a substrate of course gravel sand, gravel, and some silt in current, and in less than 3 feet of water (Parmalee and Bogan 1998).
Little-winged Pearly Mussel *Pegias fabula*	Federal-E TN-E KY-E	Big South Fork NRRA	Prefers cool, clear tributary streams with high gradients and swift currents. Inhabits the Cumberland Plateau and is thought to exist in only a handful of stream reaches (TDEC 2009).
Cumberlandian Combshell *Epioblasma brevidens*	Federal-E TN-E KY-E	Big South Fork NRRA	Occurs in Virginia, Mississippi, Kentucky, Tennessee, and Alabama, in streams with coarse gravel or gravel substrate (TDEC 2009).
Clubshell *Pleurobema clava*	Federal-E, h TN-E KY-E	Big South Fork NRRA	Occurs in medium-sized and large rivers at depths of 15 to 18 feet on a firm substrate of sand and gravel (Parmalee and Bogan 1998).
Cumberland Elktoe *Alasmidonta atropurpurea*	Federal-E TN-E KY-E	Big South Fork NRRA	Occurs only in Kentucky and Tennessee. Prefers fine substrates and more slow moving current, usually in smaller streams (TDEC 2009).
Dromedary Pearly mussel *Dromus dromas*	Federal-E, h TN-E KY-X	Big South Fork NRRA	An inhabitant of shoals and riffles, it has been collected in a gravel and sand substrate in about 3 feet of water (Parmalee and Bogan 1998).
Oyster Mussel *Epioblasma capsaeformis*	Federal-E, h TN-E KY-E	Big South Fork NRRA	Usually found in shallow riffles in fast water less than 3 feet in depth in a gravel and sand substrate (Parmalee and Bogan 1998).
Fluted Kidneyshell *Ptychobranchus subtentum*	Federal-C KY-S	Big South Fork NRRA	Primarily a stream and small river species, inhabiting a sand or sand and gravel substrate in riffles with fast current, usually at depths of 2 feet or less (Parmalee and Bogan 1998).

TABLE 22. STATE-LISTED SPECIES PRESENT IN BIG SOUTH FORK NATIONAL RIVER AND RECREATION AREA AND OBED WILD AND SCENIC RIVER

Species	Status[1]	Park Unit	Habitat description
Spectaclecase *Cumberlandia monodonta*	Federal-C TN-E KY-E	Big South Fork NRRA	Found in medium to large rivers, in substrates from mud and sand to gravel, cobble, and boulders (TDEC 2009).
Fish			
Olive Darter *Percina squamata*	TN – D KY – E	Both	Occurs in upland rivers in Blue Mountain and Cumberland Plateau regions of Tennessee, and Cumberland River drainage. Occupies streams with steep gradients and fast moving water over boulders and bedrock (Etnier and Starnes 1993).
Ashy Darter *Etheostoma cinereum*	TN – T KY - S	Both	Has a fragmented range of silt-free streams and slow pool edges around rubble and boulders in the Cumberland, Duck, and Tennessee river basins (Etnier and Starnes 1993).
Emerald Darter *Etheostoma baileyi*	TN - D	Big South Fork NRRA	Found in rocky pools and sometimes riffles of Upper Kentucky and Cumberland river drainages (Etnier and Starnes 1993).
Spotfin Chub *Erimonax monachus*	Federal-T h TN-T	Obed WSR	Occurs within the four river systems in Tennessee River. Inhabits clear water over gravel in mid-sized rivers with moderate current (Etnier and Starnes 1993).
Arrow Darter *Etheostoma sagitta*	TN - D	Big South Fork NRRA	Prefers shallow, cool pools and slow to moderate current runs in intermittent streams (Etnier and Starnes 1993).
Tippecanoe Darter *Etheostoma tippecanoe*	TN - D	Big South Fork NRRA	Found in warm, clear larger rivers with gravel substrate (Etnier and Starnes 1993).
Blackside Dace *Phoxinus cumberlandensis*	TN - T KY - T	Big South Fork NRRA	Inhabits small, clear, cool woodland streams over sandstone, shale, or sand substrates in Upper Cumberland River drainage in Kentucky and Tennessee (Etnier and Starnes 1993).
Duskytail Darter *Etheostoma percnurum*	KY - E	Big South Fork NRRA	Inhabits large streams to moderately large rivers. Occurs in gently flowing pools, generally in the vicinity of riffles, with substrate of large rocks strewn over bedrock or sand and gravel (Etnier and Starnes 1993).
Mountain Brook Lamprey *Ichthyomyzon greeleyi*	KY - T	Big South Fork NRRA	Inhabits small upland rivers and creeks with gravel substrate (Etnier and Starnes 1993).
Plants			
Climbing Fumitory *Adlumia fungosa*	TN - T	Obed WSR	Found in moist coves, rocky woods, ledges, alluvial slopes, and thickets (Flora of North America n.d.).
Roundleaf Shadbush *Amelanchier sanguinea*	TN - T	Both	Found in upland shrub of hillsides, upland woods, and rocky slopes (Native Plant Information Network n.d.).
Lucy Braun's White Snakeroot *Ageratina luciae-brauniae*	TN - T	Big South Fork NRRA	Occurs in sandy floors of sandstone rockhouses of the Cumberland Plateau, particularly where water seeps or drips (NatureServe 2009).
Spreading False-foxglove *Aureolaria patula*	TN - T	Big South Fork NRRA	Found on steep limestone bluffs in the shade of rather open stands of mixed hardwoods (root parasitic on oaks) (NatureServe 2009).

TABLE 22. STATE-LISTED SPECIES PRESENT IN BIG SOUTH FORK NATIONAL RIVER AND RECREATION AREA AND OBED WILD AND SCENIC RIVER

Species	Status[1]	Park Unit	Habitat description
American Barberry *Berberis canadensis*	TN - S	Both	Occurs in open woods, on bluffs and cliffs, and along river banks in the eastern and central United States. Formerly an inhabitant of savannas and open woodlands, fire suppression has significantly restricted its habitat to sites with shallow soil (such as glades and cliffs) or areas with mowing or other canopy-clearing activities (such as power line corridors, railroad/road right-of-ways, and riverbanks) (NatureServe 2009).
Cumberland Sandgrass *Calamovilfa arcuata*	TN - E	Both	Occurs in open areas along rocky stream banks or stream beds, intermittent rocky drainage areas among large rocks, and areas showing evidence of natural disturbance due to water flow (Center for Plant Conservation 2007).
Round Leaf Watercress *Cardamine rotundifolia*	TN - S	Big South Fork NRRA	Found along springs, brooks, and wet forested spots (Natural History of North America 2009).
American chestnut *Castanea dentata*	TN - S	Big South Fork NRRA	Occurs in Mesic to Dry Forest and flowers from June to July (TDEC 2008b).
Green and Gold *Chrysogonum virginianum*	TN - T	Big South Fork NRRA	Performs best in moist, well-drained soil, under partial or full shade. This plant is tolerant to a wide range of well-drained soils, and may develop successfully in richly organic soils. It is also tolerant to lighting conditions, although partial or full shade is vital in southern regions (Cornell University 2009).
Sweet Fern *Comptonia peregrina*	TN - E	Big South Fork NRRA	Grows in dry, sterile, sandy to rocky soils in pinelands or pine barrens, clearings, or edges of woodlots (Flora of North America n.d.).
Cumberland Rosemary *Conradina verticillata*	Federal-T TN – T	Both	Restricted to boulder/cobble/gravel-bars, sand bars and islands, sandy river banks, floodplains in river gorges, and similar sunny riparian areas where seasonal flooding minimizes competition (by keeping out less well-adapted competitors) and creates new gravel-bar habitats for colonization (NatureServe 2009).
Plukenet's Flatsedge *Cyperus plukenetii*	TN - S	Big South Fork NRRA	Occurs in Sandy Barrens and flowers from July through October (TDEC 2008b).
Pink Lady's Slipper *Cypripedium acaule*	TN - E	Both	Occurs in dry to wet forests, bogs, brushy barrens, heath, and roadsides on highly acidic soil (Flora of North America n.d.).
Southern Lady's Slipper *Cypripedium kentuckiense*	TN - E	Big South Fork NRRA	Found in mesic, shaded areas in mature floodplain forests, near streams and creeks and in ravines. Also associated with woodland acid spring seeps and with forested limestone seeps adjacent to bayheads (NatureServe 2009).
Needleleaf Rosette Grass *Dichanthelium aciculare*	TN - E	Big South Fork NRRA	Occurs in Sandy Pinewoods and Barrens and flowers from May to October (TDEC 2008b).
Spinulose Shield-fern *Dryopteris carthusiana*	TN - T	Big South Fork NRRA	Found in bogs. Sporulation occurs from June to September (TDEC 2008b).

TABLE 22. STATE-LISTED SPECIES PRESENT IN BIG SOUTH FORK NATIONAL RIVER AND RECREATION AREA AND OBED WILD AND SCENIC RIVER

Species	Status[1]	Park Unit	Habitat description
Tawny Cotton-grass *Eriophorum virginicum*	TN - E	Both	Found in bogs and meadows (Flora of North America n.d.).
Rockcastle Aster *Eurybia saxicastellii*	TN - E	Both	Found in sandstone boulder-cobble river bars that are spring-flooded and summer-dry (NatureServe 2009).
Mountain Witch Alder *Fothergilla major*	TN - T	Both	Found in dry ridgetop forests of middle elevation ridges in the mountains, especially along the Blue Ridge Escarpment, summits, and upper slopes of Piedmont monadnocks, and north-facing bluffs in the lower Piedmont (NatureServe 2009).
Lesser Rattlesnake Plantain *Goodyera repens*	TN - S	Big South Fork NRRA	Found in moist conifer/rhododeron woods. Flowers from June to August (TDEC 2008b).
Rough Hawkweed *Hieracium scabrum*	TN - T	Both	Occurs in sandy soils, open, disturbed sites (fields, stream sides), and wooded sites (Flora of North America n.d.).
Goldenseal *Hydrastis canadensis*	TN - S	Both	Grows best in rich, mesic hardwood forest, especially those underlain by limestone or alkaline soils (NatureServe 2009).
American marshpennywort *Hydrocotyle americana*	TN - E	Big South Fork NRRA	Occurs in wet soils and pools. Flowers in June and July (TDEC 2008b).
Butternut *Juglans cinerea*	TN - T	Both	Grows in rich mesophytic forests, lower slopes, ravines, and various types of bottomland, including banks and terraces of creeks and streams, and floodplain forests (NatureServe 2009).
Marsh Peavine *Lathyrus palustris*	TN - S	Big South Fork NRRA	Occurs in wet woods and Marshes. Flowers May through June (TDEC 2008b).
Whorled Yellow Loosestrife *Lysimachia quadrifolia*	TN - S	Big South Fork NRRA	Occurs in Spring runs and fens. Flowers June through August (TDEC 2008b).
Large-flowered Barbara's-buttons *Marshallia grandiflora*	TN - E	Both	Grows in rocky lake shores, creek banks, bluffs, and floodplains. It tends to occur in moist to wet sandy soil, in sandy/cobbly alluvium, or in bedrock crevices along rivers (NatureServe 2009).
Cumberland stitchwort *Minuartia cumberlandensis*	Federal-T TN - E	Big South Fork NRRA	Occurs in rockhouses. Flowers July through September (TDEC 2008b).
Sweet Pinesap *Monotropsis odorata*	TN - T	Big South Fork NRRA	Grows in pine woodlands of the southeastern U.S., mostly in the Appalachian Mountains (Botanical Society of America 2009).
American Ginseng *Panax quinquefolius*	TN - S	Both	Primarily occurs in rich, cool, moist, but not extremely wet woods, under a closed canopy (NatureServe 2009).
Long Beechfern *Phegopteris connectilis*	TN - S	Big South Fork NRRA	Occurs in mountain bogs and rocky seeps. Sporulation in June and August (TDEC 2008b).

TABLE 22. STATE-LISTED SPECIES PRESENT IN BIG SOUTH FORK NATIONAL RIVER AND RECREATION AREA AND OBED WILD AND SCENIC RIVER

Species	Status[1]	Park Unit	Habitat description
White Fringeless Orchid *Platanthera integrilabia*	Federal-C TN – E	Big South Fork NRRA	Generally found in wet, flat, boggy areas at the head of streams or seepage slopes (NatureServe 2009).
Palegreen Orchid *Platanthera flava var. herbiola*	TN - T	Big South Fork NRRA	Occurs in swamps and floodplains. Flowers May through June (TDEC 2008b).
Tennessee Pondweed *Potamogeton tennesseensis*	TN – T	Both	Found in streams, ponds, and shallows of rivers (NatureServe 2009).
Virginia Spiraea *Spiraea virginiana*	Federal-T TN – E	Both	This species occurs along creek edges with margins of exposed rock and piled detritus, bars of gravel, rubble, and/or boulders, and including dolomitic limestone. It occurs in alluvial silt collected within cracks in the bedrock. These sites experience a regime of periodic flooding. Elevations range from 850 to 1,420 feet (NatureServe 2009).
Pinelands Dropseed *Sporobolus junceus*	TN - S	Obed WSR	Found in openings in pine and hardwood forests, usually in sandy to loamy soils (Utah State University Herbarium n.d.).
Wofford's featherbells *Stenanthium diffusum*	TN – E	Big South Fork NRRA	Occurs in rockhouses. Flowers September and October (TDEC 2008b).
American Yew *Taxus canadensis*	TN - E	Big South Fork NRRA	Found in understory shrub in rich forests (deciduous, mixed, or coniferous), bogs, swamps, gorges, ravine slopes, and rocky banks (Flora of North America n.d.).
Roundleaf Fameflower *Talinum teretifolium*	TN - T	Big South Fork NRRA	Found on rock outcrops (NatureServe 2009).
Menges' Fameflower *Talinum mengesii*	TN - T	Obed WSR	Found in woods, glades, barrens, cliffs, outcrops, rocky banks, sandstone, granite, gneiss, and rarely on limestone at 100-1,000 meters elevation. Flowering occurs from April to October (Flora of North America n.d.).
Northern White Cedar *Thuja occidentalis*	TN - S	Big South Fork NRRA	Occurs mostly on calcareous substrates, neutral to basic swamps, shores of lakes and rivers, uplands, cliffs, and talus (Flora of North America n.d.).
Bristle-fern *Trichomanes boschianum*	TN - T	Big South Fork NRRA	Found in deeply sheltered grottoes on noncalcareous rocks (Flora of North America n.d.).
Zig-zag Bladderwort *Utricularia subulata*	TN - T	Obed WSR	Inhabits acidic wet sand and bogs (Penskar and Higman 1999).
Sand Grape, Rock Grape *Vitis rupestris*	TN - E	Big South Fork NRRA	Occurs in sandy rocky riverbanks. Flowers May through June (TDEC 2008b).

[1]Status: E, Endangered; T, Threatened; S, Special Concern; h, Historic; D, Deemed in need of management; X, Extirpated. Note that where "T" occurs with "h," this indicates that the species is still threatened throughout their range, and that they have historically been identified within the park but are not known to occur there today.

SOUNDSCAPES

According to NPS, a soundscape is defined to be the “total acoustic environment of an area,” which includes both natural and human sounds (NPS 2009b). According to section 4.9 of NPS *Management Policies 2006*, the natural soundscape of a park refers to the combination of all of the natural sounds occurring within the park, absent the human-induced sounds, as well as the physical capacity for transmitting those natural sounds (NPS 2006c). Natural sounds may range from bird calls, insect chirps, and bats to sounds produced by physical processes like wind rushing through leaves on trees, thunder, and rushing and falling water through rivers, creeks, and streams within a park. In a survey conducted in 1998 in which people were asked to define the most important reasons for having national parks, 72% indicated that parks provide opportunities to experience natural peace and the sounds of nature. Further, visitor preference studies identified birds, animals, wind, and water as very pleasing sounds (NPS 2009b).

Unnatural and unwanted sounds in a national park setting, hereafter referred to as “noise,” are intrusive, human-made sounds, whose degree of disturbance is highly dependent upon the particular situation and location. Individuals tend to judge the annoyance of noise relative to the natural sounds (i.e., without the intruding noise source) and to the activities occurring where the noise is heard. For example, if regions of the park are dedicated to enjoying the tranquility and serenity of the natural environment, sounds from motor boating and hunting would be distracting to the visitor experience. However, if these activities are consistent with the purpose of a particular zone of the park, these sounds would be considered appropriate. Therefore, noise is a subjective term, and it is important to characterize the activities essential to the park’s purpose (NPS 2000).

In addition to its effect on humans, noise can adversely affect wildlife communities within parks by interrupting important communication networks for survival and reproduction between insects, birds, and mammals. For example, certain wildlife communications may signify mating calls, danger from predators, and territorial claims (NPS 2009b).

The magnitude of noise is usually described by its sound pressure. Since the range of sound pressure varies greatly, a logarithmic scale is used to relate sound pressures to some common reference level, usually the decibel. Sound pressures described in decibels are called sound pressure levels and are often defined in terms of frequency-weighted scales (A, B, C, or D).

The A-weighted decibel scale is commonly used to describe noise levels because it reflects the frequency range to which the human ear is most sensitive (1,000–6,000 Hertz). Sound levels measured using an A-weighted decibel scale are generally expressed as dBA. Throughout this section, all noise levels are expressed in dBA. Several examples of sound pressure levels in the dBA scale are listed in table 23, while table 24 presents examples of sound pressure levels measured in national parks.

TABLE 23. EXAMPLES OF COMMON SOUNDS: A-WEIGHTED SOUND LEVEL IN DECIBELS (DBA)

A-weighted	Overall Level	Noise Environment
120	Uncomfortably loud (32 times as loud as 70 dBA)	Military jet airplane takeoff at 50 feet.
100	Very loud (8 times as loud as 70 dBA)	Jet flyover at 1,000 feet. Locomotive pass-by at 100 feet.
80	Loud (2 times as loud as 70 dBA)	Propeller plane flyover at 1,000 feet. Diesel truck 40 mph at 50 feet.
70	Moderately loud	Freeway at 50 feet from pavement edge at 10 AM. Vacuum cleaner (indoor).
60	Relatively quiet (1/2 times as loud as 70 dBA)	Air condition unit at 100 feet. Dishwasher at 10 feet (indoor).
50	Quiet (1/4 times as loud as 70 dBA)	Large transformers. Small private office (indoor).
40	Very quiet (1/8 times as loud as 70 dBA)	Birds calls. Lowest limit of urban ambient sound.
10	Extremely quiet (1/64 times as loud as 70 dBA)	Just audible.
0		Threshold of hearing.

Source: Federal Interagency Committee on Noise 1992 (Modified by The Louis Berger Group, Inc., 2009).

TABLE 24. SOUND PRESSURE LEVELS MEASURED IN NATIONAL PARKS

Sound	dBA[a]
Threshold of human hearing	0
Haleakala NP: Volcano crater	10
Canyonlands NP: Leaves rustling	20
Zion NP: Crickets (less than 20 feet)	40
Whitman Mission: Conversational speech (less than 20 feet)	60
Yellowstone NP: Snowcoach (approximately 100 feet)	80
Arches NP: Thunder	100
Yukon-Charley Rivers NP: Military jet (approximately 330 feet above ground level)	120

Source: NPS 2003c.

[a]dBA = A-weighted sound level in decibels.

SOUNDSCAPES AND SOURCES OF NOISE AT THE PARKS

Big South Fork National River and Recreation Area

Sources of noise that affect the existing soundscape at Big South Fork NRRA include vehicular traffic, including off-highway vehicle use; construction and maintenance of park roads; oil and gas operations within and adjacent to park; visitor uses such as hunting; logging and timber harvesting; industrial activities such as manufacturing, sawmills, and coal mining; and agricultural activities in the area around the park (NPS 2006c). Vehicular access within the gorge section of the park is limited to 11 river accesses to keep noise pollution and other environmental impacts at a minimum. No off-highway vehicle use or mineral extraction is allowed in these areas. Nonetheless, the soundscape in the gorge is impacted by activities in adjacent areas. For example, tourist activities and oil and gas extraction near Honey Creek on the plateau affect the soundscapes of the gorge below (Blount, pers. comm., 2007).

Obed Wild and Scenic River

The narrow land base of Obed WSR allows for the sounds of civilization to intrude in many places. The close proximity to county roadways makes traffic flow one of the sources of noise at this park unit. Although oil and gas operations occur around the Obed WSR, the noise is masked by that associated with traffic flow. Equipment used at active oil wells is barely audible until one is within sight of the wellpad; however, the majority of tourists do not visit these areas. Further, rushing water in the gorge area is the primary source of sound, making it one of the more peaceful places in the park unit (Schapansky, pers. comm., 2009).

Existing Sound Levels

The natural soundscapes of Big South Fork NRRA and the Obed WSR have not been studied and characterized by sound level measurements in the past. Since there are currently no available data for these park units, determining similarities between them and a park with a similar geologic setting where noise measurements have been conducted allows for drawing conclusions about the existing soundscapes of Big South Fork NRRA and the Obed WSR.

In order to formulate a comparison between park units, it is important to understand the many factors that influence the acoustic condition of a park. Some of these factors include the vegetation type, topography, climatic conditions, and biotic factors (i.e., biological sounds from unique bird populations, insect noise, etc.). Although all of these factors are relevant, the two most significant factors that may be used to determine the acoustic similarity between two park units, when no other data is available, are the dominant vegetation type and topography.

Data was recently collected (winter 2005 and summer 2006) at Great Smoky Mountains National Park. Great Smoky Mountains National Park is located approximately 125 miles from Big South Fork NRRA and the Obed WSR, also in the southern Appalachians. Based on a discussion with park staff at Big South Fork NRRA and the Obed WSR, as well as the NPS Natural Sounds Program, the vegetation types and the vastly changing rugged terrain that characterize the Great Smoky Mountains National Park are relatively similar to the vegetation and topography of Big South Fork NRRA and the Obed WSR. For example, sound level measurements within the Great Smoky Mountains National Park were conducted in vegetation zones including mixed forest type, open field grass/pasture, cove hardwood, hardwood/ deciduous, hardwood, northern hardwood and spruce evergreen. Measurements were conducted at varying elevations as well. Similarly, Big South Fork NRRA contains hardwood deciduous and mixed deciduous but also contains hardwood mixed with pine, which differs from the Great Smoky Mountains National Park vegetation zones. Also, Big South Fork NRRA does not contain any spruce forest types, and it must be noted that the density of the trees in Big South Fork NRRA may be less than that of the Great Smoky Mountains National Park due to early to mid-20th century logging. However, the density issue is mainly confined to the understory and should not substantially affect the comparison to the Great Smoky Mountains National Park data. The vegetation in the Obed WSR includes hemlock ravines near the rivers and white and Virginia pines. In terms of topography, both Big South Fork NRRA and the

Obed WSR contain vast rugged terrain and scenic bluffs due to the gorge area cut by the rivers that flow through the park units.

Although the vegetation types and topographical features of Big South Fork NRRA and the Obed WSR are relatively similar to the Great Smoky Mountains National Park, it is important to note that differences in vegetation and topography between the park units can affect the sound propagation differently. In general, vegetative cover affects the transmission of sound by reflecting and absorbing energy. Tree trunks, branches, and foliage partially scatter acoustic energy, and the frequencies that are scattered or absorbed are dependent upon the size of the tree trunks as well as the leaf area and cross-section (Bucur 2006). Thus, vegetation type is also relevant. Additionally, the density of trees and shrubs can affect sound transmission. It has been noted that a dense stand of trees and shrubs at least 16 feet wide is necessary to alter sound transmission (Anderson et al. 1984). Less dense regions of vegetation may allow for lesser amounts of attenuation. Along with vegetative effects on sound propagation, topographical features such as hills and valleys, as well as surface materials, may influence sound propagation. For example, acoustic energy may become diffracted (or “bent”) at obstacles such as hills, thus changing the propagation of the sound wave. Further, soft forest soils or soft ground in open fields are good absorbers of acoustic energy, whereas water and rocky surfaces reflect acoustic energy.

Since the Great Smoky Mountains National Park data is the best available, and the vegetation types and topography are similar enough to make comparisons to Big South Fork NRRA and the Obed WSR, it has been used in this analysis to characterize the soundscapes of these park units. The Great Smoky Mountains National Park data was collected during the winter of 2005 and the summer of 2006 for a daytime (7:00 AM to 7:00 PM) and nighttime (7:00 PM to 7:00 AM) period. Several noise metrics were measured that facilitate the characterization of the soundscape; however, impact assessment is based on comparisons against the natural ambient levels since the NPS is required to protect the natural experience. Natural ambient levels represent the natural environment absent human sounds, and may be well estimated based on the L90 metric. The L90 metric represents the level exceeded 90% of the time.

During the winter of 2005, the daytime L90 levels in the Great Smoky Mountains National Park ranged between 26.3 and 32.2 dBA in the mixed forest, open field grass/pasture, various hardwood, and spruce/evergreen vegetation zones for varying elevations. Nighttime L90 levels ranged between 24.4 and 32.9 dBA (NPS 2009c). Similarly, during the summer of 2006, the daytime L90 ranged between 24.9 and 39.0 dBA, while the nighttime L90 ranged between 21.6 and 42.6 dBA. It is expected that the natural ambient noise levels in Big South Fork NRRA and the Obed WSR would cover similar wintertime and summertime ranges (NPS 2009d).

CULTURAL RESOURCES

In order to understand the archeological resources, historic structures, cultural landscapes, and ethnographic resources at both Big South Fork NRRA and Obed WSR, the prehistoric context and historic cultural context of the Cumberland Plateau is described below.

PREHISTORIC CULTURAL CONTEXT OF THE CUMBERLAND PLATEAU

The prehistory of the Cumberland Plateau is divided into the PaleoIndian period, Archaic period, Woodland period, and the late prehistoric or Mississippian period. Site types for these prehistoric occupants of the Cumberland Plateau range from lithic (stone flake) scatters to prehistorically occupied rockshelters. Table 25 summarizes the time frames and characteristics of each period.

TABLE 25. PREHISTORIC CULTURAL TIMELINE OF CUMBERLAND PLATEAU

Cultural Period	Sub-period	Dates	Characteristics
PaleoIndian		10,000–8000 BC	Exemplified by the use of large distinct projectile (spear) point types used to hunt herding animals and megafauna; nomadic hunters and gatherers migrating through the area subsisting on the abundant game and plant life of the region.
Archaic	Early	8000–6000 BC	Diversified subsistence strategy based on maximizing local resources set the prehistoric seasonal life cycle for the next 9000 years; including hunting smaller game, gathering plant food, and fishing; inhabited rockshelters as well as riverine base camps.
	Middle	6000–4000 BC	Widespread introduction of groundstone tools, adzes (axe-like tool), axes, bannerstones, and pendants; projectile points were probably used in conjunction with spears & darts and a throwing stick known as the atlatl; variety of bone tools; increased group size and/or longer periods of seasonal occupation.
	Late	4000–1000 BC	Emergence of cultivated plants, suggesting the development of early plant domestication; seasonal patterns of hunting, fishing, and plant food processing practices; increase in population, and possibly extended habitation.
Woodland	Early	1000–200 BC	Use of smaller projectile points suggest invention & use of Bow & Arrow. Invention of and early pottery styles reveal that occupation of rockshelter sites increase in the Big South Fork area at this time.
	Middle	200 BC–AD 600	Continuation of hunting and gathering with the use of cord-marked or fabric-marked pottery and plain and check-stamped–limestone-tempered pottery. Primary occupation is still in the rockshelters
	Late	AD 600–1000	Horticulture and village settlement have not been identified in the region of Big South Fork NRRA and Obed WSR.
Late Prehistoric		AD 900–1600	Mississippian cultural groups characterized by shell-tempered ceramics, platform mounds, sustainable agriculture, densely populated settings, and complex political hierarchies exist in the large river bottoms but not in the Big South Fork. Pottery from this period provides evidence for seasonal forays onto the Cumberland Plateau to supplement corn, bean, squash agriculture.

Sources: Chapman 1975; Cohen 1977; Dragoo 1976; Jennings 1989; Kerr 1998; McNutt and Lumb 1987; Willey 1966; Wilson and Finch 1980; Des Jean 1994.

HISTORIC CULTURAL CONTEXT OF THE CUMBERLAND PLATEAU

Historic Period

The late 1700s and 1800s saw the introduction of European people to the area. Hunting and agriculture drew small settlements to the area. The rugged landscape and nature of the region kept it from becoming heavily populated. The first Euro-American fur trappers or “long hunters” arrived in the region in the late 1700s, and camps were established at “Station Camp Creek” near the modern Charit Creek Lodge. By 1780, the Big South Fork and its tributaries were being actively hunted and explored. By 1800, there were several permanent homesteads in the area. The early settlements were limited to the river and streams where small sections of fertile land could be found. Small farms and communities sprang up along the Upper Cumberland Plateau and the river bottom areas of the Big South Fork of the Cumberland River (NPS 2008b).

During the early 1800s pioneers began developing sodium chloride salt production in the region. One of the early salt production areas, the Beatty Saltworks, was established near “Salt Town” sometime after 1813. The saltworks operated until approximately 1840. In 1818, under a lease from Martin Beatty, Marcus Huling and Andrew Zimmerman were drilling to obtain brine water for salt production. Instead of salt water, the well began producing 100 barrels of oil per day. This quantity of oil was sufficient to ruin the well as a source of salt water. Huling and Zimmerman began collecting this viscous oil into casks that they carried out and sold to local merchants and even sent as much as 2,000 gallons to European markets. This well and the site became the country’s first commercial oil well (Jillison 1952; Fiege11988; Commonwealth of Kentucky House Resolution #78, 1970; Argus of Western America 1818; Shepard 1988).

Saltpeter, potassium nitrate, was also being produced in the rockshelters of the area during the early through mid-19th century. This essential ingredient of gunpowder was found here and exploited by cottage industries. After the Civil War, however, cheaper sources and a drop in demand effectively ended this industry. Rebuilding and expansion after the war created a need for timber and coal and exploitation of those resources intensified (NPS 2008b; Des Jean 1997).

Coal mines such as the Blue Heron, or Mine 18, owned by the Stearns Coal and Lumber Company operated from 1937 through 1962. When the Stearns Coal and Lumber Company abandoned Blue Heron in 1962, the town was abandoned and the buildings were raised and relocated or collapsed due to neglect and decay (NPS 2008b).

The post-World War II era experienced a departure of young men as they returned from the war and were lured away by the promise of a better, more productive life elsewhere (NPS 2008b).

ARCHEOLOGICAL RESOURCES

Archeological resources consist of “any material or physical evidence of past human life or activities which are of archeological interest, including the record of the effects of human activities on the environment. They are capable of revealing scientific or humanistic information through archeological research” (NPS 2006c).

Big South Fork National River and Recreation Area

The Big South Fork NRRA is located in the Cumberland Plateau along the Kentucky–Tennessee border. The Cumberland Plateau has been occupied by humans for approximately 12,000 years and contains a rich and diversified cultural context.

The Big South Fork NRRA is considered by some to be the most important archeological location in the Southeast Region of the NPS. The Big South Fork NRRA contains approximately 1,350 documented archeological sites, which may possibly represent only 40% of the estimated total for the park unit. Between 1996 and 2001, 249 new culturally associated rockshelters were recorded by Middle Tennessee State University (Smith and Des Jean 2008). These rockshelter occupations date from PaleoIndain through to the Mississippian periods (10,000 BC - AD 1400) to the modern Historic Period (AD 1900-1974).

Archeological resources at the Big South NRRA consist of locations chosen by prehistoric hunter-gatherers and include limited use and seasonal hunting camps, rockshelters, semi-sedentary open campsites, and small hunting camps. Archeological sites created by historic occupations include 19th century farms and communities, moonshine-still operation sites, niter mined rockshelter sites, salt manufacturing locations, and coal mines and "coal camps," timber production sites, and contemporary farms (NPS 2009e).

Historic moonshine-still operation site.

Obed Wild and Scenic River

Obed WSR is located approximately 20 miles south of the Big South Fork NRRA in Tennessee (refer to figure 1 in chapter 1). The Obed WSR area contains a diverse and long cultural history dating back to the PaleoIndian period 12,000 years ago. Native Americans continuously occupied the Obed WSR region, hunting and gathering food along its banks. More than 200 rockshelters have been recorded within the Obed WSR boundaries, and 10 of these have been assessed as significant archeological sites possibly eligible for inclusion into the National Register of Historic Places (national register).

According to Thompson (1979), numerous archeological resources exist in the vicinity of the Obed WSR. These resources exist mostly in the form of rockshelters, prehistoric open camps, historic hunting camps, gristmills, moonshine still sites, subsistence farms, timber production sites, coal mines, and segments of historic railroad grade (NPS 2004b).

Artifacts within the Obed WSR consist of projectile (dart and arrow) points, lithic (stone) scrapers, faunal remains plain or cord-marked ceramics, lithic flakes, and ruins of structures (Thompson 1979). Based on physiographic features and archeological investigations conducted at nearby Big South Fork NRRA, an estimated 340 rockshelters may exist within the congressionally approved boundary of Obed WSR (NPS 2004b).

Historic structure at Big South Fork NRRA.

HISTORIC STRUCTURES AND RESOURCES

The NPS defines historic structures as "a constructed work, usually immovable by nature or design, consciously created to serve some human activity." Examples are buildings of various kinds, monuments, dams, roads, railroad tracks, canals, millraces, bridges, tunnels, locomotives, nautical vessels, stockades, forts and associated earthworks, ruins, fences, and outdoor sculpture. In the national register context of Big South Fork NRRA and Obed WSR, a historic structure is any structure constructed by or utilized by humans during the post-contact era.

Big South Fork National River and Recreation Area

Early settlers, Cumberland farmsteads, and a brief boom of the Industrial Revolution left a variety of historic structures at the Big South Fork NRRA. These buildings and engineering structures have survived relatively intact and are important examples of the historic human use of this area through time.

Historic farmstead structure.

Currently, there are 13 “Cumberland” style farm structures that have been assessed as eligible for inclusion in the national register (NRHP 2009; Des Jean, pers. comm. 2010). Additionally, three abandoned railroad bridges, a vehicular low-water timber bridge, and a large steel coal mine tipple have also been identified as eligible for inclusion into the national register (NPS 1996).

Table 26 contains the 18 historic structures that are listed on the NPS List of Classified Structures (LCS) and are available for visitation by guests of the Big South Fork NRRA. In order for a building to be considered for the LCS, the structure must meet one of the following criteria: either the structure is listed individually or is eligible for the national register, or the structure is a contributing element of an historic site or district that is listed or is eligible for the national register. In addition, the LCS includes other structures, such as those that have been moved or reconstructed; commemorative structures; and structures that have achieved significance within the last 50 years that are managed as cultural resources.

Obed Wild and Scenic River

Currently, there are no structures within the Obed WSR listed on the NPS LCS. However, small coal mines located in the vicinity of the Obed WSR had been in use since 1847, and the number increased with the construction of the railroads. Iron furnaces around Rockwood have created a need for coal since 1868. Numerous small and larger mines developed after the 1880s, and later strip mining became important after World War II. The structures and features within the Obed WSR associated with coal mining and extraction sites include a 1880s railroad tunnel and mining camp remnants (NPS 2004b). Other developments of the historic period include gristmills, oil and gas development sites and sandstone quarries used for producing building stones. Although there are numerous oil and gas wells within the Obed WSR watershed, little historical information is available on the extent or locations of abandoned operations within the Obed WSR boundaries (Des Jean, pers. comm., 2009). The remains of the historic gristmill at Lilly Bluff sit at that location and are being managed for preservation. There are no sites listed in the national register at Obed WSR (NRHP 2009).

TABLE 26. LIST OF CLASSIFIED STRUCTURES IN THE BIG SOUTH FORK NATIONAL RIVER AND RECREATION AREA

Resource	Type	Date Constructed	LCS Number	Eligibility Status	Description
Litton/Slaven Barn	Structure	1900	92182	Eligible, 1981	The barn is listed as a contributing building and currently serves as a museum that houses the exhibits within the proposed Big South Fork Rural Historic District.
Litton/Slaven House and Cabin	Structure	1900	92183	Eligible, 1981	The Litton/Slaven House and Cabin is listed as a contributing building, and is currently serving as a wayside exhibit within the proposed Big South Fork Rural Historic District.
Litton/Slaven Earthen Dam	Super-structure	1900	232905	Eligible, 1981	Currently the dam forms part of a hiking trail that runs above the farmstead.
Blevins, Oscar. House	Structure	1879	92185	Eligible, 1981	House is listed as a contributing building and is currently serving as an exhibit in the proposed Big South Fork Rural Historic District.
Blevins, Oscar. Corn Crib	Structure	1879	504439	Eligible, 1981	The corn crib exhibits the vernacular design and construction techniques of the former residents of an isolated Cumberland Plateau community.
Blevins, Oscar. Outbuilding	Structure	1870s–1880s	511850	Eligible, 1981	The outbuilding exhibits the vernacular design and construction techniques of the former residents of an isolated Cumberland Plateau community.
Blevins, John. Barn	Structure	1925	92186	Eligible, 1981	The John Blevins Simpson Barn was constructed in 1925 and assessed as eligible for inclusion into the national register under criteria A and C due to its association with the historic subsistence farming culture of the Cumberland Plateau. The barn is an exemplary example of the vernacular folk architecture of Southern Appalachia. The barn currently serves as a warehouse for general supply storage.
Blevins, John. House	Structure	1824	92187	Eligible, 1981	The John Blevins House is listed as a contributing building within the proposed Big South Fork Rural Historic District and currently serves as a dormitory.
Blevins, John. Corn Crib	Structure	1920	92188	Eligible, 1981	The corn crib currently is being utilized as general storage facility.
Blevins, John. Smithy	Structure	1920	92189	Eligible, 1981	The John Blevins Smithy, built in 1920, originally served as a mill. Currently, the structure is being utilized as a general storage facility.
Litton, John. Cabin Ruins at Parched Corn Creek	Structure	1881	100405	Eligible, 1981	The cabin was assessed as eligible for inclusion into the national register due to its representation of an exemplary example of log barn construction on the Cumberland Plateau. Unfortunately this cabin burned to the ground in 1997 leaving only the standing, cut-stone chimney.

TABLE 26. LIST OF CLASSIFIED STRUCTURES IN THE BIG SOUTH FORK NATIONAL RIVER AND RECREATION AREA

Resource	Type	Date Constructed	LCS Number	Eligibility Status	Description
Privy at Parched Corn Creek	Structure	1960s–1970s	100406	Not Eligible, 1981	The privy has been dated to approximately the late 1960s / early 1970s based on oral history. The privy originally served as a latrine, but is not in use or maintained. The structure was assessed as not eligible for inclusion into the national register despite its close proximity to the old Armpie Blevins farmstead. The structure is determined to be a noncontributing component of the Big South Fork Rural Historic District.
Blevins, Lora. Corn Crib	Structure	1929	92178	Eligible, 1981	The Lora Blevins Corn Crib is listed as a contributing structure within the proposed Big South Fork Rural Historic District and currently serves as an exhibit.
Blevins, Lora. House	Structure	1929	92179	Eligible, 1981	The Lora Blevins house was built in 1929, is listed as a contributing building in the Big South Fork Rural Historic District, and was recently determined a contributing feature of a Component Landscape as documented in a 1998 NPS Cultural Landscape Inventory, Level 1. The house currently serves as an exhibit.
Blevins, Lora. Pole Barn	Structure	1929	92177	Eligible, 1981	The Lora Blevins Pole Barn was built in 1929 and is listed as a contributing building in the proposed Big South Fork Rural Historic District. The barn currently serves as an exhibit.
Ranson Boyatt Farmstead Ruins	Structure	Unknown	416703	Eligible, 1981	The farmstead typifies the confined but picturesque setting that many of the first farming settlers of the Upper Cumberland adapted to in the mid- to late nineteenth century. The Ranson-Boyatt Farmstead Site has integrity of location and setting, exhibiting extant cultural artifacts and landscape features from the original Boyatt farmstead.
Low Water Bridge	Structure	Unknown	579462	Eligible, 1981	The LCS contains only limited information pertaining to the status of the bridge and its description.
Coal Tipple at Blue Heron	Structure	1939	578708	Eligible, 1981	The Blue Heron Tipple was mechanized in the 1930s. It separated the various sizes of coal coming from the mine in coal cars. The tipple is currently part of Blue Heron, or Mine 18, Mining Community.

Source: NPS 2009f.

CULTURAL LANDSCAPES

Cultural landscapes are defined as "a geographic area (including both cultural and natural resources and the wildlife or domestic animals therein) associated with a historic event, activity, or person or exhibiting other cultural or aesthetic values" (NPS 2006c). Figures 8, 9, and 10 in chapter 2 show the cultural landscapes at Big South Fork NRRA and Obed WSR.

Big South Fork National River and Recreation Area

Beginning in 1997, the cultural landscape team from the NPS Southeast Regional Office in Atlanta, GA, began documenting the many cultural landscape features of the Big South Fork for a level I cultural landscape inventory. Features at the park include cemeteries that are both actively tended and others long abandoned. Industrial remnants at the park include the Blue Heron Tipple and Tram, the Yamacraw and Roaring Paunch Railroad bridges, the mine and town ruins at Worley, and the K and T Railroad bed and the site of the Beatty Oil Well. Transportation features, such as a stone-lined footbridge at No Business Creek, remain in place as do several other cut-stone culverts and the evidence of farming in the form of remnant fields, farmhouse ruins, and fences (Brown et al. 2001).

Historic farmstead structures.

Some features are very remote and are the only remaining part of a formerly intact cultural landscape. However, several farmsteads were found to retain enough integrity to warrant listing on the national register. More attention was focused on these farmsteads, such as the Oscar Blevins, Lora Blevins, Litton-Slaven, and Parched Corn Creek sites, which are now regarded as component landscapes within an overall Big South Fork "Rural Historic District" (Des Jean, pers. comm., 2009). In addition, when Congress created the NRRA, the Charit Creek Farmstead was to be maintained in its historic appearance. Therefore, it is treated as an "administrative landscape" (Des Jean, pers. comm., 2009).

One townsite that is being reviewed is No Business. No Business is a small, linear, abandoned town site in the Big South Fork NRRA that was permanently vacated in the early 1960s after 164 years of continuous settlement. The site was once one of the largest communities in the area with approximately 300 inhabitants, including many now prominent families. Many of the landscape features around the No Business drainage carry these surnames.

Additional properties under review as cultural landscapes consist of the Ranse Boyatt Farmstead, Salt Town, and the Newtie King home site. These properties are currently designated and managed by the Big South Fork NRRA as administrative landscapes pending further review (Des Jean, pers. comm., 2009).

Obed Wild and Scenic River

The Obed WSR contains some possible cultural landscapes. Below is a summary of the prominent landscape features that are worthy of protection and management consideration, but are not currently managed as cultural landscapes.

The Tub Mill at Lilly Bluff contained a horizontal water wheel in the channel of the spillway and is currently pending further review for consideration as a cultural landscape; however, no maintenance of the property is being conducted at the site (Des Jean, pers. comm., 2009).

Another important landscape landmark within the Obed WSR is Lilly Arch, which rises nearly 50 feet from base to apex, and is considered one of the most impressive and prominent natural features at the park unit. The natural arch is carved out of Pennsylvanian sandstone, and is the only one of its kind in the park unit. Located near the end of the Point Trail, the Lilly Arch represents a natural link to the past. Like many boulders and cliffs at the park, the arch was used by Native Americans and the early pioneers as a place of shelter. Today you can walk through the arch and peer down into the rushing waters of the Obed River (NPS 2008c). Although archeological resources have been recorded within the vicinity of the arch, the arch is currently not considered, nor under review as a cultural landscape (Des Jean, pers. comm., 2009).

An additional property of interest that is adjacent to the Obed WSR boundary, but is under the management of other governmental agencies, is the old girder and truss bridge at Nemo. The bridge was erected in 1930–1931 and was the first iron structure to join the two banks of the river. Located just above the Obed–Emory confluence, the old bridge is now closed to motor traffic and is used as a footbridge by hikers as a part of the 300-mile-long Tennessee State Cumberland Trail. Automobile traffic crossing the river at Nemo bridge was moved to a new concrete bridge in 1999 (NPS 2008c).

Ethnographic Resources

Ethnographic resources are defined as “cultural and natural features of a park that are of traditional significance to traditionally associated peoples. These peoples are the contemporary park neighbors and ethnic or occupational communities that have been associated with a park for two or more generations (40 years), and whose interests in the park’s resources began before the park’s establishment” (NPS 2006c).

The Shawnee and Cherokee tribes have been historically associated with the Big South Fork area. Under a series of treaties and agreements, including the 1785 Treaty of Hopewell, the 1790 Butler and Walton Treaty of Tellico, and the 1805 Treaty of Tellico, Cherokee tribal rights and land ownership was ceded to the U.S. government (NPS 2007a). The Shawnee claim association with the area; however, there are no identified sites attributed to the Shawnee. Both tribes most likely used the upland areas for supplementary subsistence hunting and gathering (Des Jean, pers. comm., 2009).

Although there were Scots-Irish and German immigrants to the area in historic times, there are no distinct ethnographic groups of European descent associated with either Big South Fork NRRA or Obed WSR (Des Jean, pers. comm., 2009).

December 29, 2006, the NPS sent letters to three Cherokee bands, three Shawnee groups, and the Chickasaw Nation to notify them of the plan/EIS in order to initiate compliance with Section 106 of the National Historic Preservation Act. Two responses were received. The United Keetowah Band of Cherokee Indians in Oklahoma merely requested continued consultation on the project. The Eastern Band of Cherokee Indians responded that the project area may have cultural, archeological, or religious significance to the Eastern Band of Cherokee.

VISITOR USE AND EXPERIENCE

BIG SOUTH FORK NATIONAL RIVER AND RECREATION AREA

Visitor Use

Annual Visitor Statistics—Table 27 displays visitation numbers at Big South Fork NRRA, which are based largely on counts taken at the Bandy Creek Visitor Center. While these counts may underestimate the actual number of annual visitors to the park, they record a general trend in visitation, which is illustrated in figure 23. The total number of visitors to Big South Fork NRRA during the period from 1990 to 2009 was approximately 15 million. An average of 783,090 visitors come to the park each year. Visitation peaked in 2001 and has generally declined from 2002 to the present, increasing slightly from 2004 to 2005 and then again, more recently, from 2007 to 2009.

Seasonal Visitor Statistics—Seasonal visitor use patterns at Big South Fork NRRA are generally predictable throughout the year. Visitation at Big South Fork NRRA increases throughout the summer (figure 24) with peak visitation occurring in October. Spring visitor use is moderate to high, with visitor numbers increasing during the summer months. Winter season use is relatively light, with January and February accounting for the lowest percentage of park visitors over the 17-year period (NPS 2009i).

TABLE 27. ANNUAL VISITATION AT BIG SOUTH FORK NATIONAL RIVER AND RECREATION AREA

Year	Annual Visitation	% Change
2009	686,747	1.6%
2008	675,928	7.8%
2007	626,751	0.6%
2006	622,807	−10.9%
2005	699,230	0.4%
2004	696,114	−7.4%
2003	752,140	−11.8%
2002	852,873	−6.9%
2001	916,548	6.1%
2000	864,200	0.5%
1999	860,224	0.4%
1998	856,480	−0.2%
1997	858,388	0.3%
1996	855,882	−4.1%
1995	892,328	11.5%
1994	800,460	8.5%
1993	737,947	−1.9%
1992	752,203	−12.5%
1991	860,017	8.2%
1990	794,539	

Source: NPS 2009i

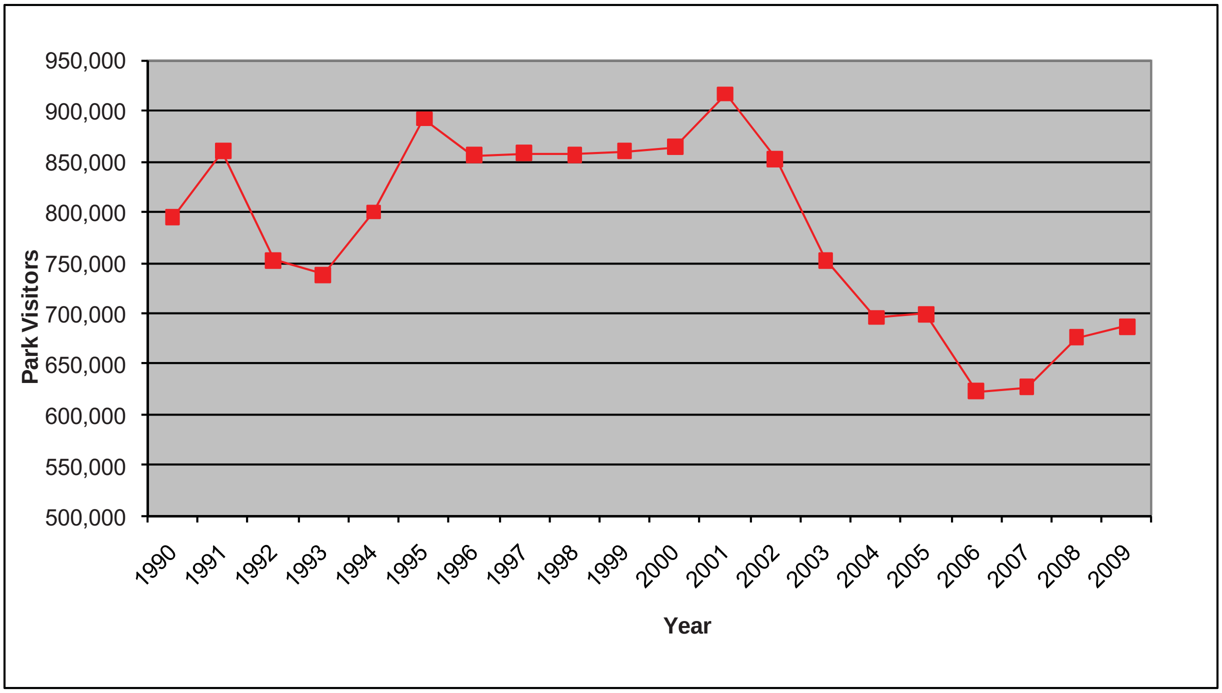


FIGURE 23. TREND IN ANNUAL VISITATION AT BIG SOUTH FORK NATIONAL RIVER AND RECREATION AREA

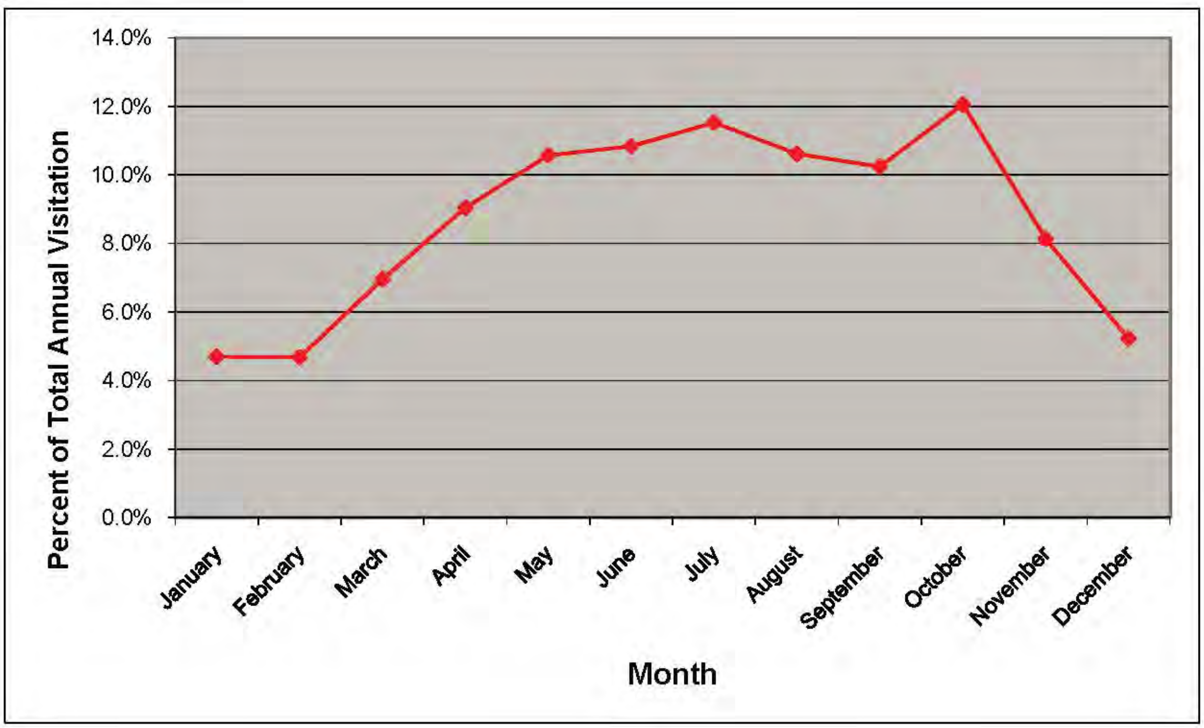


FIGURE 24. PERCENT OF TOTAL ANNUAL VISITATION, BY MONTH, FOR BIG SOUTH FORK NATIONAL RIVER AND RECREATION AREA (1990–2008)

Visitor Activities

The NPS or its licensed concessionaires operate the facilities within the Big South Fork NRRA and Obed WSR. The Big South Fork NRRA contains two developed campgrounds, one lodge, a horse stable, two visitor centers, 11 river accesses, and numerous recreational opportunities. Figures 8 through 10 in chapter 2 show the locations of visitor use areas. The NPS owns 9 acres of land in Stearns, KY, outside the recreation area boundaries. The Stearns Visitor Services Division office and a maintenance building are operated at this site. The Kentucky visitor center is located in the Stearns train depot operated by the Big South Fork Scenic Railroad. The NPS also owns 20 acres of land located between the recreation area headquarters and Oneida, TN. This land was acquired for potential use as a visitor center and is currently undeveloped (NPS 1997). The following discussion includes a brief description of each of these opportunities.

Hiking—There are over 300 miles of hiking trails located throughout the park, which exist both in the gorge and on the plateau, providing ample scenic opportunities to park visitors. Trail lengths range from short, paved trails leading to scenic vistas to longer, loop trails used for day-hiking and long-distance backpacking trails traversing much of the park area. Leatherwood Ford Trailhead offers a short trail up to the Bandy Creek Rapids, which is designed to be accessible to individuals with disabilities. Hiking is pursued year-round, but peaks during traditional high-use periods including spring break (NPS 2005a).

Mountain Biking—Biking is permitted on three biking-dedicated trails, some horse trails, marked multiple-use trails, and on all roads in the area. Many of the roads and trails open to bike use are not ideal because of the gravel and sand surfaces or heavy use for other activities. The dedicated trails are maintained by organized bike groups that use the trails. As with most other activities, spring and fall are the most popular seasons for bike use (NPS 2005a).

Mountain biking at Big South Fork NRRA.

All-terrain Vehicles—ATV use is presently only allowed for the purpose of transporting big game during hunting seasons. Federal regulations require all off-road vehicles, including ATVs, to be restricted to designated routes on all federal lands. ATVs can legally be used on multiple-use trails during deer and hog hunting seasons if the operator is actively involved in hunting. Although recreational ATV riding has been identified in the General Management Plan, actual designations for off-road vehicle use are still in the planning stages.

Camping—Bandy Creek and Blue Heron campgrounds both offer campsites and restroom/shower facilities accessible to individuals with disabilities. There are 190 improved campsites at Bandy Creek, which is the largest visitor development area and includes a large campground with swimming pool and play structures, electric and water hookups, and restroom/shower houses. Group campgrounds are also provided, as are stables for horse boarding and rentals, picnicking, a large variety of trails, and a small visitor information station. The Blue Heron campground contains 45 developed campsites. A smaller, more primitive campground at Alum Ford adjoins Lake Cumberland and contains 7 campsites and a boat ramp. The Sheltowee Trace trail transects this site. Camping is also allowed along some of the back roads and in the backcountry, and there are horse campgrounds at Station Camp and Bear Creek that have special facilities for equestrians (NPS 2005a).

Limited camping occurs within the gorge near trail heads and is most popular along the streams. There is a general trend towards an increase in recreational vehicle camping and a decrease in tent camping, although backcountry camping is increasing, especially during the popular summer season. May and October are the most popular times for weekend camping, and hunters use the camping facilities during the fall hunting season. Camping outside designated areas does occur and has caused minor resource damage (NPS 2005a).

Horse Riding—Big South Fork NRRA has a reputation for being a premier riding area and is frequented by locals and visitors alike. Many people bring their own horses and camp at special campgrounds. Concessionaire-operated activities are available through Bandy Creek Stables, and horses can be rented from licensed businesses outside of the park. Members of equestrian organizations visit the area often and can hold competitive events with a special use permit. As this is one of the most popular recreational activities in the park, it occurs regularly in all but the coldest months. Fifteen- to 25-mile loops comprise approximately two-thirds of the park unit horse trails and are primarily located between White Oak Creek and the Tennessee state line. Marked routes are also available for use by wagons drawn by livestock (e.g. horses and mules). Maintenance of horse trails is a major work item for NPS staff, and riding groups also often assist in this task. Proper planning and maintenance are critical for both resource protection and rider safety (NPS 2005a).

Horseback riding at Big South Fork NRRA.

Canoeing, Kayaking, and Rafting—There are 11 access points to the Big South Fork River or its major tributaries within the recreation area. Access points are located at Blue Heron, Yamacraw (East), Yamacraw (West), Alum Ford, Worley, Burnt Mill Bridge, North White Oak, Peter’s Bridge, Brewster Bridge, Zenith, Leatherwood Ford, Station Camp, and outside the park at New River Bridge

Part of the reason the Big South Fork NRRA was established was to protect the free-flowing Big South Fork and its tributaries. As a result, this river system offers some of the highest quality rafting in the eastern United States. Whitewater rafting and kayaking generally occur upstream from Leatherwood Ford, while canoeing occurs mostly downstream from Leatherwood Ford. The river flow must be a minimum of 800 cfs for rafting through the main gorge, and 10,000 cfs is the recommended maximum for safe rafting.

Kayaking at Big South Fork NRRA.

Whitewater recreation occurs mostly in the spring and is popular with visitors from outside the local area. Commercially provided trips are available and very popular (NPS 2005a).

Climbing—Rock climbing and rappelling is gaining popularity at Big South Fork NRRA. The natural terrain, which includes an extensive network of sandstone cliffs, provides attractive opportunities for recreational climbing (NPS 2005a). Climbing is limited based on the park compendium.

Hunting and Trapping—Hunting is allowed at Big South Fork NRRA, with squirrel, raccoon, and deer being the most popular game. The hunting seasons are determined by applicable Kentucky and Tennessee hunting regulations. In Tennessee in 2008, small game hunting seasons occur throughout the year, with the timing of open seasons dependent upon specific species. Big game hunting season for deer and wild hog extend from late September through mid-January. A special park season for wild hog extends from January 21st through the last day of February to help control the population of the nonnative species. Wild turkey seasons occurred in the fall from mid-November to mid-December and in the spring from late March to mid-May. In Kentucky, elk season extended from October to January; deer were hunted in McCreary County from mid-October to mid-December; fall turkey season extended from early September to mid-January; and small game open seasons were dependent upon specific species (NPS 2005a; TWRA 2008; KDFWR 2008).

Within the park, safety zones have been established for the protection of visitors. Vehicular restrictions have limited some traditional hunting access in both the plateaus and gorge areas (NPS 2005a).

Fishing—Fishing is seasonal and managed according to state regulations. Fishing by locals and visitors occurs in the small and large streams and in the headwaters of Lake Cumberland. Creek fishing is more popular with locals. Many of the fishing spots are in the gorge, but require hiking due to the legislative restrictions on vehicular use. Within the watersheds surrounding the park, there are a total of 79 species of fish, including 15 that are classified as game fish. Altogether, the fish population contains a total of 12 different families, including lampreys, darters, shiners, minnows, suckers, and bass (Scott 2007).

Fishing at Big South Fork NRRA.

Big South Fork Scenic Railway—The non-profit McCreary County Heritage Foundation owns and operates a sightseeing train (Big South Fork Scenic Railroad) that runs from historic downtown Stearns through Barthell, which is adjacent to the national area boundary, and to the Blue Heron Mine. This scenic route takes visitors through the gorge and is seasonally popular. The first phase of an expansion of the route from Barthell north to Worley was completed in the summer of 2006 (BSFSR 2009). McCreary County Heritage Foundation also has plans to extend the route from Worley to Yamacraw.

Visitor Centers—The Bandy Creek Visitor Center serves as the primary contact point for park visitors and is open seven days per week, year-round, except on Christmas. Center staff are available to provide visitors with information and supply backcountry permits. A small book store, brochures, limited exhibits, restrooms, and nearby Oscar Blevin trailhead are found at this location. The Stearns Depot Visitor Center in Kentucky is open daily from May through October from 9:00 AM to 5:30 PM. Staff are available to provide visitors with general information, and the departure point for the scenic railway is located nearby (NPS 2009g).

Aesthetic Resources

Although the presence of humans is evident in the park units and surrounding region, the dominant visual elements are water and vegetation on a predominantly hilly landscape. While man-made developments are apparent, the relatively dense vegetation reduces these influences within a short distance.

The general absence of light pollution provides for night sky-watching at Big South Fork NRRA. On clear nights, around 2,000 stars are visible to the naked eye (NPS 2008d). The University of Tennessee works in cooperation with Big South Fork in presenting astronomy programs throughout the year.

As it becomes increasingly difficult to find places free of air pollution and light interference, places with dark, clear night skies become that much more valuable. Sources of nearby artificial light that may obscure views of the night sky are the nearby towns of Oneida and Huntsville, vehicle lights from nighttime traffic along Tennessee State Highway 52 and Interstate Highway 27, as well as the more distant Interstates 75 and 40.

Health and Safety

Big South Fork NRRA experiences an average of 10 emergency medical cases per year. This covers the most serious injuries that require some type of EMS treatment other than basic first aid. The majority of these are related to recreational activities within the National Area. Approximately five of these cases are basic life support cases involving broken bones, sprains and soft tissue injuries that most often require emergency room treatment. The other are advanced life support cases that often involve back or head related injuries requiring overnight medical treatment. The primary cause of these injuries is horseback riding accidents usually caused by falling from a horse. Other types of injuries occur during river activities such as rafting or kayaking, backpacking, and day hiking. Approximately one injury per year is caused by a snake bite. This is often in one of the developed campgrounds. Motor vehicle accident injuries are limited within the National Area, most likely due to the low speed roads.

Big South Fork NRRA experiences, on average, one fatality per year. These incidents are almost exclusively from water related activities such as swimming, wading, or boating. These accidents usually occur at the National Area’s River access points.

While reviewing the case files over the last five years, there were three oil related accidents within the park. One involved a trash truck blowing out a hydraulic line and releasing approximately 5 gallons of hydraulic fluid. The other two were oil transportation related incidents with one being an overturned oil tanker truck near the New River outside of the National Area and the other being a broken pipeline crossing the New River within the boundary of the National Area. There were no injuries caused by any of these incidents.

OBED WILD AND SCENIC RIVER

Visitor Use

Annual Visitor Statistics—Table 28 displays visitation statistics for Obed WSR. While these counts may underestimate the actual number of annual visitors to the park, they record a general trend in visitation, which is illustrated in figure 25. The total number of visitors to Obed WSR during the period from 1990 to 2009 was approximately 4.1 million. An average of 207,613 visitors come to the Obed WSR each year. Visitation peaked in 1997, and has generally fluctuated year-to-year since 2001. Table 28 displays visitation numbers, while the general trend in visitation is illustrated in figure 25 (NPS 2009i).

TABLE 28. ANNUAL VISITATION AT OBED WILD AND SCENIC RIVER

Year	Annual Visitation	Percent Change
2009	212,933	10.8%
2008	192,154	5.3%
2007	182,504	−1.4%
2006	185,176	5.3%
2005	175,800	−27.6%
2004	242,682	17.6%
2003	206,337	−11.4%
2002	232,768	20.5%
2001	193,105	−19.6%
2000	240,194	−2.3%
1999	245,899	−1.5%
1998	249,518	−16.4%
1997	298,642	37.8%
1996	216,699	−6.7%
1995	232,228	−4.0%
1994	241,947	7.0%
1993	226,077	21.4%
1992	186,272	115.6%
1991	86,414	−17.6%
1990	104,902	

Source: NPS 2009i

Seasonal Visitor Statistics—Seasonal visitor use patterns at Obed WSR are generally predictable throughout the year. Visitation at Obed WSR increases during the spring season, peaks in early summer, and declines in early fall. Overall, most visitation from 1990 to 2009 occurred during the summer and fall months with peak visitation occurring in June. Spring visitor use is moderate to high, with visitor numbers increasing during the summer months. Winter season use is relatively light, with the months of January and February accounting for the lowest percentage of visitors to the park over the 17 year period (see figure 26, NPS 2009i).

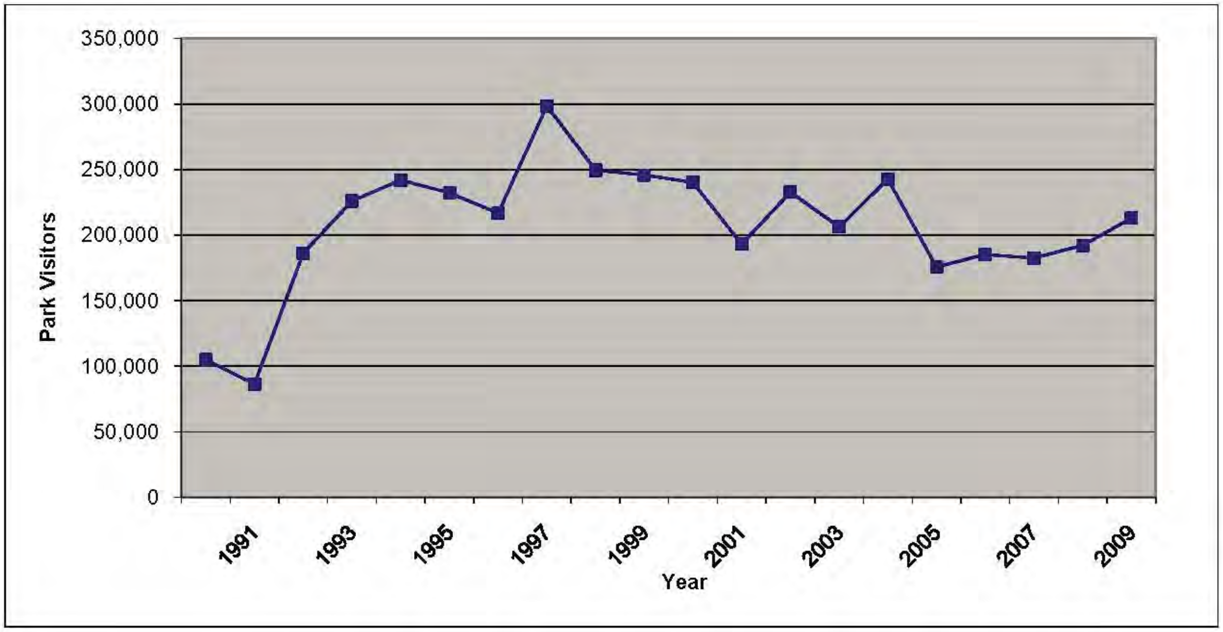


FIGURE 25. TREND IN ANNUAL VISITATION AT OBED WILD AND SCENIC RIVER

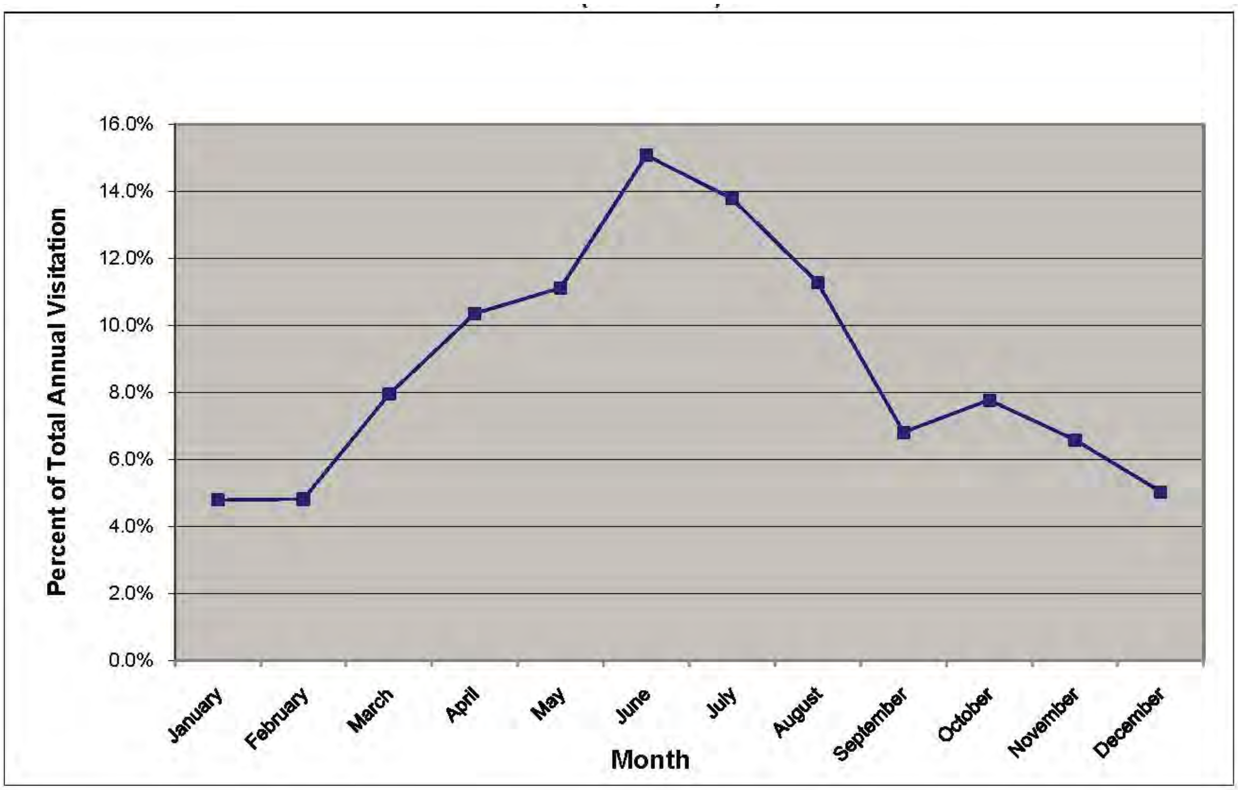


FIGURE 26. PERCENT OF TOTAL ANNUAL VISITATION, BY MONTH, FOR OBED WILD AND SCENIC RIVER (1990-2008)

Visitor Activities

The NPS or its licensed concessionaires operate the facilities within Obed WSR, which include two camping areas and numerous recreational opportunities for hiking, paddling, rock climbing, and fishing. Five bridges span rivers and creeks within the park, allowing visitors access to the water and serving as focal points for recreation. Figure 18 illustrates the location of these areas within the park. The following discussion includes a brief description of each of these opportunities.

Hiking—Hiking the trails along the Obed WSR is one of the most enjoyable activities for visitors. Several different trails with different lengths and scenery are available, including the Point Trail (3.8 miles roundtrip), the Lilly Bluff Overlook Trail (200 yards), the Lilly Bridge Trail (0.8 mile roundtrip), the Lilly Boulder Trail (l mile roundtrip), the Emory River Nature Trail (0.7 mile roundtrip), and a portion of the Cumberland Trail, a scenic trail that travels through 11 Tennessee counties following a line of ridges and gorges along the eastern escarpment of the Cumberland Plateau in Tennessee (NPS 2009h).

Camping—There is one developed campground, Rock Creek Campground, located at the north side of the Nemo Bridge access which contains 12 primitive camping sites on the south shore of the Emory River. The Barnett Bridge access to Clear Creek also includes two to three primitive camping sites (NPS 2009h).

Canoeing, Kayaking and Rafting—Canoeing, kayaking, and rafting bring many people to the Obed WSR. The river includes difficulty classifications ranging from II to IV, making it one of the best whitewater rivers in the eastern United States. Spring and winter are usually the best times to paddle on the river, as increased water levels during those seasons are common. Favorite spots for paddlers to embark include: Potters Ford, Devils Breakfast Table, Barnett Bridge, Jett Bridge, Lilly Bridge, and Nemo. No outfitters are available near the river, so paddlers must have experience and equipment to take advantage of the Obed WSR rapids (NPS 2009h).

Climbing—The Obed WSR sandstone rock faces provide a challenging opportunity for experienced climbers, with several hundred climbing routes spanning through much of the park. Obed WSR has a long history of rock climbing dating back to the 1970s. Through the 1990s, the number of climbers increased annually, although in recent years those numbers have stabilized. Boulder climbing is also available along the Obed River and is an important activity for visiting climbers. Along the Boulder Trail over a dozen boulders are available to climbers and over 100 are located within the park unit’s boundaries (NPS 2009h).

Due to its popularity, Obed WSR has been featured in climbing magazines that popularized places like Lilly Boulders, which provides bouldering “problems” or routes for all skill levels. Due to the impacts of this sport on the vegetation and wildlife that inhabit the rock faces and bouldering areas, Obed WSR completed a *Climbing Management Plan* in 2002 that prescribed a resource inventory of important ecological communities along the cliffline in order to allow the park to develop appropriate management prescriptions regarding sport climbing routes (NPS 2002a).

Hunting and Trapping—Hunting is permitted in certain locations at the Obed WSR during the state and federal hunting seasons. As in Big South Fork NRRA, squirrel, raccoon, and deer are the popular game. In 2008, small game hunting lasted year-round, with the timing of open seasons dependent upon specific species. Big game hunting season for deer, feral hog, wild hog, and bear extended from late November through mid-January. Wild turkey seasons occurred in the fall from mid-November to mid-December and in the spring from late March to mid-May (NPS 1995a; TWRA 2008).

Fishing—Fishing opportunities are plentiful at the Obed WSR. An assortment of smallmouth bass, bluegills, catfish, and muskie are but a few of the various fish that swim the river (NPS 2009h).

Visitor Center—The Obed WSR Visitor Center is located in downtown Wartburg and serves as the primary contact point for all visitors. It is open 7 days per week, year-round, except for Thanksgiving and Christmas. The visitor center houses a small bookstore, brochures, and exhibits on the river, its inhabitants, the cultural history of the area, and the recreational opportunities that the park provides (NPS 2009h).

Aesthetic Resources

Like the neighboring Big South Fork NRRA, dominant visual elements at Obed WSR are water and vegetation on a predominantly hilly landscape. While man-made developments are apparent, the relatively dense vegetation mitigates these influences within a short distance. While there is no specific information related to night sky-watching at Obed WSR, the general absence of light pollution at nearby Big South Fork NRRA enables around 2,000 stars to be visible to the naked eye on clear nights (NPS 2008d).

As it becomes increasingly difficult to find places free of air pollution and light interference, places with dark, clear night skies become that much more valuable. Sources of nearby artificial light that may obscure views of the night sky are the nearby towns of Wartburg and Crossville and vehicle lights from nighttime traffic along Tennessee State Highways 27 and 298.

Human Health and Safety

The NPS policy regarding public health and safety (contained in the NPS *Management Policies 2006*, section 8.2.5) is that the saving of human life will take precedence over all other management actions. The NPS and its concessionaires, contractors, and cooperators will seek to provide a safe and healthful environment for visitors and employees. The NPS works cooperatively with other federal, state, and local agencies, organizations, and individuals to carry out this responsibility. However, park visitors assume a substantial degree of risk and responsibility for their own safety when visiting areas that are managed and maintained as natural, cultural, or recreational environments (NPS 2006c).

During the period between January 2005 and December 2009, park staff responded to two incidents requiring medical care within the park. In the first incident, on June 8, 2007, a man fell while hiking on a designated trail at night. Visitors located him the following day and he was taken by ambulance to a nearby hospital and treated for broken bones and a punctured lung. In the second incident, on November 14, 2007, a park a park visitor was walking along the streambed below Lilly Bridge when he slipped and injured his knee. He was quickly treated by park staff; the knee was immobilized and he was carried to an ambulance. Within the same reporting period (2005 to 2009) there were two incident reports relating to oil and gas development. In the first, on October 10, 2005 a visitor reported that a gas line attached to Lilly Bridge was dripping oil. Investigation revealed significant amounts of petroleum sheen on the surface of Clear Creek and on rocks along the shore. The company which owned the gas line stated that they had pressurized the gas line to test for leaks and that when the line failed to maintain its pressure, they found two leaking gaskets—one on either side of Lilly Bridge. Other government agencies were notified (the National Response Center, the USFWS and the Tennessee Division of Water Pollution Control), a boom was stretched across Clear Creek and absorbent pads were used to clean some of the sheen from the surface of the water and from the surrounding rocks. In a second incident involving the same pipe under Lilly Bridge, on February 1, 2006, park personnel observed a petroleum-smelling liquid seeping out of this line and hardware attached to it onto the ground. The owner of the line was contacted and corrected the problem (Hudson, pers. comm., 2009).

PARK MANAGEMENT AND OPERATIONS

BIG SOUTH FORK NATIONAL RIVER AND RECREATION AREA

Park management and operations refer to the adequacy of staffing levels and the quality and effectiveness of park infrastructure in protecting and preserving vital resources and providing for an effective visitor experience. Park infrastructure facilities include roads that provide access to and within the park (for administrative, visitor, and emergency use), housing for staff required to work and live in the park, visitor orientation facilities (visitor centers, developed and interpreted sites, and other interpretive features), visitor amenities (including lodging and food service), administrative buildings (park staff offices and workspace), management-support facilities (garages, shops, storage buildings and yards used to house and store equipment, tools, and materials), and utilities (phones, sewer, water, and electricity).

Currently, the Big South Fork NRRA has approximately 50 full-time employees and the number of seasonal employees varies from year to year based on available funds (table 29). There are five divisions: park management, administration, resource management, visitor services, and facility management (Blount, pers. comm., 2009b).

TABLE 29. PARK MANAGEMENT AND OPERATIONS IN THE BIG SOUTH FORK NATIONAL RIVER AND RECREATION AREA

Division	Responsibilities	Number of Employees
Management	All management functions of the park and external relations; also supervises the Obed Unit Manager and Obed Operations.	2
Administrative	Parkwide administrative, managerial, and support functions; safety and planning; coordination with external institutions.	6 (full-time)
Resource Management	Ecosystem monitoring, research, restoration efforts; species-specific management initiatives; prescribed fire management; environmental compliance (NEPA); resource protection; Cultural Resource Management program related to American Indian and European-American heritage and archeology in the park.	9 (full-time)
Visitor Services (Interpretation and Law Enforcement Sections)	Public and media communications; facilitation of interpretive programs for park visitors; management of park exhibits, visitor center displays, site bulletins and booklets, park newspaper, information rack, and park website. Safety and security enforcement for park visitors and staff; emergency medical services; search and rescue; law enforcement; archeological site patrols; resource damage detection; wildland fire; criminal investigation and prosecution.	15 full-time and career seasonals (subject to furlough)
Facility Management	Maintenance of paved and unpaved surfaces, road shoulders, and bridges; maintenance of buildings; maintenance, repair, and rehabilitation of the trails.	18 full-time and career seasonals (subject to furlough)

Source: Blount, pers. comm., 2009b.

Management

The annual budget of the park was $4,458,000 as of 2009. Big South Fork NRRA is managed by the park superintendent and there is one administrative support position. The Superintendent’s office is responsible for all management functions of the park including program accountability, budget, reporting, coordination with the Southeast Regional and Washington offices, lands, supervision of division chiefs, and external relations. The Big South Fork Superintendent also supervises the Obed Unit Manager and Obed Operations.

Administrative

This division oversees all of the administrative procedures that must take place within the Big South Fork NRRA. The budget, payroll, personnel actions, purchasing, funding requests, GIS, and anything that pertains to monetary or administrative activities is overseen by this division. This division has 6 full-time employees (Blount, pers. comm., 2009b).

Resource Management

This division is responsible for all cultural and natural resources with regard to the National Environmental Policy Act (NEPA) compliance, compliance with section 102 and 106 of the National Historic Preservation Act, and other cultural and natural resource compliance. Additionally, they conduct on-site compliance reviews for NEPA documents; this may include archeological, historic structure, botanical, or landscape analyses. The division is also responsible for managing research permits and interacting with other outside agencies on resource issues such as fish and wildlife, oil, gas and mining. Other responsibilities include the provision of scientific information to ecological researchers from external institutions, and the management of land records, archives, historic photographs, historic documents, museum objects and artifacts, and historic objects associated with the park (Blount, pers. comm., 2009b).

The resource management division has the following positions filled by full-time employees: Chief of Resource Management, community planner - NEPA coordinator, archeologist, wildlife biologist, botanist, geologist, oil and gas technician, biological technician, geologist, and museum management technician.

Big South Fork NRRA had requested a permanent increase to base funding to address the workload associated with existing oil and gas sites and future operations. A single biological science technician was coordinating the oil and gas program prior to 2009. The park received a partial funding increase in 2008 and the full funding increase in 2009. The funding increase provides for salaries and supporting costs for 3 full-time positions. A geologist and biological science technician were hired in 2009 and one permanent position is presently vacant. Duties for the oil and gas staff include: inspecting existing oil and gas operations; coordinating with state environmental programs to ensure operations are in compliance with state regulations; coordinating plugging and reclamation of orphaned wells.; monitoring park resources in the vicinity of oil and gas sites; coordinating with NPS technical staff to insure wells meet 9B regulations; and coordinating with operators for development of plans of operations. The present estimated cost of running this program, which can vary year to year, is approximately $287,000 per year, which includes the salaries of the three full-time employees noted above; contributions from other staff (e.g., wildlife biologist, archeologist, community planner, botanist, and chief of resource management); and other miscellaneous costs (Blount, pers. comm., 2009b).

Visitor Services

The visitor services division includes law enforcement and interpretation.

Law enforcement is responsible for enforcing all of the laws in the Big South Fork NRRA. Their other responsibilities include managing special use permits, firefighting, managing campgrounds, managing the fee program and enforcing fee compliance, and providing services to visitor centers.

Interpretation is responsible for public outreach, education, and visitor center management. This includes activities such as campfire talks, outreach to schools, and interpretive programs for visitors and staff members. Additionally, the interpretive section of this division staffs the visitor contact stations, including the main visitor center of the park. They also publish all outreach materials, including the newsletter and all brochures. There are 15 full-time employees between both sections (Blount, pers. comm., 2009b).

Facilities Management

This division is responsible for the care and maintenance of all Big South Fork NRRA roads, trails, grounds, and buildings. This includes provision of specialized maintenance services, routine maintenance, construction, and rehabilitation. All of the Big South Fork NRRA facilities are serviced by this division (Blount, pers. comm., 2009b).

OBED WILD AND SCENIC RIVER

The Obed WSR has six divisions, staffed by seven full-time, permanent employees (table 30). Every year, the park hires approximately five seasonal employees who work during the summer months. The divisions are: maintenance, resource management, interpretive, resource and visitor protection, administration, and management (Campbell, pers. comm., 2009).

TABLE 30. PARK OPERATIONS AND MANAGEMENT IN THE OBED WILD AND SCENIC RIVER

Division	Responsibilities	Number of Employees
Maintenance	Care of physical plant, construction, signs, fences	1 full-time, 1–3 seasonal
Resource Management	Resource protection issues, including applying for research funding, overseeing NEPA compliance, overseeing cultural compliance	1 full-time, 1 seasonal (occasionally)
Interpretive	Public interpretation programs, public communication and education, visitor programs, staffing of visitor center	1 full-time, 1 seasonal
Resource and Visitor Protection	Law enforcement, fee compliance and collection, public safety, safety education, search and rescue operations	2 full-time
Administration	Human resource issues, payroll, procurement, assistance of management division with budget	1 full-time
Management	Supervision of all activities, evaluations, budget management, oversight of reports to be submitted to NPS, coordination with state agencies of relevance	1 full-time

Source: Campbell, pers. comm., 2009.

The Obed WSR is a relatively small unit, and its annual budget is approximately $625,000. Approximately 90% of that budget is appropriated to staff salaries (Campbell, pers. comm., 2009).

Maintenance

The maintenance division is responsible for taking care of the physical plant, constructing various structures in the Obed WSR per the area’s needs, installing signs, and installing fences. This division has one full-time employee, and hires one to three seasonal workers for every summer (Campbell, pers. comm., 2009).

Resource Management

This division is responsible for guiding the resource protection issues that are deemed important for the Obed WSR. This involves applying for research funding, overseeing NEPA compliance, overseeing cultural compliance issues associated with the Obed WSR museum, and other issues pertaining to resource management. This division has one full-time employee, and occasionally hires a seasonal employee during the summer (Campbell, pers. comm., 2009). Support for oil and gas management at Obed WSR comes from the staff at Big South Fork NRRA.

Interpretive

The interpretive division deals with the interpretive responsibilities of the Obed WSR, according to the usual interpretive aspects of NPS units. This includes staffing the visitor center, scheduling visitor programs, and maintaining public communication and education. Particular programs might include the Obed WSR "Owl Prowl" or other wildlife-watching programs for the public. This division is staffed by one employee, who acquires a seasonal staff in the summer months. The seasonal staff is typically a college student (Campbell, pers. comm., 2009).

Resource and Visitor Protection

This division deals with law enforcement in the park and the provision of safety measures for visitors and staff. This involves patrolling and policing the campground, collecting fees and ensuring fee compliance by visitors, conducting search and rescue operations, and communication with the public regarding climbing and watercraft safety (kayak, canoe, raft, etc.). There are two full-time staff members; due to the extensive training necessary to fulfill this division's responsibilities, no seasonal staff are ever hired (Campbell, pers. comm., 2009).

Administration

The administration division deals with all human resources issues, including procurement, payroll, and a large number of miscellaneous tasks pertaining to the administrative needs of the Obed WSR. The division also assists the management division with the overall budget management. There is one full-time employee in this division (Campbell, pers. comm., 2009).

Management

The management division is staffed by one full-time employee. This individual's responsibility is to supervise all activities, conduct evaluations, manage the Obed WSR overall budget, and compose and/or oversee any reports that must be submitted. Such reports may include annual reports or statements of goals and objectives. The management division must develop plans and see that they are carried out. This division is also responsible for facilitating cooperation with various state agencies that interact with the Obed WSR (Campbell, pers. comm., 2009).

CHAPTER 4: ENVIRONMENTAL CONSEQUENCES

This "Environmental Consequences" chapter analyzes both beneficial and adverse impacts that would result from implementing any of the alternatives considered in this Non-federal Oil and Gas Management Plan/Environmental Impact Statement (plan/EIS). This chapter also includes a summary of laws and policies relevant to each impact topic, definitions of impact thresholds (i.e., negligible, minor, moderate, and major), and the methods used to analyze impacts and determine cumulative impacts. As required by the Council on Environmental Quality (CEQ) regulations implementing the National Environmental Protection Act (NEPA), a summary of the environmental consequences for each alternative is provided in table 10, which can be found in "Chapter 2: Alternatives." The resource topics presented in this chapter, and the organization of the topics, correspond to the resource discussions contained in "Chapter 3: Affected Environment."

SUMMARY OF LAWS AND POLICIES

Three overarching environmental protection laws and their implementing policies guide the actions of the National Park Service (NPS) in the management of parks and their resources: the NPS Organic Act of 1916, NEPA and its implementing regulations, and the Omnibus Management Act. For a complete discussion of these and other guiding authorities, refer to the section titled "Related Laws, Policies, Plans, and Constraints" in "Chapter 1: Purpose of and Need for Action." These guiding authorities are briefly described below.

The NPS Organic Act of 1916 (16 USC 1), as amended or supplemented, commits the NPS to making informed decisions that perpetuate the conservation and protection of park resources unimpaired for the benefit and enjoyment of future generations.

The National Environmental Policy Act of 1969 is implemented through regulations of the CEQ (40 CFR 1500–1508). The NPS has, in turn, adopted procedures to comply with these requirements, as found in Director's Order 12 (NPS 2001) and its accompanying handbook.

The Omnibus Management Act (16 USC 5901 et seq.) underscores the NEPA provisions in that both acts are fundamental to park management decisions. Both acts provide direction for connecting resource management decisions to the analysis of impacts and communicating the impacts of those decisions to the public, using appropriate technical and scientific information. Both acts also recognize that such data may not be readily available, and they provide options for resource impact analysis should this be the case.

Section 4.5 of Director's Order 12 (NPS 2001) adds to this guidance by stating, "when it is not possible to modify alternatives to eliminate an activity with unknown or uncertain potential impacts, and such information is essential to making a well-reasoned decision, the NPS will follow the provisions of the CEQ regulations (40 CFR 1502.22)." In summary, the NPS must state in an environmental assessment or EIS (1) whether such information is incomplete or unavailable, (2) the relevance of the incomplete or unavailable information to evaluating reasonably foreseeable significant adverse impacts on the human environment, (3) a summary of existing credible scientific adverse impacts that are relevant to evaluating the reasonably foreseeable significant adverse impacts, and (4) an evaluation of such impacts based on theoretical approaches or research methods generally accepted in the scientific community. Collectively, these guiding regulations provide a framework and process for evaluating the impacts of the alternatives considered in this draft EIS.

GENERAL METHODOLOGY FOR ESTABLISHING IMPACT THRESHOLDS AND MEASURING EFFECTS BY RESOURCE

The following elements were used in the general approach for establishing impact thresholds and measuring the effects of the alternatives on each resource category:

- General analysis methods as described in guiding regulations, including the context and duration of environmental effects
- Basic assumptions used to formulate the specific methods used in this analysis
- Thresholds used to define the level of intensity of the impact resulting from each alternative
- Methods used to evaluate the cumulative impacts of each alternative in combination with unrelated factors or actions affecting park resources
- Methods and thresholds used to determine if impairment of specific resources would occur under any alternative

These elements are described in the following sections.

GENERAL ANALYSIS METHODS

The analysis of impacts follows CEQ guidelines and Director's Order 12 procedures (NPS 2001) and is based on the underlying goal of managing non-federal oil and gas operations to protect park resources.

For each resource topic addressed in this chapter, the applicable analysis methods are discussed, including assumptions and impact intensity thresholds.

BASIC ASSUMPTIONS

Several guiding assumptions were made to provide context for this analysis. These assumptions are described below.

Analysis Period

Goals, objectives, and specific implementation actions are needed to manage non-federal oil and gas operations for the next 15 to 20 years or until conditions change and warrant an update. Therefore, for the purposes of the analysis, the life of the plan and period used for assessing impacts is up to 20 years.

Geographic Area Evaluated for Impacts (Area of Analysis)

The geographic study area (or area of analysis) for this plan includes Big South Fork National River and Recreation Area (NRRA) and Obed Wild and Scenic River (WSR). The area of analysis may extend beyond the parks' boundaries for some cumulative impact assessments. The specific area of analysis for cumulative impacts is described in table 31.

Duration and Type of Impacts

The following assumptions are used for all impact topics (the terms “impact” and “effect” are used interchangeably throughout this document):

- *Short-term impacts*: Impacts would occur for a matter of weeks up to three years, without lasting effects. Examples include impacts on native wildlife and visitors from drilling operations, construction activities, or geophysical operations.
- *Long-term impacts*: Impacts would last for longer than three years, with potentially permanent effects. Examples include the beneficial effects of plugging and reclaiming wells and the longer term effects of roads and on-going production.

  NOTE: All impacts on archeological resources are considered long term.
- *Direct impacts*: Impacts would occur as a direct result of non-federal oil and gas management actions.
- *Indirect impacts*: Impacts would occur from non-federal oil and gas management actions and would occur later in time or farther in distance from the action.

Future Trends

Visitor use and demand are anticipated to remain relatively steady over the life of the plan. Although there have been increases and decreases from year to year, from 1990 to 2009 an average of 783,090 and 207,613 people per year visited Big South Fork NRRA and Obed WSR, respectively. Considering past visitation trends and a likely continued increase in visitation from local/regional areas within driving distance of the park, it is expected that annual visitation over the life of the plan would increase slightly, with some variation from year to year.

IMPACT THRESHOLDS

Determining impact thresholds is a key component in applying NPS *Management Policies 2006* (NPS 2006c) and Director’s Order 12 (NPS 2001). These thresholds provide the reader with an idea of the intensity of a given impact on a specific topic. The impact threshold is determined primarily by comparing the effect to a relevant standard based on applicable or relevant/appropriate regulations or guidance, scientific literature and research, or best professional judgment. Because definitions of intensity vary by impact topic, intensity definitions are provided separately for each impact topic analyzed in this document. Intensity definitions are provided throughout the analysis for negligible, minor, moderate, and major impacts. In all cases, the impact thresholds are defined for adverse impacts. Beneficial impacts are addressed qualitatively.

CUMULATIVE IMPACTS ANALYSIS METHOD

The CEQ regulations for implementing NEPA require the assessment of cumulative impacts in the decision-making process for federal projects. Cumulative impacts are defined as “the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions” (40 CFR 1508.7). As stated in the CEQ handbook, “Considering Cumulative Effects under the National Environmental Policy Act” (CEQ 1997), cumulative impacts need to be analyzed in terms of the specific resource, ecosystem, and human community being affected and should focus on effects that are truly meaningful. Cumulative impacts are considered for all alternatives, including alternative A (the no-action alternative).

Cumulative impacts were determined by combining the impacts of the alternative being considered with other past, present, and reasonably foreseeable future actions. Therefore, it was necessary to identify other ongoing or reasonably foreseeable future projects and plans at the park and, if applicable, the surrounding area. Table 31 summarizes these actions that could affect the various resources at the park. Those requiring additional explanation are discussed in the narrative that follows the table or in chapter 1.

The analysis of cumulative impacts was accomplished using four steps:

- *Step 1*—Identify resources affected.

  Fully identify resources affected by any of the alternatives. These include the resources addressed as impact topics in chapters 3 and 4 of the document.

- *Step 2*—Set boundaries.

  Identify an appropriate spatial and temporal boundary for each resource.

- *Step 3*—Identify cumulative action scenario.

  Determine which past, present, and reasonably foreseeable future actions to include with each resource. These are listed in table 31 and described below.

- *Step 4*—Perform cumulative impact analysis.

  Summarize the impacts of these other actions (x) plus the impacts of the proposed action (y), to arrive at the total cumulative impact (z). This analysis is included for each resource in chapter 4.

TABLE 31. CUMULATIVE IMPACT SCENARIO

Impact Topic	Area of Analysis	Past*	Present	Future*
Geology/soils geologic features	Big South Fork of Cumberland Watershed, Emory River Watershed	• Abandoned mines (acid mine drainage, landslides) • Old logging and agricultural operations • Abandoned well sites and oil and gas access roads • Construction, use, and maintenance of dirt roads and oil and gas wellpads; leaks and spills of contaminating and hazardous substances from oil and gas development; and blowouts during drilling in and adjacent to park • Plugging and reclamation of oil and gas wells in the park (beneficial) • Park maintenance activities including installation and maintenance of roads, trails, and developed sites • Park prescribed-fire program • Visitor uses such as climbing, ORV use, horseback riding, and mountain biking • Logging and timber harvesting • Coal mining • Agricultural activities • Local planning efforts to promote growth • Commercial and/or residential development • Development, use, and maintenance of county and state roads	Same as past	Same as past, plus: • Future coal mining and surface reclamation • Changes to 9B regulations
Water resources/ floodplains/ wetlands	Watersheds	• Abandoned mines (acid mine drainage) • Old logging and agricultural operations • Erosion from abandoned well sites and oil and gas access roads • Construction, use, and maintenance of dirt roads and oil and gas wellpads; leaks and spills of contaminating and hazardous substances from oil and gas development; and blowouts during drilling in and adjacent to park • Oil and Gas development within and adjacent to the parks • Plugging and reclamation of oil and gas wells in the park (beneficial) • Park maintenance activities including installation and maintenance of roads, trails, and developed sites • Combustion of fossil fuels contributing to acidity of water • Park prescribed-fire program • Visitor uses such as ORV use, kayaking, and swimming • Coal mining • Agricultural activities • Park, commercial, and/or residential development and maintenance • Local planning efforts to promote growth • Trail maintenance • Equestrian activities • Industrial discharges • Nonpoint source runoff from industrial and construction sites, roads • Municipal, industrial, and/or park water use and treatment, including withdrawals for local utility districts (Oneida, Jamestown) • Impoundments • Motorboat use downstream • Septic tanks • Sand and gravel mining • Herbicide use • Insect invasions—pine bark beetle,—death of vegetation—resultant changes in water temperature and other chemistry	Same as past, plus: • Potential for coal bed methane/shale gas development and withdrawal or disposal of produced water • Logging and timber harvesting	Same as past, plus: • Potential for coal bed methane/shale gas development and withdrawal or disposal of produced water • Development and implementation of water quality standards per 303(d) program (beneficial) • Logging and timber harvesting • Hemlock woolly adelgid • Changes to 9B regulations

TABLE 31. CUMULATIVE IMPACT SCENARIO

Impact Topic	Area of Analysis	Past*	Present	Future*
Vegetation	The park units and a 1,500-foot setback outside the park units	• Well workovers, access road and wellpad maintenance activities • Abandoned mines (acid mine drainage) • Old logging, including clear-cutting, and agricultural operations • Abandoned well sites and oil and gas access roads, which create disturbances susceptible to invasion of non-native species • Construction, use, and maintenance of dirt roads and oil and gas wellpads; leaks and spills of contaminating and hazardous substances from oil and gas development; and blowouts during drilling in and adjacent to park • Plugging and reclamation of oil and gas wells in the parks • Park maintenance activities including installation and maintenance of roads, trails, and developed sites • Park prescribed-fire program • Visitor uses such as ORV use • Coal mining • Agricultural activities • Local planning efforts to promote growth • Commercial and/or residential development • Exotic species control in and adjacent to park • Insect invasions—pine bark beetle • Fields management	Same as past, plus: • Logging and timber harvesting	Same as past, plus: • Replanting and surface reclamation of logging sites (beneficial) • Spread of exotics from adjacent lands • hemlock woolly adelgid • Logging and timber harvesting • Changes to 9B regulations
Wildlife and aquatic species	The park units and 1 to 5 miles around perimeter	• Abandoned mines (acid mine drainage) • Old logging, including clear-cutting, and agricultural operations • Habitat loss and fragmentation • Infestations: pine bark beetle, • Overhunting/poaching • Introduction of exotic species, including wildlife • Construction, use, and maintenance of dirt roads and oil and gas wellpads; leaks and spills of contaminating and hazardous substances from oil and gas development; and blowouts during drilling in and adjacent to park • Plugging and reclamation of oil and gas wells • Park maintenance activities including installation and maintenance of roads, trails, and developed sites • Park prescribed-fire program • Visitor uses such as ORV use • Coal mining • Agricultural activities • Commercial and/or residential development • Local planning efforts to promote growth • Exotic species control in park (beneficial) • Hunting and trapping • Poaching • Vehicle–wildlife collisions • Harassment • Reintroduction of native wildlife: deer (1950s–1960s), river otters (1980s), turkey (1970s–1980s), and bear and elk (1990s); introduction of non-native species: hogs (1980s) and trout (1970s) • Fields management	Same as past, except: • Overhunting Plus: • Hunting • New commercial and industrial developments • Development of new residential and second home communities	Same as past, except: • Overhunting Plus: • Wildlife management • Spread of exotics from adjacent lands • Replanting and surface reclamation of logging sites (beneficial) • Changes to 9B regulations

TABLE 31. CUMULATIVE IMPACT SCENARIO

Impact Topic	Area of Analysis	Past*	Present	Future*
Federally and state-listed or special-status species	Watersheds	• Abandoned mines (acid mine drainage) • Old logging and agricultural operations • Erosion from abandoned well sites and oil and gas access roads • Habitat loss and fragmentation • Infestations: pine bark beetle, • Overhunting/poaching • Introduction of exotic species, including wildlife • Construction, use, and maintenance of dirt roads and oil and gas wellpads; leaks and spills of contaminating and hazardous substances from oil and gas development; and blowouts during drilling in and adjacent to park • Plugging and reclamation of oil and gas wells in the park (beneficial) • Park maintenance activities including installation and maintenance of roads, trails, and developed sites • Combustion of fossil fuels contributing to acidity of water • Park prescribed-fire program • Visitor uses such as ORV use, kayaking, and swimming • Coal mining • Agricultural activities • Park, commercial, and/or residential development and maintenance • Local planning efforts to promote growth • Trail maintenance • Equestrian activities • Industrial discharges • Nonpoint source runoff from industrial and construction sites, roads • Municipal, industrial, and/or park water use and treatment, including withdrawals for local utility districts (Oneida, Jamestown) • Impoundments • Motorboat use downstream • Septic tanks • Sand and gravel mining • Herbicide use • Exotic species control in park (beneficial) • Hunting and trapping • Poaching • Vehicle–wildlife collisions • Harassment • Reintroduction of native wildlife: deer (1950s–1960s), river otters (1980s), turkey (1970s–1980s), and bear and elk (1990s); introduction of non-native species: hogs (1980s) and trout (1970s) • Reintroduction of mussels (in the park) • Fish stocking (outside) • Fields management	Same as past, plus: • Potential for coal bed methane/shale gas development and withdrawal or disposal of water • Logging and timber harvesting • New commercial and industrial developments. • Development of new residential and second home communities.	Same as past, plus: • Potential for coal bed methane/shale gas development and withdrawal or disposal of water • Logging and timber harvesting • Spread of exotics from adjacent lands • USFWS recovery plans for threatened and/or endangered species (beneficial) • Section 7(a)(1) of ESA park program (beneficial) • Changes to 9B regulations

TABLE 31. CUMULATIVE IMPACT SCENARIO

Impact Topic	Area of Analysis	Past*	Present	Future*
Soundscapes	The park units and a 1,500-foot setback outside the park units	• Construction, use, and maintenance of new and existing dirt roads within and near the park • Vehicular traffic including ORV use, gravel hauling within and near the park • Oil and gas operations within and in close proximity to the park Plugging and reclamation of oil and gas wells • Park maintenance activities • Visitor uses such as hunting • Logging and timber harvesting • Industrial activities such as hardwood flooring production, other manufacturing, and sawmill operation • Coal mining • Agricultural activities • Big South Fork scenic railway • New commercial and industrial developments	Same as past, plus: • Development of new residential and second home communities.	Same as present, plus: • Changes to 9B regulations
Cultural resources	The park units and adjacent lands	• Abandoned mines • Old logging and agricultural operations • Abandoned well sites and oil and gas access roads, providing unauthorized access to cultural resources • Leaks and spills of contaminating and hazardous substances from past oil and gas development in and adjacent to park • Vandalism • Cemetery management • Fields management • Drilling and production operations within and outside the park that are in close proximity to cultural landscapes and cultural sites • Earth-moving activities associated with construction and maintenance of dirt roads and oil and gas wellpads; leaks and spills of contaminating and hazardous substances from oil and gas development; and blowouts during drilling in and adjacent to park • Park maintenance activities including installation and maintenance of roads, trails, developed sites, cultural structures/landscapes • Park prescribed-fire program • Visitor uses such as ORV use • Logging and timber harvesting • Coal mining • Agricultural activities • Commercial and/or residential development • Local planning efforts to promote growth	Same as past	Same as past, plus: • Changes to 9B regulations

TABLE 31. CUMULATIVE IMPACT SCENARIO

Impact Topic	Area of Analysis	Past*	Present	Future*
Visitor use and experience	The park units and a 1,500-foot setback outside the park units	• Abandoned mines (acid mine drainage) • Old logging and agricultural operations • The presence of abandoned well sites and oil and gas access roads, resulting in conditions that may adversely affect visitor use and experience, human health and safety, and recreation • Construction and maintenance of dirt roads and oil and gas wellpads; leaks and spills of contaminating and hazardous substances from oil and gas development; and blowouts during drilling in and adjacent to park • Oil and gas developments in proximity to recreational sites, such as the Howard/White Unit No. 1 oil well on the boundary of Obed WSR • Park maintenance activities including installation and maintenance of roads, trails, and developed sites • Plugging and reclamation of oil and gas wells • Park prescribed-fire program • Visitor uses such as ORV and equestrian use • Logging and timber harvesting • Coal mining • Agricultural activities • Commercial, industrial, and/or residential development • Hunting, trapping, and fishing •	Same as past, plus: • Development of new residential and second home communities.	Same as past, plus: • Changes to 9B regulations
Park management and operations	The park units	• Abandoned mine reclamation • Plugging and reclamation of oil and gas wells	Same as past, plus: • Oil and gas operations • Visitor uses such as ORV use • Implementation of GMP	Same as past, plus: • Oil and gas operations • Visitor uses such as ORV use • Implementation of GMP • Increased visitation • Changes to 9B regulations

*The temporal boundary for cumulative impacts extends from the late 1960s (when oil and gas activity began to increase in the park) to 15 to 20 years in the future (life of the plan).

ESA = Endangered Species Act; GMP = general management plan; ORV = off-road vehicle; USFWS = U.S. Fish and Wildlife Service.

CUMULATIVE IMPACT SCENARIO

The following describes in more detail various cumulative plans, policies, and actions listed in table 31.

NPS MANAGEMENT ACTIONS

Fires and Fire Management, including Prescribed Fires

From 1991 to 2001, 36 wildland fires were suppressed and 7,317 acres were burned at Big South Fork NRRA. In 2004, the Big South Fork NRRA Fire Management Plan (NPS 2006e) was developed to guide actions taken in meeting the fire management goals established for the park. These actions include suppression, mechanical hazard fuel reduction, and prescribed fire to achieve cultural and resource management objectives. The plan specifies the use of prescribed fire and mechanical hazard fuel reduction to reduce accumulations around historic structures, developed areas, and near park boundaries to reduce the likelihood of wildland fire negatively impacting park resources or spreading onto other public or private lands. During the first 5 years of the plan, prescribed fire was used to treat an average of 800 acres annually (NPS 2006e).

Fields Management

Big South Fork NRRA contains 102 field units, totaling approximately 740 acres. Although this represents a very small part (less than 1%) of the park, fields are important components of the park’s natural and cultural landscape. The 2006 Big South Fork NRRA Fields Management Plan (NPS 2006d) identifies desired resource conditions and the kinds/levels of visitor use for each of the fields in the park, depending on the General Management Plan (GMP) zone within which it is located. The plan also identifies specific vegetation conditions for each field (e.g., native warm season grasses, tall fescue (*Lolium arundinaceum*) mix, turfgrass, grassy woodland, and forest). The desired conditions, uses in each field, and whether or not the field is included in a designated cultural landscape were all taken into account when developing the management prescriptions for each field. The long-term objectives for this plan are to (1) restore disturbed lands to natural conditions, (2) enhance habitat for game and non-game wildlife, (3) preserve cultural landscapes, and (4) enhance recreational opportunities (NPS 2006d).

Exotic Species Management

The spread of non-native plant species has historically been occurring, and now represents a serious problem within the national park units. At Big South Fork NRRA, efforts to control exotic vegetation such as multiflora rose have involved the use of herbicides as the primary tool for controlling exotic plant infestations in managed fields. Spot treatments of herbicides applied at labeled rates and various frequencies have been used to control most exotic plant infestations (NPS 2005a).

Threatened and Endangered Species Management

Recovery plans for threatened and endangered species carried out under the U.S. Fish and Wildlife Service (USFWS) and efforts to ensure agency cooperation under Section 7(a)(1) of the Endangered Species Act (ESA) are important for managing populations of threatened and endangered species. There are eight recovery plans in place for 12 species that occur at Big South Fork NRRA or Obed WSR and that are listed as threatened or endangered under the ESA. These species include three plants (Virginia spiraea, Cumberland rosemary and Cumberland sandwort), five mussels (Cumberland elktoe, oyster mussel, Cumberland combshell, purple bean, and rough rabbitsfoot), and four fish (spotfin chub, duskytail darter, blackside dace, and palezone shiner). Please refer to the chapter 1 section “Threatened and Endangered Species Recovery Plans" for detailed descriptions of species recovery plans. As part of these efforts, Big South Fork NRRA staff are working with the USFWS, U.S. Geological Survey (USGS), Tennessee Wildlife Resources Agency (TWRA), and two mussel hatcheries, Virginia Tech Mussel Facility and Kentucky Center for Mollusk Conservation, to propagate freshwater mussels and reintroduce them into the wild.

Implementation of the General Management Plan at Big South Fork NRRA

The GMP for Big South Fork NRRA was completed in 2005, and park staff members have begun its implementation. More details about this plan are provided in the "Relationship to Planning Documents for Big South Fork National River and Recreation Area" section of chapter 1. The Natural Environment Recreation Zone, the Sensitive Resource Protection Zone, and the All-Terrain Vehicle Planning Area are the three zones in which the GMP identifies specific management priorities given the potential for oil and gas activities (see Zone Maps 1-7 in GMP for additional detail). Within the Natural Environment Recreation Zone, natural processes are protected that would allow natural succession into mature forest, which would contribute to predominantly natural conditions being apparent to park visitors. Resources in the Sensitive Resource Protection Zone reflect natural processes and are carefully protected from unnatural degradation. The All-Terrain Vehicle Planning Area Zone is a use-oriented overlay on the Natural Environment Recreation Zone. Within this zone, the desired resource conditions remain the same as described above for the Natural Environment Recreation Zone, but the need for further planning to address the conflicts between this potential experimental area and oil and gas operations is identified as a priority.

Cemetery Management

Big South Fork NRRA is in the process of developing a cemetery management plan to aid in the preservation of the 25 privately owned cemeteries and the 33 federally owned cemeteries located within the boundary of the National River and Recreation Area. In the interim the park follows a draft standard operating procedure (Big South Fork NRRA Draft SOP, B-2 (NPS n.d.a)) that allows access for burial, decoration, and visitation, provided these are consistent with the Big South Fork NRRA GMP and the intent of the enabling legislation for Big South Fork NRRA. Generally, all cemetery access roads are being kept open and in the condition at which they were being maintained at the time of federal acquisition and consistent with access as defined in the 2005 GMP. Private cemetery maintenance and upkeep may be done by family members, while federal cemetery maintenance and upkeep may be done by either family members or by the U.S. government, if the cemetery is determined to have historical significance. No new cemeteries are allowed to be developed, and all cemetery boundaries are those identified at the time of U.S. government acquisition. No new burials are allowed outside of cemetery boundaries on government land.

Visitor Activities Within/Adjacent To the Park Units

Visitor activities such as horseback riding, biking, hunting, recreational rock climbing, swimming, kayaking, and off-road vehicle (ORV) use all occur within Big South Fork NRRA and/or Obed WSR and may contribute to cumulative impacts on the resources considered in this plan/EIS. These activities, as well as the use of motorboats, also occur outside the park units. Overhunting has been an issue in the past, in addition to other unauthorized activities, such as poaching, harassing wildlife, rock gathering, and vandalism at cultural sites. Fishing is another popular recreational activity, and outside the park units, stocking is used to support fisheries. Although visitor uses are not expected to change, annual visitation over the life of the plan is expected to increase slightly, with some variation from year to year.

The nonprofit McCreary County Heritage Foundation owns and operates a sightseeing train that runs from historic downtown Stearns through Barthell (which is adjacent to the boundary of Big South Fork NRRA) to the Blue Heron mine. This scenic route takes visitors through the gorge and is seasonally popular. Expansion of the route north to Yamacraw is in planning.

Development and Maintenance Activities Inside the Park Units

Big South Fork NRRA and Obed WSR have developed numerous features related to parkwide administrative, managerial, and support functions, as well as visitor use. Facilities within Big South Fork NRRA are described in detail under the "Visitor Use" section of chapter 3 and include such amenities as campgrounds, day use areas, interpretive center/visitor contact stations, river access areas, administration buildings, over 300 miles of trails, and over 275 miles of dirt and gravel roads. Facilities in the Obed WSR include a campground and a picnic area. Roads in Big South Fork NRRA are open for use by personal vehicles, commercial vehicles (e.g., gravel trucks), and ORVs for hunting and other recreational opportunities. The NPS routinely maintains these facilities as well as cultural landscapes in the park units.

Development Outside the Park Units

Big South Fork NRRA and Obed WSR are both within 40 miles of Knox and Cumberland counties, as well as interstates 75 and 40. Proximity to these developed areas can affect lightscapes and soundscapes. Relatively low-density residential development occurs in various locations surrounding the park units, and has resulted in the development of infrastructure such as roads, utilities, septic tanks, and water impoundments/intakes for water supply/treatment. More recently, there have been local planning efforts to promote growth surrounding the park units, and new developments include a federal prison in McCreary County, Kentucky; commercial buildings; and a new industrial park. Other development plans in the vicinity of Big South Fork NRRA include new residential and second home communities.

Industrial activity sites that could contribute to cumulative impacts include power plants, railroads hardwood flooring factories, sawmills, and other manufacturing facilities. These sites result in discharges to surface waters as well as nonpoint source pollution from runoff. Southwest of Obed WSR, two industrial parks have been developed in the Crossville area. The Davis Road Park consists of 189 acres of industrial sites. Another 70-acre industrial park is located on Genesis Road in Crossville near Interstate 40 (NPS 1998b).

Oil and Gas Operations

Please refer to the chapter 1 sections "Non-Federal Oil and Gas Development/Management at Big South Fork National River and Recreation Area" and "Non-Federal Oil and Gas Development/Management at Obed Wild and Scenic River" for detailed descriptions of oil and gas operations within and near both park units.

The siting, construction, maintenance, and use of roads, wellpads, production facilities, tank batteries, flowlines, and/or pipelines, as well as the presence of abandoned oil and gas wells within and near the parks, have the potential to contribute to cumulative impacts. Other potential effects of oil and gas operations include the release of hydrocarbons or other pollutants. Present and future oil and gas operations are addressed within the analysis of the proposed alternative in this plan. Past operations also contribute to cumulative impacts. For example, well blowouts have occurred in Tennessee in the last 10 years. Spills and leaks from the Howard/White Unit No. 1 have caused impacts (e.g., soil and water contamination or harm to vegetation) to floodplains and/or wetlands at Obed WSR. The blowout at the Howard/White Unit No. 1 on July 19, 2002, at Obed WSR was particularly notable for the extent of the damage it caused to adjacent lands. During this incident, oil pressures increased to a point at which an oil spill developed around the well and outside the containment area at an estimated 200–500 barrels per hour. The oil well then caught fire, and the spilled oil flowed downhill from the wellhead into White Creek and also into Clear Creek. The fire followed both oiled paths, burning the vegetation and the oil-soaked soil, and the oil adjacent to the banks in both creeks caught fire as well. After the initial spill, oil continued to seep from the creek bank into Clear Creek, with sheens continuing to be released as late as April 2003 (NPS 2003a). A more recent spill occurred on July 29, 2008, when crude oil was released from an abandoned oil well pit east of the town of Oneida, Tennessee (outside the park). The well pit had reached overflow capacity. The abandoned oil well and blowout pit contained approximately 1,000 gallons of oil and rainwater, and released oil to a branch of Paint Rock Creek south of Oneida. During the subsequent cleanup, 30 cubic yards of crude-contaminated soil was removed from the site (U.S. EPA 2008).

Plugging and Reclamation

In addition to oil and gas development, there are also wells that have been or are in the process of being plugged and reclaimed in or near the park units. The NPS plans to plug and reclaim 14 abandoned wells at Big South Fork NRRA through a cooperative agreement with the Tennessee Department of Environment and Conservation, Division of Water Pollution Control. These wells will be plugged in order to protect zones of freshwater from pollution and to prevent the escape of oil, gas, brine, or other fluids to the surface or other zones. The NPS has placed these 14 wells high on an NPS plugging priority list because they are known to leak hydrocarbons, are located near heavy visitor use areas, have seriously worn and unreliable control equipment, have unknown downhole conditions, and/or lie near drinking water sources (NPS 2008a). In addition, the NPS has also recently received funding under the American Recovery and Reinvestment Act (ARRA) to plug and reclaim an additional 39 wells at Big South Fork NRRA to protect resources and provide a safe visitor experience. An environmental assessment addressing this action was completed in early 2010 (NPS 2010a). One other well was plugged with NPS funds in 2005.

Changes to 9B Regulations

On November 25, 2009, the NPS published an advance notice of proposed rulemaking in the Federal Register, seeking comments to assist the agency in developing a proposed rule to revise the 9B regulations governing non-federal oil and gas development within the boundaries of NPS units. Generally, the proposed changes focus on improving resource protection aspects of the regulations while accounting for advances in oil and gas technology and industry practices. Changes being considered include bringing exempted operations under the scope of the regulations, including compliance with operating standards and financial assurances; retaining or enhancing incentives for operators to conduct directional drilling while minimizing indirect impacts of such operations; incorporating updated, effective operating standards in line with those of other agencies and industry groups; requiring access fees; and assessing monetary penalties for noncompliant operations. Although these changes are still in the proposed stage, if adopted, they would result in more protection for park resources and a greater regulatory effort, which may require revising or supplementing this plan/EIS.

Agricultural Activities/Logging

Agriculture other than forestry has occurred on less than 20% of the land in counties adjacent to Big South Fork NRRA and Obed WSR. Most of this has been dedicated to hay production, livestock grazing, and only a very little row-cropping. A plateau area above and to the north of Bear Creek consists of two large, flat ridges of agricultural lands and hardwood forests (NPS 2005a). Because of logging in the early to mid-20th century, most of the forested areas of Big South Fork NRRA are second or third growth Large portions of the extensive Darrow Ridge area in the southwest (including Tar Kiln Ridge) have undergone logging activities.

At Obed WSR, clearing and harvesting from logging and agriculture is particularly evident. Small-scale agriculture and grazing takes place on private lands set back from the rim of the gorge where mixed hardwood–pine forests have been cleared for cropland and browse. Easements on some private lands prohibit livestock operations with large populations of animals. Approximately 3% of the land area in the Obed/Emory River watershed is in agricultural production, primarily livestock production, corn, snap peas, and tobacco. Pasture areas comprise 25% of the land use in the Obed River and upper Emory River watersheds (NPS 1998b).

In addition to continued logging and harvesting, it is expected that replanting and surface reclamation of logging sites would continue to occur.

Mining

In addition to active mining operations, approximately 25,100 acres of unreclaimed abandoned coal mines exist in the Tennessee counties adjacent to the Big South Fork NRRA, and there are about 10 abandoned surface coal mine sites in McCreary County, Kentucky. Most of these sites were mined prior to 1977, before the Surface Mining Control and Reclamation Act required reclamation of mine sites (NPS 2005a). There are an estimated 100 abandoned deep coal mine openings and associated spoil piles within Big South Fork NRRA. Mine reclamation efforts, funded by the Office of Surface Mining, have concentrated on reclamation of former mine sites at areas having visitor access. Threats continue, however, in the New River headwaters due to a recent resurgence in coal mining activities.

Impacts on water quality from coal mining include siltation of streams and acid mine drainage, which occurs from sulfuric acid and ferric hydroxide runoff at active and abandoned coal mining sites. During coal mining, acid is formed by the oxidation of the sulfur in tailings exposed during mining activities, which results in increased acidity, increased heavy metals, and a sterile coating of ferric hydroxide on stream substrate (NPS 1997). Water quality impacts from acid mine drainage are particularly notable in Bear Creek, Roaring Paunch Creek, and New River. Impacts are also evident in the former mining community of Worley.

Impacts on soils and vegetation can occur from strip mining activities. Although extensive coal mining occurs in the Obed/Emory River watershed, there are no active coal mine operations in the Obed WSR. Abandoned strip mines located on the Obed River have revegetated with scrub vegetation. Currently operating quarries in areas of the Obed/Emory River watershed mine primarily fieldstone and Crab Orchard stone. Sand mining also occurs in limited areas of the watershed: two mines are located on a tributary to Island Creek. Some limited impacts from sedimentation occur due to these mines (NPS 1998b).

Steep slopes of the rugged mountains in the area are prone to naturally occurring landslides. In 2005 a massive landslide originating at the site of a reclaimed strip mine occurred in the remote mountains of Scott County, covering 25 acres and affecting a tributary to the New River (Barker 2005).

Wildlife Management

The reintroduction of native wildlife, including deer (1950s to 1960s), turkeys (1970s to 1980s), river otters (1980s), bears (1990s), and elk (1990s), has occurred in the vicinity of Big South Fork NRRA and Obed WSR. There have also been introductions of non-native species, such as feral hogs and non-native trout.

Hunting and trapping, which are regulated by the state, are allowed in both Big South Fork NRRA and Obed WSR. See the “Visitor Use and Experience” section of chapter 3 for more details.

Insect Invasions

Diseases and pests of vegetation, such as the pine bark beetle, have adversely impacted the landscape, causing a demise in vegetation that has resulted in water temperature increases due to lack of shading and changes to water chemistry due to increased erosion and nutrient-rich sediment loads to streams. Pine bark beetles cause damage to the phloem (the living tissue that carries organic nutrients) through larval and adult feeding. Some bark beetle species also carry a blue stain fungus and introduce it into trees, where it colonizes sapwood and disrupts water flow to the tree crown, hastening tree death. A Southern pine bark beetle infestation occurred in Big South Fork NRRA in 2000-2001 and significant tree mortality occurred in pine stands throughout the park. Extensive tree death can also occur as a result of the hemlock woolly adelgid, an exotic insect native to Japan that feeds by sucking sap from young needles, causing them to drop prematurely. While it is suspected to occur in Big South Fork NRRA, this species is not yet confirmed to exist in the park.

Development and Implementation of Water Quality Standards under Section 303(d) of the Clean Water Act

Several 303(d)-listed impaired water bodies exist in the vicinity of both park units. In the 303(d) lists for Kentucky and Tennessee for the year 2008, there are a total of four impaired streams that fall within the Big South Fork NRRA. Within the Obed WSR, there is one stream that was listed in the 303(d) report for Tennessee in 2008. Please refer to Water Resources, in chapter 3 of this document, for more information on these impairments. A total maximum daily load (TMDL) limit must be developed and implemented for these stream segments. A TMDL is a study that (1) quantifies the amount of a pollutant in a stream, (2) identifies the sources of the pollutant, and (3) recommends regulatory or other actions that may need to be taken in order for the stream to return to an unpolluted state. Currently, there are approved TMDLs for two of the four impaired waters in Big South Fork NRRA (Pine Creek and Rock Creek) (TDEC 2008a); a TMDL is still needed for the other two impaired waters, but the schedule for these TMDLs is unknown. A TMDL is also needed for the impaired water at Obed WSR; however, it is considered low priority in the 2008 Tennessee 303(d) report, which indicates the TMDL would be prepared some time before 2020 (TDEC 2008a).

SUMMARY OF OIL AND GAS RESTRICTIONS IN ALTERNATIVES A, B, AND C

For the reader’s convenience, the following summarizes the areas subject to oil and gas operations restrictions under each alternative, unless authorized in an approved plan of operations. These descriptions apply to all topics discussed and are not repeated in each analysis.

Alternative A: No Action (Current Management Continued)—Under alternative A, operations associated with geophysical exploration, drilling, and production could be allowed in all areas of the park units where non-federal oil and gas rights exist, with the exception of protected areas identified by current legal and policy requirements (CLPRs), including the 9B regulations, the gorge restrictions at Big South Fork NRRA, and deed restrictions at Obed WSR, unless authorized in an approved plan of operations. However, while an approved plan of operations could relax SMA restrictions, it would not supersede applicable statutes such as gorge restrictions and deed restrictions. Based on a comparison of known private mineral rights and the extent of these protected areas, geophysical exploration and drilling/production may be restricted on approximately 8,413 acres of land that overlies the approximately 17,477 acres of private minerals at Big South Fork NRRA (unless otherwise approved in a plan of operations and not subject to gorge or deed restrictions). Because of the restrictions at Obed WSR, these operations would not be allowed within the park unit.

Alternative B: Comprehensive Implementation of the 9B Regulations and a New Management Framework for Plugging and Reclamation—Under alternative B, (similar to alternative A), operations associated with geophysical exploration, drilling, and production could be allowed in all areas of the park units where non-federal oil and gas rights exist, with the exception of protected areas identified by CLPRs, including the 9B regulations, the gorge restrictions at Big South Fork NRRA, and deed restrictions at Obed WSR. Based on a comparison of known private mineral rights and the extent of these protected areas, geophysical exploration and drilling/production may be restricted on approximately 8,413 acres of land that overlies the approximately 17,477 acres of private minerals at Big South Fork NRRA (unless otherwise approved in a plan of operations). Because of the restrictions at Obed WSR, which include a No Surface Use stipulation for the gorge area under alternative B, these operations would not be allowed within the park unit. In addition, under alternative B the NPS would implement this oil and gas management plan that clearly articulates and proactively enforces the CLPRs applicable to the exploration, production, and transportation of non-federal oil and gas resources in Big South Fork NRRA and Obed WSR, as described in detail in chapter 2.

Alternative C: Comprehensive Implementation of the 9B Regulations, a New Management Framework for Plugging and Reclamation, and Establishment of Special Management Areas—Operations associated with geophysical exploration, drilling, and production could be allowed in all areas of the park units as described for alternatives A and B; however, under alternative C, Special Management Areas (SMAs) with surface use and timing stipulations would also be formally designated, and operations would be limited in SMAs (see table 8 for details) unless authorized in an approved plan of operations. As a result, under alternative C geophysical exploration may be restricted on approximately 10,943 acres of land that overlies the approximately 17,477 acres of private minerals at Big South Fork NRRA, and drilling/production may be restricted on 11,587 acres of land that overlies the approximately 17,477 acres of private minerals at Big South Fork NRRA (unless otherwise approved in a plan of operations). Establishing the Obed WSR SMA would preclude non-federal oil and gas operations (exploration, drilling, and production) on all federal lands in the park unit. In addition, similar to alternative B, the NPS would implement this oil and gas management plan that clearly articulates and proactively enforces the CLPRs applicable to the exploration, production, and transportation of non-federal oil and gas resources in Big South Fork NRRA and Obed WSR, as described in detail in chapter 2.

GEOLOGY AND SOILS

GUIDING REGULATIONS AND POLICIES

NPS *Management Policies 2006* (NPS 2006c) address soils and geologic resources under several sections: Section 4.8.2—Management of Geologic Features states that the NPS will protect geologic features from unacceptable impacts of human activity while allowing natural processes to continue. The term “geologic features” describes the products and physical components of geologic processes and includes features such as rocks, soils, and minerals; canyons and arches; and dramatic or unusual rock outcrops and formations. Section 4.8.2.4—Soil Resource Management states that the NPS will actively seek to understand and preserve the soil resources of park units, and to prevent, to the extent possible, the unnatural erosion, physical removal, or contamination of the soil or its contamination of other resources. Management action will be taken by park superintendents to prevent, or at least minimize, adverse, potentially irreversible impacts on soils.

Methodology, Assumptions, and Impact Thresholds

The impact intensity threshold definitions are based on the potential for changes to geology and soils characteristics, as follows:

Negligible: Impacts would result in a change to geologic or soil resources, but the change would be so slight that it would not be of any measurable or perceptible consequence. Erosion rates, soil productivity, and soil stability would remain consistent with current conditions.

Minor: Impacts would result in a change to geologic or soil resources, including a change to erosion rates, soil productivity, and soil stability, which would be detectable. The disturbance would be expected to be nearly indiscernible, of little consequence, and localized. Mitigation measures, if needed to offset adverse effects, would be simple and successful.

Moderate: Impacts would result in a change to geologic or soil resources, including a change to erosion rates, soil productivity, and soil stability, which would be readily detectable. The disturbance would be expected to be relatively small and localized. Local geomorphologic features would be affected. Mitigation measures, if needed to offset adverse effects, could be extensive, but would likely be successful.

Major: Impacts would result in a long-term or permanent change to geologic or soil resources that would result in the loss of local geomorphologic features, or would have substantial consequences on a regional scale. The disturbance would be expected to be large and many geologic features would be lost. Extensive mitigation measures would be needed to offset any adverse effects, and the success of these measures would not be guaranteed.

IMPACT OF THE ALTERNATIVES

Alternative A: No Action (Current Management Continued)

Analysis

Geophysical Exploration—The primary impacts on soils from geophysical exploration would result from vegetation clearing and use of seismic vibrator technology. Removal of vegetation increases the potential for soil erosion. Surface disturbances from survey crews traversing the area during geophysical exploration could also cause soil compaction, reducing the soil’s water-holding and infiltration capacities. Compacted soils increase runoff of surface waters and accelerate soil erosion.

There is the possibility that use of seismic vibrator technology could cause disturbance to soils or geologic features from soil movement or settling or ground vibrations. However, mitigation would include the proper selection of vibrator system, setbacks from sensitive resources, adjustments in the energy source, timing during the dry period, and erosion control as needed. Surveys would typically last only 1 to 3 days, and laying of recording devices would also be along designated roads and trails with use of vehicles similar to those used by the public or park maintenance/enforcement staff (all terrain vehicles or 4×4 pickup trucks). Any off road access would be by foot. Vibroseis® units can adjust the amplitude and/or the frequency of the energy source so they can obtain the best imaging of the target formations. That capability can also be used if necessary to help prevent damage to sensitive surface structures or geologic formations. In addition, seismic surveys would be conducted under an approved plan of operations for all alternatives. Natural resource surveys would be conducted as deemed necessary by resource specialists, and appropriate mitigation applied, including offsets from sensitive features determined on a case-by-case basis. As described in the forecast of oil and gas activities in chapter 2, minimal geophysical exploration is expected at Big South Fork NRRA,. Therefore, with the proper selection of the vibrator system and application of mitigation as described above, impacts to soils and geology would be localized, negligible, and adverse.

Drilling and Production—Drilling and production operations would not directly impact soils or geologic resources in protected areas where operations would not be permitted under CLPRs. Where permitted, the construction, maintenance, and use of access roads, wellpads, flowlines, and pipelines could increase soil erosion and affect soil productivity from vehicle compaction and vegetation clearing, and soils could be adversely affected by soil contamination from leaking equipment or spills.

Surface disturbances during drilling and production activities could cause soil compaction, thereby reducing the soil’s water-holding and infiltration capacities. This would in turn reduce the root-penetration capabilities of vegetation and hinder plant growth and further soil formation. These compacted soils would also increase runoff of surface waters and accelerate soil erosion. Soil hydrologic groups C and D, which are typically found in lowland areas (wetlands and floodplains), are very susceptible to adverse impacts from oil and gas operations. These soils have moderate to high erodibility and are especially susceptible to vehicle use.

Where new wells could be located, the construction and maintenance of access roads, wellpads, flowlines, and pipelines would require vegetation clearing, and could erode, compact, and rut soils, thereby reducing soil permeability. To accommodate the well drilling rig and accompanying equipment, the drill site must first be prepared. Site preparation may include extensive clearing, grading, cutting, filling, and leveling of the pad using heavy construction equipment. Soil material suitable for plant growth is often removed first and stockpiled for later use in reclamation. Under CLPRs the NPS does not permit digging reserve pits within the parks. The operator must use a containerized mud system. There are, however, many reserve pits at Big South Fork NRRA from previously existing operations. Slopes are particularly susceptible to erosion caused from road and wellpad construction. Avoidance of steep slopes and sensitive soils is required under CLPRs and is the most cost-effective and sensible approach that would avoid adverse impacts. Soil displacement and losses cannot be predicted with any degree of accuracy until soil studies have been done for a plan of operations. If there are no other practicable alternatives to constructing roads and pads on slopes, construction would be permitted if least damaging methods are used. In all areas of the park units, and particularly for operations constructed on slopes greater than 3%, establishment of 70% native grass cover would be required within 3 months of initiating reclamation to minimize soil erosion.

In the case of Big South Fork NRRA, where new drilling and production operations would be allowed, a 14-foot-wide road (including shoulders and turnouts) 1/4 mile in length would disturb approximately 0.85 acre of soil. Elevated pads for drilling and production operations may disturb as much as 1.5 acres of soil per site. Under the forecast of oil and gas activities, this would result in approximately 36 acres of new disturbance at Big South Fork NRRA, resulting in localized, short-term (construction activities and drilling operations) to long-term (roads, production operations, and flowlines and pipelines), moderate, adverse impacts from construction of oil and gas facilities.

In addition to construction-related impacts associated with development of the access roads and wellpads, another primary impact on soils is the potential for releases of hazardous or contaminating substances during drilling or production operations, including well workovers and servicing. In most cases, primary and secondary containment on a wellpad should prevent the release of drilling muds, diesel fuel, oil and gas, and other substances beyond the wellpad. The composition of the drilling mud depends on the types of formations being drilled as well as other project-specific factors. Mud is often composed of water, and chemical additives such as alkalis, bactericides, soluble chromates, and corrosion inhibitors are often used to optimize well drilling. The drilling mud and cuttings from the well account for the largest volume of waste generated at the well site and, according to CLPRs, the drilling mud (including drill cuttings and waste fluids) must be completely containerized in tanks for off-site disposal at a state-approved facility. Drilling operations in the park units should not encounter formations with H_2S, or with high pressures and associated uncontrolled flows of oil, gas, brine, or freshwater. Safety precautions such as the use of properly weighted drilling muds and blowout preventers are expected to promote safe drilling operations that would prevent blowouts and the release of contaminants.

However, the NPS recognizes that unplanned incidents associated with oil and gas operations such as well blowouts, fires, and major spills within the boundaries of the park present a risk of release of contaminants that can adversely impact soils and geological resources. However, the incident rates for such incidents are low and are not a typical expectation of project implementation. If such an incident did occur, required mitigation measures such as use of blowout preventers and implementation of Spill Prevention, Control, and Countermeasure (SPCC) plans would result in lessening the potential for spilled substances or a well fire to spread into the park, and for timely response and cleanup, so that there is a reasonable expectation that long term adverse impacts would not occur or be limited to minor to moderate levels of intensity, although there could be short-term major adverse effects during the release. In the event that the park’s resources or values are damaged, the NPS could seek remedy both on the ground and in the form of monetary compensation.

Since production operations could continue for multiple years, the potential for leaks and spills of hazardous or contaminating substances from these operations (including flowlines and pipelines) is greater than for any other type of oil and gas operation. Impacts on soils may occur from accidental discharge of drilling fluids during workovers, hazardous waste spills (including diesel fuel), well blowouts, and rupture of flowlines and pipelines. Chronic small leaks and spills could spread through various pathways and over an extended period of time could become substantial and costly to remediate. The intensity of the impacts resulting from this scenario would depend on the type of substance spilled (hydrocarbons, produced waters, chemicals, solvents, and fuels) and the size of the area impacted. Releases of contaminating or hazardous substances normally require in situ treatment or the removal of all of the contaminated soil and replacement with soil brought in from outside the park unit. The chances of undetected spills are greater under this alternative because routine inspections would not occur beyond base workload levels, which increases the potential for a more severe or widespread adverse impact.

Under CLPRs, risks associated with accidental releases of hazardous and contaminating substances are reduced by a variety of operating stipulations. Careful siting of operations would avoid moderate or steep slopes, reducing the potential for downslope contamination with oil, gas, or other hazardous substances. Other considerations for locating a production site would include avoiding close proximity to wetlands, floodplains, or waterways. Other mitigation techniques include the use of less toxic or hazardous substances, storing the minimum quantity of contaminating and hazardous substances at operations locations, storing barrels or smaller containers of chemicals with secondary containment, using automatic shutoff valves on wells and on flowlines on each side of crossings of waterways and other sensitive resource areas, constructing berms and installing liners at production tank facilities and increasing their capacity to accommodate high precipitation events, and including a spill notification and response plan in the plan of operations.

Although the NPS would not monitor and inspect wells as frequently, it would typically be notified when a problem was discovered, and would take steps to minimize adverse impacts from leaks and spills of hazardous and contaminating substances. Given the operating stipulations and mitigation under CLPRs, as well as the limited number of new operations projected in the forecast of oil and gas activities, there would be localized short- to long-term minor to moderate adverse impacts on soils from drilling and production operations in the park units, although the potential for a major adverse impact from an undetected spill or release is more likely under this alternative.

Plugging and Reclamation—As described in the forecast of oil and gas activities, approximately 50 wells are expected to be plugged and reclaimed, resulting in the reclamation of approximately 87 acres of land. Well plugging, shutting down and abandoning/removing flowlines and pipelines, and use of heavy equipment and vehicles during reclamation activities could cause soil erosion and could disturb and contaminate soils. Most plugging jobs would be in the 2- to 3-day range from rig up to rig down. Equipment and materials to be used during the plugging operations may consist of cement trucks, pulling rigs, water trucks, personal vehicles, and tanks for holding well material.

Incorrectly removing fill materials could result in exposure and erosion of the underlying soils. Contamination from hydrocarbons and produced water persists at several of these inactive and abandoned oil and gas operations. Until cleanup is successfully completed, there would be adverse impacts on geologic resources. CLPRs require the operator to conduct baseline soil chemical analyses so that if there were a release of hazardous or contaminating substances, the operator could remove or remediate the contaminants to acceptable levels and reclaim the site to predisturbance conditions. Predisturbance conditions would most often not be known with certainty; however, cut-and-fill areas of original road and pad construction would often be readily apparent. Surrounding plant communities are strong indicators of predisturbance vegetation conditions. Decisions on returning a site to its original contours would take into consideration current conditions of plant communities and soils/slope stability. Typically, small earthmoving equipment (small bulldozer or backhoe) would be used to restore contours, remove pit contents if necessary, etc. Erosion-control measures would be used to prevent soil movement off the site. Considering these factors, plugging and reclamation activities would result in localized short-term negligible to minor adverse impacts on soils.

Once plugging and reclamation is complete, there would be long-term beneficial impacts on geology and soils across approximately 87 acres of the park units. Plugging and reclamation of wells would allow vegetation in disturbed areas to recover and provide erosion control in areas of previous impacts from oil and gas operations. Plugging and reclamation would also remove sources of potential leakage such as wellhead equipment and flowlines.

Directionally Drilled Wells—Wells directionally drilled and produced from outside the park units to bottomholes beneath the park units could indirectly impact soils and other geologic resources in the park units. The types of impacts related to soil erosion and runoff are expected to be similar to those described above for operations inside the park units, but the intensity of impacts could increase for operations sited closer to park boundaries, where water and sediment can be transported downslope into park units through gullies or overland flow. Impacts would depend on proximity of operations to the park units; site-specific environmental conditions, such as steepness and direction of slope, and surface hydrology; and mitigation measures being employed. Based on these factors, indirect impacts on geologic resources in the park units would range from no impact to localized, short- to long-term, minor adverse impacts, with the potential for major adverse impacts due to a well blowout, fire, or large uncontrolled release. However, reclamation of wells directionally drilled from outside the park units to bottomholes beneath them would also result in long-term beneficial impacts.

Cumulative Impacts

With the continuing reduction of impacts from oil and gas activities in both park units stemming from increased plugging and reclamation, and a corresponding decrease in new drilling and production, impacts to geology and soils are expected to diminish and contribute less to cumulative impacts over time. However, several actions described in the “Cumulative Impacts Scenario” section of this chapter would result in both adverse and beneficial cumulative impacts on soils and geology at the park units.

Geologic resources (primarily soils) under all alternatives could be adversely affected by agricultural and forestry operations, urban and residential development, road construction, and oil and gas operations within and outside the park units. Agricultural, forestry, and construction activities may cause compaction and rutting, reduce permeability, and increase erosion. These actions would have potentially widespread short- and long-term minor to moderate adverse impacts on soils and geology.

Urban, residential, and agricultural runoff (such as fertilizers and oil, and leachate from septic systems) and accidental leaks and spills of oil, produced water, or other contaminating substances from abandoned, ongoing, and future oil and gas operations could contaminate sediments and soils, resulting in minor to major adverse impacts. Existing and abandoned operations in the park units would continue to adversely affect geologic resources until the sites are reclaimed. Existing and future coal mining would also contribute incrementally to cumulative impacts in the study area, resulting in long-term minor to major localized adverse impacts on soils and geology.

In addition to cumulative actions that have negative effects on soils and geology, there are also some actions that have beneficial effects. For example, the NPS has published an advance notice of proposed rulemaking in the Federal Register regarding a proposed rule to revise the 9B regulations governing non-federal oil and gas development within the boundaries of NPS units. Generally, the proposed changes focus on improving resource protection aspects of the regulations while accounting for advances in oil and gas technology and industry practices. These changes could have long-term beneficial impacts on soils and geology, due to improving resource protection practices. The NPS has plugged one well and is in the process of plugging and reclaiming 14 abandoned wells at Big South Fork NRRA and also recently received funding to plug and reclaim an additional 39 wells at Big South Fork NRRA to protect resources and provide a safe visitor experience. Surface reclamation that has occurred or would occur on these existing access roads and wellpads would reduce soil erosion and reestablish surface drainage flows. These actions would result in long-term beneficial impacts on soils and geology. The information provided by geologic resource surveys of proposed operations in the park units would increase NPS knowledge of the resource in the park units, a negligible beneficial impact.

Overall, the impacts of these actions, when combined with the localized short-term negligible to moderate adverse impacts and the beneficial effects of alternative A, would result in short- and long-term minor to moderate adverse cumulative impacts on soils and geological resources. Alternative A would directly impact a relatively small area and would contribute a minimal amount to overall adverse cumulative impacts.

Conclusion

Under alternative A geophysical exploration, including soil compaction and use of seismic vibrator technology, would result in short-term localized negligible adverse impacts on geology and soils. During drilling, production, or transport, hydrocarbons, produced waters, or treatment chemicals could be released with short- to long-term minor to moderate adverse impacts, but with a risk for more widespread or severe adverse impacts from leaks and spills that could go undetected. Pad construction would result in localized long-term moderate adverse impacts. Well plugging, shutting down and abandoning/removing flowlines and pipelines, and use of heavy equipment and vehicles during reclamation activities would result in localized short-term negligible to minor adverse impacts at sites throughout the park units. Once plugging and reclamation is complete, however, there would be long-term beneficial impacts on geology and soils in areas where drilling had occurred, allowing vegetation in disturbed areas to recover and provide erosion control in areas of previous impacts from oil and gas operations. Indirect impacts on geologic resources in the park units from directionally drilled wells outside the units would range from no impact to localized, short- to long-term, minor adverse impacts. However, reclamation of wells directionally drilled from outside the park units to bottomholes beneath them would also result in long-term beneficial impacts. For both in-park and adjacent directionally drilled wells, up to major short-term adverse effects could occur in the unlikely event of a well blowout, fire, or uncontrolled release.

The adverse and beneficial effects of past, present, and reasonably foreseeable future actions, when combined with the short- and long-term negligible to moderate adverse impacts as well as the long-term beneficial effects of alternative A, would result in short- and long-term minor to moderate adverse cumulative impacts on soils and geologic resources. When compared to the broader area of analysis, alternative A would directly impact a relatively small area and contribute minimally to overall adverse cumulative impacts.

Alternative B: Comprehensive Implementation of the 9B Regulations and a New Management Framework for Plugging and Reclamation

Analysis

Geophysical Exploration—Similar to alternative A, minimal geophysical exploration is expected at Big South Fork NRRA, except for the limited possibility of conventional seismic lines in areas of existing roads where data could be acquired quickly and inexpensively using seismic vibrator technology. As a result, impacts associated with geophysical exploration in alternative B from vegetation clearing, crew access and seismic vibrator use would be very similar to the impacts described in alternative A, and would be localized, short term, negligible, and adverse.

Drilling and Production—Drilling and production activities under alternative B would result in no direct impacts on geologic resources covered by the No Surface Use stipulation described previously. In all other areas of the park units where drilling and production operations could be permitted, the construction and maintenance of access roads, wellpads, flowlines, and pipelines could erode, compact, and rut soils; introduce non-native construction materials; and reduce soil permeability. Releases of hazardous or contaminating substances during drilling or production operations could also adversely affect soils, and well blowouts, fires or large uncontrolled releases could cause short-term major adverse impacts. However, under alternative B the NPS would implement an oil and gas management plan that clearly communicates and proactively enforces the CLPRs applicable to the exploration, production, and transportation of non-federal oil and gas resources in Big South Fork NRRA and Obed WSR. Additionally, increased inspections and monitoring under alternative B would reduce the chance of leaks or releases going undetected and affecting a large area of soils, and would proactively identify sites that may be impacting, or threatening to impact, park resources beyond the operations area. The 9B regulations would be enforced at any such sites, and operations found to pose a significant threat to federally owned or controlled lands would be suspended by the superintendent until the threat is removed or remedied (see 36 CFR 9.33 and 9.51). As a result, although short-term and long-term adverse impacts from drilling and production would still occur, this alternative would protect park resources and values, including soils, better than alternative A. Therefore, alternative B would have short-term and long-term minor adverse impacts.

Plugging and Reclamation—Between both park units, approximately 50 wells are expected to be plugged and reclaimed, resulting in the reclamation of approximately 87 acres of land. Similar to alternative A, well plugging, shutting down and abandoning/removing flowlines and pipelines, and use of heavy equipment and vehicles during reclamation activities could cause soil erosion and could disturb and contaminate soils. However, under alternative B the NPS would implement an oil and gas management plan that clearly articulates the CLPRs applicable to the exploration, production, and transportation of non-federal oil and gas resources in Big South Fork NRRA and Obed WSR. This includes a new management framework for plugging and reclamation of wells, which would allow the NPS and operators to efficiently complete the compliance process for the plugging and reclamation of inactive wells that represent potential threats to park resources and values. Coupled with the mitigation described for alternative A and in appendix B, there would be localized short-term negligible to minor adverse impacts.

Once plugging and reclamation is complete, there would be long-term beneficial impacts on soils and geology from removing sources of erosion and releases of hydrocarbons or toxic substances. Additionally, the new management framework for plugging and reclamation would increase the certainty that wells would be plugged and reclaimed to applicable standards, and therefore, long-term beneficial effects would be more likely to be realized sooner.

Directionally Drilled Wells—Wells directionally drilled and produced from outside the park units to bottomholes beneath them could indirectly impact geology and soils in the park units. For the three wells directionally drilled from outside the park unit at Obed WSR, impacts would be very similar to the impacts described under alternative A. The intensity of impacts on park resources would depend on the proximity of operations to the park and site-specific conditions. Adverse impacts on geology and soils in the park would range from no impact to localized, short- to long-term, minor adverse impacts, with the potential for major adverse impacts due to a well blowout, fire, or large uncontrolled release. However, reclamation of wells directionally drilled from outside the park units to bottomholes beneath them would also result in long-term beneficial impacts.

Cumulative Impacts

Impacts on soils and geology from other actions that were considered under the cumulative impact scenario would be the same as described for alternative A. The adverse and beneficial effects of the cumulative actions, when combined with the short- and long-term negligible to minor adverse impacts as well as the long-term beneficial effects of alternative B, would result in short- and long-term minor to moderate adverse cumulative impacts on soils and geology in the watersheds. The more proactive enforcement of CLPRs and increased inspections/monitoring would limit adverse impacts, but the majority of the impacts on soils and geology of the watershed lie outside the park units, where impacts may or may not be mitigated. When compared to the larger area of analysis, alternative B would directly impact a relatively small area and would contribute minimally to overall adverse cumulative impacts. Alternative B would provide long-term cumulative benefits due to its proactive management and enforcement and expedited well plugging.

Conclusion

Similar to alternative A, limited exploration operations would result in localized short-term negligible adverse impacts on soils and geology from vegetation clearing, crew access, and seismic vibrator technology. The construction and maintenance of drilling and production operations would result in localized short-and long-term minor adverse impacts in Big South Fork NRRA where such activities would be permitted. Plugging and reclamation of new and existing and abandoned operations would result in localized short-term negligible to minor adverse impacts on geologic resources. Indirect impacts on geologic resources in Obed WSR from drilling and production of directional wells drilled from outside the park unit to bottomholes beneath the park unit would range from no impact to localized short to long--term minor adverse impacts. Once plugging and reclamation is complete, there would be long-term beneficial impacts on soils and geology from removing sources of erosion and releases of hydrocarbons or toxic substances. Although up to major short-term adverse effects could occur in the unlikely event of a well blowout, fire, or uncontrolled release from any well, the risk of that occurring is less under alternative B due to increased monitoring and inspections.

The adverse and beneficial effects of the cumulative actions, when combined with the short- and long-term negligible to minor adverse impacts as well as the long-term beneficial effects of alternative B, would result in short- and long-term minor to moderate adverse cumulative impacts on soils and geologic resources. When compared to the broader area of analysis, alternative B would directly impact a relatively small area and would contribute minimally to overall adverse cumulative impacts. Alternative B would provide long-term cumulative benefits due to its proactive management and enforcement and expedited well plugging.

Alternative C: Comprehensive Implementation of the 9B Regulations, a New Management Framework for Plugging and Reclamation, and Establishment of Special Management Areas

Analysis

Geophysical Exploration—Similar to alternative A, minimal geophysical exploration is expected at Big South Fork NRRA, except for the limited possibility of conventional seismic lines in areas of existing roads where data could be acquired quickly and inexpensively using seismic vibrator technology. With the addition of the Sensitive Geomorphic Feature and Cliff Edge SMAs under alternative C, potential impacts on sensitive geomorphic features would be identified early on and avoided. As a result, impacts associated with geophysical exploration in alternative C from vegetation clearing, crew access and seismic vibrator use would be very similar to the impacts described in alternative A, and would be localized, short term, negligible, and adverse.

Drilling and Production—Although the forecast of oil and gas activities accounts for 36 acres of disturbance associated with new drilling and production operations, the designation of SMAs would limit the effects on geology and soils within SMA boundaries. Limiting drilling and production operations in the Sensitive Geomorphic Feature and Cliff Edge SMAs would reduce the degree of adverse impacts on soils and sensitive geomorphic features susceptible to adverse impacts from oil and gas operations. Impacts on soils and geology in areas of the park where drilling and production would be permitted would be essentially the same as described for alternative B: the construction and maintenance of access roads, wellpads, flowlines, and pipelines could erode, compact, and rut soils; introduce non-native construction materials; and reduce soil permeability; and releases of hazardous or contaminating substances during drilling or production operations could adversely affect soils. Well blowouts, fires, or large releases could cause short-term major adverse impacts, but the probability of occurrence would be low. Overall, impacts on geology and soils at Big South Fork NRRA from drilling and production under alternative C would be localized, short to long term, negligible to minor, and adverse.

Plugging and Reclamation—As with alternatives A and B, approximately 50 wells are expected to be plugged and reclaimed, resulting in the reclamation of approximately 87 acres of land. Similar to alternative B, well plugging, shutting down and abandoning/removing flowlines and pipelines, and use of heavy equipment and vehicles during reclamation activities could cause soil erosion and could disturb and contaminate soils, but with mitigation and the new management framework for plugging and reclamation of wells, there would be localized short-term negligible to minor adverse impacts.

Once plugging and reclamation is complete, there would be long-term beneficial impacts on soils and geology from removing sources of erosion and releases of hydrocarbons or toxic substances. Because SMAs would be used to prioritize wells for plugging, those in proximity to sensitive geomorphic features and cliff edges could be plugged sooner. Additionally, the new management framework for plugging and reclamation would increase the certainty that wells would be plugged and reclaimed to applicable standards. Therefore, long-term beneficial effects would be more likely to be realized sooner.

Directionally Drilled Wells—Under alternative C some wells may be directionally drilled from outside the SMAs or outside the park units to develop hydrocarbons underlying the SMAs. The intensity of impacts on soils is dependent on where the operation is located with respect to soil type, whether the operation is sited inside or outside of the park unit, and on the resource protection measures that are employed. Indirect impacts on geologic resources in the park units from drilling and production of directional wells from outside the park or SMA boundaries could range from no impact to short- to long-term, negligible to minor, adverse impacts, with the potential for major adverse impacts due to a well blowout, fire, or large uncontrolled release. Reclamation of directionally drilled wells would result in long-term beneficial impacts.

Cumulative Impacts

Cumulative impacts on soils and geology in the area of analysis from other actions that were considered under the cumulative impact scenario would be the same as described for alternative A. The adverse and beneficial effects of the cumulative actions, when combined with the short- and long-term negligible to minor adverse impacts as well as the long-term beneficial effects of alternative C, would result in short- and long-term minor to moderate adverse cumulative impacts on soils and geology in the watersheds. When compared to the broader area of analysis, alternative C would directly impact a relatively small area and would contribute minimally to overall adverse cumulative impacts. Alternative C would provide long-term cumulative benefits due to its proactive management and enforcement, identification and protection of SMAs, and expedited well plugging.

Conclusion

Under alternative C, limited exploration operations would result in localized short-term negligible adverse impacts on soils and geologic resources in the park units from vegetation clearing, crew access, and use of seismic vibrator technology. Drilling and production would be permitted in areas of Big South Fork NRRA outside of established SMAs (or as approved in a plan of operations that protects SMA resources and values), with localized short- to long-term negligible to minor adverse impacts. Plugging, abandonment, and reclamation of existing and abandoned operations throughout the park units and of new operations located outside SMAs would result in localized short-term negligible to minor adverse impacts on geologic resources. Once plugging and reclamation is complete, there would be long-term beneficial impacts on soils and geology, as described in the previous section. Impacts from directional drilling from outside SMAs could range from no impact to localized, short- to long-term, negligible to minor, adverse impacts. Reclamation of directionally drilled wells would result in long-term beneficial impacts. Although up to major short-term adverse effects could occur in the unlikely event of a well blowout, fire, or uncontrolled release from any well, the risk of that occurring is less under alternative C due to increased monitoring and inspections.

Cumulative impacts would be similar to those described for alternative B, with short- and long-term minor to moderate adverse cumulative impacts on soils and geology. When compared to the broader area of analysis, alternative C would directly impact a relatively small area and would contribute minimally to overall adverse cumulative impacts. Alternative C would provide long-term cumulative benefits due to its proactive management and enforcement, SMA identification and protection, and expedited well plugging.

WATER RESOURCES

GUIDING REGULATIONS AND POLICIES

The importance of water resources is highlighted in the Big South Fork NRRA purpose, which states that the NRRA was established to preserve the free-flowing Big South Fork and portions of its tributaries and to preserve the natural integrity of the gorge, and is also highlighted in the Obed WSR purpose, which states that the purpose of this park service unit is to preserve and protect the Obed WSR system and the surrounding area in an essentially primitive condition, with unpolluted waters, for the benefit and enjoyment of present and future generations (NPS 2005b).

The NPS *Management Policies 2006*, section 4.6.1 (NPS 2006c), addresses water resource management and states that the NPS will perpetuate surface and groundwater as integral components of park ecosystems and avoid the pollution of park waters by human activities occurring in and outside the park units. The NPS will take all necessary actions to maintain or restore the quality of surface and groundwater within the park units in a manner consistent with all applicable regulations.

The Water Resources Development Act of 1974 states:

> …the Big South Fork NRRA was created: for the purposes of … preserving as a natural, free-flowing stream the Big South Fork of the Cumberland River, major portions of its Clear Fork and New River stems, and portions of their various tributaries for the benefit and enjoyment of present and future generations, the preservation of the natural integrity of the scenic gorges and valleys, and the development of the area's potential for healthful recreation.

Other guiding regulations and policies that pertain to water resources include numerous federal and state statutes, as described in appendix F.

METHODOLOGY, ASSUMPTIONS, AND IMPACT THRESHOLDS

Given the programmatic nature of this plan/EIS, the exact locations of oil and gas operations associated with the reasonably foreseeable development (RFD) scenario and the forecast of oil and gas activities are unknown. The degree of potential impacts on water resources from oil and gas development would depend on the types and locations of operations and the mitigation measures used to reduce impacts. As a result, a qualitative analysis of the potential impacts of oil and gas operations on surface and groundwater was conducted based on best professional judgment and discussions with NPS staff and consultants.

The impact intensity threshold definitions are based on the potential for changes to water resource characteristics, as follows:

Negligible: Impacts would result in a change to water resources but the change would be so slight that it would not be of any measurable or perceptible consequence. Water quality and streamflows would be consistent with historical or baseline conditions. These changes would not affect the main stems of the Big South Fork of the Cumberland River or Obed WSR or wild and scenic river values.

Minor: Impacts would result in a change to water resources of the main stems of the Big South Fork of the Cumberland River or Obed WSR, whether they are detectable or not. For other waters, impacts would result in a detectable change to water resources, but the change would be expected to be small, of little consequence, and localized. Water quality and streamflows would be consistent with historical or baseline conditions, and the impacts would not affect wild and scenic river values. Mitigation measures, if needed to offset adverse effects, would be simple and successful.

Moderate: Impacts would result in a change to water resources that would be readily detectable and localized. Occasional alterations of historical or baseline water quality or streamflow conditions may occur, but would not affect wild and scenic river values. Mitigation measures, if needed to offset adverse effects, could be extensive but would likely be successful.

Major: Impacts would result in a change to water resources that would have substantial consequences on a regional scale, including the potential for affecting wild and scenic river values. Frequent alterations in the historical or baseline water quality and streamflow conditions would occur over a large area and could result in modifications to the natural stream channel and instream flow characteristics. Extensive mitigation measures would be needed to offset any adverse effects, and the success of these measures would not be guaranteed.

IMPACT OF THE ALTERNATIVES

Alternative A: No Action (Current Management Continued)

Analysis

Geophysical Exploration—As described in the forecast of oil and gas activities in chapter 2, minimal geophysical exploration is expected at Big South Fork NRRA, except for the limited possibility of conventional seismic lines in areas of existing roads where data could be acquired quickly and inexpensively, using seismic vibrator technology. Therefore, since designated existing access roads would be used, receiver lines would be laid on foot, and no explosives would be used, there would be very limited impacts on water quality. Where the use of existing roads would disturb existing unpaved surfaces and could result in increased road runoff or would include driving across small streams or gullies, CLPRs would also protect water resources, since the 9B regulations require that “Surface operations shall at no time be conducted within 500 feet of the banks of perennial, intermittent, or ephemeral watercourses” (36 CFR 9B). Natural drainage paths would be avoided when possible, and refueling of vehicles would not be done near surface waters to reduce the chances for spills. These stipulations would minimize impacts on surface water resources, which would be localized, short term, negligible, and adverse.

Drilling and Production—Drilling and production operations would not directly impact water resources in protected areas where operations would not be permitted under CLPRs. Where permitted, the construction, maintenance, and use of access roads, wellpads, flowlines, and pipelines could increase turbidity, sedimentation, and soil erosion, and could alter flow characteristics and hydrologic functions of surface waters. Clearing of vegetation for these activities would expose soils to erosion, which could move downslope and increase turbidity and sedimentation in nearby surface waters. This could also create ruts or gullies that channel surface water flows. Road construction and the use of compacted road fill could also reduce infiltration rates on road surfaces, increasing surface runoff. Access roads and pads could also disrupt natural surface flow patterns and might result in an increase or decrease in the amount of water in some areas. Additional roads in the park could increase access, which in turn could result in additional land disturbance and erosion. If roads are used during wet conditions, rutting could occur and might concentrate surface water flows.

Water resources could become contaminated if hazardous or contaminating substances are released during drilling, production, servicing, or transport. Although drilling operations in the park should not encounter formations with H_2S or high pressures and associated uncontrolled flows of oil, gas, brine, or freshwater, blowouts could occur during drilling and release hydrocarbons, water, and drilling mud. There could also be accidental spills of drilling mud, diesel fuel, and other chemicals during drilling operations. If drilling mud, fuels, or other chemicals are spilled on the ground and there is no impermeable liner on the wellpad, the fluids could infiltrate into shallow aquifers or reach nearby surface waters, resulting in potentially major adverse impacts if these are not detected and remediated.

The NPS recognizes that unplanned incidents associated with oil and gas operations such as well blowouts, fires, and major spills within the boundaries of the park present a risk of release of contaminants that can adversely impact water resources. However, the incident rates for such incidents are low and are not a typical expectation of project implementation. If such an incident did occur, required mitigation measures such as use of blowout preventers and implementation of SPCC plans would result in lessening the potential for spilled substances or a well fire to spread into the park, and for timely response and cleanup, so that there is a reasonable expectation that long term adverse impacts would not occur or be limited to minor to moderate levels of intensity, although there could be short-term major adverse effects during the release. In the event that the park's resources or values are damaged, the NPS could seek remedy both on the ground and in the form of monetary compensation.

Because production operations could continue for 20 years or longer, the potential for leaks and spills of hazardous or contaminating substances from production operations (including flowlines and pipelines) is greater than for any other phase of oil and gas operations. Adverse impacts on water quality might occur from accidental leaks and spills of drilling fluids during workovers, hazardous waste spills (including diesel fuel), well blowouts, ruptures of flowlines and pipelines, and spills from tanker trucks. Chronic small leaks and spills could spread through various pathways, and over an extended period of time could become substantial and costly to remediate. The chances of undetected spills, which increase the potential for a major adverse impact, are greater under this alternative than under the action alternatives because routine inspections would be limited to base workload levels. Faulty installation or corrosion of production casing might go undetected and could adversely impact groundwater, if hydrocarbons and/or produced waters migrate into an aquifer and contaminate groundwater. The intensity of the impact would depend on the type of substance spilled (hydrocarbons, produced waters, chemicals, solvents, and fuels) and the size of area impacted, but, as noted above, could reach the level of major adverse impacts.

The transport of hydrocarbons also has the potential to adversely affect water quality. Production pipelines can rupture from corrosion of the pipe, or from failure of a flange, valve, or seal. Oil and gas pipelines are generally larger in diameter and under more pressure than the smaller flowlines and therefore pose the potential for a large-volume release. The escaping fluids could contaminate surface and groundwater and could have adverse impacts on water quality. In lieu of transporting hydrocarbons via pipelines, the product could be transported by tanker truck. This method has a greater potential for leaks and spills during transfer of fluids to the tanker, in addition to the potential for vehicular accidents in which the tank contents could be spilled.

Although the potential for water quality impacts would exist, as described in the forecast of oil and gas activities in chapter 2, only up to 20 new wells are expected in Big South Fork NRRA and only up to 5 wells, directionally drilled from outside the park unit, are expected in Obed WSR. In addition, measures to be implemented under CLPRs are expected to prevent the contamination of surface and groundwater. For new operations, siting drilling and production operations 500 feet from waterways as required under 36 CFR 9.41(a), unless specifically authorized by an approved plan of operations, would reduce the likelihood of spills entering waterways. Also, careful siting of wellpads away from moderate or steep slopes would minimize the potential of contaminating or hazardous substances being transported downslope into adjacent waters. The use of automatic shutoff valves on flowlines and pipelines on each side of any water-body crossing would reduce the volume of a hydrocarbon release. Additional mitigation measures that would protect water resources include using the least contaminating and hazardous substances, storing the minimum quantity of contaminating and hazardous substances at operations locations, storing barrels or smaller containers of chemicals in “coffins” or other secondary containment, constructing berms and installing liners at drilling operations and at production facilities, increasing capacity within the firewall to accommodate high precipitation events, and including a spill notification and response plan in the plan of operations. In addition, safety precautions, such as the use of properly weighted drilling muds and blowout preventers, are expected to promote safe drilling operations, avoiding blowouts and the release of contaminants. Primary and secondary containment systems, such as containerized mud systems, impermeable wellpad liners, and berms around the perimeter of the wellpad, should prevent the release of hazardous and contaminating substances into surface and groundwater. Proper site containment and placement and cementing of casing through all usable aquifers according to the minimum standards should adequately protect groundwater from contamination with hydrocarbons and produced waters.

Although the NPS would not routinely monitor and inspect wells as frequently as desired under this alternative, it would typically be notified when a problem was discovered, and would take steps to minimize adverse impacts from leaks and spills of hazardous and contaminating substances. Releases of contaminating or hazardous substances normally require in situ treatment of soils and surface and groundwater, or the removal of all the contaminated soil and replacement with soil brought in from outside the park. Cleanup attainment levels are to the baseline surface- and groundwater chemistry, which is determined prior to beginning operations.

Given the above operating standards and other mitigation under CLPRs, as well as the limited number of new operations projected in the forecast of oil and gas activities, there would be localized short- to long-term negligible to moderate adverse impacts from drilling and production operations in the park units, although the potential for a major adverse impact from a spill or release would be more likely under this alternative.

Plugging and Reclamation—As indicated in the forecast of oil and gas activities in chapter 2, plugging and reclamation of wells is expected to be the primary oil and gas operation conducted in Big South Fork NRRA and Obed WSR during the life of this plan. Between both park units, approximately 50 wells are expected to be plugged and reclaimed, resulting in the reclamation of approximately 87 acres of land.

Clearing vegetation from oil and gas access roads and wellpads and the use of heavy equipment and vehicles would temporarily increase localized erosion potential, which could result in turbidity and sedimentation in nearby waterways. In addition, there is the potential for release of liquid hydrocarbons and/or contaminating or hazardous substances into surface and groundwater from vehicles, wellhead equipment, or flowlines during well plugging and reclamation activities. These temporary activities could cause detectable, localized changes to water quality in the case of wells located near surface waters.

However, mitigation measures would be applied during plugging and reclamation operations to minimize potential long-term impacts on water resources. These measures include conducting activities within previously disturbed areas, using chainsaws and tractors equipped with bush hogs to limit ground disturbance, using erosion-control structures (straw bales and silt fences), placing tanks at each well to capture any well fluids produced during plugging, and placing a liner around the wellhead and under all service vehicles to prevent contamination. All stream crossings on routes identified in the GMP as part of the trail system would have a subbase of rock and a filter fabric layer installed, or the crossings would be hardened with concrete planks. Soil, hydrology, and native vegetation communities would be restored as soon as practicable after completion of the plugging operation to limit erosion and runoff. Reclamation of wellpads and access roads would reduce erosion rates to predisturbance levels. Over time, these practices could eliminate the adverse impacts caused by original drilling and production operations, if fill materials are completely removed, sites are properly prepared, sites are stabilized to match original contours, and proper seed mixtures and revegetation techniques are used. Therefore, plugging and reclamation activities would have localized short-term minor adverse impacts on water resources.

There are currently a number of known well sites with the potential to adversely affect surface water as a result of leaking fluids, past or present spills, and poor condition of existing structures at orphaned well sites. During plugging operations, park staff would conduct a more thorough testing for contamination at each site. If contamination is found, subsequent steps would be taken to remove or neutralize contaminating substances. In addition, reclaiming the wellpads and access roads would have a beneficial impact on water resources by reducing soil erosion and reestablishing surface drainage flows, once recontouring and planting and establishment of native vegetation in disturbed areas is complete. As a result, there would be long-term beneficial effects on water resources once reclamation is complete.

Directionally Drilled Wells—Wells directionally drilled and produced from outside the park units to bottomholes beneath them could indirectly impact water resources in the park. The types of impacts are expected to be similar to those described above for operations inside the park, but the intensity of impacts could increase for operations sited closer to the park boundary, where erosion or leaks and spills could affect adjacent park waters. Impacts would depend on proximity to the park units; site-specific environmental conditions, particularly surface hydrology and slopes; and mitigation measures being employed. Based on these factors, and with implementation of required spill-prevention features and plans under state regulations, indirect impacts on water resources in the park could range from no impact to indirect, localized to widespread, short- to long-term, minor to moderate, adverse impacts, but with the potential for major impacts in the case of a well blowout, fire, or large uncontrolled release especially from locations where runoff can reach park waters. In addition, there would be long-term beneficial impacts as a result of reclaiming the wellpads and access roads of well sites drilled from outside the park units.

Cumulative Impacts

With the continuing reduction of impacts from oil and gas activities in both park units stemming from increased plugging and reclamation, and a corresponding decrease in new drilling and production, impacts to water resources are expected to diminish and contribute less to cumulative impacts over time. However, several actions described in the “Cumulative Impacts Scenario” section of this chapter would result in both adverse and beneficial cumulative impacts on water resources. Past and future oil and gas development within and outside Big South Fork NRRA would have short- and long-term minor to moderate adverse impacts on water resources from vegetation clearing, vehicle use, and the construction and maintenance of access roads, wellpads, and flowlines. Contamination of surface and groundwater from leaking wells would also contribute to impacts. Coal bed methane/shale gas drilling is an ongoing activity in the vicinity of Big South Fork NRRA, and it has similar impacts to traditional oil and gas development.

Acid mine drainage and abandoned mine impacts include contamination of water resources from sulfuric acid and ferric hydroxide runoff at active and abandoned coal mining sites. Acidic drainage can also occur as a result of naturally occurring processes by the oxidation of pyritic or ferrous compounds contained in sandstone or shale when these minerals are exposed to water. Residential development and industrial activity outside the park unit would also contribute to the potential for contamination from improper handling of hazardous substances and the discharge of sediments to surface waters through soil erosion. These activities would have long-term localized negligible to moderate adverse impacts on water resources.

Visitor activities that include ground disturbance, such as ORV use, and improper refuse disposal would contribute to adverse impacts on water resources. These activities would have negligible to minor impacts on water through increased turbidity and sedimentation from ground disturbance and potential contamination of surface waters from improper refuse disposal.

Fires and fire management activities can also affect water quality. The *2006 Big South Fork National River and Recreation Area Fire Management Plan* (NPS 2006e) recommends using mechanical means in combination with prescribed fire to reduce hazard fuel accumulations, which can result in ground disturbance and temporary loss of vegetation cover. The combustion of fuels may increase the acidity of surface water. These activities would have long-term localized negligible to minor adverse impacts on water resources.

At Big South Fork NRRA, efforts to control exotic vegetation (see discussion of non-native species in chapter 3) have involved the use of herbicides as the primary tool for controlling exotic plant infestations in managed fields. Herbicide spills could have detrimental effects on water resources. ORVs, which could cause erosion, could be used to reach areas that have exotic species infestations. Exotic species management efforts could result in localized short-term negligible to minor adverse impacts on water resources.

Relatively low-density residential development occurs in the immediate vicinity of the park units, and has resulted in the development of infrastructure such as roads, utilities, septic tanks, and water impoundments/intakes for water supply/treatment, all of which can contribute to nonpoint source pollution. Industrial activity sites near the park units that could contribute to cumulative impacts include power plants, railroads, hardwood flooring factories, sawmills, and other manufacturing facilities. These sites result in discharges to surface waters as well as nonpoint source pollution from runoff, in addition to contributing other pollutants to the environment. Southwest of Obed WSR, two industrial parks have been developed in the Crossville area. Point and nonpoint discharges from these sources would result in widespread long-term negligible to moderate adverse impacts on water resources.

Big South Fork NRRA and Obed WSR have developed numerous features related to parkwide administrative, managerial, and support functions, as well as visitor use. Developed areas exist within both park units that require varying levels of maintenance. The NPS routinely maintains trails, buildings, and roads, as well as cultural landscapes, in the park units. These activities would result in localized long-term negligible to minor adverse impacts on water resources.

Agriculture other than forestry has occurred on less than 20% of the land in counties adjacent to Big South Fork NRRA and Obed WSR, and most of the forested areas of Big South Fork NRRA have been logged. At Obed WSR, logging and clearing for agriculture is particularly evident. Small-scale agriculture and grazing takes place on private lands set back from the rim of the gorge, where mixed hardwood–pine forests have been cleared for cropland and browse. Logging and clearing activities on private inholdings could result in increased sedimentation and runoff, with short- and long-term localized to widespread minor adverse impacts on water resources.

In addition to active mining operations, approximately 25,100 acres of unreclaimed abandoned coal mines exist in the Tennessee counties adjacent to the Big South Fork NRRA, and there are about 10 abandoned surface coal mine sites in McCreary County, Kentucky. The Big South Fork NRRA has undertaken remediation studies of selected sites where contaminated mine drainage is of concern. The Worley riverside area is a former mining community where remnants of mining operations, including mine tailings, are evident. Water quality on the site is an issue due to acid mine drainage, as discussed previously, and remediation of mine effects is being planned at this site.

Diseases and insect pests of vegetation, such as the pine bark beetle, have caused a decline in streamside vegetation. Large stands of trees could be affected by infestations, which would result in increased runoff and sedimentation and changes in water temperature and chemistry. This would have a widespread long-term minor adverse impact on water resources.

Some plans and projects within the park would also have long-term beneficial effects on water resources. The GMP at Big South Fork NRRA outlines desired resource and visitor experience conditions that would protect water resources in the park. Implementation of an official roads and trails system and standards associated with the GMP would help reduce the potential for increased runoff and associated turbidity and sedimentation by reducing the erosion and compaction of soils. Kentucky and Tennessee are developing TMDLs for impaired waters in the Big South Fork NRRA. The implementation of these TMDLs would have beneficial effects on water resources by reducing pollutants entering streams. Additionally, the NPS has published an advance notice of proposed rulemaking in the Federal Register regarding a proposed rule to revise the 9B regulations governing non-federal oil and gas development within the boundaries of NPS units. Generally, the proposed changes focus on improving resource protection aspects of the regulations while accounting for advances in oil and gas technology and industry practices. These changes could have long-term beneficial impacts on water resources, due to improving resource protection practices.

Overall, the impacts of these actions, when combined with the mostly localized short-term minor to moderate adverse impacts and the beneficial effects of alternative A, would result in short- and long-term minor to moderate adverse cumulative impacts on water resources in watersheds within and adjacent to the park units. When compared to the broader area of analysis, alternative A would directly impact a relatively small area and would contribute minimally to the overall cumulative impacts.

Conclusion

Under alternative A, limited geophysical operations would result in short-term negligible adverse impacts on water resources from erosion and runoff. In areas where non-federal oil and gas operations would be permitted in the park units, drilling and production of wells could result in short-term to long-term minor to moderate adverse impacts related to site and access road clearing and construction and associated ground disturbance, compaction, and/or erosion, but with a risk of major adverse impacts from leaks and spills that could go undetected. Impacts from plugging and reclamation of wells at either park would be localized, short term, negligible to minor, and adverse. In addition, reclaiming the wellpads and access roads would have a long-term beneficial impact on water resources by reducing soil erosion and reestablishing surface drainage flows. Wells directionally drilled and produced from outside the park units would have indirect impacts on water resources in the park that could range from no impact to indirect, localized to widespread, short- to long-term, minor to moderate, adverse impacts. In addition, there would be long-term beneficial impacts as a result of reclaiming the wellpads and access roads of well sites drilled from outside the park units. For both in-park and adjacent directionally drilled wells, up to major short-term adverse effects could occur in the unlikely event of a well blowout, fire, or uncontrolled release.

The adverse and beneficial effects of past, present, and reasonably foreseeable future actions, when combined with the short- and long-term minor to moderate adverse impacts as well as the long-term beneficial effects of alternative A, would result in short- and long-term minor to moderate adverse cumulative impacts on water resources in regional watersheds. When compared to the broader area of analysis, alternative A would directly impact a relatively small area and would contribute minimally to the overall cumulative impacts.

Alternative B: Comprehensive Implementation of the 9B Regulations and a New Management Framework for Plugging and Reclamation

Analysis

Geophysical Exploration—As with alternative A, minimal geophysical exploration is expected at Big South Fork NRRA, except for the limited possibility of conventional seismic lines in areas of existing roads where data could be acquired quickly and inexpensively, using seismic vibrator technology. As a result, impacts associated with geophysical exploration in alternative B would be very similar to the impacts described in alternative A, and would be localized, short term, negligible, and adverse.

Drilling and Production—Because the forecast of oil and gas activities in chapter 2 applies to all alternatives, impacts associated with up to 20 new wells in Big South Fork NRRA and up to 5 wells directionally drilled from outside the park unit in Obed WSR and well workovers/servicing would be very similar to the impacts described in alternative A, with negligible to moderate adverse effects. As described under alternative A, the construction and maintenance of access roads, wellpads, flowlines, and pipelines could increase turbidity, sedimentation, and soil erosion, and could alter flow characteristics and hydrologic functions of surface waters of the park for wells and access. Leaks and spills during construction activities or drilling or production operations, and blowouts during drilling operations, could adversely impact water resources in the park. The intensity of the impact would depend on the type of substance spilled (hydrocarbons, produced waters, chemicals, solvents, and fuels) and the size of the area impacted, with a risk of short-term major impacts from blowouts or large uncontrolled releases.

However where drilling and production operations would be permitted, mitigation measures (as described under alternative A) would help to avoid or minimize adverse impacts on water resources. Also, under alternative B the NPS would implement an oil and gas management plan that proactively communicates and enforces the CLPRs applicable to the exploration, production, and transportation of non-federal oil and gas resources in Big South Fork NRRA and Obed WSR, including spill prevention and response responsibilities. Additionally, increased inspections and monitoring under alternative B would reduce the chance of leaks or releases going undetected and reaching surface or groundwater and would proactively identify sites that may be impacting, or threatening to impact, park resources beyond the operations area. The 9B regulations would be enforced at any such sites, and operations found to pose a significant threat to federally owned or controlled lands or waters would be suspended by the superintendent until the threat is removed or remedied (see 36 CFR 9.33 and 9.51). As a result, although short-term and long-term adverse impacts from drilling and production would still occur, compared to alternative A, this alternative would result in increased protection of park resources and values, including water resources. Therefore, alternative B would have short-term and long-term negligible to potentially moderate adverse impacts, with a reduced probability of long-term major adverse impacts associated with potential leaks and spills.

Plugging and Reclamation—As indicated in the forecast of oil and gas activities in chapter 2, plugging and reclamation of wells is expected to be the primary oil and gas operation conducted in Big South Fork NRRA and Obed WSR during the life of this plan. Between both park units, approximately 50 wells are expected to be plugged and reclaimed resulting in the reclamation of approximately 87 acres of land.

Similar to alternative A, well plugging, shutting down and abandoning/removing flowlines and pipelines, and use of heavy equipment and vehicles during reclamation activities could cause soil erosion, increase sedimentation in waterways, alter surface water flows, and contaminate surface and groundwater.

However, under alternative B the NPS would implement an oil and gas management plan that clearly articulates the CLPRs applicable to the exploration, production, and transportation of non-federal oil and gas resources in Big South Fork NRRA and Obed WSR. This includes a new management framework for plugging and reclamation of wells, which would allow the NPS and operators to efficiently complete the compliance process for the plugging and reclamation of inactive wells that represent potential threats to park resources and values. This new management framework also includes goals and specific activities for protecting park resources and values during plugging and reclamation activities. Coupled with the same mitigation measures described for alternative A and in appendix B, there would be localized short-term negligible to minor adverse impacts. Additionally, the new management framework for plugging and reclamation would increase the certainty that wells would be plugged and reclaimed to applicable standards, and therefore, long-term beneficial effects described under alternative A would be more likely to be realized sooner.

Directionally Drilled Wells—As described under alternative A, wells directionally drilled and produced from outside the park units to bottomholes beneath them could indirectly impact water resources in the park. The types of impacts are expected to be similar to those described above for operations inside the park, but the intensity of impacts could increase for operations sited closer to the park boundary, where erosion or leaks and spills could affect adjacent park waters. Impacts would depend on proximity to the park units; site-specific environmental conditions, particularly surface hydrology and slopes; and mitigation measures being employed. Based on these factors, indirect impacts on water resources in the park could range from no impact to indirect, localized to widespread, short- to long-term, minor to moderate adverse impacts, but with the potential for major impacts in the case of a well blowout, fire, or large uncontrolled release especially from locations where runoff can reach park waters. In addition, there would be long-term beneficial impacts as a result of reclaiming the wellpads and access roads of well sites drilled from outside the park units.

Cumulative Impacts

Impacts on water resources from other actions that were considered under the cumulative impact scenario would be the same as described for alternative A. The adverse and beneficial effects of the cumulative actions, when combined with the short- and long-term negligible to moderate adverse impacts as well as the long-term beneficial effects of alternative B, would result in short- and long-term minor to moderate adverse cumulative impacts on water resources. The increased enforcement and inspections/monitoring under alternative B would better promote protection of water quality, but the majority of impacts on the water quality of the watersheds in the area of analysis would lie outside the park, where impacts may or may not be mitigated. When compared to the larger area of analysis, alternative B would directly impact a relatively small area and would contribute minimally to overall adverse cumulative impacts. Alternative B would provide long-term cumulative benefits due to its proactive management and enforcement and expedited well plugging.

Conclusion

Similar to alternative A, limited geophysical operations would result in short-term negligible adverse impacts on water resources from erosion and runoff. In areas where non-federal oil and gas operations would be permitted in the park units, drilling and production of wells could result in short-term to long-term negligible to moderate adverse impacts on water resources related to site and access road clearing and construction and the associated ground disturbance, compaction, and/or erosion. Leaks and spills from wells, transport, or pipelines could result in severe adverse impacts; however, in most cases with the application of mitigation measures, increased inspections, and prompt response in the event of a spill, these impacts would be reduced to minor to moderate adverse levels. Impacts from plugging and reclamation of wells at either park would result in localized short-term negligible to minor adverse impacts on water resources. Additionally, the new management framework for plugging and reclamation would increase the certainty that wells would be plugged and reclaimed to applicable standards, and therefore, long-term beneficial effects described under alternative A would be more likely to be realized sooner. Wells directionally drilled and produced from outside the park units to bottomholes beneath them could indirectly impact water resources in the park. Effects on park resources could range from no impact to indirect, localized to widespread, short- to long-term, minor to moderate but potentially major, adverse impacts. In addition, there would be long-term beneficial impacts as a result of reclaiming the wellpads and access roads of well sites drilled from outside the park units. Although up to major short-term adverse effects could occur in the unlikely event of a well blowout or uncontrolled release from any well, the risk of that occurring is less under alternative B due to increased monitoring and inspections.

The adverse and beneficial effects of the cumulative actions, when combined with the short- and long-term negligible to moderate adverse impacts as well as the long-term beneficial effects of alternative B, would result in short- and long-term minor to moderate adverse cumulative impacts on water resources. When compared to the larger area of analysis, alternative B would directly impact a relatively small area and would contribute minimally to overall adverse cumulative impacts. Alternative B would provide long-term cumulative benefits due to its proactive management and enforcement and expedited well plugging.

Alternative C: Comprehensive Implementation of the 9B Regulations, a New Management Framework for Plugging and Reclamation, and Establishment of Special Management Areas

Analysis

Geophysical Exploration—Impacts associated with geophysical exploration under alternative C would be similar to the impacts described in alternatives A and B. However, under alternative C, SMAs would be established to further protect resources and values particularly susceptible to adverse impacts from oil and gas operations, or areas where certain resources are important to maintaining the ecological integrity of the park units. Under alternative C geophysical exploration would not be allowed in any of the SMAs or associated setbacks at Big South Fork NRRA, with the exception of the Special Scenery SMA unless otherwise approved in a plan of operations. While none of the SMAs were developed to specifically protect water resources, water resources would indirectly benefit from the SMAs and associated setbacks if water resources are located in or near these areas. Since minimal geophysical exploration is expected and would include use of existing roads and access on foot, impacts associated with geophysical exploration in alternative C would be localized, short term, negligible, and adverse.

Drilling and Production—Because the forecast of oil and gas activities in chapter 2 applies to all alternatives, impacts associated with up to 20 new wells in Big South Fork NRRA and up to 5 wells directionally drilled from outside the park unit in Obed WSR and well workovers/servicing would be similar to the impacts described in alternatives A and B. Well blowouts or large uncontrolled releases could cause short-term major adverse effects. However, the establishment of SMAs would further protect natural areas, including areas of Big South Fork NRRA and Obed WSR where resources and values would be particularly susceptible to adverse impacts from oil and gas operations, or areas where certain resources are important to maintaining the ecological integrity of the park units. Under alternative C, unless otherwise approved in a plan of operations, drilling and production would not be allowed in any of the SMA-associated setbacks at the park units. In the Cliff Edge, Visitor Use, and Cultural Landscape SMAs drilling would only be allowed during dry periods to minimize impacts on soil from rutting. This would minimize erosion and sedimentation and would minimize impacts on nearby water resources. The Cliff Edge and Sensitive Geomorphic Feature SMAs and setbacks would protect water resources by precluding drilling and production on the edge of the gorge or for features within the gorge. As result, construction and maintenance of drilling and production operations would result in short- to long-term negligible to mostly minor adverse impacts on water resources, with a more limited risk of major adverse effects from spills or leaks.

Plugging and Reclamation—As indicated in the forecast of oil and gas activities in chapter 2, plugging and reclamation of wells is expected to be the primary oil and gas operation conducted in Big South Fork NRRA and Obed WSR during the life of this plan. Between both park units, approximately 50 wells are expected to be plugged and reclaimed, resulting in the reclamation of approximately 87 acres of land. Similar to alternatives A and B, well plugging, shutting down and abandoning/removing flowlines and pipelines, and use of heavy equipment and vehicles during reclamation activities could cause soil erosion, increase sedimentation in waterways, alter surface water flows, and contaminate surface and groundwater.

However, as with alternative B, the NPS would implement an oil and gas management plan that clearly articulates the CLPRs applicable to the exploration, production, and transportation of non-federal oil and gas resources in Big South Fork NRRA and Obed WSR. This includes a new management framework for plugging and reclamation of wells, which would allow the NPS and operators to efficiently complete the compliance process for the plugging and reclamation of inactive wells that represent potential threats to park resources and values. This new management framework also includes goals and specific activities for protecting park resources and values during plugging and reclamation activities. As a result, although short-term impacts from these operations would still occur, the intensity would be less than described for alternative A.

Similar to alternative B, well plugging, shutting down and abandoning/removing flowlines and pipelines, and use of heavy equipment and vehicles during reclamation activities outside the SMAs could cause soil erosion, increase sedimentation in waterways, alter surface water flows, and contaminate surface and groundwater. However, with mitigation, these activities would result in localized short-term negligible to minor adverse impacts at sites throughout the park. Once plugging and reclamation is complete, there would be long-term beneficial impacts on water resources through removing sources of pollutants. Because SMAs would be used to prioritize wells for plugging, wells in proximity to sensitive geomorphic features and cliff edges could be plugged sooner, which would minimize the potential for them to affect downstream water resources.

Directionally Drilled Wells—As described under alternative A, wells directionally drilled and produced from outside the park units to bottomholes beneath them could indirectly impact water resources in the park. The types of impacts are expected to be similar to those described above for operations inside the park, but the intensity of impacts could increase for operations sited closer to the park boundary, where erosion or leaks and spills could affect adjacent park waters. Impacts would depend on proximity to the park units; site-specific environmental conditions, particularly surface hydrology and slopes; and mitigation measures being employed. Based on these factors, indirect impacts on water resources in the park could range from no impact to indirect, localized to widespread, short- to long-term, minor to moderate, adverse impacts but with the potential for major impacts in the case of a well blowout, fire, or large uncontrolled release especially from locations where runoff can reach park waters. In addition, there would be long-term beneficial impacts as a result of reclaiming the wellpads and access roads of well sites drilled from outside the park units.

Cumulative Impacts

Cumulative impacts on water resources in the area of analysis from other actions that were considered under the cumulative impact scenario would be the same as described for alternative A. The adverse and beneficial effects of the cumulative actions, when combined with the short- and long-term negligible to minor adverse impacts as well as the long-term beneficial effects of alternative C, would result in short- and long-term minor to moderate cumulative impacts on water resources in watersheds within and adjacent to the park units in the area of analysis. The SMA restrictions would provide more consistent protection of water resources located in and downstream from SMAs, and enforcement of CLPRs is expected to limit adverse impacts on water resources, but off-park sources and other cumulative actions would continue to adversely impact water quality in the regional watersheds. When compared to the broader area of analysis, alternative C would directly impact a relatively small area and would contribute minimally to overall adverse cumulative impacts. Alternative C would provide long-term cumulative benefits due to its proactive management and enforcement, identification and protection of SMAs, and expedited well plugging.

Conclusion

Similar to alternatives A and B, limited geophysical operations would result in short-term negligible adverse impacts on water resources from erosion and runoff. Under alternative C, with adequate setbacks, implementation of mitigation measures, and the establishment of SMAs, impacts on water resources in the park from drilling and production, related site and access road clearing and construction, and the associated ground disturbance, compaction, and/or erosion would be localized, short to long term, negligible to mostly minor, and adverse. Leaks and spills could result in minor to major adverse impacts; however, with the application of mitigation measures and prompt response in the event of a spill, these impacts would be limited in duration and reduced. Impacts from plugging and reclamation of wells at either park would result in localized short-term negligible to minor adverse impacts on water resources. Additionally, the new management framework for plugging and reclamation would increase the certainty that wells would be plugged and reclaimed to applicable standards, and therefore, the long-term beneficial effects described under alternative A would be more likely to be realized sooner. Wells directionally drilled and produced from outside the park units to bottomholes beneath them could indirectly impact water resources in the park. Effects on park resources could range from no impact to indirect, localized to widespread, short- to long-term, minor to moderate but potentially major, adverse impacts. In addition, there would be long-term beneficial impacts as a result of reclaiming the wellpads and access roads of well sites drilled from outside the park units. Although up to major short-term adverse effects could occur in the unlikely event of a well blowout or large uncontrolled release from any well, the risk of that occurring is less under alternative C due to increased monitoring and inspections.

Cumulative impacts would be similar to those described for alternative B, with short- and long-term minor to moderate adverse cumulative impacts on soils and geology. When compared to the broader area of analysis, alternative C would directly impact a relatively small area and would contribute minimally to overall adverse cumulative impacts. Alternative C would provide long-term cumulative benefits due to its proactive management and enforcement, SMA identification and protection, and expedited well plugging.

FLOODPLAINS

GUIDING REGULATIONS AND POLICIES

The NPS *Management Policies 2006*, section 4.6.4 (NPS 2006c), requires the NPS to manage for the preservation of floodplain values and minimize potentially hazardous conditions associated with flooding. The policies support avoiding environmental effects associated with the occupancy or modification of floodplains and avoiding locating development in floodplains unless that is not practicable. NPS Director’s Order 77-2: Floodplain Management (NPS 2003d) requires that oil and gas operations not be permitted within the floodplain unless there is no practicable alternative. Executive Order 11988—Floodplain Management, directs federal agencies to avoid to the extent possible adverse impacts associated with the occupancy and modification of floodplains and to avoid floodplain development wherever there is a practicable alternative. Other guiding regulations and policies that pertain to floodplains include federal and state statutes, as described in appendix F.

METHODOLOGY, ASSUMPTIONS, AND IMPACT THRESHOLDS

Given the programmatic nature of this plan/EIS, the exact locations of oil and gas operations associated with the RFD scenario and the forecast of oil and gas activities are unknown. The degree of potential impacts on floodplains from oil and gas development would depend on the types and locations of operations and the mitigation measures used to reduce impacts. As a result, a qualitative analysis of the potential impacts of oil and gas operations on floodplains was conducted based on best professional judgment and discussions with NPS staff and consultants.

The impact intensity threshold definitions are based on the potential for changes to floodplain characteristics, as follows:

Negligible: Impacts would result in a change to floodplain functions and values, but the change would be so slight that it would not be of any measurable or perceptible consequence.

Minor: Impacts would result in a detectable change to floodplain functions and values, but the change would be expected to be small, of little consequence, and localized. Mitigation measures, if needed to offset adverse effects, would be simple and successful.

Moderate: Impacts would result in a change to floodplain functions and values that would be readily detectable, measurable, and consequential, but relatively localized. Mitigation measures, if needed to offset adverse effects, could be extensive, but would likely be successful.

Major: Impacts would result in a change to floodplain functions and values that would have substantial consequences on a regional scale. Extensive mitigation measures would be needed to offset any adverse effects, and the success of these measures would not be guaranteed.

IMPACT OF THE ALTERNATIVES

Alternative A: No Action (Current Management Continued)

Analysis

Geophysical Exploration—As described in the forecast of oil and gas activities in chapter 2, minimal geophysical exploration is expected at Big South Fork NRRA, except for the limited possibility of conventional seismic lines in areas of existing roads where data could be acquired quickly and inexpensively, using seismic vibrator technology. Therefore, since designated existing access roads would be used and receiver lines would be laid on foot, there would be very limited impacts on floodplains, except where the use of existing roads would disturb existing unpaved surfaces and result in increased road runoff or would include the crossing of small areas of floodplains along tributary streams. The NPS Non-federal Oil and Gas Rights Regulations, at 36 CFR 9.41(a), require that “operations shall at no time be conducted within 500 feet of waterways, unless specifically authorized by an approved plan of operations.” This operating requirement would substantially reduce the potential for adverse impacts on some of the more sensitive areas of park floodplains. These stipulations would minimize impacts on floodplains, which would be localized, short term, negligible, and adverse.

Drilling and Production—Where permitted, the construction, maintenance, and use of access roads, wellpads, flowlines, and pipelines could harm vegetation, expose soils to erosion, compact and rut soils, introduce non-native construction materials (i.e., gravel) and exotic vegetation, reduce soil permeability, and introduce sediments in waterways, all of which can affect floodplain functions and values. Spills or releases can also damage floodplain soils and vegetation. Drilling and production would affect floodplains if new facilities were sited in floodplains; however, this would not be very likely, given the limited number of wells to be drilled and the lack of defined floodplains in the park units except in and around the gorges, which are protected. Gorge restrictions at Big South Fork NRRA, deed restrictions at Obed WSR, and the regulatory requirement that surface operations shall at no time be conducted within 500 feet of the banks of perennial, intermittent, or ephemeral watercourses or within 500 feet of the high pool shoreline of natural or man-made impoundments (36 CFR 9.41(a)) would provide protection for floodplains. Even more specific floodplain protection is provided in the NPS Director’s Order 77-2: Floodplain Management (NPS 2003d), which requires that oil and gas operations not be permitted within the floodplain unless there is no practicable alternative. The intent of the directive is to recognize and protect beneficial floodplain values and to avoid long-term surface occupancy in floodplains, and to minimize impacts when there is no practicable alternative to locating operations in a regulatory floodplain. In interpreting Director’s Order 77-2, the NPS directive requires operators to avoid or minimize developments and activities, including storage of hazardous or contaminating substances within 100- and 500-year floodplains, which could result in increasing flood hazards and reducing the beneficial value of floodplains. However, surface occupancy is permitted for limited phases of operations if there is no other practicable alternative and if floodplain/riparian impacts are minimized.

Proper siting, engineering design, construction, and maintenance of roads would substantially reduce impacts associated with road construction, use, and maintenance if roads had to cross floodplains. The proper siting and alignment of roads and pads and the placement of adequate culverts under access roads and appropriate drainage on and around drilling and production pads would minimize changes in surface water flows that could adversely impact floodplains.

If there were no other practicable alternative, and for any existing facilities already located in floodplains, impacts on floodplain resources from drilling and production or well servicing would be short term (weeks to months) for construction activities and drilling operations and long-term (extending up to 20 years or more) for roads, production operations, and flowlines and pipelines. Mitigation measures that are required to “floodproof” drilling and production operations include shutting in the well, securing storage tanks, removing hydrocarbons from storage tanks and replacing them with water, and removing excess containers of contaminating and hazardous chemicals from the site. The approach of flooding events would provide the park and operators with sufficient time to take reasonable actions at oil and gas facilities necessary to avoid or reduce the potential impacts of flooding or hurricanes, such as securing tanks, removing product from tanks and replacing with water, shutting in wells, and removing excess containers of contaminating or hazardous chemicals. With the implementation of emergency-preparedness plans that are required of all operations, impacts related to flooding events should be limited to short-term minor adverse impacts.

Given these requirements and other mitigation measures identified in appendix B, as well as the limited extent of new drilling operations described in the forecast of oil and gas activities, there would be localized, negligible to minor, adverse impacts on floodplains from drilling and production operations.

Plugging and Reclamation—As indicated in the forecast of oil and gas activities in chapter 2, plugging and reclamation of wells is expected to be the primary oil and gas operation conducted in Big South Fork NRRA and Obed WSR during the life of this plan. Between both park units, approximately 50 wells are expected to be plugged and reclaimed, resulting in the reclamation of approximately 87 acres of land.

Where plugging and reclamation activities are completed, the primary impacts on floodplains would be from the use of ORVs to transport equipment and personnel and from the use of heavy equipment. Vehicles could damage and kill plants, reduce the soil's water-holding and infiltration capacities, compact and rut soils, reduce the vegetation's root-penetration capabilities, and hinder plant growth and soil formation. Exposed, compacted soils increase runoff of surface waters and accelerate soil erosion. Erosion of floodplain soils could increase turbidity and sedimentation in nearby surface waters. Leaks and spills from ORVs could harm or kill vegetation and contaminate soils and surface and groundwater. Several mitigation measures provided for under CLPRs would help to minimize impacts on floodplain resources. With required mitigation there would be localized, short-term negligible to minor adverse impacts on floodplain resources from plugging and reclamation. In addition, plugging and reclamation of wells in or near floodplains would eliminate the issues associated with the presence of production facilities, as described for drilling and production. As a result, there would be long-term beneficial impacts on floodplains.

Directionally Drilled Wells—Wells directionally drilled and produced from outside the park units to bottomholes beneath them could indirectly impact floodplains in the park. The types of impacts are expected to be similar to those described above for operations inside the park, but the intensity of impacts could increase for operations sited closer to the park boundary, where erosion or leaks and spills could affect adjacent park floodplains. Impacts would depend on proximity to the park units; site-specific environmental conditions, particularly surface hydrology and slopes; and mitigation measures being employed. Based on these factors, and with implementation of required spill-prevention features and plans under state regulations, indirect impacts on floodplains in the park could range from no impact to indirect, localized, short- to long-term, negligible to minor, adverse impacts. In addition, there would be long-term beneficial impacts as a result of reclaiming the wellpads and access roads of well sites drilled from outside the park units.

Cumulative Impacts

With the continuing reduction of impacts from oil and gas activities in both park units stemming from increased plugging and reclamation, and a corresponding decrease in new drilling and production, impacts to floodplains are expected to diminish and contribute less to cumulative impacts over time. However, several actions described in the "Cumulative Impacts Scenario" section of this chapter would result in both adverse and beneficial cumulative impacts on floodplains. Past and future oil and gas development within and outside Big South Fork NRRA would have short- and long-term minor adverse impacts from vegetation clearing, ORV use, and the construction and maintenance of access roads, wellpads, and flowlines. In addition, potential contamination of surface and groundwater from leaking wells would also contribute to impacts. Coal bed methane/shale gas drilling is an ongoing activity in the vicinity of Big South Fork NRRA, and it has similar impacts to traditional oil and gas development.

Many impacts on water quality also affect floodplain functions and values. Acid mine drainage and abandoned mine impacts include contamination of water resources by sulfuric acid and ferric hydroxide runoff at active and abandoned coal mining sites. Residential development, agriculture, logging, and industrial activity outside the park unit would also contribute to the potential for construction within floodplains, discharge of sediments to surface waters through soil erosion, or the discharge of pollutants that could affect the ecological health of floodplain resources, with short- and long-term minor to moderate adverse effects. Loss of trees due to insect infestations or disease may affect floodplain vegetation, which would have long-term localized negligible to minor adverse cumulative impacts on floodplains.

Some plans and projects within the park would also have long-term beneficial effects on floodplains, including implementation of the GMP at Big South Fork NRRA. This plan outlines desired resource conditions that would protect natural resources, including floodplains, in the park. Implementation of an official roads and trails system and standards associated with the GMP would help reduce the potential for increased runoff and associated turbidity and sedimentation by reducing the erosion and compaction of soils. Reclamation of abandoned mines would also have long-term beneficial effects on floodplains, as would the plugging and reclamation of other wells, including the orphaned wells that are known to exist in the park and being plugged under the TDEC and ARRA projects. In addition, Kentucky and Tennessee are developing TMDLs for impaired waters in the Big South Fork NRRA. The implementation of these TMDLs would have beneficial effects on floodplains by reducing pollutants entering streams.

Additionally, the NPS has published an advance notice of proposed rulemaking in the Federal Register regarding a proposed rule to revise the 9B regulations governing non-federal oil and gas development within the boundaries of NPS units. Generally, the proposed changes focus on improving resource protection aspects of the regulations while accounting for advances in oil and gas technology and industry practices. These changes could have long-term beneficial impacts on floodplains, due to improving resource protection practices.

Overall, the impacts of these actions, combined with the negligible to minor adverse impacts and beneficial effects of alternative A, would result in short- and long-term minor adverse cumulative impacts on floodplains. Protection provided to floodplains in the park under CLPRs, especially NPS Floodplain Management directives and policies, would minimize adverse effects, but floodplains in the remainder of the watersheds would continue to be adversely affected. When compared to the broader area of analysis, alternative A would directly impact a relatively small area and contribute minimally to overall adverse cumulative impacts.

Conclusion

Under alternative A, limited geophysical operations would result in short-term negligible adverse impacts on floodplains from increased road runoff and crossing of small areas of floodplains along tributary streams,. In areas where non-federal oil and gas operations would be permitted in the park units, drilling and production of wells and the associated land disturbance and construction of facilities would result in short-term to long-term negligible to minor adverse impacts, since new oil and gas operations would not be permitted in floodplains unless there was no practicable alternative, floodplains could likely be avoided, and mitigation for floodproofing would be required. Impacts from plugging and reclamation of wells at either park would be localized, short term, negligible to minor, and adverse. In addition, reclaiming the wellpads and access roads would have a long-term beneficial impact on floodplains. Indirect impacts from wells directionally drilled and produced from outside the park units could range from no impact to localized, short- to long-term, negligible to minor, adverse impacts. In addition, there would be long-term beneficial impacts as a result of reclaiming the wellpads and access roads of well sites drilled from outside the park units.

The adverse and beneficial effects of past, present, and reasonably foreseeable future actions, when combined with the short- and long-term negligible to minor adverse impacts as well as the long-term beneficial effects of alternative A, would result in short- and long-term minor adverse cumulative impacts on floodplains. When compared to the broader area of analysis, alternative A would directly impact a relatively small area and contribute minimally to overall adverse cumulative impacts.

Alternative B: Comprehensive Implementation of the 9B Regulations and a New Management Framework for Plugging and Reclamation

Analysis

Geophysical Exploration—As with alternative A, minimal geophysical exploration is expected at Big South Fork NRRA, except for the limited possibility of conventional seismic lines in areas of existing roads where data could be acquired quickly and inexpensively, using seismic vibrator technology. As a result, impacts associated with geophysical exploration in alternative B would be very similar to the impacts described in alternative A, related primarily to road use and possible crossing of small areas of tributary floodplains, and would be localized, short term, negligible, and adverse.

Drilling and Production—Because the forecast of oil and gas activities in chapter 2 applies to all alternatives, impacts associated with up to 20 new wells in Big South Fork NRRA and up to 5 wells directionally drilled from outside the park unit in Obed WSR and well workovers/servicing would be very similar to the impacts described in alternative A. CLPRs would protect floodplains in these areas by requiring 500-foot setbacks from the banks of perennial, intermittent, or ephemeral watercourses. In addition, implementation of a comprehensive oil and gas management plan, including increased inspections and monitoring, under alternative B would proactively identify sites that may be impacting, or threatening to impact, park resources beyond the operations area. The 9B regulations would be enforced at any such sites, and operations found to pose a significant threat to federally owned or controlled lands or waters would be suspended by the superintendent until the threat is removed or remedied (see 36 CFR 9.33 and 9.51). As a result, although short-term and long-term impacts from drilling and production could still occur, this alternative would protect park resources and values better than alternative A. Therefore, there would be localized short-term to long-term negligible adverse impacts on floodplains.

Plugging and Reclamation—As indicated in the forecast of oil and gas activities in chapter 2, plugging and reclamation of wells is expected to be the primary oil and gas operation conducted in Big South Fork NRRA and Obed WSR during the life of this plan. Between both park units, approximately 50 wells are expected to be plugged and reclaimed, resulting in the reclamation of approximately 87 acres of land.

Similar to alternative A, well plugging, shutting down and abandoning/removing flowlines and pipelines, and use of heavy equipment and vehicles during reclamation activities could cause short-term adverse impacts if wells are located in floodplains. However, the implementation of the new management framework for plugging and reclamation of wells would allow the NPS and operators to efficiently complete the compliance process for the plugging and reclamation of inactive wells that represent potential threats to park resources and values. This new management framework also includes goals and specific activities for protecting park resources and values during plugging and reclamation activities. With application of the same mitigation measures described for alternative A, there would be localized short-term negligible to minor adverse impacts at sites throughout the park units. Additionally, the new management framework for plugging and reclamation would increase the certainty that wells would be plugged and reclaimed to applicable standards, and therefore, the long-term beneficial effects described under alternative A would be more likely to be realized sooner.

Directionally Drilled Wells—Similar to alternative A, wells directionally drilled and produced from outside the park to bottomholes beneath the park, and the reclamation of these wells, could indirectly impact floodplains in the park, as described for alternative A. Impacts on floodplains in the park units could range from no impact to indirect, localized, short- to long-term, negligible to minor, adverse impacts. However, reclamation of wells directionally drilled from outside the park units to bottomholes beneath them would also result in long-term beneficial impacts.

Cumulative Impacts

Impacts on floodplains from other actions that were considered under the cumulative impact scenario would be the same as described for alternative A. The adverse and beneficial effects of the cumulative actions, when combined with the short- and long-term negligible to minor adverse impacts as well as the long-term beneficial effects of alternative B, would result in short- and long-term minor adverse cumulative impacts on floodplains. When compared to the broader area of analysis, alternative B would directly impact a relatively small area and would contribute a minimal amount to overall adverse cumulative impacts. Alternative B would provide long-term cumulative benefits due to its proactive management and enforcement and expedited well plugging.

Conclusion

Similar to alternative A, limited geophysical operations would result in short-term negligible adverse impacts on floodplains from increased road runoff, crossing of small areas of floodplains along tributary streams. In areas where non-federal oil and gas operations would be permitted in the park units, drilling and production of wells could result in short-term to long-term negligible adverse impacts, since new oil and gas operations would not be permitted in floodplains unless there was no practicable alternative, so floodplains could probably be avoided, and inspections would prevent floodplain impacts. Impacts from plugging and reclamation of wells at either park would be localized, short term, negligible to minor, and adverse. Additionally, the new management framework for plugging and reclamation would increase the certainty that wells would be plugged and reclaimed to applicable standards, and therefore, the long-term beneficial effects described under alternative A would be more likely to be realized sooner. In addition, reclaiming the wellpads and access roads would have a long-term beneficial impact on floodplains. Wells directionally drilled and produced from outside the park units could result in localized short- to long-term negligible to minor adverse impacts. In addition, there would be long-term beneficial impacts as a result of reclaiming the wellpads and access roads of well sites drilled from outside the park units.

The adverse and beneficial effects of the cumulative actions, when combined with the short- and long-term negligible to minor adverse impacts as well as the long-term beneficial effects of alternative B, would result in short- and long-term minor adverse cumulative impacts on floodplains. When compared to the broader area of analysis, alternative B would directly impact a relatively small area and would contribute a minimal amount to overall adverse cumulative impacts. Alternative B would provide long-term cumulative benefits due to its proactive management and enforcement and expedited well plugging.

Alternative C: Comprehensive Implementation of the 9B Regulations, a New Management Framework for Plugging and Reclamation, and Establishment of Special Management Areas

Analysis

Geophysical Exploration—Impacts associated with geophysical exploration under alternative C would be similar to the impacts described in alternatives A and B. However, under alternative C, SMAs would be established to further protect resources and values particularly susceptible to adverse impacts from oil and gas operations, or areas where certain resources are important to maintaining the ecological integrity of the park units. Under alternative C geophysical exploration would not be allowed in any of the SMAs or associated setbacks at Big South Fork NRRA, with the exception of the Special Scenery SMA, unless otherwise approved in a plan of operations. While none of the SMAs were developed to specifically protect floodplains, floodplains would indirectly benefit from the SMAs and associated setbacks if SMAs are located in or near floodplains. Since minimal geophysical exploration is expected and would include use of existing roads and pedestrian access, impacts associated with geophysical exploration in alternative C would be localized, short term, negligible, and adverse.

Drilling and Production—Because the forecast of oil and gas activities in chapter 2 applies to all alternatives, impacts associated with up to 20 new wells in Big South Fork NRRA and up to 5 wells directionally drilled from outside the park unit in Obed WSR and well workovers/servicing would be very similar to the impacts described in alternative A. Impacts associated with drilling and production under alternative C would be similar to the impacts described in alternatives A and B. The establishment of SMAs would further protect natural areas, including areas of Big South Fork NRRA and Obed WSR where resources and values would be particularly susceptible to adverse impacts from oil and gas operations, or areas where certain resources are important to maintaining the ecological integrity of the park units. Under alternative C drilling and production would not be allowed in any of the SMAs (with the exception of the Special Scenery SMA) and associated setbacks at the park units, unless otherwise approved in a plan of operations. In the Cliff Edge, Visitor Use, and Cultural Landscape SMAs, drilling would only be allowed during dry periods to minimize impacts on soil from rutting. This would minimize erosion and sedimentation and would benefit floodplains. The Cliff Edge and Sensitive Geomorphic Feature SMAs and setbacks would protect floodplains by precluding drilling and production on the edge of the gorge or for features within the gorge. As result, construction and maintenance of drilling and production operations would result in short- to long-term negligible adverse impacts on floodplains.

Plugging and Reclamation—As indicated in the forecast of oil and gas activities in chapter 2, plugging and reclamation of wells is expected to be the primary oil and gas operation conducted in Big South Fork NRRA and Obed WSR during the life of this plan. Between both park units, approximately 50 wells are expected to be plugged and reclaimed, resulting in the reclamation of approximately 87 acres of land.

Similar to alternatives A and B, well plugging, shutting down and abandoning/removing flowlines and pipelines, and use of heavy equipment and vehicles during reclamation activities could cause soil erosion, increase sedimentation in waterways, alter surface water flows, and contaminate surface and groundwater. However, under alternative C the NPS would implement a comprehensive oil and gas management plan that includes a new management framework for plugging and reclamation of wells. This would allow the NPS and operators to efficiently complete the compliance process for the plugging and reclamation of inactive wells that represent potential threats to park resources and values. This new management framework also includes goals and specific activities for protecting park resources and values during plugging and reclamation activities. As a result, when this management plan is combined with mitigation, there would be localized short-term negligible to minor adverse impacts at sites throughout the park. Additionally, the new management framework for plugging and reclamation would increase the certainty that wells would be plugged and reclaimed to applicable standards, and therefore, long-term beneficial effects described under alternative A would be more likely to be realized sooner.

Directionally Drilled Wells—Similar to alternatives A and B, wells directionally drilled and produced from outside the park units to bottomholes beneath them could indirectly impact floodplains in the park. The types of impacts are expected to be similar to those described above for operations inside the park, but the intensity of impacts could increase for operations sited closer to the park boundary, where erosion or leaks and spills could affect adjacent park waters. Impacts would depend on proximity to the park units; site-specific environmental conditions, particularly surface hydrology and slopes; and mitigation measures being employed. Based on these factors, and with implementation of required spill-prevention features and plans under state regulations, indirect impacts on floodplains in the park could range from no impact to indirect, localized to widespread, short- to long-term, negligible to minor, adverse impacts. In addition, there would be long-term beneficial impacts as a result of reclaiming the wellpads and access roads of well sites drilled from outside the park units.

Cumulative Impacts

Impacts on floodplains from other actions that were considered under the cumulative impact scenario would be the same as described for alternative A. The adverse and beneficial effects of the cumulative actions, when combined with the short- and long-term negligible to minor adverse impacts as well as the long-term beneficial effects of alternative C, would result in short- and long-term minor adverse cumulative impacts on floodplains. The SMA restrictions would provide more consistent protection of floodplains in the SMAs, and protection provided under CLPRs is expected to promote protection of floodplain resources, but adjacent lands could continue to be developed, with adverse impacts on floodplains. When compared to the broader area of analysis, alternative C would directly impact a relatively small area and would contribute minimally to overall adverse cumulative impacts. Alternative C would provide long-term cumulative benefits due to its proactive management and enforcement, SMA identification and protection, and expedited well plugging.

Conclusion

Similar to alternatives A and B, limited geophysical operations would result in short-term negligible adverse impacts on floodplains from increased road runoff and crossing of small areas of floodplains along tributary streams. Under alternative C, with adequate setbacks, implementation of mitigation measures, and the establishment of SMAs, impacts on floodplains in the park from drilling and production would be localized, short to long term, negligible, and adverse. Establishment and avoidance of SMAs would minimize erosion and sedimentation and would benefit floodplains. Impacts from plugging and reclamation of wells at either park would result in localized short-term negligible to minor adverse impacts on floodplains. Additionally, the new management framework for plugging and reclamation would increase the certainty that wells would be plugged and reclaimed to applicable standards, and therefore, the long-term beneficial effects described under alternative A would be more likely to be realized sooner. Wells directionally drilled and produced from outside the park units to bottomholes beneath them could indirectly impact park floodplains. Impacts on floodplains could range from no impact to indirect, localized, short- to long-term, negligible to minor, adverse impacts. In addition, there would be long-term beneficial impacts as a result of reclaiming the wellpads and access roads of well sites drilled from outside the park units.

Cumulative impacts would be similar to those described for alternative B, with short- and long-term minor adverse cumulative impacts on floodplains. When compared to the broader area of analysis, alternative C would directly impact a relatively small area and would contribute minimally to overall adverse cumulative impacts. Alternative C would provide long-term cumulative benefits due to its proactive management and enforcement, SMA identification and protection, and expedited well plugging.

WETLANDS

Guiding Regulations and Policies

The NPS *Management Policies 2006,* section 4.6.5 (NPS 2006c), requires the NPS to prevent the destruction, loss, or degradation of wetlands, to preserve the natural and beneficial values of wetlands, and to avoid new construction in wetlands unless there is no practicable alternative and the proposed action takes all practicable measures to minimize harm. Director’s Order 77-1 (NPS 2002b) reiterates this position and states that the NPS will first avoid wetland impacts, then minimize impacts, and then compensate for remaining unavoidable adverse wetland impacts. Executive Order 11990—Protection of Wetlands also directs federal agencies to avoid adverse impacts on wetlands and to avoid new construction in wetlands wherever there is a practicable alternative. Other guiding regulations and policies that pertain to wetlands include federal and state statutes, as described in appendix F.

METHODOLOGY, ASSUMPTIONS, AND IMPACT THRESHOLDS

Given the programmatic nature of this plan/EIS, the exact locations of oil and gas operations associated with the RFD scenario and the forecast of oil and gas activities are unknown. The degree of potential impacts on wetlands from oil and gas development would depend on the types and locations of operations and the mitigation measures used to reduce impacts. As a result, a qualitative analysis of the potential impacts of oil and gas operations on wetlands was conducted based on best professional judgment and discussions with NPS staff and consultants.

The impact intensity threshold definitions are based on the potential for changes to wetland characteristics, as follows:

Negligible: Impacts would result in a local effect on wetlands but would not change wetland values and functions. The effect would be so slight that it would not be of any measurable or perceptible consequence.

Minor: Impacts would result in a local effect on wetlands, but it would require considerable scientific effort to measure any consequent changes in wetland values and functions. Mitigation measures, if needed to offset adverse effects, would be simple and successful.

Moderate: Impacts would result in a change to wetland values and functions that would be readily detectable but localized. Mitigation measures, if needed to offset adverse effects, would be extensive and likely successful.

Major: Impacts would result in a change to wetland values and functions that would have substantial consequences on a regional scale. Extensive mitigation measures would be needed to offset any adverse effects, and the success of these measures would not be guaranteed.

IMPACT OF THE ALTERNATIVES

Alternative A: No Action (Current Management Continued)

Analysis

Geophysical Exploration—As described in the forecast of oil and gas activities in chapter 2, minimal geophysical exploration is expected at Big South Fork NRRA, except for the limited possibility of conventional seismic lines in areas of existing roads where data could be acquired quickly and inexpensively, using seismic vibrator technology. Therefore, since designated existing access roads would be used, receiver lines would be laid on foot, and no shotholes would be drilled, there would be very limited impacts on wetlands, except where the use of existing roads would disturb existing unpaved surfaces and result in increased road runoff or would include the crossing of small areas of wetlands along tributary streams. No effect on wetland economic values (fisheries, tourism) would be expected, and there are no known cultural wetland values that would be disturbed by the limited area of disturbance. Vegetation trimmed during line placement would also be expected to recover over the short term. Natural drainage paths would be avoided when possible, and efficient refueling of vehicles would be used to reduce the chances for spills. The NPS Non-federal Oil and Gas Rights Regulations, at 36 CFR 9.41(a), require that “operations shall at no time be conducted within 500 feet of waterways, unless specifically authorized by an approved plan of operations.” This operating requirement would substantially reduce the potential for adverse impacts on wetlands adjacent to streams. These stipulations would minimize impacts on wetlands, which would be localized, short term, negligible, and adverse.

Drilling and Production—Where permitted, the construction, maintenance, and use of access roads, wellpads, flowlines, and pipelines could harm vegetation, expose soils to erosion, compact and rut soils, introduce non-native construction materials (i.e., gravel) and exotic vegetation, reduce soil permeability, and introduce sediments in waterways, all of which can affect wetland functions and values. Spills or releases can also damage wetland soils and vegetation. Wetlands could become contaminated if hazardous or contaminating substances are released during drilling, production, or transport. Although drilling operations in the park should not encounter formations with H_2S or high pressures and associated uncontrolled flows of oil, gas, brine, or freshwater, blowouts could occur during drilling and release hydrocarbons, water, and drilling mud. There could also be accidental spills of drilling mud, diesel fuel, and other chemicals during drilling operations. If drilling mud, fuels, or other chemicals are spilled on the ground and there is no impermeable liner on the wellpad, the fluids could infiltrate into shallow aquifers or reach nearby surface waters and wetlands.

The NPS recognizes that unplanned incidents associated with oil and gas operations such as well blowouts, fires, and major spills within the boundaries of the park present a risk of release of contaminants that can adversely impact wetlands. However, the incident rates for such incidents are low and are not a typical expectation of project implementation. If such an incident did occur, required mitigation measures such as use of blowout preventers and implementation of SPCC plans would result in lessening the potential for spilled substances or a well fire to spread into the park, and for timely response and cleanup, so that there is a reasonable expectation that long term adverse impacts would not occur or be limited to minor to moderate levels of intensity, although there could be short-term major adverse effects during the release. In the event that the park's resources or values are damaged, the NPS could seek remedy both on the ground and in the form of monetary compensation.

Drilling and production would affect wetlands if new facilities were sited in wetlands; however, this would not be very likely, given the limited number of wells to be drilled and the location of many wetlands in and around the gorges and the rivers, which are protected. Gorge restrictions at Big South Fork NRRA, deed restrictions at Obed WSR, and the regulatory requirement that surface operations shall at no time be conducted within 500 feet of the banks of perennial, intermittent, or ephemeral watercourses or within 500 feet of the high pool shoreline of natural or man-made impoundments (36 CFR 9.41(a)) would provide protection for park wetlands, most of which are palustrine or riverine wetlands associated with river and stream channels. Even more specific wetland protection is provided in the NPS Director's Order 77-1, Wetland Management (NPS 2002b), which requires that oil and gas operations not be permitted within wetlands unless there is no practicable alternative. In interpreting Director's Order 77-1, the NPS directive requires operators to avoid or minimize developments and activities that could result in adverse impacts on wetlands. If there is no practical alternative, then NPS mitigation requirements for direct and indirect adverse impacts on wetlands also requires a minimum compensation prior to or concurrent with starting permitted operations. The minimum compensation ratio is 1:1; however, a higher ratio may be required if (1) the functional values of the site being impacted are determined to be high and the restored wetlands would be of lower value, (2) it would take a number of years for the restored site to become fully functional, or (3) the likelihood of full restoration success is unclear. As soon as possible after completing a permitted operation (but no later than 6 months afterward), reclamation of the disturbed wetlands site, which would result in restoring wetland functions and values, must begin.

Proper siting, engineering design, construction, and maintenance of roads would substantially reduce impacts associated with road construction, use, and maintenance if roads had to cross small areas of wetlands. The proper siting and alignment of roads and pads and the placement of adequate culverts under access roads and appropriate drainage on and around drilling and production pads would minimize changes in surface water flows that could adversely impact wetlands. Also, careful siting of wellpads away from moderate or steep slopes would minimize the potential of contaminating or hazardous substances being transported downslope into adjacent wetlands.

Because production operations could continue for 20 years or longer, the potential for leaks and spills of hazardous or contaminating substances from production operations (including flowlines and pipelines) is greater than for any other phase of oil and gas operations. Adverse impacts on wetlands may occur from accidental leaks and spills of drilling fluids during workovers/servicing, hazardous waste spills (including diesel fuel), well blowouts, rupture of flowlines and pipelines, and spills from tanker trucks. Chronic small leaks and spills could spread through various pathways, and over an extended period of time could become substantial and costly to remediate. The chances of undetected spills would be greater under this alternative because routine inspections would not occur beyond base workload levels, which would increase the potential for a more substantial adverse impact at well locations in or upgradient from wetlands. Faulty installation or corrosion of production casing might go undetected and could adversely impact groundwater if hydrocarbons and/or produced waters migrated into an aquifer and contaminated the groundwater. The intensity of the impact would depend on the type of substance spilled (hydrocarbons, produced waters, chemicals, solvents, and fuels) and the size of area impacted, but, as noted above, could reach the level of major adverse impacts.

The transport of hydrocarbons also has the potential to adversely affect wetlands. Production pipelines can rupture from corrosion of the pipe or from failure of a flange, valve, or seal. Oil and gas pipelines are generally larger in diameter and under more pressure than the smaller flowlines and pose the potential for a large-volume release. The escaping fluids could contaminate surface and groundwater and could have major adverse impacts on water quality. In lieu of transporting hydrocarbons via pipelines, the product could be transported by tanker truck. This method has a greater potential for leaks and spills during transfer of fluids to the tanker, in addition to the potential for vehicular accidents in which the tank contents could be spilled.

The use of automatic shutoff valves on flowlines and pipelines on each side of any water-body crossing would reduce the volume of a hydrocarbon release. Additional mitigation measures that would protect wetlands include using the least contaminating and hazardous substances, storing the minimum quantity of contaminating and hazardous substances at operations locations, storing barrels or smaller containers of chemicals in “coffins” or other secondary containment, constructing berms and installing liners at drilling operations and at production facilities, increasing capacity within the firewall to accommodate high precipitation events, and including a spill notification and response plan in the plan of operations. Although the NPS does not routinely monitor and inspect producing wells, it is typically notified when a problem is discovered, and takes steps to minimize adverse impacts from leaks and spills of hazardous and contaminating substances.

If there were no other practicable alternative, and for any existing facilities already located in wetlands, impacts on wetlands from drilling and production would be short term (weeks to months) for construction activities and drilling operations and long term (extending up to 20 years or more) for roads, production operations, and flowlines and pipelines. Given these requirements and other mitigation measures identified in appendix B, as well as the limited extent of new drilling operations described in the forecast of oil and gas activities, there would be localized short- to long-term negligible to moderate adverse impacts from drilling and production operations.

Plugging and Reclamation—As indicated in the forecast of oil and gas activities in chapter 2, plugging and reclamation of wells is expected to be the primary oil and gas operation conducted in Big South Fork NRRA and Obed WSR during the life of this plan. Between both park units, approximately 50 wells are expected to be plugged and reclaimed, resulting in the reclamation of approximately 87 acres of land.

Clearing vegetation from oil and gas access roads and wellpads and the use of heavy equipment and vehicles would temporarily increase localized erosion potential, causing increased turbidity and sedimentation. In addition, there is the potential for release of liquid hydrocarbons and/or contaminating or hazardous substances into wetlands from vehicles, wellhead equipment, or flowlines during well plugging and reclamation activities. These temporary activities could cause detectable, localized changes to wetlands for wells located near surface waters.

However, mitigation would be applied during plugging and reclamation operations to minimize any potential long-term impacts on wetlands. Mitigation measures would include conducting activities within previously disturbed areas, using chainsaws and tractors equipped with bush hogs to limit ground disturbance, using erosion-control structures (straw bales and silt fences), placing tanks at each well to capture any well fluids produced during plugging, and placing a liner around the wellhead and under all service vehicles to prevent contamination. All stream crossings on routes identified in the GMP as part of the trail system would have a subbase of rock and a filter fabric layer installed, or the crossings would be hardened with concrete planks. Soil, hydrology, and native vegetation communities would be restored as soon as practicable after completion of the plugging operation. Reclamation of wellpads and access roads would reduce erosion rates to predisturbance levels. Over time, these practices could eliminate the adverse impacts caused by original drilling and production operations, if fill materials are completely removed, sites are properly prepared, sites are stabilized to match original contours, and proper seed mixtures and revegetation techniques are used. During plugging operations park staff would conduct more thorough testing for contamination at each site. If contamination is found, subsequent steps would be taken to remove or neutralize contaminating substances.

For impacts on wetlands, compensatory mitigation involves restoration as described above. Proper plugging of the wells would ensure that hydrocarbon contamination would not occur in the future. The success of compensatory mitigation would be dependent on the conditions of the site-specific mitigation plan. If the site is not properly recontoured and the natural hydrology is altered, or contamination remains and restoration of the natural community is not possible, and there are adverse effects on the functions and values provided by the wetland, a site-specific mitigation plan that requires site cleanup, remediation of contaminated water or soils, restoration of hydrology, and planting of native vegetation should be implemented to reduce adverse impacts to negligible to minor, unless important wetland function and values are jeopardized.

Reclaiming the wellpads and access roads would have a beneficial impact on wetlands by reducing soil erosion and reestablishing surface drainage flows, once recontouring and planting and establishment of native vegetation in disturbed areas is complete. As a result, there would be long-term beneficial effects on wetlands once reclamation is complete.

Directionally Drilled Wells—Wells directionally drilled and produced from outside the park units to bottomholes beneath them could indirectly impact wetlands in the park if wetlands are close enough to be affected by runoff. The types of impacts are expected to be similar to those described above for operations inside the park, but the intensity of impacts could increase for operations sited closer to the park boundary, where erosion or leaks and spills could affect adjacent park wetlands. Impacts would depend on proximity to the park units; site-specific environmental conditions, particularly surface hydrology and slopes; and mitigation measures being employed. Based on these factors and the location of wetlands in the park units and with implementation of required spill-prevention features and plans under state regulations, indirect impacts on wetlands in the park could range from no impact to indirect, localized, short- to long-term, mostly negligible to minor adverse impacts, although major adverse effects could occur if there were a blowout, fire or large uncontrolled release close to and/or upgradient of park wetlands. In addition, there would be long-term beneficial impacts as a result of reclaiming the wellpads and access roads of well sites drilled from outside the park units.

Cumulative Impacts

With the continuing reduction of impacts from oil and gas activities in both park units stemming from increased plugging and reclamation, and a corresponding decrease in new drilling and production, impacts to wetlands are expected to diminish and contribute less to cumulative impacts over time. However, several actions described in the “Cumulative Impacts Scenario” section of this chapter would result in both adverse and beneficial cumulative impacts on wetlands. Past and future oil and gas development within and outside Big South Fork NRRA would have short- and long-term minor to moderate adverse impacts on wetlands from vegetation clearing, ORV use, and the construction and maintenance of access roads, wellpads, and flowlines. In addition, potential contamination of surface and groundwater from leaking wells would also contribute to impacts. Coal bed methane/shale gas drilling is an ongoing activity in the vicinity of Big South Fork NRRA, and it has similar impacts to traditional oil and gas development.

Many impacts on water quality also affect wetland functions and values. Acid mine drainage and abandoned mine impacts include contamination of water resources by sulfuric acid and ferric hydroxide runoff at active and abandoned coal mining sites. Residential development, agriculture, logging, and industrial activity outside the park unit would also contribute to the potential for the discharge of sediments to surface waters through soil erosion or the discharge of pollutants that could affect the ecological health of wetlands. Ground disturbances during development and routine maintenance of facilities would increase soil erosion potential. Insect infestations or disease may affect wetland vegetation or vegetation in riparian buffers. These activities would have long-term localized negligible to moderate adverse cumulative impacts on wetlands associated with the receiving waters or directly affected by development.

The spread of non-native plant species such as multiflora rose has historically been occurring over large areas and now represents a serious problem within the national park units. At Big South Fork NRRA, efforts to control exotic vegetation have involved the use of herbicides as the primary tool for controlling exotic plant infestations in managed fields. Herbicide spills would have detrimental effects on wetlands. ORVs, which can cause soil compaction and rutting, could be used to get to areas that have exotic species infestations. Exotic species management efforts could result in localized short-term negligible to minor adverse impacts.

In addition to active mining operations, approximately 25,100 acres of unreclaimed abandoned coal mines exist in the Tennessee counties adjacent to the Big South Fork NRRA, and there are about 10 abandoned surface coal mine sites in McCreary County, Kentucky. The Big South Fork NRRA has undertaken remediation studies of selected sites where contaminated mine drainage is of concern. The Worley riverside area is a former mining community where remnants of mining operations, including mine tailings, are evident. Water quality on the site is an issue due to acid mine drainage, as discussed previously, and water quality directly influences the health of park wetlands located in the river and stream valleys.

Some plans and projects within the park would also have long-term beneficial effects on wetlands, including implementation of the GMP at Big South Fork NRRA. This plan outlines desired resource conditions that would protect natural resources, including wetlands, in the park. Implementation of an official roads and trails system and standards associated with the GMP would help reduce the potential for increased runoff and associated turbidity and sedimentation by reducing the erosion and compaction of soils. Reclamation of abandoned mines would also have beneficial long-term effects on wetlands, as would the plugging and reclamation of other wells, including many orphaned wells that are known to exist in the park that will be plugged under TDEC and ARRA projects. In addition, Kentucky and

Tennessee are developing TMDLs for impaired waters in the Big South Fork NRRA. The implementation of these TMDLs would have beneficial effects on wetlands by reducing pollutants entering streams.

Additionally, the NPS has published an advance notice of proposed rulemaking in the Federal Register regarding a proposed rule to revise the 9B regulations governing non-federal oil and gas development within the boundaries of NPS units. Generally, the proposed changes focus on improving resource protection aspects of the regulations while accounting for advances in oil and gas technology and industry practices. These changes could have long-term beneficial impacts on wetlands, due to improving resource protection practices.

Overall, the impacts of these actions, combined with the localized short-term negligible to moderate adverse impacts and the beneficial effects of alternative A, would result in short- and long-term minor to moderate adverse cumulative impacts on wetlands. Protection provided to wetlands in the park under CLPRs, especially NPS wetlands policies, would minimize adverse impacts and improve the condition of wetlands in the park units, but wetlands in other areas of the watersheds have been and could continue to be adversely affected. When compared to the broader area of analysis, alternative A would directly impact a relatively small area and would contribute minimally to the overall cumulative impacts.

Conclusion

Under alternative A, limited geophysical operations would result in short-term negligible adverse impacts on wetlands, mainly from disturbance of existing unpaved surfaces and resultant road runoff or from the crossing of small areas of wetlands along tributary streams. In areas where non-federal oil and gas operations would be permitted in the park units, drilling and production of wells could result in short-term to long-term negligible to moderate adverse impacts from vegetation clearing, ground disturbance or rutting, erosion, and runoff; however, new oil and gas operations would not be permitted in wetlands unless there was no practicable alternative, and wetlands could likely be avoided, but moderate adverse impacts could result at existing well locations in wetlands due to possible releases of hazardous substances and leaks that could go undetected. Impacts from plugging and reclamation of wells at either park would be localized, short term, negligible to minor, and adverse. In addition, reclaiming the wellpads and access roads would have a long-term beneficial impact on wetlands by reducing soil erosion and reestablishing hydrology and surface drainage flows, once recontouring and planting and establishment of native vegetation in disturbed areas is complete. Wells directionally drilled and produced from outside the park units could result in no impact to localized short- to long-term negligible to minor adverse impacts. In addition, there would be long-term beneficial impacts as a result of reclaiming the wellpads and access roads of well sites drilled from outside the park units. For both in-park and adjacent directionally drilled wells, up to major short-term adverse effects could occur in the unlikely event of a well blowout, fire, or uncontrolled release.

The adverse and beneficial effects of past, present, and reasonably foreseeable future actions, when combined with the short- and long-term negligible to moderate adverse impacts as well as the long-term beneficial effects of alternative A, would result in short- and long-term minor to moderate adverse cumulative impacts on wetlands. When compared to the broader area of analysis, alternative A would directly impact a relatively small area and would contribute minimally to the overall cumulative impacts.

Alternative B: Comprehensive Implementation of the 9B Regulations and a New Management Framework for Plugging and Reclamation

Analysis

Geophysical Exploration—As with alternative A, minimal geophysical exploration is expected at Big South Fork NRRA, except for the limited possibility of conventional seismic lines in areas of existing roads where data could be acquired quickly and inexpensively, using seismic vibrator technology. As a result, impacts associated with geophysical exploration in alternative B would be very similar to the impacts described in alternative A, stemming mainly from disturbance of existing unpaved surfaces and resultant road runoff or the crossing of small areas of wetlands along tributary streams, and would be localized, short term, negligible, and adverse.

Drilling and Production—Because the forecast of oil and gas activities in chapter 2 applies to all alternatives, impacts associated with up to 20 new wells in Big South Fork NRRA and up to 5 wells directionally drilled from outside the park unit in Obed WSR and well workovers/servicing would be very similar to the impacts described in alternative A. CLPRs would protect wetlands in these areas by requiring 500-foot setbacks from the banks of perennial, intermittent, or ephemeral watercourses. In addition, implementation of a comprehensive oil and gas management plan, including increased inspections and monitoring, under alternative B would proactively identify sites that may be impacting, or threatening to impact, park resources beyond the operations area. The 9B regulations would be enforced at any such sites, and operations found to pose a significant threat to federally owned or controlled lands or waters would be suspended by the superintendent until the threat is removed or remedied (see 36 CFR 9.33 and 9.51). As a result, although short-term and long-term impacts from drilling and production associated with vegetation removal, land disturbance, and spills or releases could still occur, this alternative would protect park resources and values better than alternative A, Therefore, there would be mostly localized short-term to long-term negligible to minor adverse impacts on wetlands, with a reduced chance of a short-term major impact from well blowouts, fires, or large uncontrolled releases.

Plugging and Reclamation—As indicated in the forecast of oil and gas activities in chapter 2, plugging and reclamation of wells is expected to be the primary oil and gas operation conducted in Big South Fork NRRA and Obed WSR during the life of this plan. Between both park units, approximately 50 wells are expected to be plugged and reclaimed, resulting in the reclamation of approximately 87 acres of land.

Similar to alternative A, well plugging, shutting down and abandoning/removing flowlines and pipelines, and the use of heavy equipment and vehicles during reclamation activities could cause short-term, adverse impacts if wells are located in or near wetlands. However, under alternative B the NPS would implement a comprehensive oil and gas management plan that includes a new management framework for plugging and reclamation of wells. This would allow the NPS and operators to efficiently complete the compliance process for the plugging and reclamation of inactive wells that represent potential threats to park resources and values. This new management framework also includes goals and specific activities for protecting park resources and values during plugging and reclamation activities. Coupled with the same mitigation measures described for alternative A and in appendix B, there would be localized short-term negligible to minor adverse impacts. Additionally, the new management framework for plugging and reclamation would increase the certainty that wells would be plugged and reclaimed to applicable standards, and therefore, the long-term beneficial effects described under alternative A would be more likely to be realized sooner.

Directionally Drilled Wells—Similar to alternative A, wells directionally drilled and produced from outside the park units to bottomholes beneath them could indirectly impact wetlands in the park if wetlands are close enough to be affected by runoff. The types of impacts are expected to be similar to those described above for operations inside the park, but the intensity of impacts could increase for operations sited closer to the park boundary, where erosion or leaks and spills could affect adjacent park wetlands. Impacts would depend on proximity to the park units; site-specific environmental conditions, particularly surface hydrology and slopes; and mitigation measures being employed. Based on these factors and the location of wetlands in the park units, and with implementation of required spill-prevention features and plans under state regulations, indirect impacts on wetlands in the park could range from no impact to indirect, localized, short- to long-term, negligible to minor adverse impacts, although major adverse effects could occur if there were a blowout, fire, or large uncontrolled release close to and/or upgradient of park wetlands. In addition, there would be long-term beneficial impacts as a result of reclaiming the wellpads and access roads of well sites drilled from outside the park units.

Cumulative Impacts

Impacts on wetlands from other actions that were considered under the cumulative impact scenario would be the same as described for alternative A. The adverse and beneficial effects of the cumulative actions, when combined with the short- and long-term negligible to minor adverse impacts as well as the long-term beneficial effects of alternative B, would result in short- and long-term minor to moderate adverse cumulative impacts on wetlands. The increased enforcement and inspections/monitoring under alternative B would better promote wetlands protection, but the majority of impacts on wetlands in the area of analysis would lie outside the park, where impacts may or may not be mitigated. Therefore, when compared to the larger area of analysis, alternative B would directly impact a relatively small area and would contribute minimally to overall adverse cumulative impacts. Alternative B would provide long-term cumulative benefits due to its proactive management and enforcement and expedited well plugging

Conclusion

Similar to alternative A, limited geophysical operations would result in short-term negligible adverse impacts on wetlands, mainly from disturbance of existing unpaved surfaces and resultant road runoff or from the crossing of small areas of wetlands along tributary streams. In areas where non-federal oil and gas operations would be permitted in the park units, drilling and production of wells could result in short-term to long-term negligible to minor adverse impacts from vegetation clearing, ground disturbance and compaction, and erosion/runoff; however, new oil and gas operations would not be permitted in wetlands unless there was no practicable alternative, wetlands could likely be avoided, and inspections would detect leaks that could damage wetlands, limiting the extent of impacts. Impacts from plugging and reclamation of wells at either park would be localized, short term, negligible to minor, and adverse. In addition, reclaiming the wellpads and access roads would have a long-term beneficial impact on wetlands by reducing soil erosion and reestablishing hydrology and surface drainage flows, once recontouring and planting and establishment of native vegetation in disturbed areas is complete. Additionally, the new management framework for plugging and reclamation would increase the certainty that wells would be plugged and reclaimed to applicable standards, and therefore, the long-term beneficial effects described under alternative A would be more likely to be realized sooner. Wells directionally drilled and produced from outside the park units could result in no impact to localized short- to long-term negligible to minor adverse impacts. In addition, there would be long-term beneficial impacts as a result of reclaiming the wellpads and access roads of well sites drilled from outside the park units. Although up to major short-term adverse effects could occur in the unlikely event of a well blowout, fire, or uncontrolled release, the risk of that occurring is less under alternative B due to increased monitoring and inspections.

The adverse and beneficial effects of the cumulative actions, when combined with the short- and long-term negligible to minor adverse impacts as well as the long-term beneficial effects of alternative B, would have short- and long-term minor to moderate adverse cumulative impacts on wetlands. When compared to the larger area of analysis, alternative B would directly impact a relatively small area and would contribute minimally to overall adverse cumulative impacts. Alternative B would provide long-term cumulative benefits due to its proactive management and enforcement and expedited well plugging.

Alternative C: Comprehensive Implementation of the 9B Regulations, a New Management Framework for Plugging and Reclamation, and Establishment of Special Management Areas

Analysis

Geophysical Exploration—Impacts associated with geophysical exploration under alternative C would be similar to the impacts described in alternatives A and B. However, under alternative C SMAs would be established to further protect resources and values particularly susceptible to adverse impacts from oil and gas operations, or areas where certain resources are important to maintaining the ecological integrity of the park units. Under alternative C geophysical exploration would not be allowed in any of the SMAs or associated setbacks at Big South Fork NRRA, with the exception of the Special Scenery SMA, unless otherwise approved in a plan of operations. While none of the SMAs were developed to specifically protect wetlands, wetlands would indirectly benefit from the SMAs and setbacks located in or near wetlands, or on the edges of the gorge, where spills could reach wetlands in the gorge. Since minimal geophysical exploration is expected and would include use of existing roads and pedestrian access, impacts associated with geophysical exploration in alternative C related to vegetation clearing, ground disturbance, and crossing of small wetlands, would be localized, short term, negligible, and adverse.

Drilling and Production—Because the forecast of oil and gas activities in chapter 2 applies to all alternatives, impacts associated with up to 20 new wells in Big South Fork NRRA and up to 5 wells directionally drilled from outside the park unit in Obed WSR and well workovers/servicing would be very similar to the impacts described in alternative A.

Impacts associated with drilling and production under alternative C would be associated with vegetation removal, land disturbance/compaction, erosion, and spills or releases and would be similar to the impacts described in alternatives A and B. Well blowouts or uncontrolled releases could cause short-term major adverse effects. However, the establishment of SMAs would further protect natural areas, including areas of Big South Fork NRRA and Obed WSR where resources and values would be particularly susceptible to adverse impacts from oil and gas operations, or areas where certain resources are important to maintaining the ecological integrity of the park units. Under alternative C drilling and production would not be allowed in any of the SMA-associated setbacks at the park units unless otherwise approved in a plan of operations. In the Cliff Edge, Visitor Use, and Cultural Landscape SMAs, drilling would only be allowed during dry periods to minimize impacts on soil from rutting. This would reduce erosion/sedimentation and would minimize impacts on any nearby wetlands. As result, construction and maintenance of drilling and production operations would result in short- to long-term negligible to minor adverse impacts on wetlands.

Plugging and Reclamation—As indicated in the forecast of oil and gas activities in chapter 2, plugging and reclamation of wells is expected to be the primary oil and gas operation conducted in Big South Fork NRRA and Obed WSR during the life of this plan. Between both park units, approximately 50 wells are expected to be plugged and reclaimed, resulting in the reclamation of approximately 87 acres of land.

Similar to alternatives A and B, well plugging, shutting down and abandoning/removing flowlines and pipelines, and use of heavy equipment and vehicles during reclamation activities could cause soil erosion, increase sedimentation in waterways, alter surface water flows, and contaminate wetlands. However, under alternative C the NPS would implement a comprehensive oil and gas management plan that includes a new management framework for plugging and reclamation of wells. This would allow the NPS and operators to efficiently complete the compliance process for the plugging and reclamation of inactive wells that represent potential threats to park resources and values. This new management framework also includes goals and specific activities for protecting park resources and values during plugging and reclamation activities. As a result, there would be localized short-term negligible to minor adverse impacts at sites throughout the park. Additionally, the new management framework for plugging and reclamation would increase the certainty that wells would be plugged and reclaimed to applicable standards, and therefore, the long-term beneficial effects described under alternative A would be more likely to be realized sooner.

Directionally Drilled Wells—Similar to alternatives A and B, wells directionally drilled and produced from outside the park units to bottomholes beneath them could indirectly impact wetlands in the park. The types of impacts are expected to be similar to those described above for operations inside the park, but the intensity of impacts could increase for operations sited closer to the park boundary, where erosion or leaks and spills could affect adjacent park waters. Impacts would depend on proximity to the park units; site-specific environmental conditions, particularly surface hydrology and slopes; and mitigation measures being employed. Based on these factors, and with implementation of required spill-prevention features and plans under state regulations, indirect impacts on wetlands in the park could range from no impact to mostly indirect, localized to widespread, short- to long-term, negligible to minor adverse impacts, although major adverse effects could occur if there were a blowout, fire, or large uncontrolled release close to and/or upgradient of park wetlands. In addition, there would be long-term beneficial impacts as a result of reclaiming the wellpads and access roads of well sites drilled from outside the park units.

Cumulative Impacts

Impacts on wetlands from other actions that were considered under the cumulative impact scenario would be the same as described for alternative A. The adverse and beneficial effects of the cumulative actions, when combined with the short- and long-term negligible to minor adverse impacts as well as the long-term beneficial effects of alternative C, would result in short- and long-term minor to moderate adverse cumulative impacts on wetlands. The SMA restrictions would provide more consistent and more certain protection of wetlands in the SMAs, and proactive planning and enforcement of CLPRs is expected to promote protection of wetland resources, but adjacent lands could continue to be developed and impacts from outside the park boundaries would continue, often adversely impacting wetlands without adequate mitigation. When compared to the broader area of analysis, alternative C would directly impact a relatively small area and would contribute minimally to overall adverse cumulative impacts. Alternative C would provide long-term cumulative benefits due to its proactive management and enforcement, identification and protection of SMAs, and expedited well plugging.

Conclusion

Similar to alternatives A and B, limited geophysical operations would result in short-term negligible adverse impacts on wetlands from disturbance of existing unpaved surfaces and resultant road runoff or from the crossing of small areas of wetlands along tributary streams. Under alternative C, with adequate setbacks, implementation of mitigation measures, and the establishment of SMAs, impacts on wetlands in the park from drilling and production would be localized, short to long term, negligible to minor, and adverse. Impacts from plugging and reclamation of wells at either park would result in localized short-term negligible to minor adverse impacts on wetlands. Additionally, the new management framework for plugging and reclamation would increase the certainty that wells would be plugged and reclaimed to applicable standards, and therefore, the long-term beneficial effects described under alternative A would be more likely to be realized sooner. Wells directionally drilled and produced from outside the park units to bottomholes beneath them could indirectly impact park wetlands. These effects could range from no impact to indirect, localized, short- to long-term, minor adverse impacts. In addition, there would be long-term beneficial impacts as a result of reclaiming the wellpads and access roads of well sites drilled from outside the park units. Although up to major short-term adverse effects could occur in the unlikely event of a well blowout, fire, or uncontrolled release, the risk of that occurring is less under alternative C due to increased monitoring and inspections.

Cumulative impacts would be similar to those described for alternative B, with short and long term minor to moderate adverse cumulative impacts on wetlands. When compared to the broader area of analysis, alternative C would directly impact a relatively small area and would contribute minimally to overall adverse cumulative impacts. Alternative C would provide long-term cumulative benefits due to its proactive management and enforcement, identification and protection of SMAs, and expedited well plugging.

VEGETATION

GUIDING REGULATIONS AND POLICIES

The NPS *Management Policies 2006* (NPS 2006c) addresses biological resource management, which includes the management of native and exotic plant species. NPS *Management Policies 2006* state that the NPS will maintain all plants native to the park ecosystem by preserving and restoring natural abundances, diversities, dynamics, and distributions of native plants and the communities and ecosystems in which they occur, and by minimizing human impacts on native plants, populations, communities, and ecosystems, and the processes that sustain them. Further, the NPS will not allow exotic species to displace native species if displacement can be prevented.

The importance of vegetation is also stated in the park’s purpose and significance, which emphasizes the wide variety of habitats, with associated flora and fauna, of the Cumberland Plateau in a limited geographic area.

Other guiding regulations and policies for vegetation are presented in appendix F.

METHODOLOGY, ASSUMPTIONS, AND IMPACT THRESHOLDS

Given the programmatic nature of this analysis, the exact locations of future operations are unknown. As a result, actions under the RFD scenario and the forecast of oil and gas activities were analyzed qualitatively against the types of vegetation in Big South Fork NRRA and Obed WSR that could be impacted. The vegetation types were defined and described based on the sources cited in chapter 3. The assessment of impacts is based on best professional judgment and was developed through discussions with park staff and EIS team members. Because of the extensive vegetation cover in Big South Fork NRRA and Obed WSR, it was assumed any oil and gas activity would most likely result in some adverse impact on vegetation, since it would be almost impossible to avoid vegetated areas.

The impact intensity threshold definitions are based on the potential for changes to native vegetation characteristics, as follows:

Negligible: Impacts would result in a change to native vegetation, but the change would have no measurable or perceptible effects on plant community size, integrity, or continuity.

Minor: Impacts would result in a measurable or perceptible change to native vegetation types, their habitats, or the natural processes sustaining them, but the changes would be localized within a relatively small area. The overall viability of a plant community would not be affected and, if left alone, the community would recover. Mitigation measures, if needed to offset adverse effects, would be simple and successful.

Moderate: Impacts would result in effects on native vegetation types, their habitats, or the natural processes sustaining them, and would cause a measurable change in a plant community (e.g., abundance, distribution, quantity, or quality); however, the impact would remain localized. Mitigation measures, if needed to offset adverse effects, could be extensive, but would likely be successful.

Major: Impacts would result in a change that would contribute substantially to the deterioration of park vegetation to the extent that the park's vegetation would no longer function as a natural system. Extensive mitigation measures would be needed to offset any adverse effects, and the success of these measures would not be guaranteed.

IMPACT OF THE ALTERNATIVES

Alternative A: No Action (Current Management Continued)

Analysis

Geophysical Exploration—As described in the forecast of oil and gas activities in chapter 2, minimal geophysical exploration is expected at Big South Fork NRRA, except for the limited possibility of conventional seismic lines in areas of existing roads where data could be acquired quickly and inexpensively, using seismic vibrator technology. Therefore, since designated existing access roads would be used, receiver lines would be laid on foot, and no shotholes would be drilled, there would be limited impacts on vegetation, except where vegetation could be cut or trimmed during seismic surveying and cable laying.

CLPRs provide for use of mitigation to limit the impacts on vegetation associated with seismic surveys. Activities would be conducted during dormant seasons when possible; vegetation would only be trimmed along receiver lines, setbacks, and access routes; and activities would be in accordance with the park's current vegetation and management plans or policies. The use of global positioning systems could also be encouraged to reduce the need for line-of-sight surveys. Given application of these mitigation measures, the limited amount of geophysical exploration expected during the life of this plan, the minimal amount of disturbance, and the limited duration (weeks) of seismic surveys, there would be short-term negligible adverse impacts on vegetation.

Drilling and Production—Drilling and production operations would not directly impact vegetation in protected areas where operations would not be permitted under CLPRs. However, where permitted, drilling and production of oil and gas would cause direct loss of vegetation and habitat as a result of clearing, contouring, construction, and maintenance of the pads, roads, flowlines, pipelines, and other ancillary facilities. Site preparation may include clearing, grading, cutting, filling, and leveling of the pad using heavy construction equipment. Ground disturbance could also promote the introduction of exotic species. However, these long-term effects could be minimized by using already disturbed areas (including existing pads) for wellpad sites and using existing access roads. In addition, exotic-vegetation-control plans should be part of every plan of operations. In environmentally sensitive areas, a large effort would be made not to alter the surface area comprising the drill site more than necessary.

Use of truck-mounted drill rigs and water trucks could cause compaction and rutting of soils. Soil compaction related to road and wellpad construction reduces porosity and increases the soil's bulk density. A decrease in soil porosity causes a reduction of available water and oxygen for plant growth. The use of fill materials for the construction of access roads, wellpads, and berms around wellpads is required to protect soils in the park units. Use of fill materials would protect the soils from erosion and would maintain the soil structure that is essential for reestablishment of vegetation following the completion of operations. Once drilling and production operations are completed, the fill would be removed, exposing the underlying, undisturbed soils.

Indirect effects on vegetation include a potential for leaks and spills of drilling muds, hydrocarbons, produced waters, or treatment chemicals during drilling, production, servicing, or transport that could impact on-site or off-site soil and groundwater and associated vegetation. The chances of undetected spills would be greater under this alternative because routine inspections would not occur beyond base workload levels, which would increase the potential for a more severe impact on nearby off-site vegetation. Herbicides used to control site vegetation could drift or migrate off site, causing damage to nontarget vegetation in nearby areas. Observation of areas with high soil chloride levels from spills of produced water suggest that these spills are lethal to vegetation and can persist for many years, if not remediated. Other indirect adverse impacts impacting off-site vegetation include the possibility of erosion and sedimentation if runoff from the site occurs, burying nearby vegetation.

The NPS recognizes that unplanned incidents associated with oil and gas operations such as well blowouts, fires, and major spills within the boundaries of the park present a risk of release of contaminants that can adversely impact vegetation. However, the incident rates for such incidents are low and are not a typical expectation of project implementation. If such an incident did occur, required mitigation measures such as use of blowout preventers and implementation of SPCC plans would result in lessening the potential for spilled substances or a well fire to spread into the park, and for timely response and cleanup, so that there is a reasonable expectation that long term adverse impacts would not occur or be limited to minor to moderate levels of intensity, although there could be short-term major adverse effects during the release. In the event that the park's resources or values are damaged, the NPS could seek remedy both on the ground and in the form of monetary compensation.

Mitigation measures could be implemented to minimize the potential indirect effects on vegetation, including using closed-loop drilling fluid systems and tanks to hold cuttings and fluids, which are then disposed of offsite. In addition, indirect impacts from leaks and spills could be limited by using automatic shutdown, blowout preventers, drip pans, berms, liners, cleanup plans and equipment, and regular flowline testing. Herbicides used to keep vegetation off the site should be limited and/or restricted to those that do not readily drift or migrate off site. Silt fences or barriers should be used to eliminate off-site sedimentation.

Although the potential for vegetation impacts would exist, as described in the forecast of oil and gas activities in chapter 2, only up to 20 new wells are expected in Big South Fork NRRA and up to 5 wells directionally drilled from outside the park unit are expected in Obed WSR. Vegetation clearing would be limited in extent, and mitigation would require that least damaging methods are used for site preparation. As a result, drilling and production could result in localized short-term to long-term minor adverse impacts from the loss and maintenance of vegetation, including approximately 36 acres disturbed for new wells and access.

Plugging and Reclamation—As indicated in the forecast of oil and gas activities in chapter 2, plugging and reclamation of wells is expected to be the primary oil and gas operation conducted in Big South Fork NRRA and Obed WSR during the life of this plan. Between both park units, approximately 50 wells are expected to be plugged and reclaimed, resulting in the reclamation of approximately 87 acres of land.

This alternative would require clearing vegetation at the well and access roads, which would temporarily affect vegetation communities. The use of heavy equipment and vehicles during plugging and reclamation activities could release oil and other contaminating and hazardous substances, which could harm or kill vegetation. With minimal use of equipment used to clear wellpads and access roads and revegetation of the area with weed-free native seed mix, the area affected would be small; there would be few effects on plant community size, integrity, or continuity; and impacts would not affect the overall viability of plant communities. Therefore, alternative A would result in localized short-term negligible to minor adverse impacts on vegetation at sites throughout the park units.

During reclamation operations, sites are reclaimed by removing any contaminated soil or materials, grading the site to promote drainage and site reclamation, replacing topsoil, seeding with a selected mix of native herbaceous vegetation, and possibly planting. Weed-free native seed mixtures would be used to revegetate well sites and access roads following ground disturbance and, where possible, forest duff would be blown into areas to aid in revegetation of these areas. Site recovery is monitored and success is determined by measuring species survival, native vegetation density and diversity, percent cover, etc. Site monitoring also includes monitoring by the Big South Fork NRRA and Obed WSR botanist and staff for exotic species and follow-up treatment if required.

Recovery of vegetation communities would be primarily dependent on location, soil conditions, precipitation, and type of community desired. Most vegetation communities in the park units would be expected to reestablish vegetation in a relatively short time period. If access roads are not reclaimed, but continue to be used for other administrative purposes, adverse impacts on vegetation could occur if visitors travel off established routes. Despite this potential effect, restoration of native vegetation communities associated with plugging and reclamation would ultimately have long-term beneficial impacts.

Directionally Drilled Wells—Wells directionally drilled and produced from outside the park units to bottomholes beneath the park units could indirectly impact vegetation in the park. Some impacts, such as from soil erosion, contaminant release, or herbicide use, are expected to be similar to those described above for operations inside the park units, but the intensity of impacts could increase for operations sited closer to the park boundary. Impacts would depend on the proximity of operations to the park units; site-specific environmental conditions, such as steepness and direction of slope and surface hydrology; and mitigation measures being employed. Based on these factors, indirect impacts on vegetation in the park units could range from no impact to indirect, localized to widespread, short- to long-term, minor adverse impacts, with the potential for major adverse impacts due to a well blowout, fire, or large uncontrolled release. In addition, there would be long-term beneficial impacts as a result of reclaiming the wellpads and access roads of well sites drilled from outside the park units.

Cumulative Impacts

With the continuing reduction of impacts from oil and gas activities in both park units stemming from increased plugging and reclamation, and a corresponding decrease in new drilling and production, impacts to vegetation are expected to diminish and contribute less to cumulative impacts over time. However, several actions described in the “Cumulative Impacts Scenario” section of this chapter have the potential to result in adverse cumulative effects on vegetation at the park units. Past and future oil and gas development within and outside Big South Fork NRRA would have short- and long-term minor to moderate adverse impacts on vegetation from clearing during siting, construction, maintenance, and use of roads, wellpads, production facilities, tank batteries, flowlines, and/or pipelines. The presence of abandoned oil and gas wells has the potential to contribute to adverse cumulative impacts, mainly due to potential leaks over time and the past clearing of vegetation.

In addition to traditional oil and gas development, coal bed methane/shale gas drilling is an ongoing feature in the vicinity of the park units, which can result in vegetation loss and damage. There are also ongoing mining operations around the park units, which have resulted in removal of vegetation, and acid mine drainage associated with active and abandoned mines impacts water resources, which can affect vegetation in the park units. Acid mine drainage and abandoned mine impacts include contamination of resources by sulfuric acid and ferric hydroxide runoff at active and abandoned coal mining sites, as well as clearing of vegetation at active mine sites, with long-term minor to moderate adverse impacts. The Big South Fork NRRA has undertaken remediation studies of selected sites where contaminated mine drainage is of concern. One such area studied is the Worley riverside area, where remediation of mine effects is being planned, which would have long-term beneficial effects on vegetation.

Agricultural activities on land adjacent to the park units, primarily logging activities and hay production, cause the loss of natural vegetation and habitat, with long-term minor adverse impacts. Because of logging in the early to mid-20th century, most of the forested areas of Big South Fork NRRA are second or third growth. At Obed WSR, clearing and harvesting from logging and agriculture is particularly evident.

Fields, roads, trails, and other disturbed areas are often source areas for exotic plants. The abandonment of well sites and oil and gas access roads creates disturbances that increase the invasion and migration of non-native plant species into previously stable communities, where they displace native plants. NPS staff members at Big South Fork NRRA and Obed WSR routinely manage for exotic species. Efforts to control exotic species primarily include spot treatments of herbicide at infested areas. The spread of exotic species has a minor adverse effect on native vegetation, but the active management of exotic species has a long-term localized beneficial effect.

Other cumulative actions that would contribute to impacts on vegetation include visitor activities such as horseback riding, biking, hunting, and ORV use, all of which occur within Big South Fork NRRA and/or Obed WSR. Development and routine maintenance of facilities, including installation and maintenance of roads, trails, and developed sites within the park, would also disturb vegetation locally due to the presence of work crews and clearing of vegetation. These activities would have long-term localized negligible adverse cumulative impacts on vegetation.

Development outside the park, including commercial, industrial, and residential, could contribute moderate adverse cumulative impacts as a result of vegetation loss and damage.

Diseases and insect pests of vegetation, such as the pine bark beetle, have caused a decline in streamside vegetation, with large stands of trees affected by infestations causing widespread long-term minor adverse impacts on vegetation.

In addition to cumulative actions that have adverse effects on vegetation, there are also some actions that have beneficial effects. Reclamation of abandoned mines would have long-term beneficial effects on vegetation, as would the plugging and reclamation of other wells, including 14 orphaned wells that are known to exist in the park. The NPS has also recently received funding under the ARRA to plug and reclaim an additional 39 wells at Big South Fork NRRA to protect resources that would help restore and protect native vegetation in and around the park units.

Fire management activities can also affect water quality. The 2006 *Big South Fork NRRA Fire Management Plan* (NPS 2006e) recommends using mechanical means in combination with prescribed fire to reduce hazard fuel accumulations, which can result in ground disturbance and temporary loss of vegetation cover. The implementation of a fire management plan would have long-term beneficial effects on vegetation within the Big South Fork NRRA and the Obed WSR by reducing hazard fuel accumulations around oil and gas well facilities and aiding in fire suppression activities by reducing fire intensity and severity, protecting existing native vegetation.

The 2006 *Big South Fork NRRA Fields Management Plan* (NPS 2006d) identifies desired resource conditions, including specific vegetation conditions for each field managed as native fields, grassy woodlands, and forests, helping restore native plant communities. Additionally, the revised 9B regulations (36 CFR 9B) governing non-federal oil and gas development within the boundaries of NPS units focuses on improving resource protection aspects of the regulations while accounting for advances in oil and gas technology and industry practices. These changes could have long-term beneficial impacts on vegetation, due to improving resource protection practices.

Overall, the impacts of these actions, combined with the short- and long-term negligible to minor adverse impacts as well as the long-term beneficial effects of alternative A, would result in short- and long-term minor to moderate adverse cumulative impacts on vegetation. Protection provided to vegetation in the park units under CLPRs would minimize adverse impacts and gradually improve the condition of vegetation through reclamation, but vegetation in areas surrounding the park units has been and could continue to be adversely affected. When compared to the broader area of analysis, alternative A would directly impact a relatively small area and would contribute a minimal amount to the overall cumulative impacts.

Conclusion

Given application of the mitigation measures, the limited amount of geophysical exploration expected during the life of this plan, the minimal amount of disturbance, and the limited duration (weeks) of seismic surveys, there would be short-term negligible adverse impacts on vegetation from geophysical exploration due to vegetation clearing and effects on soils. In areas where non-federal oil and gas operations would be permitted in the park units, drilling and production operations could result in localized short-term to long-term minor adverse impacts from the loss of vegetation and ground disturbance/soil erosion and compaction, but with a risk of more severe adverse impacts from leaks and spills that could go undetected or migrate off site. Impacts on vegetation during implementation from plugging and reclamation activities at either park under alternative A would be localized, short term, negligible to minor, and adverse. However, there would be long-term beneficial effects under alternative A from site reclamation and removing the risks associated with unplugged wells. Indirect impacts on vegetation in the park units could range from no impact to localized to widespread, short- to long-term, minor adverse impacts. In addition, there would be long-term beneficial impacts as a result of reclaiming the wellpads and access roads of well sites drilled from outside the park units. For both in-park and adjacent directionally drilled wells, up to major short-term adverse effects could occur in the unlikely event of a well blowout, fire, or uncontrolled release.

The adverse and beneficial effects of past, present, and reasonably foreseeable future actions, when combined with the short- and long-term negligible to minor adverse impacts as well as the long-term beneficial effects of alternative A, would result in short- and long-term minor to moderate adverse cumulative impacts on vegetation. When compared to the broader area of analysis, alternative A would directly impact a relatively small area and would contribute a minimal amount to the overall cumulative impacts.

Alternative B: Comprehensive Implementation of the 9B Regulations and a New Management Framework for Plugging and Reclamation

Analysis

Geophysical Exploration—Minimal geophysical exploration is expected at Big South Fork NRRA, except for the limited possibility of conventional seismic lines in areas of existing roads where data could be acquired quickly and inexpensively, using seismic vibrator technology. Given the restrictions at Obed WSR, including the No Surface Use stipulation for the gorge, these operations would not be allowed within the park unit under alternative B. Under alternative B the NPS would implement an oil and gas management plan that clearly articulates the CLPRs applicable to the exploration of non-federal oil and gas resources in Big South Fork NRRA and Obed WSR. This plan would ensure that geophysical exploration is conducted in a way that best protects park resources and values, including vegetation. As a result, impacts associated with geophysical exploration in alternative B from vegetation removal and effects on soils would be very similar to the impacts described in alternative A, and would be localized, short term, negligible, and adverse.

Drilling and Production—Because the forecast of oil and gas activities in chapter 2 applies to all alternatives, impacts associated with up to 20 new wells in Big South Fork NRRA and up to 5 wells directionally drilled from outside the park unit in Obed WSR would be very similar to the impacts described in alternative A. It is also assumed that 125 wells at Big South Fork NRRA and 2 wells at Obed WSR would be worked over or serviced, as staffing limitations and resources allow for review of the proposed projects.

As described for alternative A, where drilling and production operations could be permitted, these activities could harm or kill vegetation or cause the direct loss of vegetation as described for alternative A. However, mitigation measures described under alternative A would be applied, such as the use of previously disturbed areas, non-native species control, implementation of spill prevention and response measures, and erosion control. Also, under alternative B the NPS would implement a comprehensive oil and gas management plan and would increase inspections and monitoring. This would reduce the chance of leaks or releases going undetected and reaching vegetation, and would proactively identify sites that may be impacting, or threatening to impact, park resources beyond the operations area. The 9B regulations would be enforced at any such sites, and operations found to pose a significant threat to federally owned or controlled lands or waters would be suspended by the superintendent until the threat is removed or remedied (see 36 CFR 9.33 and 9.51). As a result, although short-term and long-term impacts from drilling and production would still occur, this alternative would protect park resources and values, including vegetation, better than alternative A. Therefore, there would be short- to long-term minor adverse impacts from drilling and production activities with a reduced chance of a short-term major impact from well blowouts, fires, or large uncontrolled releases.

Plugging and Reclamation—As indicated in the forecast of oil and gas activities in chapter 2, plugging and reclamation of wells is expected to be the primary oil and gas operation conducted in Big South Fork NRRA and Obed WSR during the life of this plan. Between both park units, approximately 50 wells are expected to be plugged and reclaimed, resulting in the reclamation of approximately 87 acres of land.

Under alternative B plugging and reclamation procedures would apply the same mitigation measures as described for alternative A. Sites would be reclaimed by removing any contaminated soil or materials, grading the site to promote drainage and site reclamation, replacing topsoil, seeding with a selected mix of native herbaceous vegetation, and possibly planting. Weed-free native seed mixtures would be used to revegetate well sites and access roads, and site recovery would be monitored. In addition, under alternative B the NPS would implement a comprehensive oil and gas management plan that includes a new management framework for plugging and reclamation of wells, which would allow the NPS and operators to efficiently complete the compliance process for the plugging and reclamation of inactive wells that represent potential threats to park resources and values. This new management framework also includes goals and specific activities for protecting park resources and values during plugging and reclamation activities. As a result, alternative B would result in negligible to minor adverse impacts on vegetation from plugging and reclamation. Additionally, the new management framework for plugging and reclamation would increase the certainty that wells would be plugged and reclaimed to applicable standards, and therefore, the long-term beneficial effects described under alternative B would be more likely to be realized sooner.

Directionally Drilled Wells—Similar to alternative A, wells directionally drilled and produced from outside the park units to bottomholes beneath the park units could indirectly impact vegetation in the park. The types of impacts are expected to be similar to those described above for operations inside the park units, but the intensity of impacts could increase for operations sited closer to the park boundary. Impacts would depend on the proximity of operations to the park units; site-specific environmental conditions, such as steepness and direction of slope and surface hydrology; and mitigation measures being employed. Based on these factors, indirect impacts on vegetation in the park units could range from no impact to indirect, localized to widespread, short- to long-term, minor adverse impacts, with the potential for major adverse impacts due to a well blowout, fire, or large uncontrolled release. In addition, there would be long-term beneficial impacts as a result of reclaiming the wellpads and access roads of well sites drilled from outside the park units.

Cumulative Impacts

Impacts on vegetation from other actions that were considered under the cumulative impacts scenario would be the same as described for alternative A. The adverse and beneficial effects of the cumulative actions, when combined with the short- to long-term negligible to minor adverse impacts as well as the long-term beneficial effects of alternative B, would result in short- and long-term minor to moderate adverse cumulative impacts on vegetation. The more proactive enforcement of CLPRs and increased inspections/monitoring would limit adverse impacts on vegetation in the park units, but the majority of the impacts on vegetation in the region lie outside the park units, where impacts may or may not be mitigated. When compared to the broader area of analysis, alternative B would directly impact a relatively small area and would contribute minimally to the overall adverse cumulative impacts. Alternative B would provide long-term cumulative benefits due to its proactive management and enforcement and expedited well plugging.

Conclusion

Similar to alternative A, limited geophysical operations would result in short-term negligible adverse impacts on vegetation from clearing and effects on soils. In areas where non-federal oil and gas operations would be permitted in the park units, drilling and production of wells could result in short- to long-term minor adverse impacts from the loss of vegetation, ground disturbance with resultant soil erosion or compaction, or leaks and spills. With applied mitigation and the implementation of a comprehensive oil and gas management plan, the risks of vegetation damage from spills or releases would be reduced. Impacts from plugging and reclamation of wells at either park would result in negligible to minor impacts on vegetation. Additionally, the new management framework for plugging and reclamation would increase the certainty that wells would be plugged and reclaimed to applicable standards, and therefore, the long-term beneficial effects described under alternative A would be more likely to be realized sooner. Indirect impacts on vegetation in the park units from wells directionally drilled and produced from outside the park units could range from no impact to indirect, localized to widespread, short- to long-term, minor adverse impacts. In addition, there would be long-term beneficial impacts as a result of reclaiming the wellpads and access roads of well sites drilled from outside the park units. Although up to major short-term adverse effects could occur in the unlikely event of a well blowout, fire, or uncontrolled release, the risk of that occurring is less under alternative B due to increased monitoring and inspections.

The adverse and beneficial effects of the cumulative actions, when combined with the short- and long-term negligible to minor adverse impacts as well as the long-term beneficial effects of alternative B, would have short- and long-term minor to moderate adverse cumulative impacts on vegetation. When compared to the larger area of analysis, alternative B would directly impact a relatively small area and would contribute minimally to overall adverse cumulative impacts. Alternative B would provide long-term cumulative benefits due to its proactive management and enforcement and expedited well plugging

Alternative C: Comprehensive Implementation of the 9B Regulations, a New Management Framework for Plugging and Reclamation, and Establishment of Special Management Areas

Analysis

Geophysical Exploration—Impacts associated with geophysical exploration under alternative C would be similar to the impacts described in alternatives A and B. However, under alternative C geophysical exploration would not be allowed in any of the SMAs or associated setbacks at Big South Fork NRRA, with the exception of the Special Scenery SMA unless otherwise approved in a plan of operations. The SMA for Honey Creek and Twin Arches state natural areas was set aside primarily because of their rich undisturbed forest communities and their high diversity of forest species. The Sensitive Geomorphic Feature and Cliff Edge SMAs would also protect some unusual vegetation, along with geology. Given the areas protected by SMA restrictions and the limited extent of geophysical exploration anticipated during the life of this plan, including the use of existing roads and access on foot, impacts associated with geophysical exploration in alternative C would result in localized short-term negligible adverse impacts on vegetation at Big South Fork NRRA.

Drilling and Production—Because the forecast of oil and gas activities in chapter 2 applies to all alternatives, impacts associated with up to 20 new wells in Big South Fork NRRA and up to 5 wells directionally drilled from outside the park unit in Obed WSR and well workovers/servicing would be very similar to the impacts described in alternatives A and B. Similar to alternatives A and B, impacts from the construction and maintenance of drilling and production operations sited in uplands would result in impacts on vegetation, such as the direct loss of vegetation as a result of clearing, contouring, and maintenance activities. Well blowouts, fires, or large uncontrolled releases could occur and cause short-term major adverse effects.

However, mitigation measures described under alternatives A and B would be applied, such as the use of previously disturbed areas, non-native species control, implementation of spill prevention and response measures, and erosion control. Similar to alternative B, under alternative C the NPS would implement an oil and gas management plan that clearly articulates the CLPRs applicable to the production and transportation of non-federal oil and gas resources and would implement increased inspections and monitoring. This would reduce the chance of leaks or releases going undetected and reaching vegetation, and would proactively identify sites that may be impacting, or threatening to impact, park resources beyond the operations area. The 9B regulations would be enforced at any such sites, and operations found to pose a significant threat to federally owned or controlled lands or waters would be suspended by the superintendent until the threat is removed or remedied (see 36 CFR 9.33 and 9.51).

In addition, the establishment of SMAs would further protect natural areas, including areas of Big South Fork NRRA and Obed WSR where resources and values are particularly susceptible to adverse impacts from oil and gas operations, or areas where certain resources are important to maintaining the ecological integrity of the park units. Under alternative C, drilling and production would not be allowed in any of the SMAs or associated setbacks at Big South Fork NRRA unless otherwise approved in plan of operations. Drilling and production would be precluded in Obed WSR.

Due to the designation of the State Natural Area, Managed Fields, and Obed WSR SMAs, it is likely under alternative C that some wells may be directionally drilled from outside the SMAs, or possibly outside the park, to develop underlying hydrocarbons. The intensity of impacts on vegetation would be dependent upon where the operation is located with respect to vegetation type, whether the operation is sited inside or outside the park, and on the resource protection measures that are employed.

Although short-term and long-term impacts from drilling and production would still occur, alternative C would protect vegetation better than alternatives A and B because of the SMA restrictions and other mitigation included in this alternative. Therefore, there would be short- to long-term negligible to minor adverse impacts from drilling and production activities with a more limited risk of major adverse effects from spills or leaks.

Plugging and Reclamation—Similar to alternatives A and B, this alternative would require clearing vegetation at the well and access roads that would temporarily affect vegetation communities by the use of heavy equipment and vehicles that could release oil and other contaminating and hazardous substances, which could harm or kill vegetation. Sites would be reclaimed by removing any contaminated soil or materials, grading the site, replacing topsoil, seeding with a selected mix of native herbaceous vegetation, and possibly planting, and most vegetation communities would be expected to reestablish vegetation in a relatively short time period. Site-specific monitoring would be done to ensure successful reclamation. If access roads are not reclaimed, but continue to be used for other administrative purposes, adverse impacts on vegetation could occur if visitors travel off established routes.

However, as with alternative B, the NPS would implement a comprehensive oil and gas management plan that includes a new management framework for plugging and reclamation of wells, which would allow the NPS and operators to efficiently complete the compliance process for the plugging and reclamation of inactive wells that represent potential threats to park resources and values. Also, SMAs would be used under alternative C to set priorities for plugging, which would better protect vegetation at those SMAs that receive priority for action. Overall, alternative C would result in negligible to minor adverse impacts on vegetation at sites throughout the park units. Despite this potential effect, restoration of native vegetation communities associated with plugging and reclamation would ultimately have long-term beneficial impacts, which would be more likely to be realized sooner given the implementation of the new management framework for plugging and reclamation.

Directionally Drilled Wells—Indirect impacts on vegetation in the park units from drilling and production of wells directionally drilled from outside the park units to bottomholes beneath the park units would be similar to those described above for alternatives A and B, and could range from no impact to indirect, localized to widespread, short- to long-term, minor adverse impacts, with the potential for major adverse impacts due to a well blowout, fire, or large uncontrolled release. In addition, there would be long-term beneficial impacts as a result of reclaiming the wellpads and access roads of well sites drilled from outside the park units.

Cumulative Impacts

Impacts on vegetation from other actions that were considered under the cumulative impacts scenario would be the same as described for alternative A. The adverse and beneficial effects of the cumulative actions, when combined with the short- to long-term negligible to minor adverse impacts as well as the long-term beneficial effects of alternative C, would result in short- and long-term minor to moderate cumulative adverse impacts on vegetation. The SMA restrictions would provide more consistent protection of vegetation in the SMAs, and protection provided to vegetation in the park under CLPRs and increased inspections and enforcement is expected to limit adverse impacts and improve conditions through reclamation. However, adjacent lands could continue to be developed, adversely impacting vegetation without adequate mitigation in the area of analysis. When compared to the broader area of analysis, alternative C would directly impact a relatively small area and would contribute minimally to overall adverse cumulative impacts. Alternative C would provide long-term cumulative benefits due to its proactive management and enforcement, identification and protection of SMAs, and expedited well plugging.

Conclusion

Similar to alternatives A and B, limited geophysical operations would result in short-term negligible adverse impacts on vegetation from clearing and effects on soils. Under alternative C, with adequate setbacks, application of mitigation measures, and the establishment of SMAs, impacts on vegetation in the park from drilling and production would be short- to long-term negligible to minor adverse impacts from the loss of vegetation or leaks and spills. Impacts from plugging and reclamation of wells at either park would result in negligible to minor impacts on vegetation. Additionally, the new management framework for plugging and reclamation would increase the certainty that wells would be plugged and reclaimed to applicable standards, and therefore, the long-term beneficial effects described under alternative A would be more likely to be realized sooner. Wells directionally drilled from outside the park units to bottomholes beneath the park units could result in effects ranging from no impact to indirect, localized to widespread, short- to long-term, minor adverse impacts. In addition, there would be long-term beneficial impacts as a result of reclaiming the wellpads and access roads of well sites drilled from outside the park units. Although up to major short-term adverse effects could occur in the unlikely event of a well blowout, fire, or uncontrolled release, the risk of that occurring is less under alternative C due to increased monitoring and inspections.

Cumulative impacts under alternative C would be similar to those described for alternative B, with short- and long-term minor to moderate cumulative adverse impacts on vegetation. When compared to the broader area of analysis, alternative C would directly impact a relatively small area and would contribute minimally to overall adverse cumulative impacts. Alternative C would provide long-term cumulative benefits due to its proactive management and enforcement, identification and protection of SMAs, and expedited well plugging.

WILDLIFE AND AQUATIC SPECIES

Guiding Regulations and Policies

The NPS Organic Act of 1916 and NPS *Management Policies 2006* (NPS 2006c) direct NPS managers to provide for the protection of park resources. The Organic Act requires that wildlife be conserved unimpaired for future generations, which has been interpreted to mean that native animal life is to be protected and perpetuated as part of a park unit's natural ecosystem. Parks rely on natural processes to control populations of native species to the greatest extent possible; otherwise, they are protected from harvest, harassment, or harm by human activities. The NPS *Management Policies 2006* make restoration of native species a high priority. Management goals for wildlife include maintaining components and processes of naturally evolving park ecosystems, including natural abundance, diversity, and ecological integrity of plants and animals (NPS 2006c).

METHODOLOGY, ASSUMPTIONS, AND IMPACT THRESHOLDS

Given the programmatic nature of this analysis, the exact locations of future operations are unknown. As a result, actions under the RFD scenario and the forecast of oil and gas activities were analyzed qualitatively against the types of wildlife and wildlife habitat in Big South Fork NRRA and Obed WSR that could be impacted. The wildlife and aquatic species were defined and described based on the sources cited in chapter 3. The assessment of impacts is based on best professional judgment and was developed through discussions with park staff and EIS team members.

The impact intensity threshold definitions are based on the potential for changes to wildlife and aquatic species characteristics, as follows:

Negligible: There would be no observable or measurable impacts on native species, their habitats, or the natural processes sustaining them.

Minor: Impacts on native species, their habitats, or the natural processes sustaining them would be detectable on a local level. Occasional responses to disturbance by some individuals could be expected, but without interference to factors affecting population levels. Sufficient habitat would remain functional to maintain viability of all native species. Impacts would be outside critical reproduction periods or key habitat.

Moderate: Impacts on native species, their habitats, or the natural processes sustaining them would be detectable, and changes to population numbers, population structure, genetic variability, and other demographic factors could occur on a local level. Responses to disturbance by some individuals could be expected and could have negative impacts on factors affecting local population levels, but species would remain stable and viable. Sufficient habitat would remain functional to maintain the viability of all native species, but habitat quality could be affected. Some impacts might occur during critical periods of reproduction or in key habitat.

Major: Impacts on native species, their habitats, or the natural processes sustaining them would be detectable, and population numbers, population structure, genetic variability, and other demographic factors might experience large declines over a wide geographic area. Responses to disturbance by some individuals would be expected, with negative impacts resulting in a decrease in population levels. Loss of habitat might affect the viability of some native species. Impacts would regularly occur during critical periods of reproduction or in key habitat.

IMPACT OF THE ALTERNATIVES

Alternative A: No Action (Current Management Continued)

Analysis

Geophysical Exploration—As described in the forecast of oil and gas activities in chapter 2, minimal geophysical exploration is expected at Big South Fork NRRA, except for the limited possibility of conventional seismic lines in areas of existing roads where data could be acquired quickly and inexpensively, using seismic vibrator technology. Therefore, since designated existing access roads would be used, receiver lines would be laid on foot, and no shotholes would be drilled, there would be very limited impacts on wildlife and aquatic species. Wildlife and aquatic species could be displaced or could experience increased stress and mortality and decreased production as a result of work crews trimming vegetation, or laying lines, and there could be temporary disturbance during the use of the seismic vibrator due to noise and ground vibration. Operations would avoid critical reproduction periods or key habitat. Impacts related to noise are usually temporary, with wildlife and aquatic species avoiding or moving away from the source but returning after noise is reduced or eliminated. Seismic survey disturbance would be very localized and intermittent, with the level of impact dependent on the strength of the vibration and proximity to the source.

However, under any alternative, protection of water quality and aquatic species and wildlife would be provided by CLPRs, which require operations to maintain a 500-foot setback from rivers, streams, and other water bodies, unless specifically authorized by an approved plan of operations. The setback would avoid or substantially reduce sedimentation and turbidity and vibration impacts. The 500-foot setback from water bodies would protect wildlife and aquatic species using water and the immediate riparian areas within this protective zone. Protection of aquatic habitats would also be provided by the wetlands and floodplains permitting and compliance requirements. Also, natural resource surveys would be conducted as deemed necessary by resource specialists, and appropriate mitigation applied.

As a result, geophysical operations under alternative A could result in localized short-term negligible to minor adverse impacts on wildlife and aquatic species.

Drilling and Production—Where drilling and production operations would be permitted, the construction and maintenance of roads, wellpads, and production pads could result in the direct loss of habitat. Increased wildlife and aquatic species mortality could result from vehicles, construction activities, and increased access into previously inaccessible areas, resulting in localized short-term (construction and well drilling) to long-term (road, flowline, pipeline, well, and production operations) minor adverse impacts. Drilling muds, hydrocarbons, produced waters, or treatment chemicals could be released during drilling, production, or transport, with minor to potentially major adverse impacts, but with mitigation and prompt response in the event of a spill, the intensity of long-term adverse impacts would be minor to moderate.

Many of the impacts on wildlife and aquatic species from drilling and production are associated with construction activities. Wildlife and aquatic species, particularly small mammals, invertebrates, and herpetofauna (reptiles and amphibians), that cannot escape an area during construction could be killed, and increased mortality of small mammals is also likely to occur along access roads.

Aquatic species could experience habitat degradation from road construction and use, construction of wellpads, and placement of pipelines in drainages where these species occur. These effects could decrease the long-term viability of populations as a result of increased sedimentation from construction activities and long-term use, if appropriate mitigation measures are not applied. Some risk of direct mortality of aquatic species could occur if a pipeline ruptures at a stream crossing or if toxic materials (such as diesel fuel) are spilled into streams. In some cases, improved human access to remote streams could result in greater fish mortality from licensed fishing or poaching, which would constitute an indirect effect. These effects would depend on where new production ultimately occurs, and careful siting of developments could avoid or minimize these impacts substantially. Because waterways are inherently a part of floodplains (riparian corridors) and wetland areas, they receive added protection under the Executive Orders and NPS implementing guidelines for protection of wetlands and floodplains, and are protected by a 500-foot setback under the NPS Non-federal Oil and Gas Rights Regulations at 36 CFR 9.41(a) (unless specifically authorized by an approved plan of operations). These protective measures promote the proper protection of water levels, stream temperatures, water quality, and streamflow. When there are no practicable alternatives to locating an operation or activity in floodplains and wetlands, careful siting of facilities and application of stringent mitigation measures are expected to minimize potential impacts. Therefore, the sediment increases are not expected to change channel processes or affect viability of the aquatic species populations. Required compensatory mitigation for direct and indirect impacts on wetlands could be used to restore wetlands habitats and increase wildlife and aquatic species habitat values.

Construction of oil and gas–related roads, wellpads, or flowlines would result in direct loss of habitat. However, identification of wildlife and aquatic species habitat through biological surveys, if needed, would result in development of mitigation measures intended to avoid or minimize impacts. These surveys must be performed by biologists who have sufficient technical knowledge and/or experience to appropriately time when and how surveys are performed, and who are qualified to identify the species (and habitat of the species) that are present or may potentially use the area.

Wildlife could also be adversely impacted when human access is increased or becomes easier, especially in areas that were previously inaccessible. This increases the risk of wildlife and aquatic species mortality, through legal or illegal means. The park superintendent can close or restrict motorized public access on roads that are to be used for oil and gas development, if necessary. With this authority, the NPS can mitigate the effects of increased public access via oil and gas access roads.

Alteration of wildlife and aquatic species habitat and increased human access and intrusion can also allow for the introduction of non-native species. Ground-disturbing activities in wet soils, such as in floodplains and wetlands areas (including riparian corridors), could increase the possibility for introduction of, and invasion by, non-native vegetation such as the Japanese spiraea and tree-of-heaven. A landscape invaded by non-native species would not support native wildlife populations as effectively as a landscape with native vegetation.

All construction activities are likely to displace animals along access corridors and near the wellpads during construction, and through the exploration and production phase of the wells. Displacement is the predominant effect on most wildlife species. Displacement of wildlife would continue from the initial wellpad construction phase into exploratory drilling, and if the well is placed in production, during the potentially long life of the producing well. Road and pad development and drilling operations would reduce the usable habitat for large carnivores as well as their prey species. Secure areas for large carnivores and prey species would be reduced and the risk of mortality would increase. The increase and ease of public access routes would serve to increase public motorized travel, or if the roads are closed to public motorized travel, they would still serve as access routes on foot, horseback, and mountain bike. New access roads may even serve as travel corridors for large carnivores, which may increase their risk of mortality from hunting, poaching, or vehicle collisions. Increased access would also result in the same effects on smaller wildlife species, with increases in direct loss of wildlife through trapping and hunting. Low-speed roads are not expected to appreciably increase mortality from roadkill and should not be barriers to movements of smaller wildlife species.

Noise from drilling or well servicing operations would also impact wildlife. Drilling operations introduce noise with the highest measurements in the 90 dBA (A-weighted decibel) range for a period of a week or two up to a few months, with noise coming mostly from multiple diesel engines (see table 32 in the "Soundscapes" analysis). Therefore, noise impacts could be severe, but limited to a localized area and relatively short duration.

Also, in spite of careful best management practices to minimize the release of oil and other contaminating and hazardous substances, in the worst-case scenario, releases could potentially escape primary and secondary containment systems and species inhabiting the area could be harmed. If releases are transported into waterways, fish and other species occupying or using the water could be impacted. The severity of impacts would depend on the type and amount of pollutant released, physical and environmental factors of the site, the method and speed with which cleanup occurs, and the sensitivity of wildlife and aquatic species to these impacts during different stages of their life cycle. The NPS recognizes that unplanned incidents associated with oil and gas operations such as well blowouts, fires, and major spills within the boundaries of the park present a risk of release of contaminants that can adversely impact wildlife and aquatic species. However, the incident rates for such incidents are low and are not a typical expectation of project implementation. If such an incident did occur, required mitigation measures such as use of blowout preventers and implementation of SPCC plans would result in lessening the potential for spilled substances or a well fire to spread into the park, and for timely response and cleanup, so that there is a reasonable expectation that long term adverse impacts would not occur or be limited to minor to moderate levels of intensity, although there could be short-term major adverse effects during the release. In the event that the park's resources or values are damaged, the NPS could seek remedy both on the ground and in the form of monetary compensation.

Some facilities associated with production operations (i.e., heater treater units/separator units) could kill bats, migratory birds, and raptors through asphyxiation or incineration. To mitigate the residual impacts from these facilities, mitigation such as a cone device, placed on top of all vent stacks to prevent perching and access, may be required under CLPRs. Inaccessibility to the vent stacks would curtail any potential mortality of bats and birds.

Another protective measure that may be required is netting or covering open containers that collect stormwater. This requirement prevents bird and other wildlife species from accessing stormwater that has come in contact with and mixed with oil, gas, and other contaminating and hazardous substances.

Selection and use of herbicides and pesticides must be approved by the NPS Integrated Pest Management Coordinator to avoid adverse effects on non-target species.

Existing and future oil and gas operations would comply with CLPRs to protect wildlife and aquatic species. Operating stipulations may include biological surveys performed by a qualified biologist when this information is determined to be necessary for the NPS to evaluate the potential impacts of the proposed operation on wildlife and aquatic species. The biologist conducting the field surveys must have sufficient technical knowledge and/or experience to appropriately time when and how biological surveys shall be performed and to identify species and habitat of wildlife and aquatic species that may occur or be potentially impacted in and adjacent to the proposed operations area. The information provided by biological resource surveys of proposed operations in the park units would increase the NPS knowledge of the resource in the park units, which would have a negligible beneficial impact.

Considering the potential lack of frequent inspections and monitoring of all operations, but also the above operating standards and mitigation measures and the limited extent of new drilling and production operations, there would be short- to long-term minor to moderate adverse impacts on wildlife and aquatic species. The chances of undetected spills would be greater under this alternative because routine inspections would not occur beyond base workload levels, which would increase the potential for a moderate or even major adverse impact on affected wildlife and aquatic species, especially those that are not mobile and cannot leave the affected area.

Plugging and Reclamation—As indicated in the forecast of oil and gas activities in chapter 2, plugging and reclamation of wells is expected to be the primary oil and gas operation conducted in Big South Fork NRRA and Obed WSR during the life of this plan. Between both park units, approximately 50 wells are expected to be plugged and reclaimed, resulting in the reclamation of approximately 87 acres of land.

Plugging and abandonment operations and site preparation during reclamation would introduce heavy equipment, along with increased noise levels, for a short time. This could disturb wildlife and aquatic species and cause them to temporarily avoid the area. Vehicle use on and vegetation clearing of access roads and wellpads may adversely affect wildlife and aquatic species by increasing poaching in open areas and may temporarily disrupt feeding, denning, spawning/reproduction, and other wildlife behaviors. Plugging and reclamation activities may increase human access and edge effects and temporarily alter wildlife and aquatic species composition and migration. The use of heavy equipment and vehicles to plug and reclaim sites could have the potential for releases of oil and other contaminating and hazardous substances, which could harm or kill aquatic and wildlife species, but would be minimized with mitigation. These operations would cause occasional responses by wildlife and aquatic species, but would not cause observable or measurable impacts on native species populations. Sufficient habitat would be available to support these species, and operations would be timed to avoid critical reproduction periods. Therefore, there would be localized short-term negligible to minor adverse impacts at sites throughout the park during plugging and reclamation activities.

Wherever access roads have been built or are used for the primary purpose of allowing access for oil and gas operations, access roads would be reclaimed at the completion of operations. This would return the area to its natural conditions, thereby having a beneficial impact on the park environment. As oil and gas operations are plugged and abandoned, wildlife and aquatic species habitat would be reclaimed. Wherever possible, habitats would be improved to perpetuate the viability of habitats and increase the survivability of species. The reclamation of the previously disturbed areas, including monitoring for exotic species, would also enhance native plant communities in the project areas, and over time, reduce fragmentation. This would result in long-term beneficial impacts on native species, their habitat, and the natural processes sustaining them.

Directionally Drilled Wells—Wells directionally drilled and produced from outside the park units to bottomholes beneath the park units could indirectly impact wildlife and aquatic species in the park units. The types of impacts are expected to be similar to those described above for operations inside the park, but the intensity of impacts could increase for operations sited closer to the park boundary, especially due to noise that can affect species in the park unit or runoff of contaminants. Impacts would depend on the proximity of operations to the park; site-specific environmental conditions, such as steepness and direction of slope and surface hydrology; and mitigation measures being employed. Based on these factors, indirect impacts on wildlife and aquatic species in the park could range from no impact to indirect, localized to widespread, short- to long-term, minor adverse impacts, with the potential for major adverse impacts due to a well blowout, fire, or large uncontrolled release. In addition, there would be long-term beneficial impacts as a result of reclaiming the wellpads and access roads of well sites drilled from outside the park units.

Cumulative Impacts

With the continuing reduction of impacts from oil and gas activities in both park units stemming from increased plugging and reclamation, and a corresponding decrease in new drilling and production, impacts to wildlife and aquatic species are expected to diminish and contribute less to cumulative impacts over time. However, several actions described in the “Cumulative Impacts Scenario” section of this chapter have the potential to contribute to adverse cumulative effects on wildlife and aquatic species at the park units. In addition to traditional oil and gas development, coal bed methane/shale gas drilling is an ongoing feature in the vicinity of the park units. There are also ongoing mining operations around the park units, and acid mine drainage associated with active and abandoned mines impacts water resources, which have both adversely affected wildlife and aquatic species in the area. Acid mine drainage and abandoned mine impacts include contamination of resources by sulfuric acid and ferric hydroxide runoff at active and abandoned coal mining sites, as well as clearing of vegetation at active mine sites, with long-term minor to moderate adverse effects. The Big South Fork NRRA has undertaken remediation studies of selected sites where contaminated mine drainage is of concern, including the Worley riverside area. Water quality on the site is an issue due to acid mine drainage. This is a site where remediation of mine effects is being planned, which would have long-term beneficial effects on wildlife and aquatic species.

Agricultural activities on land adjacent to the park units, primarily logging activities and hay production, could result in negligible to minor long-term adverse impacts on wildlife and aquatic species, due to the loss of natural vegetation and habitat. Most of the forested areas of Big South Fork NRRA have been logged. At Obed WSR, clearing and harvesting from logging and agriculture is particularly evident.

Fields, roads, trails, and other disturbed areas are often source areas for exotic plants. From these sites, exotic plants can migrate into previously stable vegetation communities, where they displace native plants (NPS 2005a). NPS staff members at Big South Fork NRRA and Obed WSR routinely manage for exotic species. Efforts to control exotic species primarily include spot treatments of herbicide at infested areas. The spread of exotic species has a minor adverse effect on native habitat, but the active management of exotic species has a long-term localized beneficial effect.

Existing surface disturbances (including existing and abandoned operations and transpark oil and gas pipelines), in combination with other park developments and activities (including park roads, visitor use areas, recreational activities, hunting and trapping, and prescribed-fire management practices), have reduced the amount of habitat available for use by wildlife and aquatic species, with short- and long-term minor to moderate and generally localized adverse impacts on wildlife and habitat. Roads in Big South Fork NRRA are used by personal vehicles and commercial vehicles (e.g., gravel trucks) as well as ORVs for hunting and other recreational opportunities. The NPS routinely maintains trails, buildings, and roads, as well as cultural landscapes in the park units. Visitor activities such as horseback riding, biking, hunting, recreational rock climbing, swimming, kayaking, and ORV use all occur within Big South Fork NRRA and/or Obed WSR. Park and visitor activities would have long-term localized negligible adverse impacts on habitat.

Development outside the park, including commercial, industrial, and residential, could contribute minor to moderate adverse cumulative impacts as a result of habitat loss and damage, temporary disturbance and relocation, or incidental take of a species. On lands surrounding the park units, population growth and continued development (including the construction and operation of reservoirs, pipelines, roads, commercial and private forestry, and residential developments), in combination with natural events such as fire, flood, and drought, could increase displacement of wildlife and aquatic species, and could increase stress, which reduces the resiliency of local populations, resulting in the long-term incremental loss of wildlife and aquatic species, and habitat decline primarily influenced through changes in water quality and quantity.

Diseases and insect pests of vegetation, such as the pine bark beetle, have caused a decline in streamside vegetation, resulting in increased runoff, sedimentation, and changes in water temperature and other chemistry, reducing potential habitat for wildlife and aquatic species. These effects would continue under this alternative and would have widespread long-term minor adverse impacts on wildlife and aquatic species.

In addition to cumulative actions that would have negative effects on wildlife and aquatic species, there are also some actions that would have beneficial effects. In addition to new oil and gas development, there are wells that have been plugged and reclaimed in or near the park units. The NPS plans to plug and reclaim 14 abandoned wells at Big South Fork NRRA through a cooperative agreement with the Tennessee Department of Environment and Conservation, Division of Water Pollution Control, and 39 other wells would soon be plugged as part of an action funded by the ARRA. Reclamation of disturbed areas in the park would reestablish natural topographic contours and native vegetation communities and provide for the safe movement of native wildlife and the normal flow of surface waters. Wherever possible, habitats would be improved to perpetuate the viability of habitats and increase the survivability of wildlife and aquatic species. Adverse impacts on plants, aquatic species, and wildlife habitat resulting from reclamation operations would be short term and minor, while the long-term protection of wildlife and aquatic species and their habitat in the park units would provide beneficial impacts.

The reintroduction of native wildlife, including deer (1950s to 1960s), turkeys (1970s to 1980s), river otters (1980s), bears (1990s), and elk (1990s), has occurred in the vicinity of Big South Fork NRRA and Obed WSR and has had an overall beneficial impact on wildlife, while the introduction of non-native species has resulted in long-term minor adverse impacts.

The 2006 *Big South Fork NRRA Fire Management Plan* (NPS 2006e) recommends using mechanical means in combination with prescribed fire to reduce hazard fuel accumulations, which can result in ground disturbance and temporary loss of vegetation cover. The implementation of a prescribed-fire plan would have long-term beneficial effects on wildlife and aquatic species within the Big South Fork NRRA and the Obed WSR by reducing hazard fuel accumulations around oil and gas well facilities and aiding in fire-suppression activities by reducing fire intensity and severity, and protecting wildlife and aquatic species and habitat. The park units' prescribed-fire management program could contribute to short-term habitat loss and wildlife displacement, and could increase erosion and sedimentation, but would result in long-term beneficial impacts on park vegetation and improved habitat for protected wildlife species.

Additionally, the revised 9B regulations governing non-federal oil and gas development within the boundaries of NPS units focus on improving resource protection aspects of the regulations while accounting for advances in oil and gas technology and industry practices. These changes could have long-term beneficial impacts on wildlife and aquatic species, due to improving resource protection practices.

Overall, the impacts of these actions, combined with the short- and long-term negligible to moderate adverse impacts as well as the long-term beneficial effects of alternative A, would result in short- and long-term minor to moderate adverse cumulative impacts on wildlife and aquatic species. Protection provided to wildlife and aquatic species in the park units under CLPRs is expected to limit adverse impacts and improve the condition of these resources, but wildlife and aquatic species in the watersheds surrounding the park units have been and could continue to be adversely affected. When compared to the broader area of analysis, alternative A would directly impact a relatively small amount of habitat and would contribute minimally to the overall cumulative impacts.

Conclusion

Under alternative A, limited geophysical exploration would result in localized short-term negligible to minor adverse impacts on wildlife and aquatic species from habitat removal and disturbance, particularly short-term noise. In areas where non-federal oil and gas operations would be permitted in the park units, drilling and production operations could result in localized short- to long-term minor to moderate adverse impacts on wildlife and aquatic species from loss or disruption of habitat due to vegetation and site clearing, possible injury to or mortality of less mobile species, noise and associated species displacement or stress, and spills or releases of harmful substances. Impacts from plugging and reclamation of wells at sites at either park could also cause injury to or mortality of wildlife and aquatic species, but with mitigation, there would be localized short-term negligible to minor adverse impacts. In addition, there would be long-term beneficial impacts as a result of reclaiming the wellpads and access roads of well sites. The long-term effect of these activities would be to return the area to natural conditions, which would have a beneficial impact on wildlife and aquatic species. Indirect impacts on wildlife and aquatic species in the park units from directionally drilled wells outside the park units could range from no impact to indirect, localized to widespread, short- to long-term, minor adverse impacts. In addition, there would be long-term beneficial impacts as a result of reclaiming the wellpads and access roads of well sites drilled from outside the park units. For both in-park and adjacent directionally drilled wells, up to major short-term adverse effects could occur in the unlikely event of a well blowout, fire, or uncontrolled release.

The adverse and beneficial effects of past, present, and reasonably foreseeable future actions, when combined with the short- and long-term negligible to moderate adverse impacts as well as the long-term beneficial effects of alternative A, would result in short- and long-term minor to moderate adverse cumulative impacts on wildlife and aquatic species. When compared to the broader area of analysis, alternative A would directly impact a relatively small amount of habitat and would contribute minimally to the overall cumulative impacts.

Alternative B: Comprehensive Implementation of the 9B Regulations and a New Management Framework for Plugging and Reclamation

Analysis

Geophysical Exploration—As with alternative A, minimal geophysical exploration is expected at Big South Fork NRRA, except for the limited possibility of conventional seismic lines in areas of existing roads where data could be acquired quickly and inexpensively, using seismic vibrator technology. Because of the restrictions at Obed WSR, including the no surface use of the gorge, these operations would not be allowed within the park unit under alternative B.

Under alternative B the NPS would implement an oil and gas management plan that clearly articulates the CLPRs applicable to the exploration, production, and transportation of non-federal oil and gas resources in Big South Fork NRRA and Obed WSR. This plan would ensure that geophysical exploration is conducted in a way that best protects park resources and values as well as wildlife and aquatic species, including avoidance of critical reproduction periods or key habitat. As a result, impacts associated with geophysical exploration in alternative B would be very similar to the impacts described in alternative A, stemming from habitat disturbance and vegetation removal and noise, and would be localized, short term, negligible to minor, and adverse.

Drilling and Production—Because the forecast of oil and gas activities in chapter 2 applies to all alternatives, impacts associated with up to 20 new wells in Big South Fork NRRA and up to 5 wells directionally drilled from outside the park unit in Obed WSR and well workovers/servicing would be very similar to the impacts described in alternative A. However, implementing a comprehensive oil and gas management plan, including increased inspections and monitoring that would reduce the chance of leaks or releases going undetected and reaching wildlife and aquatic species or their habitat, and would proactively identify sites that may be impacting, or threatening to impact, park resources beyond the operations area, would minimize impacts. The 9B regulations would be enforced at any such sites, and operations found to pose a significant threat to federally owned or controlled lands or waters would be suspended by the superintendent until the threat is removed or remedied (see 36 CFR 9.33 and 9.51). As a result, although short- and long-term impacts associated with the noise and disturbance, habitat loss, direct injury and mortality, and possible releases of hazardous substances of drilling and production would still occur, this alternative would protect park resources and values, as well as wildlife and aquatic species, better than alternative A. Therefore, there would be short- to long-term minor adverse impacts from drilling and production activities with a reduced probability of long-term major adverse impacts associated with potential leaks and spills.

Plugging and Reclamation—As indicated in the forecast of oil and gas activities in chapter 2, plugging and reclamation of wells is expected to be the primary oil and gas operation conducted in Big South Fork NRRA and Obed WSR during the life of this plan. Between both park units, approximately 50 wells are expected to be plugged and reclaimed, resulting in the reclamation of approximately 87 acres of land.

Similar to alternative A, well plugging; shutting down, abandoning, and removing flowlines and pipelines; and use of heavy equipment and vehicles to reclaim sites would have the potential for releases of oil and other contaminating and hazardous substances, which could harm or kill protected plants, fish, and wildlife. However, under alternative B the NPS would implement a comprehensive oil and gas management plan including a new management framework for plugging and reclamation of wells, which would allow the NPS and operators to efficiently complete the compliance process for the plugging and reclamation of inactive wells that represent potential threats to park resources and values. This new management framework also includes goals and specific activities for protecting park resources and values during plugging and reclamation activities. Therefore, short-term adverse impacts on wildlife and aquatic species would be negligible to minor, and over the long term, it is anticipated that fragmentation could be reduced and wildlife and aquatic species habitat could be improved. Additionally, these beneficial impacts would be more likely to be realized sooner under this alternative as compared to alternative A, given the implementation of the new management framework for plugging and reclamation.

Directionally Drilled Wells—Similar to alternative A, wells directionally drilled and produced from outside the park units to bottomholes beneath the park units could indirectly impact wildlife and aquatic species in the park units. The types of impacts are expected to be similar to those described above for operations inside the park, but the intensity of impacts could increase for operations sited closer to the park boundary. Impacts would depend on the proximity of operations to the park; site-specific environmental conditions, such as steepness and direction of slope and surface hydrology; and mitigation measures being employed. Based on these factors, indirect impacts on wildlife and aquatic species in the park could range from no impact to indirect, localized to widespread, short- to long-term, minor adverse impacts, with the potential for major adverse impacts due to a well blowout, fire, or large uncontrolled release. In addition, there would be long-term beneficial impacts as a result of reclaiming the wellpads and access roads of well sites drilled from outside the park units.

Cumulative Impacts

Impacts on wildlife and aquatic species from other actions that were considered under the cumulative impacts scenario would be the same as described for alternative A. The adverse and beneficial effects of the cumulative actions, when combined with the short- to long-term negligible to minor adverse impacts as well as the long-term beneficial effects of alternative B, would result in short- and long-term minor to moderate cumulative impacts on wildlife and aquatic species. The more proactive enforcement of CLPRs and increased inspections/monitoring would improve the condition of these resources, but the majority of the impacts on wildlife and aquatic species in the region occur outside the park units, where impacts may or may not be mitigated. When compared to the broader area of analysis, alternative B would directly impact a relatively small area and would contribute minimally to the overall adverse cumulative impacts. Alternative B would provide long-term cumulative benefits due to its proactive management and enforcement and expedited well plugging.

Conclusion

Similar to alternative A, limited geophysical operations would result in short-term negligible to minor adverse impacts on wildlife and aquatic species from habitat removal and disturbance as well as noise. In areas where non-federal oil and gas operations would be permitted in the park units, drilling and production of wells would result in short- to long-term minor adverse impacts on wildlife and aquatic species from the direct loss of habitat, injury and mortality, or displacement of wildlife and aquatic species. Impacts would be similar to those under alternative A, but with applied mitigation and implementation of a comprehensive oil and gas management plan, the risks of injury and other impacts would be reduced. Although up to major short-term adverse effects could occur in the unlikely event of a well blowout, fire, or uncontrolled release, the risk of that occurring is less under alternative B due to increased monitoring and inspections. Impacts from plugging and reclamation of wells at either park would result in short-term negligible to minor adverse impacts on wildlife and aquatic species. The new management framework for plugging and reclamation would increase the certainty that the wells and access roads would be plugged and reclaimed to applicable standards, and therefore, the long-term beneficial effects described under alternative A would be more likely to be realized sooner. Indirect impacts on wildlife and aquatic species in the park units from directionally drilled wells outside the park units could range from no impact to indirect, localized to widespread, short- to long-term, minor adverse impacts. In addition, there would be long-term beneficial impacts as a result of reclaiming the wellpads and access roads of well sites drilled from outside the park units. Although up to major short-term adverse effects could occur in the unlikely event of a well blowout, fire, or uncontrolled release, the risk of that occurring is less under alternative B due to increased monitoring and inspections.

The adverse and beneficial effects of the cumulative actions, when combined with the short- to long-term negligible to minor adverse impacts as well as the long-term beneficial effects of alternative B, there would be short-and long-term minor to moderate cumulative adverse impacts on wildlife and aquatic species. When compared to the larger area of analysis, alternative B would directly impact a relatively small area and would contribute minimally to overall adverse cumulative impacts. Alternative B would provide long-term cumulative benefits due to its proactive management and enforcement and expedited well plugging

Alternative C: Comprehensive Implementation of the 9B Regulations, a New Management Framework for Plugging and Reclamation, and Establishment of Special Management Areas

Analysis

Geophysical Exploration—Impacts associated with geophysical exploration under alternative C would be similar to the impacts described in alternatives A and B. However, under alternative C the NPS would implement a comprehensive oil and gas management plan that includes the establishment of SMAs to further protect resources and values particularly susceptible to adverse impacts from oil and gas operations, or areas where certain resources are important to maintaining the ecological integrity of the park units. Under alternative C, geophysical exploration would not be allowed in any of the SMAs or associated setbacks at Big South Fork NRRA, with the exception of the Special Scenery SMA unless otherwise approved in a plan of operations. The SMA for Honey Creek and Twin Arches state natural areas was set aside primarily because of their rich, undisturbed forest communities and their high diversity of forest species. The SMAs for Sensitive Geomorphic Features and Cliff Edges would also protect some wildlife species along with geology.

Given the limited extent of geophysical exploration anticipated during the life of this plan, mitigation to avoid critical reproduction periods or key habitat, and the use of existing roads and pedestrian access, impacts associated with geophysical exploration in alternative C would result in localized short-term negligible to minor adverse impacts on wildlife and aquatic species at Big South Fork NRRA.

Drilling and Production—Because the forecast of oil and gas activities in chapter 2 applies to all alternatives, impacts associated with up to 20 new wells in Big South Fork NRRA and up to 5 wells directionally drilled from outside the park unit in Obed WSR and well workovers/servicing would be very similar to the impacts described in alternatives A and B. In addition, the establishment of SMAs would further protect natural areas, including areas of Big South Fork NRRA and Obed WSR where resources and values would be particularly susceptible to adverse impacts from oil and gas operations, or areas where certain resources are important to maintaining the ecological integrity of the park units. Under alternative C, drilling and production would not be allowed in any of the SMAs or associated setbacks at Big South Fork NRRA unless otherwise approved plan of operations, and mitigation would include avoidance of critical reproduction periods or key habitat. Drilling and production would be precluded in Obed WSR.

In smaller SMAs, the added protection would primarily be provided for small mammals and invertebrates that occupy these areas. In larger SMAs, protection from additional habitat fragmentation would benefit all fish and wildlife species. The increased setback from visitor use and administrative areas, from a 500-foot setback to a 1,500-foot setback, would further reduce the potential impacts of oil and gas operations and activities in these areas. The 1,500-foot setback from rivers and streams that are habitat for listed mussel species and their fish hosts would reduce the possibility of impacts on mussels and other wildlife using these areas during nesting, breeding, and migration.

The designation of Obed WSR SMA, the Cliff Edge SMA, the Sensitive Geomorphic Feature SMA, the Managed Fields SMA, and the State Natural Area SMA would increase protection and improve habitat for terrestrial and aquatic species that use these areas. Some wells may be directionally drilled from outside the SMAs, or even outside the park, to develop underlying hydrocarbons.

As a result, although short-term and long-term impacts from the noise and disturbance, habitat loss, direct injury or mortality, and possible releases of hazardous substances of drilling and production would still occur, this alternative would protect park resources and values better than alternatives A and B. Therefore, there would be short- to long-term negligible to minor adverse impacts from drilling and production activities with a more limited risk of major adverse effects from spills or leaks.

Plugging and Reclamation—Similar to alternatives A and B, well plugging, shutting down and abandoning/removing flowlines and pipelines, and use of heavy equipment and vehicles to reclaim sites would have the potential for releases of oil and other contaminating and hazardous substances, which could harm or kill wildlife and aquatic species. With mitigation, these effects would result in localized short-term negligible to minor adverse impacts on wildlife and aquatic species at sites throughout the park, some of which are located within SMAs.

The establishment of SMAs would further protect natural areas, including areas of Big South Fork NRRA and Obed WSR where resources and values, including wildlife and aquatic species, would be particularly susceptible to adverse impacts from oil and gas operations, or areas where certain resources are important to maintaining the ecological integrity of the park units. Park staff would evaluate all wells that are candidates for plugging and reclamation to determine their potential for impacts on park unit resources and values. Sites would be prioritized for plugging and reclamation based on a number of factors, including the proximity of well sites to SMAs.

Directionally Drilled Wells—Similar to alternatives A and B, indirect impacts on wildlife and aquatic species in the park units from drilling and production of wells directionally drilled from outside the park units to bottomholes beneath the park units could range from no impact to indirect, localized to widespread, short- to long-term, minor adverse impacts, with the potential for major adverse impacts due to a well blowout, fire, or large uncontrolled release. In addition, there would be long-term beneficial impacts as a result of reclaiming the wellpads and access roads of well sites drilled from outside the park units.

Cumulative Impacts

Impacts on wildlife and aquatic species from other actions that were considered under the cumulative impacts scenario would be the same as described for alternative A. The adverse and beneficial effects of the cumulative actions, when combined with the short- to long-term negligible to minor adverse impacts as well as the long-term beneficial effects of alternative C, would result in short- and long-term minor to moderate adverse cumulative impacts on wildlife and aquatic species. The SMA restrictions would provide more consistent and more certain protection of wildlife and aquatic species in the SMAs, and protection provided to these species in the park under CLPRs and increased inspections and enforcement would limit adverse impacts, but actions on adjacent lands have adversely affected and could continue to adversely affect wildlife and aquatic species and habitat, often without adequate mitigation. When compared to the broader area of analysis, alternative C would directly impact a relatively small area and would contribute minimally to overall adverse cumulative impacts. Alternative C would provide long-term cumulative benefits due to its proactive management and enforcement, identification and protection of SMAs, and expedited well plugging.

Conclusion

Similar to alternatives A and B, limited geophysical operations would result in short-term negligible to minor adverse impacts on wildlife and aquatic species from habitat removal and disturbance as well as noise. Under alternative C, with adequate setbacks, implementation of mitigation measures, and the establishment of SMAs, effects from drilling and production would be short- to long-term negligible to minor adverse impacts on wildlife and aquatic species in the park. Plugging and reclamation of wells at either park would result in short-term negligible to minor adverse impacts on wildlife and aquatic species. Additionally, the new management framework for plugging and reclamation would increase the certainty that wells would be plugged and reclaimed to applicable standards, and therefore, the long-term beneficial effects described under alternative A would be more likely to be realized sooner. Wells directionally drilled from outside the park units to bottomholes beneath the park units could range from no impact to indirect, localized to widespread, short- to long-term, minor adverse impacts. In addition, there would be long-term beneficial impacts as a result of reclaiming the wellpads and access roads of well sites drilled from outside the park units. Although up to major short-term adverse effects could occur in the unlikely event of a well blowout, fire, or uncontrolled release, the risk of that occurring is less under alternative C due to increased monitoring and inspections.

Cumulative impacts under alternative C would be similar to those described for alternative B, with short- and long-term minor to moderate cumulative adverse impacts on wildlife and aquatic species. When compared to the broader area of analysis, alternative C would directly impact a relatively small area and would contribute minimally to overall adverse cumulative impacts. Alternative C would provide long-term cumulative benefits due to its proactive management and enforcement, identification and protection of SMAs, and expedited well plugging.

FEDERALLY LISTED THREATENED AND ENDANGERED SPECIES

GUIDING REGULATIONS AND POLICIES

The ESA (16 USC 1531 et seq.) and amendments mandate that all federal agencies consider the potential effects of their actions on species listed as threatened or endangered. If the NPS determines that an action may adversely affect a federally listed species, consultation with the USFWS is required to ensure that the action would not jeopardize the species continued existence or result in the destruction or adverse modification of critical habitat. The NPS *Management Policies 2006* (NPS 2006c) section 4.4.2.3 states that the NPS will protect all species native to national park system units that are listed under the ESA and will proactively conserve listed species and prevent detrimental effects on these species.

METHODOLOGY, ASSUMPTIONS, AND IMPACT THRESHOLDS

Given the programmatic nature of this analysis, the exact locations of future operations are unknown. As a result, actions under the RFD scenario and the forecast of oil and gas activities were analyzed qualitatively against the federally listed threatened and endangered species in Big South Fork NRRA and Obed WSR that could be affected. The species were defined and described based on the sources cited in chapter 3. The assessment of impacts is based on best professional judgment and was developed through discussions with park staff and EIS team members. For federally listed species, the terms “threatened” and “endangered” describe the official federal status of vulnerable species as defined by the ESA of 1973. The term “candidate” is used officially by the USFWS when describing those species for which sufficient information exists about the biological vulnerability and threats to the species to support a proposed rule to list; however, issuing the rule is precluded for some reason. Federal “species of concern” are those for which listing may be warranted, but further biological research and field study are needed to clarify their conservation status.

The USFWS and National Oceanic and Atmospheric Administration Fisheries guidance for implementing section 7 consultation under the ESA defines the terminology used to assess impacts on listed species as follows:

> *No effect*: the appropriate conclusion when the action agency determines its proposed action will not affect a listed species or listed critical habitat.
>
> *May affect, is not likely to adversely affect*: the appropriate conclusion when effects on listed species are expected to be discountable, insignificant, or completely beneficial. Beneficial effects are contemporaneous positive effects without any adverse effects to the species. Insignificant effects relate to the size of the impact and should never reach the scale where take occurs. Discountable effects are those extremely unlikely to occur. Based on best judgment, a person would not: (1) be able to meaningfully measure, detect or evaluate insignificant effects; or (2) expect discountable effects to occur.
>
> *May affect, likely to adversely affect*: the appropriate finding in a biological assessment (or conclusion during informal consultation) if any adverse effect to listed species may occur as a direct or indirect result of the proposed action or its interrelated or interdependent actions, and the effect is not: discountable, insignificant, or beneficial (see definition of “is not likely to adversely affect”). In the event the overall effect of the proposed action is beneficial to the listed species, but is also likely to cause some adverse effects, then the proposed action “is likely to adversely affect” the listed species. If incidental take is anticipated to occur as a result of the proposed action, an “is likely to

adversely affect" determination should be made. An "is likely to adversely affect" determination requires the initiation of formal section 7 consultation.

The NPS developed the following thresholds under the NEPA guidelines to determine the magnitude of effects on federally listed special-status species and their associated habitat, including designated critical habitat, that would result from implementation of any of the alternatives.

Negligible: Impacts would result in a change to a population or individuals of a federal listed threatened and endangered species, but the change would be well within the range of natural fluctuations.

Minor: An action that would affect a few individuals of a federal threatened and endangered species or have very localized impacts upon their habitat. The change would have barely perceptible consequences to the species or habitat function. Sufficient habitat would remain functional to maintain species viability. Impacts would be outside of critical reproduction periods. Mitigation measures, if needed to offset adverse effects, would be simple and successful.

Moderate: An action that would cause measurable effects on: (1) a relatively small percentage of the species population, (2) the existing dynamics between multiple species (e.g., predator-prey, herbivore-forage, vegetation structure-wildlife breeding habitat), or (3) a relatively large habitat area or important habitat attributes. A population or habitat might deviate from normal levels under existing conditions, but would remain indefinitely viable within the park. Response to disturbance by some individuals could be expected, with some negative impacts to feeding, reproduction, or other factors impacting short-term population levels. Mitigation measures, if needed to offset adverse effects, could be extensive, but would likely be successful.

Major: An action that would have drastic and permanent consequences for a species population, dynamics between multiple species, or almost all available unique habitat. A population or its habitat would be permanently altered from normal levels under existing conditions, and the species would be at risk of extirpation from the park. Frequent responses to disturbance by some individuals would be expected, with negative impacts to feeding, reproduction, or other factors resulting in a decrease in population levels. Extensive mitigation measures would be needed to offset any adverse effects and their success would not be guaranteed.

IMPACT OF THE ALTERNATIVES

Alternative A: No Action (Current Management Continued)

Analysis

Geophysical Exploration—As described in the forecast of oil and gas activities in chapter 2, minimal geophysical exploration is expected at Big South Fork NRRA, except for the limited possibility of conventional seismic lines in areas of existing roads where data could be acquired quickly and inexpensively, using seismic vibrator technology. Because of the restrictions at Obed WSR, these operations would not be allowed within the park unit.

Where exploration operations could be permitted, these operations would avoid impacting federally listed species and their habitat, which would be identified through consulting park biologists, or biological surveys, if determined to be necessary by the NPS through consultation with the USFWS, and through scoping with the TWRA or other state agency biologists. When federally listed species and their habitat are found to be within the project area, mitigation measures, including sufficient setbacks and/or timing restrictions for nesting and other sensitive periods in a given species' life cycle, would result in avoiding or minimizing potential adverse effects.

Potential effects from exploration operations could include increased displacement, increased risk of mortality, decreased production, and increased stress levels from the noise and disturbance associated with seismic survey activities. These effects could be caused by seismic crews traveling to access the area to be surveyed and by pedestrian travel along receiver lines, as well as the vibrations from the seismic operations, trimming vegetation, and using vehicles on existing roads. Types of species that could be affected by these activities are the listed plant and mammal species described in chapter 3, including the gray bat and Indiana bat, Cumberland rosemary, and the white fringeless orchid. The mussel and fish species described in chapter 3 would not likely be affected because none of these activities would be performed in aquatic habitat. Listed species could be particularly impacted by the noise associated with seismic survey work, especially vehicle noise. Impacts related to noise are usually temporary, with nearby species avoiding or moving away from the source but returning after noise is reduced or eliminated. Geophysical operations are short term and would have very limited impact on animals given the short duration of operations and pre-operations surveys.

Under alternative A, protection of water quality is provided by 36 CFR 9.41(a), which requires operations to be offset 500 feet from the banks of perennial, intermittent, or ephemeral watercourses, unless specifically authorized by an approved plan of operations, which would minimize erosion and sedimentation and other impacts on water quality and quantity that could adversely impact aquatic species. The standard 500-foot setback from water bodies would protect fish, wildlife using water, and wetland vegetation within this protective zone, which supports many listed species. Through project-specific consultation with USFWS under the ESA, and scoping with or other state agency biologists, the setback could be increased. The 500-foot standard setback would provide primary protection to all of the fish and mussel species described in chapter 3, including the duskytail darter, blackside dace, spotfin chub, Cumberland bean, little-winged pearlymussel, purple bean, dromedary pearlymussel, and the spectaclecase. Additional protection to these habitats would be provided by the wetlands and floodplains Executive Orders, NPS Director's Orders, and project-specific permitting requirements.

Listed species that occupy upland areas outside the 500-foot shoreline setbacks include bats (gray bat) and upland plants (Cumberland sandwort). Bat species could be affected by the presence of seismic crews and the noise associated with the surveys, but there would be little if any trimming of vegetation or clearing required. All these species would be protected under the required consultation in the ESA.

Under alternative A, non-federal oil and gas operations could be developed under CLPRs, which include consultation under the ESA if operations are in an area where threatened and endangered species are known to occur or could impact listed species. Mitigation measures, including setbacks and/or timing restrictions, would result in avoiding or minimizing potential adverse effects. Additionally, upon the completion of operations, reclamation of disturbed areas would be required, and recovery of any vegetation disturbed is expected to occur over the short term. Application of these requirements would result in short-term negligible adverse impacts on federally listed species or their habitat from geophysical exploration.

Drilling and Production—Drilling and production operations (surface uses for drilling and production operations, including the placement of flowlines) would not directly impact listed species or their habitat in protected areas where operations would not be permitted under CLPRs, including the 9B regulations, the gorge restrictions at Big South Fork NRRA, and deed restrictions at Obed WSR. As described in the forecast of oil and gas activities in chapter 2, only up to 20 new wells are expected in Big South Fork NRRA, and only up to 5 wells, directionally drilled from outside the park unit, are expected in Obed WSR. It is also assumed that 125 wells at Big South Fork NRRA and 2 wells at Obed WSR would be worked over or serviced.

Existing operations have little ongoing effect on habitat other than the threat of spills or leaks and any maintenance activities that are needed on infrastructure. The chances of undetected spills are greater under this alternative because routine inspections and monitoring would not occur, which may increase the potential for a major adverse impact if spills should reach susceptible endangered or threatened species such as the federally listed mussels or fish. The NPS recognizes that unplanned incidents associated with oil and gas operations such as well blowouts, fires, and major spills within the boundaries of the park present a risk of release of contaminants that can adversely impact listed species. However, the incident rates for such incidents are low and are not a typical expectation of project implementation. If such an incident did occur, required mitigation measures such as use of blowout preventers and implementation of SPCC plans would result in lessening the potential for spilled substances or a well fire to spread into the park, and for timely response and cleanup, so that there is a reasonable expectation that long term adverse impacts would not occur or be limited to minor to moderate levels of intensity, although there could be short-term major adverse effects during the release. In the event that the park’s resources or values are damaged, the NPS could seek remedy both on the ground and in the form of monetary compensation.

However, most impacts from oil and gas operations would come from the construction of new access roads and wellpads. Drilling and production operations could range in duration from short term (weeks or months for well drilling and construction of roads, wellpads, flowlines, and pipelines) to long term (lasting 20 years or more for road, flowline, pipeline, well, and production operations). Construction and maintenance of roads, pads, flowlines, and pipelines could require vegetation clearing and could result in habitat loss. Potential effects on listed species would depend on where drilling and production operations are located. Careful siting of developments based on biological survey and/or assessment results could avoid or minimize these impacts substantially. Through the required biological surveys and/or assessments and consultations with USFWS and TWRA or other state agency biologists, potential impacts on federally listed species and their habitat would be identified, and the application of appropriate mitigation measures would result in minor adverse impacts.

Water-dependent species (including fluted kidneyshell, clubshell, spectaclecase, dusky-tailed darter, Cumberland elktoe, palezone shiner, and blackside dace) could be impacted by the construction and long-term maintenance of roads, pads, flowlines, and pipelines if stream crossings result in increased sedimentation or alteration of streamflow, water quality, or temperature. Under all alternatives, waterways are protected by a 500-foot setback under 36 CFR 9.41(a), unless specifically authorized by an approved plan of operations; and because waterways are inherently a part of floodplains (riparian corridors) and wetland areas, and receive added protection under various regulatory and policy requirements, streamflows, water quality, and temperature would be protected from disturbance and water levels would be maintained. When there are no practicable alternatives to locating an operation or activity in floodplains and wetlands, careful siting of facilities and application of stringent mitigation measures are expected to avoid potential adverse impacts. Required mitigation for direct and indirect impacts on wetlands could be used to restore wetland habitats and increase listed species’ habitat values.

Displacement of wildlife would continue from initial wellpad construction into exploratory drilling, and if the well is placed in production, during the life of the producing well. The increase and ease of public access routes may serve to increase public motorized travel, or if the roads are closed to public motorized travel, they would still serve as access routes on foot, horseback, and mountain bike, which could result in indirect negligible to minor adverse effects on certain species, such as the listed bats.

Noise from drilling operations would also impact protected wildlife species such as the gray bat and the Indiana bat. Drilling operations introduce noise with the highest measurements in the 90 dBA range for a period of a week or two up to a few months, with noise coming mostly from multiple diesel engines (see table 32 in the “Soundscapes” section). Therefore, noise impacts could be of concern, but limited to a localized area and relatively short duration, and surveys for listed species would ensure that noise would not cause adverse impacts, limiting impacts to minor levels.

Some facilities associated with production operations (i.e., heater treater units/separator units) could cause the mortality of bats through asphyxiation or incineration. To mitigate the residual impacts from these facilities, mitigation could include a cone device placed on top of all vent stacks. The cones would be constructed in a manner that would prevent perching on the vent stacks and subsequent asphyxiation, and would eliminate all access into the vent stack pipes. Inaccessibility to the vent stacks would curtail any potential mortality of listed bat species.

Another operating stipulation may require that all open containers that collect stormwater be netted or covered. This requirement prevents wildlife species from accessing stormwater that may have contacted and mixed with oil, gas, and other contaminating and hazardous substances.

Selection and use of any herbicides and pesticides must be approved by the NPS Integrated Pest Management Coordinator, and use of such chemicals must be kept to a minimum. All chemicals must be used in accordance with label instructions and areas of sensitive habitat or species presence would be avoided. With appropriate use and mitigation, any adverse effects on listed species would be negligible to minor

Given the above operating standards and other mitigation under CLPRs, as well as the limited number of new operations projected in the forecast of oil and gas activities, there would be localized short-term negligible to minor adverse impacts from drilling and production operations in the park units, although the potential for a major adverse impact (injury to or mortality of individuals of listed species) from a spill or release is more likely under this alternative.

Plugging and Reclamation—As indicated in the forecast of oil and gas activities in chapter 2, plugging and reclamation of wells is expected to be the primary oil and gas operation conducted in Big South Fork NRRA and Obed WSR during the life of this plan. Between both park units, approximately 50 wells are expected to be plugged and reclaimed, resulting in the reclamation of approximately 87 acres of land.

Well plugging; shutting down, abandoning, and removing flowlines and pipelines; and use of heavy equipment and vehicles to reclaim sites could have the potential for releases of oil and other contaminating and hazardous substances, which could harm or kill protected plants, fish, and wildlife. However, adhering to the consultation requirements under the ESA; performing biological surveys of the area that could be potentially impacted by proposed plugging, abandonment, and reclamation operations; identifying listed species; and applying appropriate mitigation would result in localized short-term negligible to minor adverse impacts on listed species.

Plugging operations and site preparation during reclamation would introduce heavy equipment and people, along with increased noise levels, for a short time, resulting in short-term localized negligible to minor adverse impacts, depending on the season, the background soundscape, and the proximity of operations to the species. Seasonal restrictions would include delaying activities until after a species’ nesting or spawning seasons. Access roads that have been developed or allowed to remain open for the primary purpose of allowing access for oil and gas operations would be reclaimed at the completion of operations, returning the area to its natural conditions. Wherever possible, habitats would be improved to perpetuate the viability of habitats and increase the survivability of listed species. The outcome of these activities, in returning natural conditions to the operations area, would have long-term beneficial impacts.

Directionally Drilled Wells—It is possible that some wells may be directionally drilled from outside the park units to develop hydrocarbons underlying the park units. The intensity of impacts on listed species would be dependent on where the operation is located with respect to species and their habitats, whether the operation is sited inside or outside the park, and on the resource protection measures that are employed. For wells directionally drilled and produced from outside the park units to bottomholes beneath the park units, the connected actions occurring outside the park boundaries could include constructing and maintaining access roads, well/production pads, and flowlines/pipelines; drilling the well; producing the well; plugging and abandoning the well; and site reclamation. The in-park operations associated with directional wells would consist of the wellbore crossing into the park units, usually several thousand feet or more below the surface. Therefore, for most directional wells drilled that are exempted under 36 CFR 9.32(e), the NPS regulatory authority would be limited to applying mitigation to the in-park operations to provide protection of groundwater resources beneath the park. Because the in-park operations would typically have no effect on listed species or their habitats on the surface, the NPS would have no section 7 responsibilities under the ESA. However, for the connected actions proposed outside the park, the NPS would assume the lead role in carrying out section 7 responsibilities under the ESA if there are no other federal entities with broader regulatory involvement. The USFWS may not require oil and gas operators outside the park units to apply the same degree of mitigation as the NPS applies on parklands. Further, oil and gas operators outside the park units are not required to survey for or protect federally listed species. Given that most impacts on listed species are from wellpad and access-road construction, the impacts on listed species and their habitats in the park units from drilling and production of wells drilled from surface locations outside the park units to reach bottomholes beneath the park units could result in indirect adverse impacts ranging from no impact to localized to widespread, short- to long-term, minor adverse impacts with the potential for major adverse impacts due to a well blowout, fire, or large uncontrolled release. In addition, there would be long-term beneficial impacts as a result of reclaiming the wellpads and access roads of well sites drilled from outside the park units.

Cumulative Impacts

With the continuing reduction of impacts from oil and gas activities in both park units stemming from increased plugging and reclamation, and a corresponding decrease in new drilling and production, impacts to Federally-listed threatened and endangered species are expected to diminish and contribute less to cumulative impacts over time. However, several actions described in the “Cumulative Impacts Scenario” section of this chapter would contribute to both adverse and beneficial cumulative impacts on listed species. Past oil and gas development within and outside Big South Fork NRRA has had short- and long-term minor to moderate adverse impacts on listed species from vegetation clearing, vehicle use, and the construction and maintenance of access roads, wellpads, and flowlines. Contamination of surface and groundwater from leaking wells would also contribute to impacts. Coal bed methane/shale gas drilling is an ongoing activity in the vicinity of Big South Fork NRRA, and has similar impacts to traditional oil and gas development.

Existing surface disturbances (including existing and abandoned operations) and transpark oil and gas pipelines, in combination with other park developments and activities (including park roads, visitor use areas, recreational activities, hunting and trapping, and prescribed-fire management practices), have reduced the amount of habitat available for use by listed species. It is difficult to accurately determine what types of habitat existed before being affected by development prior to the establishment of the park units. Since the establishment of the park units, however, development decisions have been applied under a well-defined regulatory process that has limited any additional impacts on listed species. Visitor activities such as horseback riding, biking, hunting, recreational rock climbing, swimming, kayaking, and ORV use all occur within Big South Fork NRRA and/or Obed WSR and may contribute to short-term localized negligible to minor adverse impacts on the federally listed species considered in this plan/EIS.

Agriculture other than forestry has occurred on less than 20% of the land in counties adjacent to Big South Fork NRRA and Obed WSR, and most of the forested areas of Big South Fork NRRA have been logged. At Obed WSR, clearing and harvesting from logging and agriculture is particularly evident. Small-scale agriculture and grazing takes place on private lands set back from the rim of the gorge, where mixed hardwood–pine forests have been cleared for cropland and browse. Logging activities in park units could result in increased habitat destruction and have the potential to affect most listed terrestrial species, resulting in short- and long-term localized to widespread minor adverse impacts.

In addition to active mining operations, approximately 25,100 acres of unreclaimed abandoned coal mines exist in the Tennessee counties adjacent to the Big South Fork NRRA, and there are about 10 abandoned surface coal mine sites in McCreary County, Kentucky. The Big South Fork NRRA has undertaken remediation studies of selected sites where contaminated mine drainage is of concern. The Worley riverside area is a former mining community where remnants of mining operations, including mine tailings, are evident. Water quality on the site is an issue due to acid mine drainage. Remediation of mine effects is being planned for this site.

Relatively low-density residential development occurs in the immediate vicinity of the park units, and has resulted in the development of infrastructure such as roads, utilities, septic tanks, and water impoundments/intakes for water supply/treatment, all of which can contribute to nonpoint source pollution and listed species habitat destruction. Industrial activity sites near the park units that could contribute to cumulative impacts include power plants, railroads, hardwood flooring factories, sawmills, and other manufacturing facilities. Southwest of Obed WSR, two industrial park units have been developed in the Crossville area. Habitat destruction and disturbances, temporary disturbance and relocation, or incidental take of a species from these sources would result in widespread long-term negligible to moderate adverse impacts on listed species.

The spread of non-native plant species has historically been occurring and now represents a serious problem within the national park units. Fields, roads, trails, and other disturbed areas are often source areas for exotic plants. From these sites, exotic plants can migrate into previously stable vegetation communities, where they displace native plants (NPS 2005a).The abandonment of well sites and oil and gas access roads creates disturbances that increase the invasion of non-native plant species. At Big South Fork NRRA, efforts to control exotic vegetation have involved the use of herbicides as the primary tool for controlling exotic plant infestations in managed fields. Spot treatments of herbicides applied at labeled rates and various frequencies have been used to control most exotic plant infestations. The spread of non-native plant species in park units could result in increased habitat destruction and has the potential to affect most listed terrestrial species, resulting in short- and long-term localized to widespread minor adverse impacts.

Other activities in the park units that could impact protected plants, fish, and wildlife include wildlife harvest (hunting and trapping), nonconsumptive recreation, and the Big South Fork NRRA prescribed-fire management program. Recreational activities in the park units are focused near developed visitor-use areas, trails, canoe routes, and roads. These developments and activities have a negligible adverse impact on protected plants, fish, and wildlife. The prescribed-fire management program could contribute to short-term habitat loss and wildlife displacement, and could increase erosion and sedimentation, but would provide long-term beneficial cumulative impacts on park vegetation and improved habitat for protected wildlife species.

Diseases and insect pests of vegetation such as the pine bark beetle have caused a decline in streamside vegetation. Large stands of trees could be affected by infestations, which would result in habitat destruction, and changes in water temperature and chemistry due to reduced shading of waterways. This would have a widespread long-term minor adverse impact on aquatic habitat.

The reintroduction of native wildlife, including deer (1950s to 1960s), turkeys (1970s to 1980s), river otters (1980s), bears (1990s), and elk (1990s) has occurred in the vicinity of Big South Fork NRRA and Obed WSR, and non-native species (feral hogs, trout) were also introduced in the later 1970s–1980s. This has resulted in these species occupying habitat also occupied by listed species, with uncertain effects.

In addition to actions that would have negative effects on listed species, there are also some actions that would have beneficial effects. In addition to new oil and gas development, there are also wells that have been plugged and reclaimed in or near the park units. The NPS plans to plug and reclaim 14 abandoned wells at Big South Fork NRRA through a cooperative agreement with the Tennessee Department of Environment and Conservation, Division of Water Pollution Control. The NPS has also recently received funding under the ARRA to plug and reclaim an additional 39 wells at Big South Fork NRRA to protect resources, including listed species. These and other oil and gas reclamation projects, as well as mine reclamation projects, help restore and protect listed species in and around the park units. Surveys would be conducted and mitigation applied to ensure that listed species are not adversely affected by these actions, which would have long-term beneficial impacts.

Other plans and projects within the park would also have long-term beneficial effects on listed species. The GMP at Big South Fork NRRA outlines desired resource and visitor experience conditions that would protect species in the park. Reclamation of disturbed areas in the park would reestablish natural topographic contours and native vegetation communities and provide for the safe movement of native wildlife and the normal flow of surface waters. Wherever possible, habitats would be improved to perpetuate the viability of habitats and increase the survivability of listed species.

The 2006 *Big South Fork NRRA Fields Management Plan* (NPS 2006d) identifies desired resource conditions and the kinds/levels of visitor use for each of the fields in the park, depending on the GMP zone in which they fall (e.g., Natural Environment Recreation Zone, Cultural Spaces, First- or Second-Order Development, and Visitor Use Zones). The plan also identifies specific vegetation conditions for each field (e.g., native warm season grasses, tall fescue (*Lolium arundinaceum*) mix, turfgrass, grassy woodland, and forest). Although the fields management plan does not specifically address oil and gas operations, the actions proposed in the oil and gas management plan have been developed while taking into consideration the objectives of this plan and desired conditions for the fields.

Kentucky and Tennessee are developing TMDLs for impaired waters in the Big South Fork NRRA. The implementation of these TMDLs would have beneficial effects on listed species by reducing pollutants entering streams. Additionally, the NPS has published an advance notice of proposed rulemaking in the Federal Register regarding a proposed rule to revise the 9B regulations governing non-federal oil and gas development within the boundaries of NPS units. Generally, the proposed changes focus on improving resource protection aspects of the regulations while accounting for advances in oil and gas technology and industry practices. These changes could have long-term beneficial impacts on listed species, due to improving resource protection practices.

Recovery plans for threatened and endangered species carried out under the USFWS, as well as efforts to ensure agency cooperation under section 7(a)(1) of the ESA, are important for managing populations of threatened and endangered species. There are four recovery plans in place for eight species that occur at Big South Fork NRRA or Obed WSR and are listed as threatened or endangered under the ESA. As part of these efforts, Big South Fork NRRA staff members are working with the USFWS, USGS, TWRA, and two mussel hatcheries (Virginia Tech Mussel Facility and Kentucky Center for Mollusk Conservation) to propagate freshwater mussels and reintroduce them into the wild.

Overall, the impacts of these actions, combined with the localized short-term and long-term negligible to minor adverse impacts and the beneficial negligible to minor effects of alternative A, would result in short- and long-term minor to moderate adverse cumulative impacts on listed species. Protection provided to listed species in the park under CLPRs, including ESA Section 7 consultation requirements, would minimize adverse impacts and result in maintaining and improving habitat for listed species, but development and other actions outside the park would be expected to continue to adversely affect listed species or their habitat, often without mitigation. When compared to the broader area of analysis, alternative A would directly impact a relatively small area and would contribute minimally to the overall cumulative impacts.

Conclusion

Under alternative A, limited geophysical operations would result in short-term negligible adverse impacts on listed species from vegetation trimming, disturbance and noise during access, as well as from vibrator truck use. In areas where non-federal oil and gas operations would be permitted in the park units, drilling and production of wells could result in short-term negligible to minor adverse impacts, primarily from the noise and disturbance related to construction of new wellpads, access roads, flowlines, and pipelines, which would require vegetation clearing and could result in habitat loss or erosion/sedimentation into park waters. There would also be a risk for up to major adverse impacts from leaks and spills that could go undetected and could reach listed species, especially immobile species such as mussels. Impacts from plugging and reclamation of wells at either park would be localized, short term to long term, negligible to minor, and adverse. In addition, reclaiming the wellpads and access roads would have a long-term beneficial impact on listed species. Wells directionally drilled and produced from outside the park units could result in indirect adverse impacts ranging from no impact to localized to widespread, short- to long-term, minor adverse impacts. In addition, there would be long-term beneficial impacts as a result of reclaiming the wellpads and access roads of well sites drilled from outside the park units. For both in-park and adjacent directionally drilled wells, up to major short-term adverse effects could occur in the unlikely event of a well blowout, fire, or uncontrolled release.

The adverse and beneficial effects of past, present, and reasonably foreseeable future actions, when combined with the short- and long-term negligible to minor adverse impacts as well as the long-term beneficial effects of alternative A, would result in short- and long-term minor to moderate adverse cumulative impacts on listed species. When compared to the broader area of analysis, alternative A would directly impact a relatively small amount of habitat and would contribute minimally to the overall cumulative impacts.

Alternative B: Comprehensive Implementation of the 9B Regulations and a New Management Framework for Plugging and Reclamation

Analysis

Geophysical Exploration—As with alternative A, minimal geophysical exploration is expected at Big South Fork NRRA, except for the limited possibility of conventional seismic lines in areas of existing roads where data could be acquired quickly and inexpensively, using seismic vibrator technology. As a result, impacts associated with geophysical exploration in alternative B would be very similar to the impacts described in alternative A, resulting from vegetation clearing, ground disturbance, vibrations, and especially noise from survey crews and vehicles, and would be short-term negligible adverse impacts on listed species.

Drilling and Production—Because the forecast of oil and gas activities in chapter 2 applies to all alternatives, impacts associated with up to 20 new wells in Big South Fork NRRA and up to 5 wells directionally drilled from outside the park unit in Obed WSR and well workovers/servicing would be very similar to the impacts described in alternative A. As described under alternative A, the construction and maintenance of access roads, wellpads, flowlines, and pipelines could disturb or destroy habitats and routines of listed species in the park. Because of the restrictions at Obed WSR, including the No Surface Use restriction at the gorge, these operations would not be allowed within the park unit under alternative B.

However, where drilling and production operations would be permitted, impacts could occur from noise and disturbance related to construction and maintenance of wellpads, access roads, flowlines, and pipelines, especially new construction which would require vegetation clearing and could result in habitat loss or erosion/sedimentation into park waters. There would also be potential adverse impacts from leaks and spills and the chance of a short-term major impact from well blowouts, fires, or large uncontrolled releases. However, under alternative B the NPS would implement an oil and gas management plan that clearly articulates the CLPRs applicable to the exploration, production, and transportation of non-federal oil and gas resources in Big South Fork NRRA and Obed WSR. Additionally, increased inspections and monitoring under alternative B would proactively identify sites that may be impacting, or threatening to impact, park resources beyond the operations area, which would help limit impacts from spills and leaks through timely detection. The 9B regulations would be enforced at any such sites, and operations found to pose a significant threat to federally owned or controlled lands or waters would be suspended by the superintendent until the threat is removed or remedied (see 36 CFR 9.33 and 9.51). Through required biological surveys and/or assessments and consultations with USFWS and TWRA or other state agency biologists, potential impacts on federally listed species and their habitat would be identified, and the application of appropriate mitigation measures would result in short- to long-term, negligible to minor adverse impacts on listed species, with a more limited risk of major adverse effects from spills or leaks.

Plugging and Reclamation—As indicated in the forecast of oil and gas activities in chapter 2, plugging and reclamation of wells is expected to be the primary oil and gas operation conducted in Big South Fork NRRA and Obed WSR during the life of this plan. Between both park units, approximately 50 wells are expected to be plugged and reclaimed, resulting in the reclamation of approximately 87 acres of land.

Similar to alternative A, well plugging, shutting down and abandoning/removing flowlines and pipelines, and use of heavy equipment and vehicles during reclamation activities could have the potential for releases of oil and other contaminating and hazardous substances, which could harm or kill protected plants, fish, and wildlife. However, applying the consultation requirements under the ESA; performing biological surveys of the area that could be potentially impacted by proposed plugging, abandonment, and reclamation operations; identifying listed species; and applying appropriate mitigation would limit adverse impacts on listed species. Under alternative B the NPS would implement an oil and gas management plan that clearly articulates the CLPRs applicable to the exploration, production, and transportation of non-federal oil and gas resources in Big South Fork NRRA and Obed WSR. This includes a new management framework for plugging and reclamation of wells, which would allow the NPS and operators to efficiently complete the compliance process for the plugging and reclamation of inactive wells that represent potential threats to park resources and values. This new management framework also includes goals and specific activities for protecting park resources and values during plugging and reclamation activities. Coupled with the mitigation described for alternative A and in appendix B, there would be localized short-term negligible to minor adverse impacts. Additionally, the new management framework for plugging and reclamation would increase the certainty that wells would be plugged and reclaimed to applicable standards, and therefore, the long-term beneficial effects described under alternative A would be more likely to be realized sooner.

Directionally Drilled Wells—As described under alternative A, wells directionally drilled and produced from outside the park units to bottomholes beneath them could indirectly impact listed species in the park. The types of impacts are expected to be similar to those described above for operations inside the park, but the intensity of impacts could increase for operations sited closer to the park boundary, where habitat disturbance or destruction could affect listed species. Impacts would depend on proximity to the park units, site-specific environmental conditions, and mitigation measures being employed. Based on these factors, indirect impacts on listed species in the park could range from no impact to localized to widespread, short- to long-term, minor adverse impacts, with the potential for major adverse impacts due to a well blowout, fire, or large uncontrolled release. In addition, there would be long-term beneficial impacts as a result of reclaiming the wellpads and access roads of well sites drilled from outside the park units.

Cumulative Impacts

Impacts on listed species from other actions that were considered under the cumulative impact scenario would be the same as described for alternative A. The adverse and beneficial effects of the cumulative actions, when combined with the short- and long-term negligible to minor adverse impacts as well as the long-term beneficial effects of alternative B, would result in short- and long-term minor to moderate adverse cumulative impacts on listed species. The more proactive planning and enforcement of CLPRs and increased inspections/monitoring would limit adverse impacts, but the majority of the impacts on listed species in the region would occur outside the park units, where impacts may or may not be mitigated. When compared to the broader area of analysis, alternative B would directly impact a relatively small area and would contribute minimally to overall cumulative impacts.

Conclusion

Similar to alternative A, limited geophysical operations would result in short-term negligible adverse impacts on listed species from vegetation clearing, ground disturbance, vibrations, and especially noise from survey crews and vehicles. In areas where non-federal oil and gas operations would be permitted in the park, effects from drilling and production activities could range from short- to long-term, negligible to minor adverse impacts on listed species from the direct loss of vegetation and habitat as a result of clearing, contouring, and construction and maintenance of the pads, roads, flowlines, pipelines, and other ancillary facilities. Mitigation, implementation of the oil and gas management plan, and identification of potential impacts on federally listed species and their habitat during biological surveys would keep impacts to a minor level. Impacts from plugging and reclamation of wells at either park would result in localized short-term negligible to minor adverse impacts. Additionally, the new management framework for plugging and reclamation would increase the certainty that wells would be plugged and reclaimed to applicable standards, and therefore, the long-term beneficial effects described under alternative A would be more likely to be realized sooner. Wells directionally drilled and produced from outside the park to bottomholes beneath the park, and the reclamation of these wells, could indirectly impact listed species in the park, resulting in effects ranging from no impact to indirect, localized to widespread, short- to long-term, minor adverse impacts. In addition, there would be long-term beneficial impacts as a result of reclaiming the wellpads and access roads of well sites drilled from outside the park units. Although up to major short-term adverse effects could occur in the unlikely event of a well blowout, fire, or uncontrolled release, the risk of that occurring is less under alternative B due to increased monitoring and inspections

The adverse and beneficial effects of the cumulative actions, when combined with the short- to long-term negligible to minor adverse impacts as well as the long-term beneficial effects of alternative B, would result in short-and long-term minor to moderate cumulative adverse impacts on listed species When compared to the larger area of analysis, alternative B would directly impact a relatively small area and would contribute minimally to overall adverse cumulative impacts. Alternative B would provide long-term cumulative benefits due to its proactive management and enforcement and expedited well plugging

Alternative C: Comprehensive Implementation of the 9B Regulations, a New Management Framework for Plugging and Reclamation, and Establishment of Special Management Areas

Analysis

Geophysical Exploration—Impacts associated with geophysical exploration under alternative C would be similar to the impacts described in alternatives A and B. However, under alternative C, SMAs would be established to further protect resources and values particularly susceptible to adverse impacts from oil and gas operations, or areas where certain resources are important to maintaining the ecological integrity of the park units. Under alternative C, geophysical exploration would not be allowed in any of the SMAs or associated setbacks at Big South Fork NRRA, with the exception of the Special Scenery SMA, unless otherwise approved in a plan of operations. The SMA for Honey Creek and Twin Arches state natural areas was set aside primarily because of their rich, undisturbed forest communities which provide important habitat for listed species. The SMAs for Sensitive Geomorphic Features and Cliff Edges would also protect some unusual listed species along with geology. With the additional protection of SMAs, and since minimal geophysical exploration is expected and would include use of existing roads and pedestrian access, actions associated with geophysical exploration (vegetation clearing, ground disturbance, and especially noise from survey crews and trucks) would have short-term negligible adverse impacts on listed species.

Drilling and Production—Because the forecast of oil and gas activities in chapter 2 applies to all alternatives, impacts associated with up to 20 new wells in Big South Fork NRRA and up to 5 wells directionally drilled from outside the park unit in Obed WSR and well workovers/servicing would be similar to the impacts described in alternatives A and B. In addition, the establishment of SMAs would further protect natural areas, including areas of Big South Fork NRRA and Obed WSR where resources and values would be particularly susceptible to adverse impacts from oil and gas operations, or areas where certain resources are important to maintaining the ecological integrity of the park units. Under alternative C drilling and production would not be allowed in any of the SMA-associated setbacks at the park units unless otherwise approved in a plan of operations.

The increase of the standard 500-foot setback under 9.41(a) (unless specifically authorized in an approved plan of operations) to a 1,500-foot setback where no oil and gas operations may occur for visitor-use, administrative, and other use areas, including water-oriented visitor-use areas, in addition to the designation of Obed WSR SMA, the Cliff Edge SMA, the Sensitive Geomorphic Feature SMA, the State Natural Area SMA, and the Managed Fields SMA, would increase protection and improve habitat for the dromedary pearlymussel and other mussel species, fish (palezone shiner, blackside dace, duskytail darter, spotfin chub), and listed plant species (e.g., Cumberland rosemary and Virginia spiraea) that use these areas. In smaller SMAs, the added protection would primarily be provided for small mammals and invertebrates that occupy these areas. In larger SMAs, protection from additional habitat fragmentation would benefit all fish and wildlife species listed in chapter 3. The increased setback from visitor-use and administrative areas, from a 500-foot setback to a 1,500-foot setback, would further reduce the potential impacts of oil and gas operations and activities in these areas. The 1,500-foot setback from rivers and streams that are habitat for listed mussel species and their fish hosts would reduce the possibility of impacts on mussels and other wildlife using these areas during nesting, breeding, and migration. Well blowouts, fires, or large uncontrolled releases could occur and cause short-term major adverse effects; however this would be an unlikely occurrence.

Through the regulatory process under the ESA, required biological surveys and consultations with USFWS and TWRA or other state agency biologists would result in identification of potential impacts on listed species and their habitat, and the implementation of an oil and gas management plan, the designation of SMAs, and the application of mitigation measures would result in short- to long-term negligible adverse impacts on listed species with a more limited risk of major adverse effects from spills or leaks.

Plugging and Reclamation—As indicated in the forecast of oil and gas activities in chapter 2, plugging and reclamation of wells is expected to be the primary oil and gas operation conducted in Big South Fork NRRA and Obed WSR during the life of this plan. Between both park units, approximately 50 wells are expected to be plugged and reclaimed, resulting in the reclamation of approximately 87 acres of land. Similar to alternatives A and B, well plugging, shutting down and abandoning/removing flowlines and pipelines, and use of heavy equipment and vehicles during reclamation activities could cause harm to or mortality of listed species of plants, fish, and wildlife. Through the well-defined regulatory process under the ESA, required biological surveys and consultations with USFWS and TWRA or other state agency biologists would result in identification of potential impacts on listed species and their habitat, and the application of mitigation measures would result in negligible to minor adverse impacts on listed species.

Similar to alternative B, the NPS would implement an oil and gas management plan under alternative C that clearly articulates the CLPRs applicable to the exploration, production, and transportation of non-federal oil and gas resources in Big South Fork NRRA and Obed WSR. This includes a new management framework for plugging and reclamation of wells, which would allow the NPS and operators to efficiently complete the compliance process for the plugging and reclamation of inactive wells that represent potential threats to park resources and values. This new management framework also includes goals and specific activities for protecting park resources and values during plugging and reclamation activities. In addition, the establishment of SMAs would further protect natural areas, including areas of Big South Fork NRRA and Obed WSR where resources and values, including listed species, would be particularly susceptible to adverse impacts from oil and gas operations, or areas where certain resources are important to maintaining the ecological integrity of the park units. Park staff would evaluate all wells that are candidates for plugging and reclamation to determine their potential for impacts on park unit resources and values. Sites would be prioritized for plugging and reclamation based on a number of factors, including the proximity of well sites to SMAs. As a result, the new management framework and use of SMAs to prioritize actions would help to ensure that the long-term beneficial effects described under alternative A would be realized sooner.

Directionally Drilled Wells—As described under alternatives A and B, wells directionally drilled and produced from outside the park units to bottomholes beneath them could indirectly impact listed species in the park. It is also possible that some wells may be directionally drilled from outside the SMAs to develop hydrocarbons underlying the SMAs. The types of impacts are expected to be similar to those described above for operations inside the park, but the intensity of impacts could increase for operations sited closer to the park or SMA boundary, where habitat disturbance or destruction could affect listed species. Impacts would depend on proximity to the park units, site-specific environmental conditions, and mitigation measures being employed. Based on these factors, indirect impacts on listed species in the park could range from no impact to localized to widespread, short- to long-term, minor adverse impacts, with the potential for major adverse impacts due to a well blowout, fire, or large uncontrolled release. In addition, there would be long-term beneficial impacts as a result of reclaiming the wellpads and access roads of well sites drilled from outside the park units.

Cumulative Impacts

The same actions identified as contributing cumulative effects under alternative A would apply to alternative C. The adverse and beneficial effects of the cumulative actions, when combined with the short- and long-term negligible to minor adverse impacts as well as the long-term beneficial effects of alternative C, would result in short- and long-term minor to moderate adverse cumulative impacts on listed species. Designation of SMAs under alternative C would minimize adverse impacts on listed species in the SMAs and their setbacks, providing more consistent and certain protection in these areas, and would benefit several species dependent on geology, rivers, streams, wetlands, and forested areas. However, actions on adjacent lands have adversely affected and could continue to adversely affect listed species or their habitat, often without adequate mitigation. When compared to the broader area of analysis, alternative C would directly impact a relatively small area and would contribute minimally to overall adverse cumulative impacts. Alternative C would provide long-term cumulative benefits due to its proactive management and enforcement, identification and protection of SMAs, and expedited well plugging.

Conclusion

Similar to alternatives A and B, limited geophysical operations would result in short-term negligible adverse impacts on listed species from vegetation clearing, ground disturbance, vibration, and especially noise from seismic crews and vehicles. Under alternative C, with adequate setbacks, implementation of mitigation measures, and the establishment of SMAs, impacts on listed species in the park from drilling and production would be short to long term, negligible, and adverse. Impacts from plugging and reclamation of wells at either park would result in localized short-term negligible to minor adverse impacts on listed species. Additionally, the new management framework for plugging and reclamation would increase the certainty that wells would be plugged and reclaimed to applicable standards, and therefore, the long-term beneficial effects described under alternative A would be more likely to be realized sooner. Wells directionally drilled and produced from outside the park units to bottomholes beneath them could indirectly impact listed species, resulting in effects ranging from no impact to indirect, localized to widespread, short- to long-term, minor adverse impacts. In addition, there would be long-term beneficial impacts as a result of reclaiming the wellpads and access roads of well sites drilled from outside the park units. Although up to major short-term adverse effects could occur in the unlikely event of a well blowout, fire, or uncontrolled release, the risk of that occurring is less under alternative C due to increased monitoring and inspections

Cumulative impacts under alternative C would be similar to those described for alternative B, with short- and long-term minor to moderate cumulative adverse impacts on listed species. When compared to the broader area of analysis, alternative C would directly impact a relatively small area and would contribute minimally to overall adverse cumulative impacts. Alternative C would provide long-term cumulative benefits due to its proactive management and enforcement, identification and protection of SMAs, and expedited well plugging.

SPECIES OF SPECIAL CONCERN

GUIDING REGULATIONS AND POLICIES

The Kentucky Rare Plant Recognition Act (KRS 146.600–619) has additional regulations for plants that may not be federally listed, but that Kentucky has deemed to be special status. The statute states that "lists of plant species which may become threatened in the future through habitat loss, commercial exploitation, or other means, or which are presumed to be extirpated within the Commonwealth" will be provided. Under this statute the state of Kentucky may "conduct investigations, with the permission of the landowner, on any species of plants indigenous to the Commonwealth necessary to develop information relating to population, distribution, habitat needs, limiting factors, and other biological and ecological data, and to determine protective measures and requirements necessary for its survival."

The Kentucky Endangered Species of Fish and Wildlife regulation (301 KAR 3:061.) states that "The function of this administrative regulation is to protect and conserve those endangered fish and wildlife species appearing on present and revised future lists issued by the state and federal governments." Under this regulation "any species or subspecies designated as endangered by the Secretary of the Interior on a current United States List of Endangered and Threatened Wildlife as recorded in 50 Code of Federal Regulations, Part 17, is considered an endangered species in Kentucky under the provisions of KRS 150.183. Those species described as "threatened" on the above federal list are not included under KRS 150.183 or this administrative regulation."

The state of Tennessee has a similar statute, which is known as the Tennessee Nongame and Endangered or Threatened Wildlife Species Conservation Act of 1974 (Acts 1974, ch. 769, § 1; T.C.A., § 51-901). The statute states "after consultation with other state wildlife agencies, appropriate federal agencies, and other interested persons and organizations … the wildlife resources commission shall by regulation propose a list of those species or subspecies of wildlife indigenous to the state that are determined to be endangered and threatened within this state." Under another section of this statute, the Tennessee Rare Plant Protection and Conservation Act of 1985, the state of Tennessee may "conduct investigations on species of rare plants throughout the state of Tennessee in order to develop information relative to the biology, ecology, population status, distribution, habitat needs, and other factors and to determine conservation measures necessary for rare plants" (Acts 1985, ch. 242, § 1; T.C.A., § 70-8-304).

The NPS *Management Policies 2006* (NPS 2006c) Section 4.4.2.3 states that the NPS will manage state and locally listed species in a manner similar to its treatment of federally listed species to the greatest extent possible.

METHODOLOGY, ASSUMPTIONS, AND IMPACT THRESHOLDS

Given the programmatic nature of this analysis, the exact locations of future operations are unknown. As a result, actions under the RFD scenario and the forecast of oil and gas activities were analyzed qualitatively against species of special concern in Big South Fork NRRA and Obed WSR that could be impacted. The species were defined and described based on the sources cited in chapter 3. The assessment of impacts is based on best professional judgment and was developed through discussions with park staff and EIS team members.

As stated above, NPS policy requires that state-listed species, and others identified as species of special concern by the park, are to be managed in park units in a manner similar to those that are federally listed (NPS 2006c). The Tennessee Division of Natural Areas and Kentucky State Nature Preserves Commission maintain county lists of rare species (Tennessee Division of Natural Areas 2007; Kentucky State Nature Preserves Commission 2009). The lists for the counties that encompass the park units were compared with species lists from the NPS (Britzke 2007; NPS 2007b; R. Schapansky, pers. comm., 2008a, 2008b, 2008c; Scott 2007; Stedman 2006; Stephens et al. 2008) to identify those that are known to occur in Big South Fork NRRA and Obed WSR (listed as "present in the park" on NPS lists). Based on this comparison, 68 state-listed species were identified for consideration in this plan/EIS. These include mammals, birds, reptiles, amphibians, fish, plants, and invertebrates, including many mussel species, as described in chapter 3. In addition, some state sensitive species known to occur in the park units but not included on the county lists are also considered. A summary of information regarding these species, including the park unit where they are known to occur, and a brief description of their habitat is included in chapter 3 in the "Species of Special Concern" section.

The impact intensity threshold definitions are based on the potential for changes to species of special concern characteristics, as follows:

Negligible: There would be no observable or measurable impacts on native species, their habitats, or the natural processes sustaining them.

Minor: Impacts on native species, their habitats, or the natural processes sustaining them would be detectable at a local level. Occasional responses to disturbance by some individuals could be expected, but without interference to factors affecting population levels. Sufficient habitat would remain functional to maintain viability of all native species. Impacts would be outside critical reproduction periods or key habitat.

Moderate: Impacts on native species, their habitats, or the natural processes sustaining them would be detectable, and changes to population numbers, population structure, genetic variability, and other demographic factors would occur at a local level. Responses to disturbance by some individuals could be expected and could have negative impacts on factors affecting local population levels, but species would remain stable and viable. Sufficient habitat would remain functional to maintain the viability of all native species, but habitat quality could be affected. Some impacts might occur during critical reproduction periods or in key habitat.

Major: Impacts on native species, their habitats, or the natural processes sustaining them would be detectable, and population numbers, population structure, genetic variability, and other demographic factors might experience large declines over a wide geographic area. Responses to disturbance by some individuals would be expected, with negative impacts to factors resulting in a decrease in population levels. Loss of habitat might affect the viability of some native species. Impacts would regularly occur during critical reproduction periods or in key habitat.

IMPACT OF THE ALTERNATIVES

Alternative A: No Action (Current Management Continued)

Analysis

Geophysical Exploration—As described in the forecast of oil and gas activities in chapter 2, minimal geophysical exploration is expected at Big South Fork NRRA, except for the limited possibility of conventional seismic lines in areas of existing roads where data could be acquired quickly and inexpensively, using seismic vibrator technology. Therefore, since designated existing access roads would be used, receiver lines would be laid on foot, and no shotholes would be drilled, there would be very limited impacts on species of special concern or their habitat, Potential effects from exploration operations could include increased displacement, increased risk of mortality, decreased production, and increased stress levels from the noise and disturbance associated with seismic survey activities. These effects could be caused by seismic crews traveling to access the area to be surveyed and pedestrian travel along receiver lines, as well as vibrations from the seismic vibrator, trimming vegetation, and using vehicles on existing roads. Types of species that could be affected by these activities are the plant, reptile, amphibian, bird, and mammal species described in chapter 3. The mussel and fish species described in chapter 3 would not likely be affected because none of these activities would be performed in aquatic habitat. Any species near any noise associated with seismic survey work, particularly vehicle noise, could be impacted by such activities. Impacts related to noise are usually temporary, with nearby species avoiding or moving away from the source but returning after noise is reduced or eliminated.

Under alternative A, protection of water quality is provided by 36 CFR 9.41(a), which requires operations to be offset 500 feet from the banks of perennial, intermittent, or ephemeral watercourses, unless specifically authorized by an approved plan of operations, which would minimize erosion and sedimentation and other impacts on water quality and quantity that could adversely impact aquatic species. The standard 500-foot setback from water bodies would protect fish, wildlife using water, and wetland vegetation within this protective zone, which supports many species of special concern. Through project-specific consultation with TWRA or other state agency biologists, the setback could be increased. The 500-foot standard setback would provide some primary protection to fish, mussel, and some amphibian species described in chapter 3. Additional protection to these habitats would be provided by the wetlands and floodplains Executive Orders, NPS Director’s Orders, and project-specific permitting requirements.

Types of species that occupy upland areas outside the 500-foot shoreline setbacks include bats, rodents, birds, reptiles, and upland plants. These types of species could be affected by the presence of seismic crews and the noise associated with the surveys, but there would be minimal trimming of vegetation or clearing required. If geophysical operations were to be proposed in areas where species of special concern or their habitat are known to occur under alternative A, there would be seasonal limitations and setbacks to protect those species during prime breeding season.

Where exploration operations could be permitted, these operations would avoid impacting species of special concern and their habitat, which would be identified through consulting park biologists or biological surveys, if determined necessary by the NPS through consultation with state agency biologists. When species of special concern and their habitat are found to be within the project area, application of mitigation measures, including sufficient setbacks and/or timing restrictions for nesting and other sensitive periods in a given species’ life cycle, would result in avoiding or minimizing potential adverse effects. Additionally, upon the completion of operations, reclamation of disturbed areas would be required, and recovery of any vegetation disturbed is expected to occur over the short term. Application of these requirements would result in short-term negligible adverse impacts on species of special concern or their habitat from geophysical exploration.

Drilling and Production—Drilling and production operations would not directly impact species of special concern or their habitat in protected areas, where operations would not be permitted under CLPRs, including the 9B regulations, the gorge restrictions at Big South Fork NRRA, and deed restrictions at Obed WSR. As described in the forecast of oil and gas activities in chapter 2, only up to 20 new wells are expected in Big South Fork NRRA, and only up to 5 wells, directionally drilled from outside the park unit, are expected in Obed WSR. It is also assumed that 125 wells at Big South Fork NRRA and 2 wells at Obed WSR would be worked over or serviced under this alternative, as staffing limitations and resources allow for review of the proposed projects.

Existing operations have little ongoing effect on habitat other than the threat of spills or leaks and any maintenance activities that are needed on infrastructure. The chances of undetected spills are greater under this alternative because routine inspections and monitoring would not occur, which may increase the potential for a major adverse impact if spills should reach susceptible species including state-listed mussels or fish. The NPS recognizes that unplanned incidents associated with oil and gas operations such as well blowouts, fires, and major spills within the boundaries of the park present a risk of release of contaminants that can adversely impact listed species. However, the incident rates for such incidents are low and are not a typical expectation of project implementation. If such an incident did occur, required mitigation measures such as use of blowout preventers and implementation of SPCC plans would result in lessening the potential for spilled substances or a well fire to spread into the park, and for timely response and cleanup, so that there is a reasonable expectation that long term adverse impacts would not occur or be limited to minor to moderate levels of intensity, although there could be short-term major adverse effects during the release. In the event that the park's resources or values are damaged, the NPS could seek remedy both on the ground and in the form of monetary compensation.

However, most impacts from oil and gas operations come from the construction of new access roads and wellpads. Drilling and production operations could range in duration from short term to long term (lasting 20 years or more). Construction and maintenance of roads, pads, flowlines, and pipelines could require the clearing of vegetation and could result in habitat loss. Potential effects on species of special concern would depend on where drilling and production operations are located. Careful siting of development based on biological survey and/or site assessment results could avoid or minimize these impacts substantially. Implementing the required biological surveys and consultations with TWRA or other state agency biologists would result in identification of potential impacts on species of special concern and their habitat, and the application of mitigation measures.

Water-dependent species (including fluted kidneyshell, spectaclecase, Cumberland elktoe, ashy darter, and mountain brook lamprey) could be impacted by the construction and long-term maintenance of roads, pads, flowlines, and pipelines if stream crossings result in alteration of streamflow, water quality, or temperature or in increased sedimentation. Under all alternatives, waterways would be protected by a 500-foot setback under 36 CFR 9.41(a), unless specifically authorized by an approved plan of operations; also, because waterways are inherently a part of floodplains (riparian corridors) and wetland areas, and receive added protection under various regulatory and policy requirements, streamflows, water quality, and water temperature would be protected from disturbance and water levels would be maintained. When there are no practicable alternatives to locating an operation or activity in floodplains and wetlands, careful siting of facilities and application of stringent mitigation measures would be expected to avoid potential adverse impacts. Required mitigation for direct and indirect impacts on wetlands could be used to restore wetland habitats and increase species of special concern habitat values.

Displacement of wildlife would continue from initial wellpad construction into exploratory drilling, and if the well is placed in production, during the life of the producing well. The increase and ease of public access routes may serve to increase public motorized travel, or if the roads are closed to public motorized travel, they would still serve as access routes on foot, horseback, and mountain bike.

Noise from drilling operations would also impact protected wildlife species such as the American black bear and the cerulean warbler. Drilling operations introduce noise with the highest measurements in the 90 dBA range for a period of a week or two up to a few months, with noise coming mostly from multiple diesel engines (see table 32 in the "Soundscapes" section). Therefore, noise impacts on terrestrial species would be moderate, but limited to a localized area and of relatively short duration. Preconstruction surveys would be done to ensure that impacts on species of special concern would not be excessive.

Some facilities associated with production operations (i.e., heater treater units/separator units) could cause the mortality of special-status bats or birds through asphyxiation or incineration, and mitigation such as a cone device placed on top of all vent stacks could be required to prevent perching and access. Open containers that collect stormwater may be required to have netting or covers to prevent wildlife species from accessing stormwater that may have contacted and mixed with oil, gas, and other contaminating and hazardous substances. Also, selection and use of herbicides and pesticides on the site must be approved by the NPS Integrated Pest Management Coordinator, and use of such chemicals would be kept to a minimum and done following label instructions and avoiding sensitive habitats or species locations, so that any adverse impacts would be minor.

Given the above operating standards and other mitigation under CLPRs, as well as the limited number of new operations projected in the forecast of oil and gas activities, there would be localized short-term negligible to minor adverse impacts from drilling and production operations in the park units, although the potential for a major adverse impact from a spill or release is more likely under this alternative.

Plugging and Reclamation—As indicated in the forecast of oil and gas activities in chapter 2, plugging and reclamation of wells is expected to be the primary oil and gas operation conducted in Big South Fork NRRA and Obed WSR during the life of this plan. Between both park units, approximately 50 wells are expected to be plugged and reclaimed, resulting in the reclamation of approximately 87 acres of land.

Well plugging; shutting down, abandoning, and removing flowlines and pipelines; and use of heavy equipment and vehicles to reclaim sites could have the potential for release of oil and other contaminating and hazardous substances, which could harm or kill protected plants, fish, and wildlife. However, performing biological surveys of the area that could be potentially impacted by proposed plugging, abandonment, and reclamation operations; identifying species of special concern; and applying appropriate mitigation would result in short-term localized negligible to minor adverse impacts on species of special concern.

Plugging operations and site preparation during reclamation would introduce heavy equipment and people, along with increased noise levels, for a short time. These operations would result in short-term localized negligible to minor adverse impacts, depending on the season, the background soundscape, and the proximity of operations to species of special concern. Seasonal restrictions would include delaying activities until after a species' nesting or spawning seasons. Access roads that have been developed or allowed to remain open for the primary purpose of allowing access for oil and gas operations would be reclaimed at the completion of operations, returning the area to its natural condition. Wherever possible, habitats would be improved to perpetuate the viability of habitats and increase the survivability of species of special concern. The outcome of these activities, in returning natural conditions to the operations area, would have long-term beneficial impacts.

Directionally Drilled Wells—It is possible that some wells may be directionally drilled from outside the park units to develop hydrocarbons underlying the park units. The intensity of impacts on species of special concern would be dependent on where the operation is located with respect to species and their habitats, whether the operation is sited inside or outside the park, and on the resource-protection measures that are employed. For wells directionally drilled and produced from outside the park units to bottomholes beneath the park units, the connected actions occurring outside the park boundaries could include constructing and maintaining access roads, well/production pads, and flowlines/pipelines; drilling the well; producing the well; plugging and abandoning the well; and site reclamation. The in-park operations associated with directional wells would consist of the wellbore crossing into the park units, usually several thousand feet or more below the surface. Therefore, for most directional wells drilled that are exempted under 36 CFR 9.32(e), the NPS regulatory authority would be limited to applying mitigation to the in-park operations to promote protection of groundwater resources beneath the park. The in-park operations would typically have no effect on species of special concern or their habitats on the surface. Oil and gas operators outside the park units are not required to survey for or protect species of special concern. Given that most impacts on species of special concern would be from wellpad and access-road construction, the impacts on these species and their habitats in the park units from drilling and production of wells drilled from surface locations outside the park units to reach bottomholes beneath the park units could result in indirect adverse impacts ranging from no impact to localized to widespread, short- to long-term, minor adverse impacts with the potential for major adverse impacts due to a well blowout, fire, or large uncontrolled release. In addition, there would be long-term beneficial impacts as a result of reclaiming the wellpads and access roads of well sites drilled from outside the park units.

Cumulative Impacts

With the continuing reduction of impacts from oil and gas activities in both park units stemming from increased plugging and reclamation, and a corresponding decrease in new drilling and production, impacts to species of special concern are expected to diminish and contribute less to cumulative impacts over time. However, several actions described in the "Cumulative Impacts Scenario" section of this chapter would contribute both adverse and beneficial cumulative impacts on species of special concern. Past oil and gas development within and outside Big South Fork NRRA has had short- and long-term minor to moderate adverse impacts on species of special concern from vegetation clearing, vehicle use, and the construction and maintenance of access roads, wellpads, and flowlines. Contamination of surface and groundwater from leaking wells would also contribute to impacts. Coal bed methane/shale gas drilling is an ongoing activity in the vicinity of Big South Fork NRRA, which has similar impacts to traditional oil and gas development.

Existing surface disturbances (including existing and abandoned operations) and transpark oil and gas pipelines, in combination with other park developments and activities (including park roads, visitor use areas, recreational activities, hunting and trapping, and prescribed-fire management practices), have reduced the amount of habitat available for use by species of special concern. It is difficult to accurately determine what types of habitat existed before being affected by development prior to the establishment of the park units. Since the establishment of the park units, however, development decisions have been applied under a well-defined regulatory process that has limited any additional impacts on species of special concern. Visitor activities such as horseback riding, biking, hunting, recreational rock climbing, swimming, kayaking, and ORV use all occur within Big South Fork NRRA and/or Obed WSR and may contribute to short-term localized negligible to minor adverse impacts on the resources considered in this plan/EIS.

Agriculture other than forestry has occurred on less than 20% of the land in counties adjacent to Big South Fork NRRA and Obed WSR, and most of the forested areas of Big South Fork NRRA have been logged. At Obed WSR, clearing and harvesting from logging and agriculture is particularly evident. Small-scale agriculture and grazing takes place on private lands set back from the rim of the gorge, where mixed hardwood–pine forests have been cleared for cropland and browse. Logging activities in park units could result in increased habitat destruction and have the potential to affect most terrestrial species of special concern, resulting in short- and long-term localized to widespread minor to moderate adverse impacts.

In addition to active mining operations, approximately 25,100 acres of unreclaimed abandoned coal mines exist in the Tennessee counties adjacent to Big South Fork NRRA, and there are about 10 abandoned surface coal mine sites in McCreary County, Kentucky. Big South Fork NRRA has undertaken remediation studies of selected sites where contaminated mine drainage is of concern. The Worley riverside area is a former mining community where remnants of mining operations, including mine tailings, are evident. Water quality on the site is an issue due to acid mine drainage. Remediation of mine effects is being planned for this site.

Relatively low-density residential development occurs in the immediate vicinity of the park units, and has resulted in the development of infrastructure such as roads, utilities, septic tanks, and water impoundments/intakes for water supply/treatment, all of which can contribute to nonpoint source pollution and species of special concern habitat destruction. Industrial activity sites near the park units that could contribute to cumulative impacts include power plants, railroads, hardwood flooring factories, sawmills, and other manufacturing facilities. Southwest of Obed WSR, two industrial park units have been developed in the Crossville area. Habitat destruction and disturbances, temporary disturbance and relocation, or incidental take of a species from these sources would result in widespread long-term negligible to moderate adverse impacts on species of special concern.

Fields, roads, trails, and other disturbed areas are often source areas for exotic plants. From these sites, exotic plants can migrate into previously stable communities, where they displace native plants (NPS 2005a).The abandonment of well sites and oil and gas access roads creates disturbances that increase the invasion of non-native plant species. At Big South Fork NRRA, efforts to control exotic vegetation have involved the use of herbicides as the primary tool for controlling exotic plant infestations in managed fields. Spot treatments of herbicides applied at labeled rates and various frequencies have been used to control most exotic plant infestations. The spread of non-native plant species in park units could result in increased habitat destruction and has the potential to affect most listed terrestrial species, resulting in short- and long-term localized to widespread minor adverse impacts.

Other activities in the park units that could impact protected plants, fish, and wildlife include wildlife harvest (hunting and trapping), nonconsumptive recreation, and the park units' prescribed-fire management program. Over the long term, hunting and trapping could have beneficial impacts on wildlife populations. Recreational activities in the park units are focused near developed visitor-use areas, trails, canoe routes, and roads. These developments and activities would have a negligible adverse impact on protected plants, fish, and wildlife. The park units' prescribed-fire management program could contribute to short-term habitat loss and wildlife displacement and could increase erosion and sedimentation, but would provide long-term beneficial cumulative impacts on park vegetation and improved habitat for protected wildlife species such as those described in chapter 3.

Diseases and insect pests of vegetation, such as the pine bark beetle, have caused a decline in streamside vegetation. Large stands of trees could be affected by infestations, which would result in habitat destruction and changes in water temperature and chemistry due to reduced shading of waterways. This would have a widespread long-term minor adverse impact on water resources. The reintroduction of native wildlife, including deer (1950s to 1960s), turkeys (1970s to 1980s), river otters (1980s), bears (1990s), and elk (1990s), has occurred in the vicinity of Big South Fork NRRA and Obed WSR, and non-native species (feral hogs, trout) were also introduced in the later 1970s–1980s. This has resulted in uncertain impacts on special-status species.

In addition to cumulative actions that would have negative effects on species of special concern, there are some actions that would have beneficial effects. In addition to new oil and gas development, there are wells that have been plugged and reclaimed in or near the park units. The NPS plans to plug and reclaim 14 abandoned wells at Big South Fork NRRA through a cooperative agreement with the Tennessee Department of Environment and Conservation, Division of Water Pollution Control. The NPS has also recently received funding under the ARRA to plug and reclaim an additional 39 wells at Big South Fork NRRA to protect resources, including species of special concern. These and other oil and gas reclamation projects, as well as mine reclamation projects, would help restore habitat and protect special-status species in and around the park units. Surveys would be conducted and mitigation applied to ensure that these species would not be adversely affected by these actions, which would have long-term beneficial impacts.

Other plans and projects within the park would also have long-term beneficial effects on species of special concern. The GMP at Big South Fork NRRA outlines desired resource and visitor experience conditions that would protect species in the park. Under the guidelines of the GMP, reclamation of disturbed areas in the park would reestablish natural topographic contours and native vegetation communities and provide for the safe movement of native wildlife and the normal flow of surface waters. Wherever possible, habitats would be improved to perpetuate the viability of habitats and increase the survivability of species of special concern.

The 2006 *Big South Fork NRRA Fields Management Plan* (NPS 2006d) identifies desired resource conditions and the kinds/levels of visitor use for each of the fields in the park, depending on the GMP zone in which they fall (e.g., Natural Environment Recreation Zone, Cultural Spaces, First- or Second-Order Development, and Visitor Use Zones). The plan also identifies specific vegetation conditions for each field (e.g., native warm season grasses, tall fescue (*Lolium arundinaceum*) mix, turfgrass, grassy woodland, and forest). Although the fields management plan does not specifically address oil and gas operations, the actions proposed in the oil and gas management plan have been developed while taking into consideration the objectives of this plan and desired conditions for the fields.

Kentucky and Tennessee are developing TMDLs for impaired waters in the Big South Fork NRRA. The implementation of these TMDLs would have beneficial effects on species of special concern from reducing pollutants entering streams. Additionally, the NPS has published an advance notice of proposed rulemaking in the Federal Register regarding a proposed rule to revise the 9B regulations governing non-federal oil and gas development within the boundaries of NPS units. Generally, the proposed changes focus on improving resource protection aspects of the regulations while accounting for advances in oil and gas technology and industry practices. These changes could have long-term beneficial impacts on species of special concern, due to improving resource protection practices.

Overall, the impacts of these actions, combined with the localized short-term and long-term negligible to minor adverse impacts and the beneficial effects of alternative A, would result in short- and long-term minor to moderate adverse cumulative impacts on species of special concern. Protection provided to special-status species in the park under CLPRs, especially NPS management policies for state-listed species, would minimize adverse impacts and result in maintaining and improving habitat for these species; however, development and other actions outside the park would be expected to continue to adversely affect these species or their habitat, often without mitigation. When compared to the broader area of analysis, alternative A would directly impact a relatively small area and would contribute minimally to the overall cumulative impacts.

Conclusion

Under alternative A, limited geophysical operations would result in short-term negligible adverse impacts on species of special concern from vegetation trimming, disturbance and noise during access and operations, and vibrations. In areas where non-federal oil and gas operations would be permitted in the park units, drilling and production of wells could result in short- to long-term negligible to minor adverse impacts, primarily from the noise and disturbance related to construction of new wellpads, access roads, flowlines, and pipelines, which would require vegetation clearing and could result in habitat loss or erosion/sedimentation into park waters. There would be a risk for moderate or even major adverse impacts from leaks and spills that could go undetected or migrate off site. Impacts from plugging and reclamation of wells at either park would be short term, negligible to minor, and adverse. In addition, reclaiming the wellpads and access roads would have a long-term beneficial impact on species of special concern. Wells directionally drilled and produced from outside the park units could result in indirect adverse impacts ranging from no impact to localized to widespread, short- to long-term, minor adverse impacts. In addition, there would be long-term beneficial impacts as a result of reclaiming the wellpads and access roads of well sites drilled from outside the park units. For both in-park and adjacent directionally drilled wells, up to major short-term adverse effects could occur in the unlikely event of a well blowout, fire, or uncontrolled release.

The adverse and beneficial effects of past, present, and reasonably foreseeable future actions, when combined with the short- and long-term negligible to minor adverse impacts as well as the long-term beneficial effects of alternative A, would result in short- and long-term minor to moderate adverse cumulative impacts on species of special concern. When compared to the broader area of analysis, alternative A would directly impact a relatively small amount of habitat and would contribute minimally to the overall cumulative impacts.

Alternative B: Comprehensive Implementation of the 9B Regulations and a New Management Framework for Plugging and Reclamation

Analysis

Geophysical Exploration—As with alternative A, minimal geophysical exploration is expected at Big South Fork NRRA, except for the limited possibility of conventional seismic lines in areas of existing roads where data could be acquired quickly and inexpensively, using seismic vibrator technology. As a result, impacts associated with geophysical exploration in alternative B would be very similar to the impacts described in alternative A, resulting from vegetation clearing, ground disturbance, vibrations, and especially noise from survey crews and vehicles, and would be short-term negligible adverse impacts on species of special concern.

Drilling and Production—Because the forecast of oil and gas activities in chapter 2 applies to all alternatives, impacts associated with up to 20 new wells in Big South Fork NRRA and up to 5 wells directionally drilled from outside the park unit in Obed WSR and well workovers/servicing would be very similar to the impacts described in alternative A. As described under alternative A, the construction and maintenance of access roads, wellpads, flowlines, and pipelines could destroy habitat and disturb or displace species of special concern in the park. Because of the restrictions at Obed WSR, including the No Surface Use restriction in the gorge, these operations would not be allowed within the park unit under alternative B. There would also be potential adverse impacts from leaks and spills and the chance of a short-term major impact from well blowouts, fires, or large uncontrolled releases.

However, where drilling and production operations would be permitted, mitigation measures (as described under alternative A) would avoid or minimize adverse impacts on species of special concern. Also, under alternative B the NPS would implement an oil and gas management plan that clearly articulates the CLPRs applicable to the exploration, production, and transportation of non-federal oil and gas resources in Big South Fork NRRA and Obed WSR. Additionally, increased inspections and monitoring under alternative B would proactively identify sites that may be impacting, or threatening to impact, park resources beyond the operations area. The 9B regulations would be enforced at any such sites, and operations found to pose a significant threat to federally owned or controlled lands or waters would be suspended by the superintendent until the threat is removed or remedied (see 36 CFR 9.33 and 9.51). The required biological surveys and/or assessments and consultations with state biologists would result in identification of potential impacts on species of special concern and their habitat, and the application of mitigation measures would result in short- to long-term negligible to minor adverse impacts on species of special concern with a more limited risk of major adverse effects from spills or leaks.

Plugging and Reclamation—As indicated in the forecast of oil and gas activities in chapter 2, plugging and reclamation of wells is expected to be the primary oil and gas operation conducted in Big South Fork NRRA and Obed WSR during the life of this plan. Between both park units, approximately 50 wells are expected to be plugged and reclaimed, resulting in the reclamation of approximately 87 acres of land.

Similar to alternative A, well plugging; shutting down, abandoning, and removing flowlines and pipelines; and use of heavy equipment and vehicles to reclaim sites would have the potential for releases of oil and other contaminating and hazardous substances, which could harm or kill protected plants, fish, and wildlife. However, performing biological surveys of the area that could be potentially impacted by proposed plugging, abandonment, and reclamation operations; identifying species of special concern; and applying appropriate mitigation, would result in reduced adverse impacts on species of special concern.

Under alternative B, plugging and reclamation procedures would follow the same mitigation as described for alternative A. Sites would be reclaimed by removing any contaminated soil or materials, grading the site to promote drainage and site reclamation, replacing topsoil, seeding with a selected mix of native herbaceous vegetation, and possibly planting. Weed-free native seed mixtures would be used to revegetate well sites and access roads, and site recovery would be monitored. In addition, under alternative B the NPS would implement an oil and gas management plan that clearly articulates the CLPRs applicable to the exploration, production, and transportation of non-federal oil and gas resources in Big South Fork NRRA and Obed WSR. This includes a new management framework for plugging and reclamation of wells, which would allow the NPS and operators to efficiently complete the compliance process for the plugging and reclamation of inactive wells that represent potential threats to park resources and values. This new management framework also includes goals and specific activities for protecting park resources and values during plugging and reclamation activities. Coupled with the mitigation described for alternative A and in appendix B, there would be localized short-term negligible to minor adverse impacts. Additionally, the new management framework for plugging and reclamation would increase the certainty that wells would be plugged and reclaimed to applicable standards, and therefore, the long-term beneficial effects described under alternative A would be more likely to be realized sooner.

Directionally Drilled Wells—As described under alternative A, wells directionally drilled and produced from outside the park units to bottomholes beneath them could indirectly impact species of special concern in the park. The types of impacts are expected to be similar to those described above for operations inside the park, but the intensity of impacts could increase for operations sited closer to the park boundary, where habitat disturbance or destruction could affect species of special concern. Impacts would depend on the proximity of operations to the park units, site-specific environmental conditions, and mitigation measures being employed. Based on these factors, indirect impacts on species of special concern in the park could range from no impact to localized to widespread, short- to long-term, minor adverse impacts, with the potential for major adverse impacts due to a well blowout, fire, or large uncontrolled release. In addition, there would be long-term beneficial impacts as a result of reclaiming the wellpads and access roads of well sites drilled from outside the park units.

Cumulative Impacts

Impacts on species of special concern from other actions that were considered under the cumulative impact scenario would be the same as described for alternative A. The adverse and beneficial effects of the cumulative actions, when combined with the short- and long-term negligible to minor adverse impacts as well as the long-term beneficial effects of alternative B, would result in short- and long-term minor to moderate adverse cumulative impacts on species of special concern. The more proactive planning and enforcement of CLPRs and increased inspections/monitoring would limit adverse impacts, but the majority of the impacts on species of special concern in the region would occur outside the park units, where impacts may or may not be mitigated. When compared to the broader area of analysis, alternative B would directly impact a relatively small area and would contribute minimally to overall cumulative impacts.

Conclusion

Similar to alternative A, limited geophysical operations under alternative B would result in short-term negligible adverse impacts on species of special concern from vegetation trimming, disturbance and noise during access and operations, and vibrations. In areas where non-federal oil and gas operations would be permitted in the park, drilling and production activities could result in short- to long-term negligible to minor adverse impacts on species of special concern from the direct loss of vegetation and habitat as a result of clearing, contouring, and construction and maintenance of the pads, roads, flowlines, pipelines, and other ancillary facilities. Mitigation, implementation of the oil and gas management plan, and identification of species of special concern and their habitat during biological surveys would serve to limit adverse impacts. Impacts from plugging and reclamation of wells at either park would result in localized short-term negligible to minor adverse impacts. Additionally, the new management framework for plugging and reclamation would increase the certainty that wells would be plugged and reclaimed to applicable standards, and therefore, the long-term beneficial effects described under alternative A would be more likely to be realized sooner. Wells directionally drilled and produced from outside the park to bottomholes beneath the park, and the reclamation of these wells, could indirectly impact species of special concern in the park, resulting in impacts ranging from no impact to indirect, localized to widespread, short- to long-term, minor adverse impacts. In addition, there would be long-term beneficial impacts as a result of reclaiming the wellpads and access roads of well sites drilled from outside the park units. Although up to major short-term adverse effects could occur in the unlikely event of a well blowout, fire, or uncontrolled release, the risk of that occurring is less under alternative B due to increased monitoring and inspections

The adverse and beneficial effects of the cumulative actions, when combined with the short- to long-term negligible to minor adverse impacts as well as the long-term beneficial effects of alternative B, there would be short-and long-term minor to moderate cumulative adverse impacts on species of special concern. When compared to the larger area of analysis, alternative B would directly impact a relatively small area and would contribute minimally to overall adverse cumulative impacts. Alternative B would provide long-term cumulative benefits due to its proactive management and enforcement and expedited well plugging

Alternative C: Comprehensive Implementation of the 9B Regulations, a New Management Framework for Plugging and Reclamation, and Establishment of Special Management Areas

Analysis

Geophysical Exploration—Impacts associated with geophysical exploration under alternative C would be similar to the impacts described in alternatives A and B. However, under alternative C, SMAs would be established to further protect resources and values particularly susceptible to adverse impacts from oil and gas operations, or areas where certain resources are important to maintaining the ecological integrity of the park units. Under alternative C geophysical exploration would not be allowed in any of the SMAs or associated setbacks at Big South Fork NRRA, with the exception of the Special Scenery SMA unless otherwise approved in a plan of operations. The SMA for Honey Creek and Twin Arches state natural areas was set aside primarily because of their rich, undisturbed forest communities that provide important habitat for many species of special concern. The SMAs for Sensitive Geomorphic Features and Cliff Edges would also protect species of special concern along with geology.

Since areas are protected by SMA restrictions and minimal geophysical exploration is expected and would include use of existing roads and pedestrian access, actions associated with geophysical exploration in alternative C (vegetation clearing, ground disturbance, vibrations, and especially noise from survey crews and vehicles) would have short-term negligible adverse impacts on listed species of special concern.

Drilling and Production—Because the forecast of oil and gas activities in chapter 2 applies to all alternatives, impacts associated with up to 20 new wells in Big South Fork NRRA and up to 5 wells directionally drilled from outside the park unit in Obed WSR and well workovers/servicing would be similar to the impacts described in alternatives A and B. In addition, the establishment of SMAs would further protect natural areas, including areas of Big South Fork NRRA and Obed WSR where resources and values would be particularly susceptible to adverse impacts from oil and gas operations, or areas where certain resources are important to maintaining the ecological integrity of the park units. Under alternative C, drilling and production would not be allowed in any of the SMA-associated setbacks at Big South Fork NRRA unless otherwise approved in a plan of operations. Drilling and production would be precluded in Obed WSR.

The increase of the standard 500-foot setback under section 9.41(a) (unless specifically authorized in an approved plan of operations) to a 1,500-foot setback where no oil and gas operations may occur for visitor-use, administrative, and other use areas, including water-oriented visitor use areas, in addition to the designation of Obed WSR SMA, the Cliff Edge SMA, the Sensitive Geomorphic Feature SMA, the State Natural Area SMA, and the Managed Fields SMA, would increase protection and improve habitat for species of special concern taxonomic groups such as fishes, amphibians, reptiles, and birds, as well as water-dependent invertebrate and plant species of concern that use these areas. In smaller SMAs, the added protection would primarily be provided for small mammals and invertebrates that occupy these areas. In larger SMAs, protection from additional habitat fragmentation would benefit all species of special concern listed in chapter 3. The increased setback from visitor-use and administrative areas, from a 500-foot setback to a 1,500-foot setback, would further reduce the potential impacts of oil and gas operations and activities on these areas. The 1,500-foot setback from rivers and streams that are habitat for mussel species of special concern and their fish hosts would reduce the possibility of impacts on mussels and other wildlife using these areas during nesting, breeding, and migration. Well blowouts, fires, or large uncontrolled releases could occur and cause short-term major adverse effects; however this would be an unlikely occurrence.

Undertaking the required biological surveys and consultations with state agency biologists before beginning drilling and production activities, would result in identification of potential impacts on species of special concern and their habitat. With implementation of an oil and gas management plan, the designation of SMAs, and the application of mitigation measures, impacts on species of special concern would be short to long term, negligible to minor, and adverse.

Plugging and Reclamation—As indicated in the forecast of oil and gas activities in chapter 2, plugging and reclamation of wells is expected to be the primary oil and gas operation conducted in Big South Fork NRRA and Obed WSR during the life of this plan. Between both park units, approximately 50 wells are expected to be plugged and reclaimed, resulting in the reclamation of approximately 87 acres of land. Similar to alternatives A and B, well plugging, shutting down and abandoning/removing flowlines and pipelines, and use of heavy equipment and vehicles during reclamation activities could cause harm to or mortality of plant, fish, and wildlife species of special concern. Required biological surveys and consultations with TWRA or other state agency biologists would result in identification of potential impacts on species of special concern and their habitat, and the application of appropriate mitigation measures would reduce adverse impacts on species of special concern.

Similar to alternative B, the NPS would implement an oil and gas management plan under alternative C that clearly articulates the CLPRs applicable to the exploration, production, and transportation of non-federal oil and gas resources in Big South Fork NRRA and Obed WSR. This includes a new management framework for plugging and reclamation of wells, which would allow the NPS and operators to efficiently complete the compliance process for the plugging and reclamation of inactive wells that represent potential threats to park resources and values. This new management framework also includes goals and specific activities for protecting park resources and values during plugging and reclamation activities. The establishment of SMAs would further protect natural areas, including areas of Big South Fork NRRA and Obed WSR where resources and values, including species of special concern, would be particularly susceptible to adverse impacts from oil and gas operations, or areas where certain resources are important to maintaining the ecological integrity of the park units. Park staff would evaluate all wells that are candidates for plugging and reclamation to determine their potential for impacts on park unit resources and values. Sites would be prioritized for plugging and reclamation based on a number of factors, including the proximity of well sites to SMAs.

Therefore, the new management framework and the establishment of SMAs to further protect park resources and values under alternative C would result in localized short-term negligible to minor adverse impacts on species of special concern at sites throughout the park units, and the long-term beneficial effects described under alternative A would be more likely to be realized sooner.

Directionally Drilled Wells—As described under alternatives A and B, wells directionally drilled and produced from outside the park units to bottomholes beneath them could indirectly impact listed species in the park. It is also possible that some wells may be directionally drilled from outside the SMAs to develop hydrocarbons underlying the SMAs. The types of impacts are expected to be similar to those described above for operations inside the park, but the intensity of impacts could increase for operations sited closer to the park or SMA boundary, where habitat disturbance or destruction could affect special status species. Impacts would depend on proximity to the park units, site-specific environmental conditions, and mitigation measures being employed. Based on these factors, indirect impacts on species of special concern in the park could range from no impact to localized to widespread, short- to long-term, minor adverse impacts, with the potential for major adverse impacts due to a well blowout, fire, or large uncontrolled release. In addition, there would be long-term beneficial impacts as a result of reclaiming the wellpads and access roads of well sites drilled from outside the park units.

Cumulative Impacts

The same actions identified as contributing cumulative effects under alternative A would apply to alternative C. The adverse and beneficial effects of the cumulative actions, when combined with the short- and long-term negligible to minor adverse impacts as well as the long-term beneficial effects of alternative C, would result in short- and long-term minor to moderate adverse cumulative impacts on species of special concern. Designation of SMAs under alternative C would minimize adverse impacts on these species in the SMAs and their setbacks, providing more consistent and certain protection in these areas, and would benefit several species dependent on geology, rivers, streams, wetlands, and forested areas. However, actions on adjacent lands have adversely affected and could continue to adversely affect these species or their habitat, often without adequate mitigation. When compared to the broader area of analysis, alternative C would directly impact a relatively small area and would contribute minimally to overall adverse cumulative impacts. Alternative C would provide long-term cumulative benefits due to its proactive management and enforcement, identification and protection of SMAs, and expedited well plugging.

Conclusion

Similar to alternatives A and B, limited geophysical operations would result in short-term negligible adverse impacts on species of special concern from vegetation trimming, disturbance and noise during access, and vibrations. Under alternative C, with adequate setbacks, implementation of mitigation measures, and the establishment of SMAs, impacts on species of special concern in the park from drilling and production would be long term, negligible to minor, and adverse. Impacts from plugging and reclamation of wells at either park would result in localized short-term to long-term minor adverse impacts on species of special concern. Additionally, the new management framework for plugging and reclamation would increase the certainty that wells would be plugged and reclaimed to applicable standards, and therefore, the long-term beneficial effects described under alternative A would be more likely to be realized sooner. Wells directionally drilled and produced from outside the park units to bottomholes beneath them could indirectly impact species of special concern, and effects could range from no impact to indirect, localized to widespread, short- to long-term, minor adverse impacts. In addition, there would be long-term beneficial impacts as a result of reclaiming the wellpads and access roads of well sites drilled from outside the park units. Although up to major short-term adverse effects could occur in the unlikely event of a well blowout, fire, or uncontrolled release, the risk of that occurring is less under alternative C due to increased monitoring and inspections.

Cumulative impacts under alternative C would be similar to those described for alternative B, with short- and long-term minor to moderate cumulative adverse impacts on species of special concern. When compared to the broader area of analysis, alternative C would directly impact a relatively small area and would contribute minimally to overall adverse cumulative impacts. Alternative C would provide long-term cumulative benefits due to its proactive management and enforcement, identification and protection of SMAs, and expedited well plugging.

SOUNDSCAPES

GUIDING REGULATIONS AND POLICIES

The NPS Organic Act (16 USC 1) establishes the NPS and authorizes the NPS "to conserve the scenery and the natural and historic objects and wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations." An important aspect of the natural communities that the NPS wishes to preserve within our national parks is the natural soundscape, which protects visitor experience as well as wildlife.

Regarding general park soundscape management, NPS *Management Policies 2006*, section 4.9, Soundscape Management, requires that the NPS "preserve, to the greatest extent possible, the natural soundscapes of parks." It also states the NPS "will restore to the natural condition wherever possible those park soundscapes that have become degraded by the unnatural sounds (noise), and will protect natural soundscapes from unacceptable impacts" (NPS 2006c, section 4.9, p. 56). Additionally, Director's Order 47: Soundscape Preservation and Management (NPS 2000) was developed to emphasize NPS policies "that will require, to the fullest extent practicable, the protection, maintenance, or restoration of the natural soundscape resource in a condition unimpaired by inappropriate or excessive noise sources." This Director's Order also directs park managers to measure acoustic conditions, differentiate existing or proposed human-made sounds that are consistent with park purposes, set acoustic goals based on the sounds deemed consistent with park purposes, and determine what noise sources are impacting the park units (NPS 2000).

METHODOLOGY, ASSUMPTIONS, AND IMPACT THRESHOLDS

The methodology used to assess impacts on the natural soundscape from the management of oil and gas operations in Big South Fork NRRA and Obed WSR is consistent with NPS *Management Policies 2006* (NPS 2006c) and Director's Order 47: Soundscape Preservation and Noise Management (NPS 2000). The policies require the type, magnitude, duration, and frequency of occurrence of noise to be described in the affected environment, as well as the significance of noise levels or impacts.

Impacts on the natural soundscape were assessed based on three general phases associated with oil and gas operations that would occur within Big South Fork NRRA and Obed WSR: (1) geophysical exploration, (2) drilling and production, and (3) plugging and reclamation. The specific activities associated with each phase were evaluated in terms of the types of equipment typically used, the potential duration and frequency of occurrence of the activities, and the potential approximate noise level generated at various distances from the noise sources. Each of these factors was subsequently used to determine the degree of the impact associated with the three phases of oil and gas operations relative to natural ambient sound levels within the park units as well as visitor use. As discussed in chapter 3, data collected at Great Smoky Mountains National Park was used as a surrogate for estimating the natural ambient sound levels within Big South Fork NRRA and Obed WSR, since the natural soundscape had not previously been studied at these two park units. Similarities between the geologic settings of Big South Fork NRRA, Obed WSR, and Great Smoky Mountains allowed for the use of surrogate data.

Potential noise levels at various distances from pieces of heavy construction equipment typically used during oil and gas operations were estimated (table 32). The Federal Highway Administration's (FHWA) Roadway Construction Noise Model contains a database of common construction equipment, which was developed from the largest urban construction project in the United States (the Central Artery Tunnel project in Boston, Massachusetts). The database includes a list of the noise levels produced by each piece of construction equipment at a distance of 50 feet, per the equipment specifications. Additionally, the Federal Transportation Administration Transit Noise and Vibration Impact Assessment guidelines contain typical equipment noise levels at 50 feet from the source (FHWA 2006). A drill-rig/rotary-drilling noise level was obtained from a noise analysis conducted for the Pinedale Anticline Oil and Gas Exploration and Development Project in Pinedale, Wyoming (BLM 1999). The report documents a measured noise level of 63 dBA from a typical drill in Wyoming at a distance of 200 feet. This noise level was used for the purposes of the analysis at Big South Fork NRRA and Obed WSR, although land in Wyoming may be generally sparsely vegetated or contain low-growing vegetation and few trees. It is assumed that in Big South Fork NRRA and Obed WSR, noise levels from a drill rig could be further attenuated at a distance of 200 feet. These references were used to subsequently approximate noise levels at distances beyond 50 feet, which may be audible within the park units. As the construction equipment may be thought of as point sources of noise, the radiation pattern is such that the noise level would drop off at a rate of 6 dBA per doubling of distance from the source, based solely on source geometry without taking site surface conditions into consideration (Caltrans 1998).

In addition to the stationary sources of noise from the expected construction equipment, during geophysical exploration, there is a potential for the use of seismic vibrator technology to create noise related to the generation of seismic waves (ground vibration) as well as truck engine noise. Consideration was also given to increased vehicular sources of noise due to transporting construction equipment and crew members to and from the well sites. Noise levels generated by vehicular sources vary by the volume of traffic, the speed of traffic, and the proportion of trucks included in the volume. Typically, the loudness of traffic noise is increased by heavier traffic volumes, higher speeds, and greater proportions of trucks (FHWA 1995). Additionally, inclines cause greater laboring of vehicle engines, thereby resulting in increased traffic noise levels, especially for heavy trucks. However, as the distance from the vehicular source increases, noise levels are affected by terrain features, man-made obstacles, vegetation, and the distance from the source in general. Typically, noise levels drop off at a rate of 3 dBA per doubling of distance from a traveling vehicular sound source (FHWA 1995). It is assumed that any vehicles traveling through the park would be traveling at slow speeds.

TABLE 32. EQUIPMENT NOISE LEVEL PREDICTIONS (dBA)

Distance from Source (feet)	Grader/Bulldozer/ Concrete Pump Truck/Chainsaw	Dump Truck	Front-End Loader	Drill Rig/Rotary Drilling	Concrete Mixer Trucks	Diesel Truck
50	85	84	80	75	82	88
100	79	78	74	69	76	82
200	73	72	68	63	70	76
400	67	66	62	57	64	70
800	61	60	56	51	58	64
1,600	55	54	50	45	52	58
3,200	49	48	44	39	46	52
6,400	43	42	38	33	40	46
12,800	37	36	32	27	34	40
25,600	31	30	26	21	28	34

Notes:

Equipment noise levels represent specification values for a reference distance of 50 feet from the equipment source.

Predicted noise levels beyond 50 feet from the source were estimated, using the Federal Highway's (see table 32) assuming a 6 dBA per doubling of distance drop-off rate for a point source (stationary equipment sources may be regarded as point sources) based solely on source geometry (Caltrans 1998).

Equipment noise levels at the distances shown in this table will vary based on additional attenuation measures, including vegetation, topography, and climate conditions.

Noise from a drill rig/rotary drilling was estimated based on a measured level of 63 dBA at 200 feet for a typical drill in Wyoming. Although land in Wyoming is generally more sparsely vegetated or contains low-growing vegetation, unlike Big South Fork NRRA and Obed WSR, this noise level is consistent with a report on air-rotary drilling published by the National Institute for Occupational Safety and Health (NIOSH 2009). The report identified noise levels of approximately 90 dBA measured within 6 feet of the rig. This level was extrapolated to 50 feet and compared to the extrapolated level at 50 feet from the Wyoming data. The levels were within 2 decibels of each other.

Two sets of thresholds were formulated for identifying soundscapes impacts, one of which is for developed areas of the park and the other for undeveloped areas of the park. Note that developed areas are the areas of the park with facilities and larger concentrations of visitors. Undeveloped areas lack park facilities other than roads or trails, and concentrations of visitors are usually low.

The impact intensity threshold definitions are based on the potential for changes to soundscape characteristics, as follows:

DEVELOPED AREAS OF THE PARK

Negligible: Natural sounds predominate and human-caused noise is rarely audible, except when in very close proximity to the source. When human noise is present, it is passing and occurs at measurable but low levels in local areas.

Minor: Natural sounds usually predominate and human-caused noise is infrequently audible. When noise is present, it is passing, occurs at low to medium levels in local areas, and is rarely audible at a distance.

Moderate: Human-caused noise is present occasionally at medium levels, but is relatively short-lived. When noise is present, it is occasionally audible at a distance from the source.

Major: Human-caused noise is commonly present throughout an area and masks natural sounds for extended periods. Medium and high noise levels are occasionally experienced when in close proximity to the source. Even at greater distances from the source, a natural soundscape free of human-caused noise exists less than 50% of the time.

UNDEVELOPED AREAS OF THE PARK

Negligible: Natural sounds predominate, although human-caused noise may be audible very infrequently in local areas. When noise is present, it is at very low levels (mostly immeasurable), passing, and rarely audible from a distance.

Minor: Natural sounds predominate, although human-caused noise is present occasionally in local areas. When noise is present, it is at measurable but at low levels, passing, and rarely audible at a distance.

Moderate: Human-caused noise is present occasionally across most of an area. When present, it is at medium levels that may mask natural sounds briefly, and may be audible at a distance.

Major: Human-caused noise is commonly present throughout an area and masks natural sounds for extended periods. Noise is audible at a distance and noise levels may be high in close proximity to the source.

IMPACT OF THE ALTERNATIVES

Alternative A: No Action (Current Management Continued)

Analysis

Geophysical Exploration—As discussed in "Chapter 2: Alternatives," minimal geophysical exploration is expected due to the abundance of subsurface geologic data that is available. Any geophysical exploration would most likely take the form of conventional seismic surveys in areas of existing roads where data could be collected quickly and inexpensively, using seismic vibrator technology. Lines would be laid on foot; therefore, potential sources of noise would result from the team of survey crew members working in the park units and noise from the vibrator truck used as the seismic source. Depending on the topography and vegetation, conditions of existing roadways, and the equipment needed for data collection, some vegetation clearing may be necessary; it is assumed such clearing could be done using small hand tools, such as chainsaws, handsaws, axes, and/or shovels.

Since it is likely that only conventional seismic surveys would be necessary, work would likely be completed in a period of 1 to 4 weeks, with most surveys lasting 1-3 days. Although activities associated with geophysical exploration would elevate ambient noise levels within the park units, work would be short in duration, lasting only the length of the survey period.

Per appendix B, there are numerous statutory and regulatory requirements as well as recommended mitigation measures applicable to geophysical exploration that would potentially reduce the degree of impacts. This includes prohibitions on oil and gas operations within the gorge in Big South Fork NRRA; the establishment of 500-foot setbacks per the 9B regulations; and deed restrictions that prohibit oil and gas operations on nearly all the federal lands within Obed WSR. If applied, any recommended mitigation measures that would avoid high visitor use areas, impose time stipulations, reduce vehicle speeds, and require the proper maintenance of equipment (refer to appendix B for details and specific mitigation measures) would reduce human-induced noise levels as well as the extent of elevated noise levels throughout the park. Additionally, such measures would provide temporary noise-free periods.

With the implementation of mitigation measures coupled with the expected short-duration and intermittent sources of elevated noise levels, impacts on the natural soundscape from human-induced noise sources would be short term, negligible to minor, and adverse in both developed and undeveloped areas of Big South Fork NRRA. Negligible impacts would mainly occur in areas at a distance from the geophysical operations, where noise could be occasionally discernible. Within Obed WSR, adverse impacts would be short term and negligible, since the 9B regulations and deed restrictions would prohibit oil and gas operations on nearly all federal lands within the boundaries of the park unit.

Drilling and Production—Based on the forecast of oil and gas activities, there would be up to 20 new wells in Big South Fork NRRA and up to 5 wells directionally drilled from outside the park unit in Obed WSR. It is also assumed that 125 wells at Big South Fork NRRA and 2 wells at Obed WSR would be worked over or serviced under this alternative, as staffing limitations and resources allow for review of the proposed projects

As mentioned above, most of the adverse impacts associated with oil and gas operations within either park unit would result from the drilling and production phase, as this phase necessitates the majority of the heavy construction equipment and has the potential to be long in duration. Potential sources of noise associated with drilling and production include the construction of roads and trails for accessing the site, preparation of the drill site, drilling operations, cement work, well servicing, and workover operations. Table 32 presents some of the typical construction equipment associated with each of these activities and their associated noise levels predicted at various distances from the source. As described in the "Methodology, Assumptions, and Impact Thresholds" section above, predicted levels are representative of noise attenuation at a rate of 6 dBA per doubling of distance from the sound source (the noise level drop-off rate from a stationary point source purely due to the geometry of the source). However, additional attenuation would be realized due to vast amounts of vegetation cover as well as intervening topography at the park.

Accessing new well locations in remote areas would require upgrading of existing roadways and/or construction of new roads and trails to accommodate heavy construction equipment and increased truck traffic. Subsequently, once the drill site is accessed, clearing, grading, cutting, filling, and leveling of the wellpad is required to prepare the drill site to accommodate the rig and other equipment. Common equipment used for the construction of access roads as well as preparation of the wellpad includes graders, bulldozers, front-end loaders, and dump trucks. Concrete mixer and pump trucks may also be used for the cementing of oil-well casing. As shown in table 32, graders, bulldozers, concrete mixer trucks, and dump trucks all produce similar noise levels at a distance of 50 feet (graders, bulldozers, and concrete mixer trucks produce 85 dBA, while dump trucks produce 84 dBA) and would be the loudest pieces of equipment used for site access and wellpad preparation. Compared to the likely range of wintertime noise levels within both park units of 24 to 33 dBA as well as the summertime range of 22 to 43 dBA (see "Chapter 3: Affected Environment"), human-induced noise levels would still exceed natural ambient noise levels as far as 6,400 feet from such equipment without considering attenuation from intervening topography or vegetation. At a distance of 12,000 to 25,000 feet (2.3 to 4.7 miles), noise levels would start to decrease to natural ambient noise levels. Actual noise levels produced during site access and wellpad preparation activities would be highly dependent, however, on the number of pieces of equipment used, combinations of equipment used in conjunction with one another, and the percentage of time the equipment is operating at full power. Additionally, actual noise levels at a distance from the sources would vary depending on topography features and the types of vegetation cover. Therefore, noise levels may be further reduced by such features, and in many parts of the park, distances at which noise levels are attenuated to the natural ambient level would likely be shorter.

After establishing access to the site and prepping the wellpad, mobilizing the drill rig and beginning the drill work would result in additional elevated noise levels. Specifically, hauling the drill rig and other equipment to the location would require about 10 to 25 large truckloads, as described in appendix H, thereby resulting in a temporary increase in vehicular sources of noise. Diesel trucks operating around the site typically produce a noise level of 88 dBA at 50 feet, which would begin to decrease to the natural ambient sound levels at a distance of 12,000 to 25,000 feet (2.3 to 4.7 miles), without considering attenuation from intervening topography, vegetation, and terrain. Elevated noise levels would also arise during drilling, which is a continuous, 24-hour-a-day, 7-day-a-week operation. As indicated in appendix H, rotary drilling is used almost universally in modern drilling. Based on the noise levels indicated in table 32, noise from a rotary drill would begin to attenuate to the natural ambient sound level at a distance of 6,400 feet (1.2 miles), not accounting for additional attenuating factors such as vegetation and topography. As described above, vegetation and topography would likely reduce the distance at which noise levels from heavy construction equipment would attenuate to the natural ambient level. Although noise levels associated with drilling operation equipment are similar to noise levels produced by construction and earthmoving equipment during the site access and wellpad prepping activities, the intensity of the impacts during drilling would potentially be greater due to the continuous nature of the drilling operation.

If the drilled wells are advanced to the production stage, the use of heavy construction equipment to lay pipelines would result in elevated noise levels similar to those described above for the site access, preparation, and drilling. Additionally, over the course of time that the well is in production, well servicing and workover operations may be necessary. Depending on the maintenance necessary, well servicing may last only 1 or 2 days, requiring minor equipment and a workover rig (a scaled-down drilling rig). Major workover operations may last more than a month and could require some limited drilling operations. The production phase would still necessitate the use of some noisy construction equipment, noise could be sporadic, occurring mainly during servicing operations, or more regular and continuous, especially for gas motors and pumpjacks on existing oil well operations. Activities leading up to the production phase that are mostly part of the drilling operations would likely result in the greatest intensity of impacts.

As described under geophysical exploration, there are numerous statutory and regulatory requirements as well as recommended mitigation measures applicable to drilling and production that would potentially reduce the degree of impacts. Such regulations include the prohibition of oil and gas operations within the gorge, the establishment of 500-foot setbacks per the 9B regulations, and deed restrictions within Obed WSR. An additional mitigation measure, not discussed under geophysical exploration, includes the scheduling of work during times least likely to affect threatened and endangered species per the ESA. Such mitigation would reduce noise-related impacts on wildlife and would also provide noise-free periods. As described under geophysical explorations, any recommended mitigation measures that would avoid high visitor use areas, impose time stipulations, reduce vehicle speeds, and require the proper maintenance of equipment (refer to appendix B for details and specific mitigation measures) would reduce human-induced noise levels as well as the extent of elevated noise levels throughout the park. Additional mitigation measures recommended specifically for the drilling and operation phase include avoiding direct impacts by siting surface operations outside the boundaries of the park units. This mitigation measure is applicable to both directionally drilled wells and production facilities. This measure would potentially reduce the degree of impacts, depending on the location of drilling and production facilities relative to the park boundaries. Further, mitigation measures to reduce sounds and durations of operations to minimize impacts on wildlife would also reduce the degree of the impact on the natural soundscape. The use of existing roadways would also substantially reduce the degree of impacts, considering that loud, heavy construction equipment is typically used for the construction of new roads and trails. Specifically, within Big South Fork NRRA recommendations to establish access roads adjacent to, but not within, the gorge area would reduce the level of adverse impacts on the gorge area. Additional mitigation measures specific to the drilling and production phase that would potentially reduce the degree and extent of impacts by reducing noise levels at the source include the use of electric motors rather than diesel engines and the incorporation of sound-absorbing materials and/or mufflers.

In general, considering the implementation of mitigation measures and given the temporary nature of activities within the drilling phase (constructing the access roads and preparing the wellpads would last several weeks to a month), the nature of construction equipment to be used, and the extent throughout the park units to which noise levels would remain above natural ambient noise levels, impacts would be short term, minor to moderate, and adverse within both park units in both developed and undeveloped areas. Adverse impacts associated with the production phase would be long term and minor to moderate, as production would continue to occur until the wells are depleted, but sources of noise over the course of production would be very sporadic, occurring when wells need to be serviced. Also, since there is a small potential for new production (RFD scenario indicates a total of 18 new wells for both park units and well workovers/servicing), drilling is expected to occur on a less frequent basis and most noise would be associated with the current production of oil and gas. Further, since the potential for new production is small and would occur over a period of 15 to 20 years, there could be years without drilling operations. The intensity of the impacts would potentially be greatest within the quietest areas of either park. Further, in areas with higher concentrations of visitors, elevated noise levels would interfere with the enjoyment of the natural quiet. Specifically within Obed WSR, the prohibition of oil and gas activities on nearly all federal lands coupled with the expected use of directional-drilling techniques (which minimizes activities within park boundaries) would potentially reduce impacts to minor, depending on the location of the drilling relative to the park boundary. Minor impacts would also result during quick (1- to 2-day) well-servicing procedures requiring small pieces of equipment.

Plugging and Reclamation—As indicated in “Chapter 2: Alternatives,” in addition to the production phase, the majority of the oil and gas activities within both park units would be associated with the plugging and reclamation phase. Activities associated with this phase that would potentially result in adverse impacts include the use of heavy construction equipment and trucks to reopen and repair access roads, remove production equipment and plug wells, and restore contours. Specifically, typical equipment used in opening up and/or repairing access roads includes a small bulldozer, backhoe, and hand tools (gas-powered chainsaw, shovels, axes, etc.). As indicated in table 32, bulldozers and chainsaws could produce 85 dBA at a distance of 50 feet from the source, while a backhoe would produce a noise level of 80 dBA (FHWA 2006). Noise levels would begin to decrease to the natural ambient sound levels at a distance of 3,200 to 6,400 feet, depending on the source, although attenuating factors including vegetation and topography would likely reduce this distance. Reopening and/or repair of access roads would likely be short term, lasting only a few days to weeks, depending on the condition of the roads. During reclamation, similar earthmoving equipment would be necessary in addition to a small dump truck for the potential removal of contaminated soils. The dump truck would produce noise levels similar to that of the earthmoving equipment (see table 32). Depending on the degree of contamination at the well site, reclamation could last a few days to a few years. During plugging, trucks and cement mixer and/or pumping trucks would be used, producing similar noise levels to the earthmoving equipment used during site access and reclamation (see table 32). Plugging would be short term, lasting only 2 to 5 days, depending on the equipment in the well, wellbore conditions, number of plugs to be set, and other factors.

Additional sources of noise associated with this phase would include the use of ORVs or pick-up trucks to transport people and supplies.

Under alternative A, plugging and reclamation activities would be guided by the 9B regulations, and environmental compliance for these operations would be conducted on a case-by-case basis, thereby potentially reducing impacts on the natural soundscape. As detailed in appendix B, recommended mitigation measures, including the use of methods to minimize surface disturbance to access wells within the gorge area at Big South Fork NRRA, reduction of vehicle speeds to minimize chances of injuring wildlife, and scheduling work during seasonal times least likely to affect threatened and endangered species, would also potentially reduce human-induced noise levels. Specifically, reductions in vehicle speed would result in quieter vehicle noise emissions, and limiting work periods to particular seasons would provide temporary noise-free periods. Minimizing surface disturbances to access wells may reduce the necessity for heavy construction equipment, thereby reducing the degree of impacts.

Considering the implementation of recommended mitigation measures, the potential use of heavy construction equipment associated with this phase, coupled with increased vehicle use and the number of wells proposed to be plugged and reclaimed under this alternative (including within the gorge area), impacts would cover a large extent of both park units. In general, impacts associated with this phase would be short term, moderate, and adverse due to the short duration of most activities and the nature of the equipment to be used. Additionally, as part of reclamation and per 9B regulations, natural conditions would be restored, which would include replacing natural soils for vegetation and the reestablishment of vegetation communities that can help attenuate noise by reflecting, scattering and absorbing sound and by providing the habitat that supports natural sounds. Such procedures would potentially create a long-term benefit to the natural soundscape.

Directionally Drilled Wells—Wells directionally drilled and produced from outside the park units to bottomholes beneath the park units could indirectly impact soundscapes in the park units. The types of impacts are expected to be similar to those described above for operations inside the park, but the intensity of impacts could be greater for operations sited closer to the park boundary. The drilling or plugging and reclamation of wells that have been directionally drilled would result in short-term minor to moderate adverse impacts, with the degree of impact dependent upon the location of the directionally drilled well relative to boundaries of either of the park units. In addition, there would be long-term beneficial impacts as a result of reclaiming the wellpads and access roads of well sites drilled from outside the park units.

Cumulative Impacts

With the continuing reduction of impacts from oil and gas activities in both park units stemming from increased plugging and reclamation, and a corresponding decrease in new drilling and production, impacts to soundscapes are expected to diminish and contribute less to cumulative impacts over time. Several past, present, and future actions discussed in the “Cumulative Impacts Scenario” section of this chapter would potentially contribute to adverse cumulative impacts on the natural soundscape of both park units while some of these actions would also potentially create beneficial impacts.

Construction, use, and maintenance of new and existing dirt roads; vehicular traffic, including ORV use and gravel hauling; park maintenance activities; logging and timber harvesting; agricultural activities; plugging and reclamation of oil and gas wells; and visitor activities within each park unit have the potential to contribute to adverse cumulative impacts by creating elevated human-induced noise levels above the natural ambient noise levels within each park unit. Specifically, use of heavy construction equipment would result in increases in noise within the park units. Past and current logging and agricultural activities within Obed WSR not only create an additional source of human-induced noise but potentially reduce the noise attenuation effects otherwise created by the forested lands.

In addition to activities occurring within park boundaries, development outside of each park (including industrial activities and commercial growth, coal mining, and surrounding residential development) could contribute to cumulative impacts. Such development increases the number of people within the surrounding areas, thereby adding more vehicles to nearby roadways that pass through the park units and run along park boundaries. Increased numbers of vehicles would potentially result in elevated levels of noise outside, and potentially within, the park boundaries, especially in Big South Fork NRRA along state highways 92 and 52. Coal bed methane/shale gas drilling is an ongoing activity in the vicinity of the park units, in addition to ongoing mining operations around the park units. Such activities could create elevated levels of human-induced noise within the park units, depending on the proximity of the operations to park boundaries as well as the noise levels produced at the coal mining sites. An additional source of noise both within and outside Big South Fork NRRA is the Big South Fork scenic railway, which runs through the gorge area of the park and is in planning for expansion north to Yamacraw. This expansion would increase the extent to which noise from the operation of the train impacts the natural soundscape of Big South Fork NRRA.

Although many of these actions would result in adverse impacts on the natural soundscape, beneficial impacts would also arise from some of the aforementioned actions, as well as from other actions. Specifically, the NPS plans to plug and reclaim 14 abandoned wells at Big South Fork NRRA through a cooperative agreement with the Tennessee Department of Environment and Conservation, Division of Water Pollution Control, and another 39 wells would soon be plugged over a period of about 2 years, using ARRA funding. The plugging and reclamation of these wells has resulted and would result in long-term beneficial impacts on the natural soundscape due to revegetation and its effects on sound attenuation. Additionally, the NPS has published an advance notice of proposed rulemaking in the Federal Register regarding a proposed rule to revise the 9B regulations governing non-federal oil and gas development within the boundaries of NPS units. Generally, the proposed changes focus on improving resource protection aspects of the regulations while accounting for advances in oil and gas technology and industry practices. Changes would also include enhancing incentives for operators to conduct directional drilling while minimizing indirect impacts of such operations. These changes could have long-term beneficial impacts on the natural soundscape, particularly from the use of directional drilling, which would locate heavy construction equipment and other noise sources associated with oil and gas operations outside of park boundaries. Further, focusing on resource protection measures would include consideration of impacts on the natural soundscape as an important park resource. Resource protection measures may impose certain timing stipulations, which would in turn provide noise-free periods within the park units.

Overall, the impacts of these actions, combined with the short-term and long-term negligible to moderate adverse impacts as well as the beneficial effects created by the implementation of alternative A, would result in short- and long-term minor to moderate adverse cumulative impacts on the natural soundscape. When compared to the broader area of analysis and the variety of cumulative actions, alternative A would directly impact a relatively small area and would contribute minimally to the overall cumulative impacts.

Conclusion

It is expected that limited geophysical explorations would result in potential short-term negligible to minor adverse impacts from noise related to work crews and use of seismic vibration technology. Based on the RFD scenario, most activities would be associated with the production of existing wells, while drilling and development of new well sites would be less frequent. The greatest intensity of impacts would be associated with equipment and vehicles used during the drilling and production phase, resulting in short-term to long-term minor to moderate adverse impacts. Long-term adverse impacts would arise from continuous production at existing wells until the wells are depleted, and noise would be sporadic over the course of production, occurring during well-servicing operations, as well as continuous from ongoing pumpjack and motor operation. Impacts on soundscapes associated with plugging and reclamation would be short term, minor to moderate, and adverse. As wells are plugged and abandoned, revegetation of the well sites would potentially allow for a return to the sound attenuation effects lost when native vegetation was cleared to establish the wellpad, a long-term beneficial impact. The drilling or plugging and reclamation of directionally drilled wells would result in short-term minor to moderate adverse impacts, with the degree of impact dependent on the location of the directionally drilled well relative to boundaries of either of the park units. In addition, there would be long-term beneficial impacts as a result of reclaiming the wellpads and access roads of well sites drilled from outside the park units.

The adverse and beneficial effects of past, present, and reasonably foreseeable future actions, when combined with the short-term and long-term negligible to moderate adverse impacts as well as the beneficial effects created by the implementation of alternative A, would create short- and long-term minor to moderate adverse cumulative impacts on the natural soundscape. When compared to the broader area of analysis and the variety of cumulative actions, alternative A would directly impact a relatively small area and would contribute minimally to the overall cumulative impacts.

Alternative B: Comprehensive Implementation of the 9B Regulations and a New Management Framework for Plugging and Reclamation

Analysis

Geophysical Exploration—As described under alternative A, minimal geophysical exploration is expected and would most likely take the form of conventional seismic surveys in areas of existing roads where data could be collected quickly and inexpensively, using seismic vibrator technology. As a result, impacts under alternative B from the noise associated with work crews, vehicles, and use of seismic vibration technology would be very similar to those described under alternative A, which would be short term, negligible to minor, and adverse.

Drilling and Production—Because the forecast of oil and gas activities in chapter 2 applies to all alternatives, impacts associated with up to 20 new wells in Big South Fork NRRA and up to 5 wells directionally drilled from outside the park unit in Obed WSR and well workovers/servicing would be very similar to the impacts described in alternative A.

As described under alternative A, most of the adverse impacts associated with oil and gas operations within either park unit would result from the drilling and production phase, as this phase necessitates the majority of the heavy construction equipment and has the potential to be long in duration. Potential sources of noise associated with drilling and production include the construction of roads and trails for accessing the site, preparation of the drill site, drilling operations, cement work, well servicing, and workover operations. Similar to alternative A, noise levels would be as loud as 85 dBA at the work site, from the use of such equipment as bulldozers, graders, cement mixer and pump trucks, dump trucks, drill rigs, and diesel trucks hauling large equipment and materials, and long-term sources of noise include pumpjacks and associated motors on oil wells.

However, under alternative B the NPS would implement an oil and gas management plan that clearly articulates the CLPRs applicable to oil and gas operations in order to provide for long-term protection of park resources and values, including the natural soundscape. Specifically, the NPS would conduct increased inspections and monitoring of both current and new operations to identify sites that may be impacting, or threatening to impact, park resources, rather than depending on the state for enforcement of regulations. The 9B regulations would be enforced at any such sites, and operations found to pose a significant threat to federally owned or controlled lands would be suspended by the superintendent until the threat is removed or remedied (see 36 CFR 9.33 and 9.51). Although this practice would be mostly beneficial to protecting park resources like water resources and soils, such inspections and monitoring would ensure established mitigation measures are being followed for all park resources, including the natural soundscape. Sound mitigation could be required under new plans of operation or increased inspections/enforcement, including replacing or servicing older motors on pumpjacks, which would reduce noise from existing operations in the parks. Additionally, NPS outreach and public education efforts that offer training to oil and gas operators would further promote protection of park resources.

The plan would promote long-term protection of park resources, including the natural soundscape, and provide for additional oversight and mitigation of some noisier operations, providing an improvement to the soundscape in certain areas of the parks. However, impacts from all operations would be similar to those under alternative A due to the nature of the drilling and production activities and associated equipment, and impacts would be short term to long term, ranging from minor to moderate, and adverse.

Plugging and Reclamation—Similar to the description under alternative A, activities associated with this phase that would potentially result in adverse impacts include the use of heavy construction equipment and trucks to reopen and repair access roads, remove production equipment and plug wells, and restore contours. As a result, impacts would be similar to those described under alternative A. However, the implementation of alternative B includes a new management framework developed specifically for plugging and reclamation activities. As part of this management framework, steps would be taken to create no additional redisturbance (vegetation removal and road repair). Requirements for developing access roads would be driven by plugging equipment needs. As such, the potential exists for reduced use of some heavy construction equipment, but also for several sites to be plugged simultaneously. Additionally, as part of reclamation, the management framework would require the restoration of natural conditions (per 9B regulations), which would include replacing natural soils for vegetation and the reestablishment of vegetation communities. Such procedures would allow for a return to the sound attenuation effects that would have been lost with the clearing of vegetation to develop the well site.

With the implementation of mitigation measures and consideration of the new management framework for plugging and reclamation, impacts would be short term, minor to moderate, and adverse. Additionally, the new management framework for plugging and reclamation would increase the certainty that wells would be plugged and reclaimed to applicable standards, and therefore, the long-term beneficial effects described under alternative A would be more likely to be realized sooner, albeit with the possibility of greater short-term impacts if multiple wells are plugged at the same time.

Directionally Drilled Wells—Wells directionally drilled and produced from outside the park units to bottomholes beneath the park units could indirectly impact soundscapes in the park units. The types of impacts are expected to be similar to those described above for operations inside the park, but the intensity of impacts could be greater for operations sited closer to the park boundary. The drilling or plugging and reclamation of wells that have been directionally drilled would result in short-term minor to moderate adverse impacts, with the degree of impact dependent upon the location of the directionally drilled well relative to boundaries of either of the park units. In addition, there would be long-term beneficial impacts as a result of reclaiming the wellpads and access roads of well sites drilled from outside the park units.

Cumulative Impacts

Impacts on the natural soundscape from actions considered under the cumulative impact scenario would be the same as described for alternative A. The adverse and beneficial effects of the cumulative actions, when combined with the short- and long-term negligible to moderate adverse impacts as well as the additional long-term beneficial impacts that could be realized under alternative B, would result in short-term and long-term negligible to moderate adverse cumulative impacts. Proactive enforcement of CLPRs and the plan itself may help limit noise impacts in the park, but noise impacts would remain from a variety of sources inside and outside the park boundary. When compared to the broader area of analysis and the variety of cumulative actions, alternative B would directly impact a relatively small area and would contribute minimally to the overall cumulative impacts.

Conclusion

Similar to alternative A, under alternative B limited geophysical explorations would result in potential short-term negligible to minor adverse impacts from the noise associated with work crews, vehicle/truck use, and seismic vibration equipment. Also similar to alternative A, it is expected that drilling and production conducted under alternative B would result in potential short-term to long-term minor to moderate adverse impacts on the natural soundscape. However, under alternative B, with increased inspections and the implementation of a management plan, there would potentially be some increased certainty that mitigation measures would be implemented to promote protection of park resources, including the natural soundscape, although the range of impacts would likely remain the same due to the nature of the activities and associated equipment. Impacts from plugging and reclamation would be short term, minor to moderate, and adverse, and could include increased short-term impacts if well plugging occurs in multiple locations at the same time. However, as wells are plugged and abandoned, long-term benefits would arise from the effects of revegetation on restoring sound attenuation. Additionally, the new management framework for plugging and reclamation established under alternative B would increase the certainty that wells would be plugged and reclaimed to applicable standards, and therefore, the long-term beneficial effects described under alternative A would be more likely to be realized sooner. The drilling or plugging and reclamation of directionally drilled wells would result in short-term minor to moderate adverse impacts, with the degree of impact dependent upon the location of the directionally drilled well relative to boundaries of either of the park units. In addition, there would be long-term beneficial impacts as a result of reclaiming the wellpads and access roads of well sites drilled from outside the park units.

The adverse and beneficial impacts of the cumulative actions, combined with the short- and long-term negligible to moderate adverse impacts as well as the additional long-term benefits that could be realized under alternative B, would result in short-term and long-term negligible to moderate adverse cumulative impacts. When compared to the broader area of analysis and the variety of cumulative actions, alternative B would directly impact a relatively small area and would contribute minimally to the overall cumulative impacts. Alternative B would provide long-term cumulative benefits due to its proactive management and enforcement and expedited well plugging.

Alternative C: Comprehensive Implementation of the 9B Regulations, a New Management Framework for Plugging and Reclamation, and Establishment of Special Management Areas

Analysis

Geophysical Exploration—Implementation of alternative C would result in impacts from geophysical exploration similar to those described for alternatives A and B, simply due to the equipment needs for the activity. However, unlike alternatives A and B, which allow for oil and gas operations in all areas of the park where federal rights exist and where CLPRs do not prohibit such activities, under alternative C, SMAs would be created to further protect resources and values particularly susceptible to adverse impacts from oil and gas operations and operations may be limited or restricted in SMAs unless otherwise approved in a plan of operations. Specifically, seven SMAs would be established that restrict geophysical exploration by a No Surface Use provision (geophysical exploration would be allowed within the Special Scenery SMA). Additional restrictions would be imposed by the creation of setbacks ranging from a 100- to 1,500-foot radius (depending on the SMA and its purpose) extending from the boundary of the SMA. Within this radius, geophysical exploration would also be restricted. Although SMAs and associated setbacks would reduce noise levels within the SMAs by resulting in the noise source being located farther from the SMA, elevated noise levels would still result in locations where operations are occurring. Additionally, timing stipulations for geophysical operations would be created within the Visitor Use, Administrative Areas, and Trails SMAs as well as the Cultural Landscapes and Cemeteries SMA that would provide for an approximate 6-month period (April to October) of limited geophysical operations. As such, temporary noise-free periods may be established during this time within those areas of Big South Fork NRRA.

Since minimal geophysical exploration is expected and would include the use of existing roads as well as pedestrian access, and SMA restrictions would limit noise in sensitive areas, impacts from geophysical operations are expected to be short term, negligible, and adverse.

Drilling and Production—Because the forecast of oil and gas activities in chapter 2 applies to all alternatives, impacts associated with up to 20 new wells in Big South Fork NRRA and up to 5 wells directionally drilled from outside the park unit in Obed WSR and well workovers/servicing would be very similar to the impacts described under alternative A. However, unlike alternatives A and B, under alternative C, SMAs would be created that restrict drilling and production operations by a No Surface Use provision, unless otherwise approved in a plan of operations. Additional restrictions would be imposed by the creation of setbacks ranging from a 100- to 1,500-foot radius (depending on the SMA and its purpose) extending from the boundary of the SMA. Within this radius, drilling and production would also be restricted. As a result, there is an increased chance for directional drilling, which would locate noisy equipment and activities away from SMAs and possibly outside the park boundaries, thereby reducing noise levels from future operations within SMAs and possibly the park. The locations within the park boundaries where noise levels would be reduced to the natural ambient level would be dependent on the location of the directional-drilling activity relative to the park boundaries. For wells drilled within the park, outside the SMAs and setbacks, noise levels would be reduced within the SMAs, although not to the natural ambient level. As setbacks range from 100 to 1,500 feet, noise levels produced by drilling and production would still be relatively high compared to natural ambient noise levels at the boundaries of the SMAs (refer to table 32 for projected noise levels of bulldozers, graders, cement mixer and pump trucks, drill rigs, and diesel trucks). Depending on the distance from SMA boundary, noise levels would be further reduced but would still be above ambient noise levels for approximately 2 to 4 miles from the source (see table 32). As with geophysical operations, timing stipulations would be created within the Visitor Use, Administrative Areas, and Trails SMAs as well as the Cultural Landscapes and Cemeteries SMA that would provide for an approximate 6-month period (April to October) of limited drilling and production operations. Such stipulations would also be set for drilling activities in the Special Scenery SMA. As such, temporary noise-free periods or periods of reduced noise may be established during this time in that specific area of the park.

Impacts on the natural soundscape from drilling and existing production would range from short term to long term, minor to moderate, and adverse, as described under alternative B. However, compared to alternatives A and B, with the implementation of SMAs and associated setbacks noise levels may be reduced within the certain areas of the park units, especially in Big South Fork NRRA, since Obed WSR currently has deed restrictions restricting operations within the park boundary. Timing stipulations that limit drilling and production would potentially reduce adverse impacts to minor, depending on whether operations are scaled down or shut down completely. If operations cease for periods of time, short-term, beneficial impacts would result.

Plugging and Reclamation—Impacts from plugging and reclamation of depleted and abandoned wells would be similar to those described for alternative B, particularly since this phase would generally be guided by the 9B regulations and the new management framework that was described under alternative B. As part of reclamation, the management framework would promote the restoration of natural conditions (per 9B regulations), which would include replacing natural soils for vegetation and the reestablishment of vegetation communities. Such procedures would allow for a return to the sound attenuation effects that would have been lost with the clearing of vegetation to develop the well site.

Although the same wells identified for plugging and reclamation under alternative B would also be identified under alternative C as part of the new management framework, under alternative C the NPS would consider the proximity of well sites to the SMAs when prioritizing wells for plugging and reclamation. Such considerations would temporarily reduce the potential for impacts in those locations until the wells near such SMAs are in need of plugging and reclamation.

Similar to alternative B, impacts would be short term, minor to moderate, and adverse, although with less impact on areas protected with SMA designations and setbacks. As wells are plugged and reclaimed, some additional long-term beneficial effects would arise from the enforcement of 9B regulations to reestablish native vegetation that can attenuate noise.

Directionally Drilled Wells—Wells directionally drilled and produced from outside the park units to bottomholes beneath the park units could indirectly impact soundscapes in the park units. The types of impacts are expected to be similar to those described above for operations inside the park, but the intensity of impacts could be greater for operations sited closer to the park boundary. The drilling or plugging and reclamation of wells that have been directionally drilled would result in short-term minor to moderate adverse impacts, with the degree of impact dependent upon the location of the directionally drilled well relative to boundaries of either of the park units. In addition, there would be long-term beneficial impacts as a result of reclaiming the wellpads and access roads of well sites drilled from outside the park units.

Cumulative Impacts

Impacts on the natural soundscape from actions considered under the cumulative impact scenario would be the same as described for alternative A. The effects of these actions, when combined with the short- and long-term negligible to moderate adverse impacts as well as the additional short-term and long-term beneficial impacts that could be realized under alternative C, would result in short-term and long-term negligible to moderate adverse cumulative impacts. The SMA restrictions would provide more consistent protection of natural soundscapes in and around the SMAs, but noise from adjacent lands could continue to adversely impact the park units. When compared to the broader area of analysis and the variety of cumulative actions, alternative C would directly impact a relatively small area and would contribute minimally to the overall cumulative impacts. Alternative C would provide long-term cumulative benefits due to its proactive management and enforcement, SMA identification and protection, and expedited well plugging.

Conclusion

It is expected that geophysical explorations conducted under alternative C would result in potential short-term negligible adverse impacts from the presence and activities of work crews and vehicle/truck use. Drilling and production conducted under alternative C would result in potential short-term to long-term minor to moderate adverse impacts on the natural soundscape, as described under alternatives A and B. However, under alternative C the opportunity for directional drilling would more likely be realized and could therefore reduce future noise levels within Big South Fork NRRA or in SMAs. Also similar to alternative B, impacts under alternative C from plugging and reclamation would be short term, minor to moderate, and adverse, but the new management framework for plugging and reclamation established under alternative C would increase the certainty that wells would be plugged and reclaimed to applicable standards, and therefore, the long-term beneficial effects described under alternative A would be more likely to be realized sooner. The drilling or plugging and reclamation of directionally drilled wells would result in short-term minor to moderate adverse impacts, with the degree of impact dependent upon the location of the directionally drilled well relative to the boundaries of either of the park units. In addition, there would be long-term beneficial impacts as a result of reclaiming the wellpads and access roads of well sites drilled from outside the park units.

Cumulative impacts would be similar to those described for alternative B, with short-term and long-term negligible to moderate adverse cumulative impacts. The actions under alternative C would help ensure protection of natural soundscapes in certain areas of the park units. When compared to the broader area of analysis and the variety of cumulative actions, alternative C would directly impact a relatively small area and would contribute minimally to the overall cumulative impacts. Alternative C would provide long-term cumulative benefits due to its proactive management and enforcement, SMA identification and protection, and expedited well plugging.

CULTURAL RESOURCES

GUIDING REGULATIONS AND POLICIES

Federal actions that have the potential to affect cultural resources are subject to a variety of laws. The National Historic Preservation Act of 1966 (as amended) is the principal legislative authority for managing cultural resources associated with NPS projects. Generally, Section 106 of the act requires all federal agencies to consider the effects of their actions on cultural resources listed on or determined eligible for listing on the National Register of Historic Places (NRHP). Such resources are termed historic properties. Agreement on how to mitigate effects on historic properties is reached through consultation with the State Historic Preservation Officer; the Tribal Historic Preservation Officer, if applicable; and the Advisory Council on Historic Preservation, as necessary. In addition, federal agencies must minimize harm to historic properties that would be adversely affected by a federal undertaking. Section 110 of the act requires federal agencies to establish preservation programs for the identification, evaluation, and nomination of historic properties to the NRHP.

The National Historic Preservation Act established the NRHP, the official list of the nation’s historic places worthy of preservation. Administered by the NPS, the NRHP is part of a national program to coordinate and support public and private efforts to identify, evaluate, and protect America’s historic and archeological resources. The criteria applied to evaluate properties are contained in 36 CFR 60.4. The quality of significance in American history, architecture, archeology, engineering, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association, and:

- that are associated with events that have made a significant contribution to the broad patterns of our history; or
- that are associated with the lives of persons significant in our past; or

- that embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or
- that have yielded or may be likely to yield, information important in prehistory or history (36 CFR 60.4).

Cultural resources that meet the eligibility criteria for listing on the NRHP are considered “significant” resources and must be taken into consideration during the planning of federal projects.

Other important laws or Executive Orders designed to protect cultural resources include, but are not limited to:

- NPS Organic Act—to conserve the natural and historic objects within parks unimpaired for the enjoyment of future generations
- American Indian Religious Freedom Act—to protect and preserve for American Indians access to sites, use and possession of sacred objects, and freedom to worship through ceremonials and traditional rites
- Archeological Resources Protection Act—to secure, for the present and future benefit of the American people, the protection of archeological resources and sites that are on public lands and Indian lands
- NEPA—to preserve important historic, cultural, and natural aspects of our national heritage
- Executive Order 11593 (Protection and Enhancement of the Cultural Environment)—to provide leadership in preserving, restoring, and maintaining the historic and cultural environment of the United States
- Executive Order 13007 (Indian Sacred Sites)—to accommodate access to and ceremonial use of Indian sacred sites by Indian religious practitioners and avoid adversely affecting the physical integrity of such sacred sites

Through the legislation and Executive Orders listed above, the NPS is charged with the protection and management of cultural resources in its custody. This is further implemented through Director’s Order 28: Cultural Resource Management (NPS 1998c), NPS *Management Policies 2006* (NPS 2006c), and the 2008 “Programmatic Agreement among the NPS (U.S. Department of the Interior), the Advisory Council on Historic Preservation, and the National Conference of State Historic Preservation Officers for Compliance with Section 106 of the *National Historic Preservation Act*” (NPS 2008e). These documents charge NPS managers with avoiding, or minimizing to the greatest degree practicable, adverse impacts on park resources and values. Although the NPS has the discretion to allow certain impacts in park units, that discretion is limited by the statutory requirement that park resources and values remain unimpaired, unless a specific law directly provides otherwise.

METHODOLOGY, ASSUMPTIONS, AND IMPACT THRESHOLDS

The NPS categorizes cultural resources by the following categories: archeological resources, historic structures, cultural landscapes, museum objects, and ethnographic resources. A review of reference materials regarding cultural resources within the park units, as well as communications with NPS staff, was completed to identify and evaluate potential impacts on cultural resources. Museum objects would not be affected by this plan and are not discussed further in this section.

Cultural resources are an important component of Big South Fork NRRA and Obed WSR. Only a portion of the two park units has been formally inventoried for cultural resources. The Big South Fork NRRA contains more than 1,600 documented archeological sites, which may represent only 40% of the estimated total for the park unit. However, none of these has been evaluated for eligibility to the NRHP. In addition, 13 farm buildings, 4 bridges, and a coal tipple at Big South Fork NRRA are considered eligible for listing in the NRHP. Several recognized and administrative cultural landscapes exist within the boundaries of Big South Fork NRRA, including the "Rural Historic District," farmsteads, cemeteries, bridges, and other features.

An estimated 340 rock shelters may exist within Obed WSR, none of which have been evaluated as eligible for the NRHP. There are currently no historic structures eligible for listing on the NRHP at Obed WSR. Although there are some possible cultural landscapes, no features or landscapes at Obed WSR are currently managed as such.

Ethnographic consultations were initiated as part of this planning process, but at this time, no specific ethnographic resources that might be affected by oil and gas developments have been identified. Consultation with the seven tribes and other park-affiliated communities, as described in chapter 3, would be undertaken as project-specific plans of operations are developed, in the effort to identify ethnographic resources and associated community concerns and ensure that they are not adversely impacted by proposed oil and gas operations.

Oil and gas operations can adversely impact cultural resources if proper surveys and protection measures are not implemented. However, federal laws and regulations and NPS policies provide management tools for protection and management of cultural resources. The impact intensity threshold definitions are based on the potential for changes to cultural resource characteristics, as follows:

Archeological Resources

Negligible: The impact would be at the lowest levels of detection or barely measurable, with no perceptible consequences, to archeological resources.

Minor: The impact on archeological sites is measurable or perceptible, but it is slight and affects a limited area of a site or group of sites. The impact does not affect the character defining features of a NRHP eligible or listed archeological site and would not have a permanent effect on the integrity of any archeological sites or result in loss of important information potential.

Moderate: The impact is measurable and perceptible. The impact changes one or more character defining feature(s) of an archeological resource but does not diminish the integrity of the resource to the extent that its National Register eligibility is jeopardized. Disturbance of a site would not result in a substantial loss of important information.

Major: The impact on archeological sites is substantial, noticeable, and permanent. The impact is severe or of exceptional benefit. For National Register eligible or listed archeological sites, the impact changes one or more character defining features(s) of an archeological resource, diminishing the integrity of the resource to the extent that it is no longer eligible for listing in the National Register. Disturbance of a site would be substantial and would result in the loss of most or all of the site and its potential to yield important information.

Historic Structures

Negligible: The impact would be at the lowest level of detection or barely perceptible and not measurable.

Minor: The impact on historic structures is measurable or perceptible, but it is slight and affects a limited area of a site or group of sites. The impact does not affect the character defining features of NRHP eligible or listed properties and would not have a permanent effect on the integrity of any historic structures.

Moderate: The impact is measurable and perceptible. The impact changes one or more character defining feature(s) of historic structures but does not diminish the integrity of the resource(s) to the extent that National Register eligibility is jeopardized.

Major: The impact on historic structures is substantial, noticeable, and permanent. For National Register eligible or listed historic structures, the impact changes one or more character defining features(s) of the resource, diminishing the integrity of the resource to the extent that it is no longer eligible for listing in the National Register.

Cultural Landscapes

Negligible: The impact would be at the lowest levels of detection or barely perceptible and not measurable.

Minor: The impact on cultural landscapes is measurable or perceptible, but it is slight and affects a limited area. The impact would not affect the character-defining features of a cultural landscape listed on or eligible for the NRHP.

Moderate: The impact is measurable and perceptible. The impact would alter character-defining features of the cultural landscape but would not diminish the integrity of the landscape to the extent that its NRHP eligibility would be jeopardized.

Major: The impact on cultural landscapes is substantial, noticeable, and permanent. The impact would alter character-defining features of the cultural landscape, diminishing the integrity of the resource to the extent that it would no longer be eligible for NRHP listing.

Ethnographic Resources

Negligible: The impact would be barely perceptible and would neither alter resource conditions, such as traditional access or site preservation, nor the relationship between the resource and the affiliated group's body of beliefs and practices.

Minor: The impact would be slight but noticeable and would neither appreciably alter resource conditions, such as traditional access or site preservation, nor the relationship between the resource and the affiliated group's body of beliefs and practices.

Moderate: The impact would be apparent and would alter resource conditions. The alteration would interfere with traditional access, site preservation, or the relationship between the resource and the affiliated group's beliefs and practices, even though the group's beliefs and practices would survive.

Major: The impact would alter resource conditions. The alternative would block or greatly affect traditional access, site preservation, or the relationship between the resource and the affiliated group's body of beliefs and practices, to the extent that the survival of a group's beliefs and/or practices would be jeopardized.

IMPACT OF THE ALTERNATIVES

Alternative A: No Action (Current Management Continued)

Analysis

Geophysical Exploration—As described in the forecast of oil and gas activities in chapter 2, minimal geophysical exploration is expected at Big South Fork NRRA, except for the limited possibility of conventional seismic lines in areas of existing roads where data could be acquired quickly and inexpensively, using seismic vibrator technology. Therefore, since designated existing access roads would be used and lines would be laid on foot, without the use of heavy vehicles or ORVs, there would be limited impacts on surface cultural resources. Because of the restrictions at Obed WSR, these operations would not be allowed within the park unit.

Archeological Resources—Impacts on cultural resources from geophysical exploration could occur as a result of the vibrations caused by the proposed seismic vibrator technology, including settling and burial of artifacts located in soft soils, and collapses of features due to oscillation and ground motion. Increased access to areas by exploration crews could lead to intentional and unintentional vandalism. Illegal collection of or damage to previously unidentified cultural resources listed or eligible for listing on the NRHP would constitute an indirect adverse impact. However, cultural resource surveys would be conducted as deemed necessary by resource specialists, and with application of the mitigation measure that states that operators will not alter, destroy, or collect any object, structure, or site of historical, archeological, or cultural value (appendix B), geophysical surveys would result in long-term, negligible to minor, adverse impacts on archeological resources.

Historic Structures—Possible impacts on historic structures located within the vibration zone include cracking of foundations, breaking of glass window panes, settling and burial of artifacts located in soft soils, and collapse of structures and features due to oscillation and ground motion. Currently, there are 13 Cumberland-style farm structures that have been assessed as eligible for inclusion in the NRHP (NRHP 2009; Des Jean 2010). Additionally, three abandoned railroad bridges, a vehicular low-water timber bridge, and a large steel coal-mine tipple have also been identified as eligible for inclusion in the NRHP (NPS 1996). Currently, there are no sites listed in the NRHP at Obed WSR (NRHP 2009). With application of the mitigation measure that states that operators will not alter, destroy, or collect any object, structure, or site of historical, archeological, or cultural value (appendix B), and with the application of offsets from historic structures in plans of operation, there would be localized, long-term, negligible, adverse impacts on historic structures associated with these sites.

Cultural Landscapes— Eight cultural landscapes, including those eligible for listing on the NRHP (Parch Corn Creek, Litton Slaven farm site, Oscar Blevins farm site, Lora Blevins farm site, Ranse Boyatt farm site), must be protected from non-federal oil and gas operations at Big South Fork NRRA. The noise from the seismic vibrator operations and the sight of the work crews and their equipment could adversely impact how visitors experience the cultural landscape at these sites (see also the "Soundscapes" and "Visitor Use and Experience" sections). With application of the mitigation measures described in appendix B, including conducting surveys to document the location and significance of any cultural landscapes, there would be localized short-term minor adverse impacts on the cultural landscapes associated with these sites.

Ethnographic Resources—Consultation with the seven tribes, as described in chapter 3, would be undertaken as project-specific plans of operations are developed, in the effort to identify ethnographic resources and associated community concerns and ensure that they are not adversely impacted by proposed oil and gas operations. As a result, exploration operations that could occur in the park units would result in no impact or negligible adverse impacts on potential ethnographic resources.

Drilling and Production—Similar to geophysical surveys, drilling operations are relatively short term. However, the intensity of impacts is much higher, due to the equipment and materials needed to drill a well and the potential duration of the operation. Site preparation may include extensive clearing, grading, cutting, filling, and leveling of the wellpad using heavy construction equipment. Soil material suitable for plant growth is often removed first and stockpiled for later use in reclamation. The operator may also dig reserve pits to hold large volumes of drilling mud and drill cuttings.

Surface drilling and production operations (including the placement of flowlines) would not directly impact cultural resources in areas where operations would not be permitted under CLPRs, including the 9B regulations, the gorge restrictions at Big South Fork NRRA, and deed restrictions at Obed WSR. As described in the forecast of oil and gas activities in chapter 2, only up to 20 new wells are expected in Big South Fork NRRA, and only up to 5 wells, directionally drilled from outside the park unit, are expected in Obed WSR, plus well workovers/servicing.

Archeological Resources—Potential adverse impacts on cultural resources from the construction and maintenance of access roads, wellpads, flowlines, and pipelines on up to 36 acres in Big South Fork NRRA under the RFD scenario would be avoided or mitigated by applying CLPRs, particularly those of the National Historic Preservation Act, and through consultation with the State Historic Preservation Officer. The NPS would require that a qualified third-party monitor be present during appropriate operational phases to help protect subsurface resources. If buried cultural resources cannot be avoided, impacts would be mitigated by recovery of data (excavation) and preservation of recovered materials and associated records. However, any loss of undetected buried cultural resources would have an irreversible adverse impact. Increased access to areas by drilling crews could lead to intentional and unintentional vandalism. Illegal collection of or damage to previously unidentified cultural resources listed or eligible for listing on the NRHP would constitute an indirect adverse impact.

It is possible that important cultural sites may not be visible from the surface and could be damaged by construction activities associated with drilling and production. This would have a long-term minor to moderate adverse impact on individual archeological sites; however, the impact on archeological resources as a whole would likely be minor or less. Most of the known archeological sites can be protected from direct impacts from road construction and well drilling and production by avoidance. When significant sites cannot be avoided, impacts would be avoided or mitigated by excavating the site, using methodologies defined in a reviewed and approved research design.

Historic Structures—All of the known historic structures are visible and would not be damaged by construction activities associated with drilling and production. Impacts relating to noise effects on the visitor experience of viewing historic structures is included in the "Visitor Use and Experience" section, below. With application of the mitigation measure that states operators will not alter, destroy, or collect any object, structure, or site of historical, archeological, or cultural value, the sites can be protected from direct impacts from road construction and well drilling and production by avoidance. With this mitigation, impacts would be negligible and adverse.

Cultural Landscapes—Visual impacts from drilling and production operations on cultural landscapes would be more substantial if wellpads were placed in relatively close proximity to the sites, where visitors would be able to see the operation and all associated equipment and tanks. Exploratory drill rigs can reach heights of 180 feet, which would be readily visible through clearings and open spaces. The operations, especially drilling, would increase the presence of work crews and equipment. Although drilling is a 24-hour operation, it is temporary and would have short-term minor to moderate adverse impacts. Long-term minor adverse impacts could occur to cultural landscapes from the visual presence of wellpads, and impacts could occur to visitor experience of cultural landscapes, which is included in the "Visitor Use and Experience" section, below.

Ethnographic Resources—Ethnographic resources consist mainly of the cultural values of the tribes claiming traditional associations with the area. Consultation with the seven tribes, as described in chapter 3, would be undertaken as project-specific plans of operations are developed, in the effort to identify ethnographic resources and associated community concerns and ensure that they are not adversely impacted by proposed oil and gas operations. As a result, new drilling and production would result in negligible to minor adverse impacts on potential ethnographic resources.

All Cultural Resources—The NPS recognizes that unplanned incidents associated with oil and gas operations such as well blowouts, fires, and major spills within the boundaries of the park present a risk of release of contaminants that can adversely impact cultural resources, especially historic structures and cultural landscapes if they are in the vicinity of the release or fire. However, the incident rates for such incidents are low and are not a typical expectation of project implementation. If such an incident did occur, required mitigation measures such as use of blowout preventers and implementation of SPCC plans would result in lessening the potential for spilled substances or a well fire to spread into the park, and for timely response and cleanup, so that there is a reasonable expectation that long term adverse impacts would not occur or be limited to minor to moderate levels of intensity, although there could be major adverse impacts that could be considered long-term, since impacts to cultural resources are generally not reversible. In the event that the park's resources or values are damaged, the NPS could seek remedy both on the ground and in the form of monetary compensation.

Plugging and Reclamation—As described in the forecast of oil and gas activities in chapter 2, it is assumed that approximately 50 wells at the park units would be plugged and reclaimed under this alternative. Full-scale reclamation could include the following removal of structures, equipment, and debris used or generated during operations; removal or remediation of contaminated soils; and recontouring of disturbed areas to near original grade.

Archeological Resources—Well plugging; shutting down, abandoning, and removing flowlines and pipelines; and use of heavy equipment and vehicles during reclamation activities could disturb and compact soil, increase soil erosion, and release oil and other contaminating and hazardous substances. Application of CLPRs, particularly National Historic Preservation Act requirements, would prevent adverse impacts on known archeological resources from plugging, abandonment, and reclamation operations. It is assumed that previously drilled wells have already disturbed any extant cultural sites. However, during reclamation activities within the Big South Fork NRRA, it is possible that soils containing cultural material would be disturbed, thus displacing or destroying subsurface artifacts and resulting in long-term minor adverse impacts.

Historic Structures—Potential adverse impacts on historic structures from plugging, abandonment, and reclamation operations include the displacement of or damage to built features from vibrations and/or movement of soils containing structural remains, which would be avoided or mitigated by applying CLPRs, particularly those of the National Historic Preservation Act. Through consultation with the State Historic Preservation Officer, mitigation would be identified to reduce adverse effects, and adherence to this mitigation would result in localized long-term negligible to minor adverse impacts on historic structures throughout the park units.

Cultural Landscapes—The noise from the drill rigs and the sight of the work crews and their equipment could adversely impact how visitors experience the cultural landscape at these sites, as discussed further in the “Visitor Use and Experience” section, and introduce ground disturbance to the landscape. However, reclamation of sites and replanting with native vegetation would restore the natural character of the area, and may lessen any impacts related to disturbance in cultural setting or landscape. Consultation with the State Historic Preservation Officer would be conducted to identify mitigation to reduce adverse effects. There could be both short-term minor adverse impacts and long-term beneficial impacts on cultural landscapes as a result of plugging and reclamation.

Ethnographic Resources— Impacts could include limited access to or use of sacred sites or effects on the physical integrity of the sites. Consultation with the seven tribes, as described in chapter 3, would be undertaken as project-specific plans of operations are developed, in the effort to identify ethnographic resources and associated community concerns and ensure that they are not adversely impacted by proposed oil and gas operations. As a result, plugging and reclamation activities would result in negligible or minor adverse impacts on potential ethnographic resources.

Directionally Drilled Wells—Impacts on cultural resources in Obed WSR (and Big South Fork NRRA, if it should occur) from wells directionally drilled from outside the park to bottomholes beneath the park could occur, but would be limited, since the operations would not be on park property. Unknown subsurface archeological resources could be damaged by drilling through sites and cultural materials at drilling locations outside the park, but it is unlikely that archeological sites in the park would be disturbed, due to the depth of the directional boreholes. Runoff or erosion could occur, impacting surface archeological sites within the park units. Impacts could range from no impact on historic structures, cultural landscapes, and ethnographic resources to long-term minor adverse impacts on archeological sites, to potentially major adverse effects in the case of a well blowout, fire or uncontrolled release that reaches cultural resources in the park. There would also be long-term beneficial impacts from the restoration of vegetation and natural site appearance.

Cumulative Impacts

With the continuing reduction of impacts from oil and gas activities in both park units stemming from increased plugging and reclamation, and a corresponding decrease in new drilling and production, impacts to cultural resources are expected to diminish and contribute less to cumulative impacts over time. However, several actions described in the “Cumulative Impacts Scenario” section of this chapter would contribute both adverse and beneficial cumulative impacts on cultural resources. These include old logging and agricultural operations; abandoned well sites and oil and gas access roads that could provide unauthorized access to cultural resources; earthmoving activities associated with construction and maintenance of dirt roads and oil and gas wellpads; park maintenance activities, including installation and maintenance of roads, trails, developed sites, and cultural structures/landscapes; logging and timber harvesting; coal mining; agricultural activities; commercial and/or residential development; and the planned plugging of 14 orphaned wells at Big South Fork NRRA and plans to plug and reclaim an additional 39 wells at Big South Fork NRRA. All of these actions could involve ground disturbance and destruction of sensitive cultural resources. Similar activities occurring outside the park could affect cultural resources. Cumulatively, these would have a long-term minor to moderate adverse impact on cultural resources.

Conversely, the information provided by cultural resource surveys required of the NPS prior to carrying out park activities or permitting oil and gas operations would increase the NPS knowledge of the resources in the park, and would be used to preserve cultural resources, a beneficial cumulative impact. Over the long term, protection provided to cultural resources in the park under CLPRs, particularly the well-defined regulatory process under the National Historic Preservation Act and consultation with the State Historic Preservation Officer, would result in the preservation of important cultural resources and traditional cultural practices, which would have a beneficial cumulative impact on cultural resources in the park.

The adverse and beneficial effects of past, present, and reasonably foreseeable future actions, when combined with the long-term negligible to minor adverse impacts and long-term beneficial impacts of alternative A, would have long-term minor to moderate adverse cumulative impacts on cultural resources. Protection provided to cultural resources in the park under CLPRs would protect most cultural resources and provide for recovery of unknown artifacts that are disturbed. However, there would be a potential for moderate adverse impacts on important cultural sites that may not be visible from the surface. Actions under alternative A could contribute moderately to cumulative impacts.

Conclusion

It is expected that geophysical exploration under alternative A would result in short- and long-term localized negligible to minor adverse impacts on cultural resources as a result of soil disturbance and vibration. Considering the number of wells in areas where non-federal oil and gas operations would be permitted in the park, drilling and production activities under alternative A would have short-term and long-term negligible to minor adverse impacts on cultural resources as a result of impacts on soils, historic artifacts, and cultural landscapes. Overall, eventual reclamation of these sites and cessation of operations under alternative A would result in localized short-term and long-term negligible to minor adverse impacts and long-term beneficial impacts on cultural resources. Under alternative A, wells directionally drilled and produced from outside the park units to bottomholes beneath the park units, and the reclamation of these wells, could impact cultural resources within the park units, resulting in effects ranging from no impact to localized, long-term, negligible to minor, adverse impacts. There would also be long-term beneficial impacts from the restoration of vegetation and natural site appearance. For both in-park and adjacent directionally drilled wells, up to major short-or long term adverse impacts could occur in the unlikely event of a well blowout, fire, or uncontrolled release.

The adverse and beneficial effects of past, present, and reasonably foreseeable future actions, when combined with the long-term negligible to minor adverse impacts and long-term beneficial impacts of alternative A, would result in long-term minor adverse cumulative impacts on cultural resources. The actions under alternative A could contribute moderately to cumulative impacts.

Alternative B: Comprehensive Implementation of the 9B Regulations and a New Management Framework for Plugging and Reclamation

Analysis

Geophysical Exploration—As with alternative A, minimal geophysical exploration is expected at Big South Fork NRRA, except for the limited possibility of conventional seismic lines in areas of existing roads where data could be acquired quickly and inexpensively, using seismic vibrator technology. Because of the restrictions at Obed WSR, these operations would not be allowed within the park unit.

However, under alternative B the NPS would implement an oil and gas management plan that requires that oil and gas operations are conducted in a way that best protects park resources and values, including cultural resources and would provide for more frequent inspections and monitoring.

Archeological Resources—As described under alternative A, exploration operations (seismic surveys) could have adverse impacts on unknown archeological sites. Under alternative B there would be a formal oil and gas plan in place, including increased monitoring of operations, but there would still be the possibility of loss of unknown archeological resources due to vibration or crew disturbance, but with mitigation and surveys used to provide offsets from known resources in plans of operation. Therefore, impacts under alternative B would be essentially the same as described for alternative A: long-term, negligible to minor, and adverse.

Historic Structures—Impacts on historic structures located within the vibration zone would be the same as described for alternative A. Although a formal oil and gas plan would be in place, there would still be some potential for damage to structures from ground vibration. With the mitigation measures described in appendix B, such as avoiding known cultural resources, conducting operations to minimize site disturbance, and not allowing operators to alter, destroy, or collect any object, structure, or site of historical, archeological, or cultural value, there would be localized long-term negligible to minor adverse impacts on historic structures associated with these sites under alternative B.

Cultural Landscapes—Impacts on cultural landscapes located within the park units would be the same as described for alternative A. The noise from the seismic vibrator operations and the sight of the work crews and their equipment could adversely impact how visitors experience the cultural landscape at these sites. With the mitigation described in appendix B, there would be localized short-term minor adverse impacts on the cultural landscapes associated with these sites.

Ethnographic Resources—Consultation with the seven tribes, as described in chapter 3, would be undertaken as project-specific plans of operations are developed, in the effort to identify ethnographic resources and associated community concerns and ensure that they are not adversely impacted by proposed oil and gas operations. As a result, exploration operations that could occur in the park units under alternative B would result in negligible to minor adverse impacts on potential ethnographic resources.

Drilling and Production—Because the forecast of oil and gas activities in chapter 2 applies to all alternatives, impacts associated with up to 20 new wells in Big South Fork NRRA and up to 5 wells directionally drilled from outside the park unit in Obed WSR and well workovers/servicing would be very similar to the impacts described in alternative A. However, under alternative B the NPS would implement an oil and gas management plan that provides for, increased inspections and monitoring and a proactive approach to identify activities that may be impacting, or threatening to impact, park resources beyond the operations area. The 9B regulations would be enforced at any such sites, and operations found to pose a significant threat to federally owned or controlled lands or waters would be suspended by the superintendent until the threat is removed or remedied (see 36 CFR 9.33 and 9.51). As a result, although short-term and long-term impacts from drilling and production would still occur, this alternative would protect park resources and values, including cultural resources, better than alternative A.

Archeological Resources—As described under alternative A, potential adverse impacts on cultural resources would occur from the construction and maintenance of access roads, wellpads, flowlines, and pipelines under the RFD scenario, which could disturb up to 36 acres in the park units. These impacts would be avoided or mitigated by applying CLPRs, particularly those of the National Historic Preservation Act, and through consultation with the State Historic Preservation Officer. If buried cultural resources cannot be avoided, impacts would be mitigated by recovery of data (excavation) and preservation of recovered materials and associated records. However, any loss of undetected buried cultural resources would have an irreversible adverse impact. Increased access to areas by drilling crews could lead to intentional and unintentional vandalism. Illegal collection of or damage to previously unidentified cultural resources listed or eligible for listing on the NRHP would have an adverse impact.

As noted, it is possible that important cultural sites may not be visible from the surface and could be damaged by construction activities associated with drilling and production. This could have a long-term minor to moderate adverse impact on individual archeological sites; however, the impact on archeological resources as a whole would likely be minor or less. Most of the known archeological sites can be protected from direct impacts from road construction and well drilling and production by avoidance and the required third-party monitoring. When significant sites cannot be avoided, impacts would be avoided or mitigated by excavating the site, using methodologies defined in a reviewed and approved research design.

Historic Structures—All of the known historic structures are visible and would not be damaged by construction activities associated with drilling and production. The sites can be protected from direct impacts from road construction and well drilling and production by avoidance. With mitigation measures, such as avoiding known cultural resources, conducting operations to minimize site disturbance, and not allowing operators to alter, destroy, or collect any object, structure, or site of historical, archeological, or cultural value, adverse impacts would be negligible under alternative B.

Cultural Landscapes—Visual and noise impacts from drilling and production operations to cultural landscapes and park visitors experiencing these landscapes would be more substantial if wellpads were placed in relatively close proximity to the sites, where visitors would be able to see the operation and all associated equipment and tanks. The height of drill rigs would make them readily visible through clearings and open spaces. The operations, especially drilling, would increase the presence of work crews and equipment. Although drilling is a 24-hour operation, it is temporary and would have short-term minor to moderate adverse impacts on cultural landscapes under alternative B.

Ethnographic Resources—Consultation with the seven tribes, as described in chapter 3, would be undertaken as project-specific plans of operations are developed, in the effort to identify ethnographic resources and associated community concerns and ensure that they are not adversely impacted by proposed oil and gas operations. As a result of adhering to mitigation identified through consultation, alternative B would result in negligible to minor adverse impacts on potential ethnographic resources.

All Cultural Resources—Although up to major adverse impacts could occur in the unlikely event of a well blowout, fire, or uncontrolled release (as described for alternative A), the risk of that occurring is less under alternative B due to increased monitoring and inspections

Plugging and Reclamation—It is assumed that approximately 50 wells at the park units would be plugged and reclaimed under this alternative. Full-scale reclamation can include the following: removal of structures, equipment, and debris used or generated during operations; removal or remediation of contaminated soils; and recontouring of disturbed areas to near original grade.

Archeological Resources—As described under alternative A, well plugging; shutting down, abandoning, and removing flowlines and pipelines; and use of heavy equipment and vehicles during reclamation activities could disturb and compact soil, increase soil erosion, and release oil and other contaminating and hazardous substances. Application of CLPRs, particularly those of the National Historic Preservation Act, would ensure that adverse impacts on archeological resources from plugging, abandonment, and reclamation operations would be avoided or mitigated. It is assumed that previously drilled wells have already disturbed any extant cultural sites. However, during reclamation activities within the Big South

Fork NRRA, it is possible that soils containing cultural material would be disturbed, thus displacing or destroying subsurface artifacts and resulting in long-term minor adverse impacts under alternative B.

Historic Structures—Potential adverse impacts on cultural resources from plugging, abandonment, and reclamation operations would be avoided or mitigated by applying CLPRs, particularly those of the National Historic Preservation Act, and mitigation, as recommended through consultation with the State Historic Preservation Officer, would result in localized long-term negligible to minor adverse impacts on historic structures throughout the park units.

Cultural Landscapes—The noise from the plugging equipment and the sight of the work crews and their equipment could adversely impact how visitors experience the cultural landscape at these sites. However, reclamation of sites and replanting with native vegetation would restore the natural character of the area, and may lessen any impacts related to disturbance in cultural setting or landscape. The new management framework under alternative B also includes goals and specific activities for protecting park resources and values during plugging and reclamation activities. With these specific reclamation activities, there could be both short-term minor adverse impacts and long-term beneficial impacts on cultural landscapes as a result of reclamation.

Ethnographic Resources—Consultation with the seven tribes, as described in chapter 3, would be undertaken as project-specific plans of operations are developed, in the effort to identify ethnographic resources and associated community concerns and ensure that they are not adversely impacted by proposed oil and gas operations. As a result of mitigation identified during consultation, plugging and reclamation activities that could occur on up to approximately 87 acres would result in negligible to minor adverse impacts on potential ethnographic resources under alternative B.

Directionally Drilled Wells—Impacts on cultural resources in the park units from wells directionally drilled from outside the park units to bottomholes beneath the park units could occur. Unknown subsurface archeological resources could be damaged by drilling through sites and cultural materials at drilling locations outside the park. Runoff or erosion could occur, impacting surface archeological sites within the park units, but it is unlikely that archeological sites in the park would be disturbed, due to the depth of the directional boreholes. Impacts could range from no impact to negligible adverse impacts on historic structures, cultural landscapes, and ethnographic resources, and to long-term minor adverse impacts on archeological sites, with a chance of major adverse impacts due to well blowouts, fires and uncontrolled releases. There would also be long-term beneficial impacts from the restoration of vegetation and natural site appearance.

Cumulative Impacts

Impacts on cultural resources from other actions that were considered under the cumulative impact scenario would be the same as described for alternative A. The adverse and beneficial effects of the cumulative actions, when combined with the long-term negligible to minor adverse impacts and long-term beneficial impacts of alternative B, would have long-term minor adverse cumulative impacts on cultural resources. The more proactive planning and enforcement under alternative B would help limit adverse impacts, but there could still be moderate adverse impacts on important unknown subsurface cultural sites. The actions under alternative B would contribute moderately to cumulative impacts.

Conclusion

Impacts under alternative B would be similar to those described for alternative A for all cultural resources categories. It is expected that geophysical exploration under alternative B could result in long-term localized negligible to minor adverse impacts on cultural resources as a result of soil disturbance and vibration. Considering the number of wells in areas where non-federal oil and gas operations would be permitted in the park, drilling and production activities under alternative B would have short-term and long-term negligible to minor adverse impacts on cultural resources as a result of impacts on soils, historic artifacts, and cultural landscapes. Increased inspections and monitoring and implementation of a comprehensive management plan under alternative B would better provide for the protection of cultural resources in the park. Overall, eventual reclamation of these sites and the cessation of operations under alternative B would result in localized short-term and long-term negligible to minor adverse impacts and long-term beneficial impacts on cultural resources. Under alternative B, wells directionally drilled and produced from outside the park units to bottomholes beneath the park, and the reclamation of these wells, could impact cultural resources within the park, with effects ranging from no impact to localized, long-term, negligible to minor, adverse impacts. There would also be long-term beneficial impacts from the restoration of vegetation and natural site appearance. Although up to major adverse effects could occur in the unlikely event of a well blowout, fire, or uncontrolled release, the risk of that occurring is less under alternative B due to increased monitoring and inspections.

The adverse and beneficial effects of the cumulative actions, when combined with the long-term negligible to minor adverse impacts and long-term beneficial impacts of alternative B, would have long-term minor adverse cumulative impacts on cultural resources. The actions under alternative B could contribute moderately to cumulative impacts.

Alternative C: Comprehensive Implementation of the 9B Regulations, a New Management Framework for Plugging and Reclamation, and Establishment of Special Management Areas

Analysis

Geophysical Exploration—Impacts associated with geophysical exploration under alternative C would be similar to the impacts described in alternatives A and B. However, under alternative C the NPS would establish SMAs to further protect resources and values particularly susceptible to adverse impacts from oil and gas operations, or areas where certain resources are important to maintaining the ecological integrity of the park units. Under alternative C geophysical exploration would not be allowed in any of the SMAs, including those designated specifically to protect cultural resources, such as the Cultural Landscapes and Cemeteries and Cliff Edge SMAs unless approved in a plan of operations. At Obed WSR, designation of all federal lands within the boundaries of the park unit as an SMA would preclude these operations from occurring in the park unit.

Archeological Resources—The impacts under alternative C would be similar to those described for alternatives A and B. However, under alternative C there would be a No Surface Use restriction in the Cliff Edge SMA, where archeological sites are likely to occur unless approved in a plan of operations. Generally, a 100-foot setback would be required for all oil and gas operations (exploration, drilling, and production) unless an operator can demonstrate that these activities would not negatively impact the associated archeological resources and/or sites eligible for listing on the NRHP. In addition, previously described mitigation relating to cultural resource surveys, recovery of data (excavation), and preservation of recovered materials and associated records would be implemented. Some resources, such as cemeteries and rock shelter sites within the gorge at Obed WSR, would be protected by the SMAs, but there could still be impacts on unknown subsurface archeological resources. As a result, there could be long-term negligible to minor adverse impacts on archeological resources, with a reduced risk of disturbing significant unknown sites in and around protected SMAs.

Historic Structures—Farm structures, bridges, and a large steel coal-mine tipple have been identified as eligible for inclusion in the NRHP at Big South Fork NRRA. Cemetery features are also considered historic structures and would be identified as SMAs under alternative C in this plan. Unless otherwise approved in a plan of operations, there would be 100-foot setbacks from cemeteries for geophysical exploration from these cultural sites; this distance would help reduce vibrational impacts on the sites. With the SMA setbacks and mitigation described in appendix B, such as avoiding known cultural resources, conducting operations to minimize site disturbance, and not allowing operators to alter, destroy, or collect any object, structure, or site of historical, archeological, or cultural value, there would be localized long-term negligible adverse impacts on historic structures associated with these sites.

Cultural Landscapes—Eight cultural landscapes have been identified at Big South Fork NRRA and would be identified as SMAs (e.g., Cultural Landscapes and Cemeteries SMA and Managed Fields SMA) under alternative C in this plan. Unless otherwise approved in a plan of operations, there would be a 1,500-foot setback for geophysical exploration from these cultural sites, and this distance would help reduce visual impacts on these sites. The noise from the seismic vibrator operations and the sight of the work crews and their equipment could adversely impact how visitors experience the cultural landscape at these sites. However, visual and noise impacts would be reduced based on the setback distance from the sites. With the mitigation described in appendix B, such as conducting surveys to document the location and significance of any cultural landscapes, there would be localized short-term negligible adverse impacts on the cultural landscapes associated with these sites.

Ethnographic Resources—Consultation with the seven tribes, as described in chapter 3, would be undertaken as project-specific plans of operations are developed, in the effort to identify ethnographic resources and associated community concerns and ensure that they are not adversely impacted by proposed oil and gas operations. As a result of mitigation recommended by this consultation, geophysical exploration activities would result in no impact or negligible adverse impacts on potential ethnographic resources.

Drilling and Production—Under alternative C, the operations would be the same as under alternatives A and B; however, there would be No Surface Use restrictions in the Cultural Landscape and Cemeteries and Managed Fields SMAs, and setbacks would be required from the outer boundary of the SMA unless approved in a plan of operations. A 100-foot setback from cemeteries and a 1,500-foot setback from cultural landscapes would be required for all operations, and there would be a No Surface Use restriction in the Cliff Edge SMA unless approved in a plan of operations. Generally, a 100-foot setback would be required for all oil and gas operations (exploration, drilling, and production) unless an operator can demonstrate that these activities would not negatively impact the associated resources.

Archeological Resources—Impacts from drilling and production under alternative C would be similar to those described under alternatives A and B. There could be potential adverse impacts on cultural resources from the construction and maintenance of access roads, wellpads, flowlines, and pipelines under alternative C, with up to 36 acres of new development in Big South Fork NRRA. Impacts to most sites would be avoided or mitigated by applying the SMA restrictions and CLPRs, and a qualified third-party monitor would be present during appropriate operational phases to help protect subsurface resources. If buried cultural resources cannot be avoided, impacts would be mitigated by recovery of data (excavation) and preservation of recovered materials and associated records. However, the loss of any undetected cultural resources would have an irreversible adverse impact. Increased access to areas by drilling crews could lead to intentional and unintentional vandalism. Illegal collection of or damage to previously unidentified cultural resources listed or eligible for listing on the NRHP would have an adverse impact. SMAs would provide protection for cemeteries and other sensitive resource areas, such as the gorge at Obed WSR, but they may not provide direct protection for unknown archeological sites, so impacts on archeological resources parkwide may be similar to those described for the other alternatives, unless wells are directionally drilled from outside the parks to avoid SMAs of any kind. Taking into consideration the number of wells to be drilled parkwide, there could be long-term negligible to minor adverse impacts on archeological sites, but with less risk of disturbing significant unknown sites in and around SMAs.

Historic Structures—All of the known historic structures are visible and would not be damaged by construction activities associated with drilling and production. With the Cultural Landscapes and Cemeteries SMA setbacks and mitigation measures described in appendix B, such as avoiding known cultural resources, conducting operations to minimize site disturbance, and not allowing operators to alter, destroy, or collect any object, structure, or site of historical, archeological, or cultural value, there would be localized long-term negligible adverse impacts on historic structures associated with these sites.

Cultural Landscapes—The noise from the drill rigs and the sight of the work crews and their equipment could adversely impact how visitors experience the cultural landscape at these sites. The height of drill rigs would make them readily visible through clearings and open spaces. The operations, especially drilling, would increase the presence of work crews and equipment, especially since drilling is a 24-hour operation. However, visual and noise impacts would also be reduced based on the setback distance from the sites. With the Cultural Landscapes and Cemeteries SMA setbacks and mitigation measures described in appendix B, such as avoiding known cultural resources, there would be localized long-term negligible adverse impacts on the cultural landscapes associated with these sites.

Ethnographic Resources—Consultation with the seven tribes, as described in chapter 3, would be undertaken as project-specific plans of operations are developed, in the effort to identify ethnographic resources and associated community concerns and ensure that potential adverse impacts are mitigated. As a result, drilling and production and pipeline operations that could occur on up to 36 acres at Big South Fork NRRA and 3 acres at Obed WSR would result in no impact or negligible adverse impacts on potential ethnographic resources.

All Cultural Resources—Although up to major adverse impacts could occur in the unlikely event of a well blowout, fire, or uncontrolled release (as described for alternative A), the risk of that occurring is less under alternative B due to increased monitoring and inspections

Plugging and Reclamation—Similar to alternatives A and B, well plugging, shutting down and abandoning/removing flowlines and pipelines, and use of heavy equipment and vehicles during reclamation activities could disturb soils and damage cultural resources.

Archeological Resources—Impacts under alternative C for well plugging; shutting down, abandoning, and removing flowlines and pipelines; and use of heavy equipment and vehicles during reclamation activities would be the same as under alternatives A and B. As with alternatives A and B, it is assumed that previously drilled wells have displaced any extant cultural material. During reclamation activities within the Big South Fork NRRA, it is possible that soils containing cultural material would be disturbed, thus displacing or destroying subsurface artifacts and resulting in long-term minor adverse impacts under alternative C from plugging, abandonment, and reclamation operations.

Historic Structures—Potential adverse impacts on historic structures from plugging, abandonment, and reclamation operations, such as displacement of or damage to built features from vibrations and/or movement of soils containing structural remains, would be mitigated by avoiding historic structures. With the Cultural Landscapes and Cemeteries SMA setbacks, there would be localized long-term negligible adverse impacts on historic structures associated with these sites.

Cultural Landscapes—Within the Cultural Landscapes and Cemeteries and Managed Fields SMAs setback areas, there would be localized long-term negligible adverse impacts on the cultural landscapes associated with these sites. The noise from the drill rigs and the sight of the work crews and their equipment could adversely impact how visitors experience the cultural landscape at these sites. However, visual and noise impacts would also be reduced based on the setback distance from the sites. Reclamation of sites and replanting with native vegetation would restore the natural character of the area, and may lessen any impacts related to disturbance in cultural setting or landscape. There could be both short-term minor adverse impacts and long-term beneficial impacts on cultural landscapes as a result of reclamation.

Ethnographic Resources—Consultation with the seven tribes, as described in chapter 3, would be undertaken as project-specific plans of operations are developed, in the effort to identify ethnographic resources and associated community concerns and ensure that they are not adversely impacted by proposed oil and gas operations. As a result, plugging and reclamation activities that could occur on up to 94 to 106 acres at Big South Fork NRRA and 7 acres at Obed WSR, plugging and reclamation activities that could occur in the park units would result in no impact or negligible adverse impacts on potential ethnographic resources.

Directionally Drilled Wells—Impacts on cultural resources in the park units from wells directionally drilled from outside the park units or SMAs to bottomholes beneath the park units or SMAs could occur. Unknown subsurface archeological resources could be damaged by drilling through sites and cultural materials at drilling locations outside of the park, but it is unlikely that archeological sites in the park would be disturbed, due to the depth of the directional boreholes. Runoff or erosion could occur, impacting surface archeological sites within the park units. Impacts could range from no impact to negligible adverse impacts on historic structures, cultural landscapes, and ethnographic resources, to long-term minor adverse impacts on archeological sites with a chance of major adverse impacts due to well blowouts, fires and uncontrolled releases. There would also be long-term beneficial impacts from the restoration of vegetation and natural site appearance.

Cumulative Impacts

Impacts on cultural resources from other actions that were considered under the cumulative impact scenario would be the same as described for alternative A. The adverse and beneficial effects of the cumulative actions, when combined with the long-term negligible to minor adverse impacts and long-term beneficial impacts of alternative C, would have long-term minor adverse cumulative impacts on cultural resources. The more proactive planning and enforcement under alternative C and the prohibition of geophysical exploration and drilling/production in certain SMAs with high cultural resource values would help limit adverse impacts, but there could still be moderate impacts on important unknown subsurface resources, although there would be a much lower level of risk compared to the other alternatives. The actions under alternative C would contribute moderately to cumulative impacts.

Conclusion

Impacts under alternative C would be similar to alternatives A and B, although SMAs and setbacks that were designed to protect cultural resources and directional drilling from outside the park to avoid SMAs would more fully protect some sensitive cultural sites (such as cemeteries and rock shelter sites within the gorge) from impacts. It is expected that geophysical exploration under alternative C would result in short- and long-term localized negligible to minor adverse impacts on cultural resources as a result of soil disturbance and vibrations. In areas where non-federal oil and gas operations would be permitted in the park, drilling and production activities under alternative C would have short-term and long-term negligible to minor adverse impacts on cultural resources as a result of impacts on soils, historic artifacts, and cultural landscapes. Eventual reclamation of these sites and the cessation of operations under alternative C would result in localized short-term and long-term negligible to minor adverse impacts and long-term beneficial impacts on cultural resources. Under alternative C, wells directionally drilled and produced from outside the park units to bottomholes beneath the park units, and the reclamation of these wells, could impact cultural resources within the park, resulting in effects ranging from no impact to localized, long-term, negligible to minor, adverse impacts. There would also be long-term beneficial impacts from the restoration of vegetation and natural site appearance. Although up to major adverse effects could occur in the unlikely event of a well blowout, fire, or uncontrolled release, the risk of that occurring is less under alternative C due to increased monitoring and inspections and SMA protection.

Cumulative impacts would be similar to those described for alternative B, with long-term minor adverse cumulative impacts on cultural resources. The actions under alternative C would contribute moderately to cumulative impacts because of the continued potential for moderate adverse impacts on important unknown subsurface cultural sites, but the designation of SMAs with a No Surface Use stipulation would result in a lower probability of harm to previously unidentified cultural resources in SMAs from ground-disturbing activities.

VISITOR USE AND EXPERIENCE

GUIDING REGULATIONS AND POLICIES

The NPS *Management Policies 2006* (NPS 2006c) state that the enjoyment of park resources and values by the people of the United States is part of the fundamental purpose of all park units and that the NPS is committed to providing appropriate, high-quality opportunities for visitors to enjoy the park units (NPS 2006c, section 8.2). Similarly, NPS *Management Policies 2006* state that the NPS and its concessioners, contractors, and cooperators will “seek to provide a safe and healthful environment for visitors and employees.” Further, NPS *Management Policies 2006* state that the NPS will “strive to identify and prevent injuries from recognizable threats to the safety and health of persons and to the protection of property by applying nationally accepted codes, standards, engineering principles, and the guidance of Director’s Orders 50B, 50C, 58, and 83 and their associated reference manuals” (NPS 2006c, section 8.2.5.1).

The importance of visitor use and experience is highlighted in the Big South Fork NRRA purpose, which states that the park will provide healthful outdoor recreation for the enjoyment of the public and for the benefit of the regional economy. The value of the visitor experience is also stated in the park’s significance, which emphasizes the broad range of natural- and cultural-resource-based outdoor recreation and educational opportunities within the NRRA.

METHODOLOGY, ASSUMPTIONS, AND IMPACT THRESHOLDS

Potential impacts on visitor use and experience were considered for all phases of oil and gas development. Several topics are described in this section in order to focus on those attributes that contribute to a positive visitor experience at the park: public access, visual quality/night sky, natural soundscapes, odors, and human health and safety (soundscapes are addressed in detail in a separate section of this chapter and only referenced here). Oil and gas operations that are anticipated under the RFD scenario and the forecast of oil and gas activities are analyzed in this section. In addition, the impacts of CLPRs, including regulatory requirements, operating stipulations, and mitigation measures relevant to visitor use and experience, are described in the following section.

The impact intensity threshold definitions are based on the potential for changes to visitor use and experience characteristics, as follows:

Negligible: Visitors would not likely be aware of the effects associated with implementation of an alternative. Current visitor experience and use would remain without derogation of park resources and values.

Minor: Visitors would likely be aware of the effects associated with implementation of an alternative; however, the changes to visitor experience and use would be slight and a small number of visitors would be affected. Current visitor experience and use would remain without derogation of park resources and values.

Moderate: Changes in visitor use and experience would be readily apparent and would likely affect a small number of visitors. Current visitor experience and use would remain without derogation of park resources and values, but visitor satisfaction might be measurably affected. Some visitors who desire to continue their use and enjoyment of the activity/visitor experience at current levels would be required to pursue their choice in other available local or regional areas.

Major: Visitors would be highly aware of the effects associated with implementation of an alternative. The change in visitor use and experience would affect many visitors and would preclude future generations of some visitors from enjoying park resources and values. Some visitors who desire to continue their use and enjoyment of the activity/visitor experience would be required to pursue their choice in other available local or regional areas.

IMPACT OF THE ALTERNATIVES

Alternative A: No Action (Current Management Continued)

Analysis

Geophysical Exploration—As described in the forecast of oil and gas activities in chapter 2, minimal geophysical exploration is expected at Big South Fork NRRA, except for the limited possibility of conventional seismic lines in areas of existing roads where data could be acquired quickly and inexpensively, using seismic vibrator technology. Given the restrictions at Obed WSR, these operations would not be allowed within the park unit.

Access—During implementation, seismic operations may preclude use of the survey areas including some park roads by fishermen, hikers, hunters, and other visitors to Big South Fork NRRA. Mitigation measures provided for in appendix B, such as scheduling operations outside of peak visitation periods, would minimize impacts on visitor access. Given these mitigation measures, the limited amount of geophysical exploration expected during the life of this plan, the minimal amount of disturbance, and the limited duration (weeks) of conventional seismic surveys, there would be short-term localized negligible to minor adverse impacts on visitors as a result of access restrictions.

Visual Quality—During geophysical operations, the flagging used to mark site lines and the presence of oil and gas personnel and their vehicles could cause adverse visual impacts for visitors to Big South Fork NRRA. CLPRs and mitigation that would minimize visual impacts include a 500-foot setback from waterways, visitor use areas, and administrative and other use areas; removing trash and debris;; and removing flagging after surveys are completed. With mitigation, the limited geophysical exploration operations expected would result in localized short-term negligible to minor adverse impacts on visual quality.

Noise—Noise associated with seismic surveys would occur from the use of vehicles and Vibroseis® trucks, personnel working in the area, and other equipment used, such as chainsaws. Noise generated by the seismic vibrator operations would be intermittent and typically over a period of one to three days. With the implementation of operating stipulations and mitigation measures, noises associated with geophysical exploration operations would result in localized short-term negligible to minor adverse impacts.

Odors/Health and Safety—Seismic surveys would not be expected to contribute many offensive odors or smells, unless spills of fuels or other hazardous chemicals occurred or exhaust fumes were particularly offensive. However, seismic exploration could expose park visitors to hazards associated with increased vehicular traffic. Setbacks required from visitor use and administrative areas under 36 CFR 9.41(a) would help separate visitors from seismic operations. Warning signs would be posted and notices placed in the park and the local newspaper about the operations. All generated wastes would be cleaned up and disposed of promptly. The seismic survey would have health-and-safety plans in place in order for their plan of operations to be approved. With these stipulations and mitigation measures in place, and given the limited extent of seismic exploration expected, there would be short-term localized negligible to minor adverse human health and safety impacts on visitors.

Drilling and Production—Surface drilling and production operations (including the placement of flowlines) would not directly impact visitor use and experience in protected areas, where operations would not be permitted under CLPRs, including the 9B regulations, the gorge restrictions at Big South Fork NRRA, and deed restrictions at Obed WSR. However, as described in the forecast of oil and gas activities in chapter 2, only up to 20 new wells are expected in Big South Fork NRRA, and only up to 5 wells, directionally drilled from outside the park unit, are expected in Obed WSR. It is also assumed that 125 wells at Big South Fork NRRA and 2 wells at Obed WSR would be worked over or serviced.

Access—Where drilling and production operations would be permitted in Big South Fork NRRA, the operation areas (access roads and wellpads) would be closed to visitor access. Under the RFD scenario and the forecast of oil and gas operations, drilling and production operations could restrict visitation on up to 36 additional acres in the park unit over a 15 to 20 -year period. Due to safety concerns, there may be additional stipulations to visitor access adjacent to these sites, similar to current restrictions on access to certain parts of the park (e.g., existing drilling and production operations). Indirect impacts, such as increased noise, dust, odors, night lighting, and human activity, would not necessarily preclude recreational access, but would decrease the quality of the visitor experience in the vicinity of the operation, especially in more remote portions of the park. Given the limited extent of new drilling and production expected in Big South Fork NRRA, it is assumed that few visitors would be affected by restricting access to 36 acres of the park unit, and current visitor use and experience would remain relatively unchanged from new operations, although the planned workovers and servicing of existing operations could cause access delays or restrictions. Overall, impacts on visitor access would be would be long term, minor, and adverse.

Visual Quality—Visual impacts on visitor experience from drilling and production operations would be more substantial than other types of impacts, especially if wellpads were placed in relatively undisturbed settings where visitors would be readily able to see the operation and all associated equipment and tanks. Although the rigs used in Tennessee and Kentucky are usually slightly smaller, drill rigs can reach heights of 180 feet, which would be visible from several locations within the park. Rigs may also be visible to park visitors in boats at Big South Fork NRRA on the Big South Fork Cumberland River or any of its tributaries, and at Obed WSR on the Obed River or Clear Creek. Site clearing would remove up to 1.5 acres of vegetation for each wellpad, and access road construction would result in visible cuts through park vegetation, depending on determination of the least impacting methods to be used. Lighting of the drilling rig could interfere with visitors' night-sky views, depending on where the operations are sited. The operations, especially drilling, would increase the presence of work crews and equipment. Since drilling is a 24-hour, 7-day a week operation, these impacts would be continuous, and could last a week or two up to a few months.

Production operations, although having a less intrusive human presence, would be visible for 20 years or longer. Coming across an oil production rig could be an unpleasant experience for visitors seeking a natural, outdoor experience at the Big South Fork NRRA. The visual presence of oil and gas operations in a natural setting would adversely impact the areas by displacing the visitor or lessening the quality of the visitor experience.

Mitigation measures that would reduce visual impacts during drilling and production operations include a 500-foot setback for visitor use areas and siting the wellpads so they are screened from view by vegetation and topography. Flowlines would be sited to minimize additional land disturbances. Drilling and production equipment could be painted to blend in with the surrounding environment. Sites would be kept clean and orderly, and any spills, waste, or trash would be promptly cleaned up and removed from the operations site. There are also several measures that can be used to mitigate the effects on night sky that would adversely affect visitor experience in the immediate area.

With the implementation of these measures, impacts on visual quality could range from localized, short term, moderate, and adverse during drilling or workovers to long term, minor to moderate, and adverse during production. The impacts would be less for those visitors less concerned with the presence of such operations, and where operations are naturally screened from view.

Noise—As discussed in more detail elsewhere in the chapter, there would be increased noise from construction activities (vehicles, chainsaws, and earthmoving equipment), drilling rigs, and the drilling or workover crew that could adversely affect visitor use and experience. These noises would be different from the types of noises common in the visitor use areas, or general background noises elsewhere in the park. As noted in the "Soundscapes" section (table 32), a drill rig at a distance of 1,600 feet is associated with a noise level of about 45 dBA, while near the drill rig, sound levels are approximately 75 dBA. The 500-foot setback required for visitor use and administrative areas under the NPS 36 CFR 9B regulations would result in reducing the adverse impacts from drilling rig noise, but would not reduce sounds to background levels. As a result, there would be short-term localized moderate adverse impacts from drilling operations if they were close enough to a visitor use area (including cultural landscapes) to cause interference with the enjoyment or use of the area, and would conflict with visitor goals of having a natural outdoor or other desired experience.

Production operations would also cause long-term localized minor to moderate adverse impacts because of the noise associated with production equipment and the short-term use of loud machinery and workover rigs on site. However, most noise levels associated with production would be substantially less than those generated by a drilling operation.

Odors/Health and Safety—The primary source of odors would be from drilling or production operations, especially if spills or leaks occurred and oil or other chemicals were not quickly cleaned up and removed from the site. Mitigation measures to reduce adverse impacts from odors include the setbacks required under CLPRs, since odors would dissipate with increasing distance from the source. Also, proper handling of hazardous or contaminating substances would be required, including keeping lids on containers, cleaning up spills, and preventing blowouts. With adequate setbacks and implementation of these measures, there would be short-term negligible to minor adverse impacts due to odors.

Drilling and production have the potential for well blowouts and releases of hydrocarbons or other hazardous substances, including drilling muds and gases such as H_2S. Pumpjacks with automatic timers are also a safety hazard. Visitors could also be drawn to wellpads and sites out of curiosity, resulting in potential exposure to dangerous equipment or stored chemicals. Hunters, in particular, would need to keep a safe distance from oil and gas operations and avoid shooting near drilling rigs and production facilities (i.e., storage tanks, wellheads, and pumpjacks). There is the possibility of storm damage to drilling and production operations, which could spread hazardous and contaminating substances. Perforating or rupturing a storage tank containing oil, produced water, or treatment chemicals at a production facility would increase the threat of spills and subsequent harm to the public.

One of the biggest concerns for human health and safety is the potential exposure to hazardous and contaminating materials. During drilling and production operations, all potentially hazardous materials would be kept in completely enclosed storage containers. Drilling and production sites would not be permitted in floodplains unless there is no practicable alternative. Spill-prevention and control measures and other contingency plans included would provide for protective measures to minimize accidental discharges of hydrocarbons and produced water including containment within the operations area, in the event of storms, equipment failure, or operator error. The park staff would be guaranteed access to the site to verify that operations are conducted in a manner that minimizes the potential for spills and provides for rapid spill response and cleanup, but there would not be inspections or monitoring beyond baseline workload levels under alternative A. Site inspections and monitoring would be focused on when problems or emergencies are reported or when there are information requests from operators, so there is a risk that unsafe conditions could go unnoticed.

In general, the required setbacks between oil and gas sites and visitor use areas would help to limit visitors seeing and going near these facilities. Other mitigation measures include the use of warning signs and notices, security guards (during active drilling), secondary containment (liners and berms), and fencing around the pad and all associated tanks and equipment. In some situations, the park superintendent can restrict public access on any roads constructed and used exclusively for accessing oil and gas operations to safeguard human health and safety, and as may be necessary to protect park resources. The Big South Fork GMP states that oil and gas access roads should not be used for recreational use unless identified as part of the official roads and trails.

Precautions would also be taken to prevent well blowouts and the sudden accidental release of H_2S during drilling operations. A well blowout could cause unpredictable damage near the well site. A blowout could release H_2S and other gases, drilling fluids, formation waters, oil, or natural gas under pressure, which could spread some distance from the well site. If fires occurred, SO_2 could be produced. Preventing blowouts during drilling operations can be accomplished by using experienced drilling personnel, following required operating stipulations, and implementing mitigation measures that address high-pressure precautions (see appendix B). These measures include proper design and use of drilling muds, constant monitoring of the characteristics and volume of drilling mud to manage drilling conditions, and proper casing and cementing. Wells must be equipped with blowout preventers, which are tested periodically and can be used to shut in the well if needed. Plans of operations would also include an emergency response plan that would address H_2S. For those wells that may emit H_2S, a radius-of-exposure analysis would be performed prior to site selection.

However, the NPS recognizes that unplanned incidents associated with oil and gas operations such as well blowouts, fires, and major spills within the boundaries of the park present a risk of release of contaminants that can adversely impact visitor use and experience, depending on the location of the release. However, the incident rates for such incidents are low and are not a typical expectation of project implementation. If such an incident did occur, required mitigation measures such as use of blowout preventers and implementation of SPCC plans would result in lessening the potential for spilled substances or a well fire to spread into the park, and for timely response and cleanup, so that there is a reasonable expectation that long term adverse impacts would not occur or be limited to minor to moderate levels of intensity, although there could be short-term major adverse effects during the release.

Given the limited extent of drilling and production operations described in the forecast of oil and gas operations, as well as the operating stipulations and mitigation measures described previously, there would be short-term minor adverse impacts on human health and safety during drilling, and long-term minor adverse impacts during production.

Plugging and Reclamation—As indicated in the forecast of oil and gas activities in chapter 2, plugging and reclamation of wells is expected to be the primary oil and gas operation conducted in Big South Fork NRRA and Obed WSR during the life of this plan. Between both park units, approximately 50 wells are expected to be plugged and reclaimed, resulting in the reclamation of approximately 87 acres of land.

Access—Plugging and reclamation operations would have public access impacts similar to those described for drilling and production, but would be limited in duration to the time needed to plug and reclaim each operations site. Reclamation operations would not interfere substantially with visitor access, and when completed, would restore access to areas previously off-limits to visitors. Therefore, although there would be short-term minor adverse impacts on visitor access from activities related to plugging and reclamation of oil and gas production sites, these activities would ultimately result in long-term beneficial effects for visitors under alternative A.

Visual Quality—The presence of earthmoving, demolition, and other equipment associated with plugging and reclamation activities would have similar impacts on visual quality as described for drilling and production operations. Considering the smaller equipment that would be used and the greater number of wells to be plugged and reclaimed as compared to those that would be drilled and produced, there would be short-term (for the duration of the operation), minor to moderate, adverse impacts on visual quality during these activities.

However, plugging and reclamation would end disturbances from production activities, and the sites would be restored to their original character, although some roads may be left in place for private mineral access in the future. Reclamation of the wellpads following plugging of the wells would serve to reduce long-term visual impacts and eliminate the unnatural views of the site. The actual time required to reclaim the site’s visual quality would depend on many factors, including the erosion potential of the site, productivity of the vegetation, topography, and soil characteristics, including contamination. The time needed for recovery could last from 1 to 3 years for grasses and shrubs, the predominant vegetation on the site, although it could take longer. Ultimately, the removal of the rig and associated structures and equipment, in conjunction with site reclamation, would have long-term localized beneficial effects on visual quality near the well sites.

Noise—The operations involved in site closure would cause temporary increases in noise from earthmoving, demolition, and other equipment, as described for drilling and production. However, mitigation measures would be used to reduce engine noise and to avoid peak visitor use periods. In addition, when closure and reclamation are completed, noise levels would return to background levels. As a result, there would be short-term minor adverse impacts on visitor experience from noise near the reclamation areas. However, plugging and reclamation would end noise disturbances from production activities, and would ultimately have long-term beneficial effects on visitor use and experience in the vicinity of the well sites.

Odors/Health and Safety—There could be odors during plugging and reclamation operations from heavy-equipment exhaust and from leaks and spills. Mitigation measures to reduce adverse impacts on visitor use and experience include the setbacks required under CLPRs, since odors would dissipate with increasing distance from the source. Also, proper handling of hazardous materials and contaminating materials would be required, including secondary containment, and promptly cleaning up spills. As a result, there would be short-term minor adverse impacts on odors and health and safety during plugging and reclamation activities.

Once plugging and reclamation is complete, there would be long-term beneficial impacts on odors and health safety issues associated with producing wells, as described in the previous section. Plugging and reclamation of orphaned wells would contribute to these beneficial effects by removing threats associated with exposure to hazardous wellhead equipment, ignition of flammable gases, possible flowline ruptures, and ingestion, inhalation, or absorption of spilled or released hydrocarbons, contaminants, or hazardous substances.

Directionally Drilled Wells—Wells directionally drilled and produced from outside the park units to bottomholes beneath them could indirectly impact visitor use and experience in the park, especially with regard to noise and visual impacts that can be experienced from within the park. The types of impacts are expected to be similar to those described above for operations inside the park, with the intensity of impacts depending on the proximity of operations to the park; site-specific environmental conditions, such as accessibility, slope, vegetation screening, and topography; and mitigation measures being employed. In addition, directionally drilled wells exempted from the NPS 36 CFR 9B regulations under 9.32(e) may not be fenced or signed, as is required of operations inside the park. Based on these factors, indirect impacts on visitor use and experience in the park could range from no impact to indirect, localized, short- to long-term, negligible to moderate, adverse impacts, with a chance of major impacts if a blowout, fire or large uncontrolled release occurred close to high visitor use areas in the park. However, reclamation of wells directionally drilled from outside the park units to bottomholes beneath them would also result in long-term beneficial impacts.

Cumulative Impacts

With the continuing reduction of impacts from oil and gas activities in both park units stemming from increased plugging and reclamation, and a corresponding decrease in new drilling and production, impacts to visitor use and experience are expected to diminish and contribute less to cumulative impacts over time. However, several cumulative actions discussed in the “Cumulative Impacts Scenario” section of this chapter have the potential to contribute adverse cumulative effects on visitor use and experience at the park units. Park operations such as routine park maintenance activities, including installation and maintenance of roads, trails, and developed sites, could affect visitor use and experience due to noise from these operations, the temporary presence of work crews, and access restrictions, resulting in short-term minor adverse impacts. Another maintenance activity for Big South Fork NRRA is prescribed fires. This activity could have short-term negligible to minor adverse impacts on visitor use and experience due to restricted access and poor air quality because of the smoke, which could also impact visibility. However, impacts on visitor use and experience would be long term and beneficial subsequent to the prescribed fires due to the restoration of native plant communities associated with the fires. Remediation of existing oil and gas contamination in proximity to recreational sites, such as the Howard/White Unit No. 1 oil well on the boundary of Obed WSR, has the potential to contribute to cumulative impacts, which would have short- and long-term moderate adverse impacts on visitor use and experience. Agricultural activities on land adjacent to the park units, primarily logging activities and hay production, could result in long-term negligible adverse impacts on visitor use and experience, due to the visual effects associated with loss of natural vegetation and habitat.

Development outside the park, including commercial, industrial, and residential, could contribute to cumulative impacts. Increased development, including residential communities near the park, could increase outside noise sources and traffic congestion, which could have long-term adverse impacts on visitor use and experience.

In addition to traditional oil and gas development, coal bed methane/shale gas drilling is an ongoing feature in the vicinity of the park units. Further, there are ongoing mining operations around the park units. These activities could affect visitor use and experience due to noise and visual effects associated with these operations. In addition, acid mine drainage associated with active and abandoned mines impacts water resources, which can affect water-based recreation in the park units. Acid mine drainage could pose health and safety risks to visitors if they were to come into direct contact with such drainage, or indirect contact as a result of polluted water resources. Other visitor uses, such as ORV use, horseback riding, hunting, trapping, and fishing, could contribute to cumulative impacts. These activities create noise and pose health and safety risks to those participating in these activities, as well as those who are in the vicinity of these activities. Lastly, reclaiming some abandoned mine lands could result in long-term beneficial impacts on visitor use and experience due to the removal of abandoned mines and additional land becoming available to various visitor uses.

Additional cumulative actions that would have beneficial effects on visitor use and experience include, for example, the NPS's recent plan to plug and reclaim 14 abandoned wells at Big South Fork NRRA through a cooperative agreement with the Tennessee Department of Environment and Conservation, Division of Water Pollution Control. Another 39 wells would be plugged and reclaimed using ARRA funding. The plugging and reclamation of these wells has resulted and would result in long-term beneficial impacts on visitor use and experience due to the improved condition of the sites. Additionally, the NPS has published an advance notice of proposed rulemaking in the Federal Register regarding a proposed rule to revise the 9B regulations governing non-federal oil and gas development within the boundaries of NPS units. Generally, the proposed changes focus on improving resource protection aspects of the regulations while accounting for advances in oil and gas technology and industry practices. These changes could have long-term beneficial impacts on visitor use and experience, due to improving resource protection practices.

Overall, when the impacts of these actions are combined with the short- and long-term negligible to moderate adverse impacts as well as the long-term beneficial effects of alternative A, there would be short- and long-term minor adverse cumulative impacts on visitor use and experience. Mitigation required under CLPRs would help minimize adverse impacts and protect visitors and staff in the park units. When compared to the area of analysis for this topic, alternative A would contribute moderately to both adverse and beneficial cumulative impacts.

Conclusion

It is expected that geophysical exploration would result in short-term localized negligible to minor adverse impacts on park visitors as a result of temporary access restrictions and effects on visual quality, noise, odors, and human health and safety. In areas where non-federal oil and gas operations would be permitted in the park, drilling and production activities would have short- and long-term minor to moderate adverse impacts on visitor use and experience as a result of impacts on access, visual quality, noise, and health and safety. There would be long-term negligible to minor adverse impacts on odors. Eventual reclamation of sites at the cessation of operations would result in a localized long-term beneficial impact on visitor use and experience. Temporary effects on access, visual quality, noise, odors, and human health and safety would be short term, minor to moderate, and adverse. Wells directionally drilled and produced from outside the park to bottomholes beneath the park, and the reclamation of these wells, could indirectly impact visitor use and experience in the park, with impacts ranging from no impact to mostly indirect, localized, short- to long-term, negligible to moderate, adverse impacts. However, reclamation of wells directionally drilled from outside the park units to bottomholes beneath them would also result in long-term beneficial impacts. For both in-park and adjacent directionally drilled wells, up to major short-term adverse effects could occur in the unlikely event of a well blowout, fire, or uncontrolled release if the event occurred in a high use visitor area.

The adverse and beneficial effects of past, present, and reasonably foreseeable future actions, when combined with the short- and long-term negligible to moderate adverse impacts as well as the long-term beneficial effects of alternative A, would result in short- and long-term minor adverse cumulative impacts on visitor use and experience. The actions under alternative A would contribute moderately to both adverse and beneficial cumulative impacts in and around the park units.

Alternative B: Comprehensive Implementation of the 9B Regulations and a New Management Framework for Plugging and Reclamation

Analysis

Geophysical Exploration—As with alternative A, minimal geophysical exploration is expected at Big South Fork NRRA, except for the limited possibility of conventional seismic lines in areas of existing roads where data could be acquired quickly and inexpensively, using seismic vibrator technology. As a result, impacts associated with geophysical exploration in alternative B related to access, visual quality, noise, and health and safety would be very similar to the impacts described in alternative A, and would be localized, short term, negligible to minor, and adverse.

Drilling and Production—Because the forecast of oil and gas activities in chapter 2 applies to all alternatives, impacts associated with up to 20 new wells in Big South Fork NRRA and up to 5 wells directionally drilled from outside the park unit in Obed WSR and well workover/servicing would be very similar to the impacts described in alternative A. These activities would affect visitor use and experience as a result of restricted visitor access, visual impacts on visitor experience from drilling and production operations, increased noise from construction activities, increased odors, and increased human health and safety risks.

However, under alternative B the NPS would implement an oil and gas management plan that clearly articulates the CLPRs applicable to the exploration, production, and transportation of non-federal oil and gas resources in Big South Fork NRRA and Obed WSR. Additionally, increased inspections and monitoring under alternative B would proactively identify sites that may be impacting, or threatening to impact, park resources beyond the operations area. The 9B regulations would be enforced at any such sites, and operations found to pose a significant threat to federally owned or controlled lands or waters would be suspended by the superintendent until the threat is removed or remedied (see 36 CFR 9.33 and 9.51). As a result, although short-term and long-term impacts from drilling and production would still occur, this alternative would protect park resources and values, which form the basis for a positive visitor experience and allow diverse visitor uses, better than alternative A. Therefore, impacts on visitor use and experience due to drilling and production under alternative B might be slightly less adverse than under alternative A as a result of implementing the oil and gas management plan. With the exception of the unlikely event of a blowout, fire, or large uncontrolled release, impacts on visitor use and experience are expected to be short term, minor, and adverse during drilling (with possible short-term moderate adverse impacts due to unavoidable noise), and long term, negligible to minor, and adverse from production, as a result of temporary access restrictions and the effects on visual quality, noise, odors, and human health and safety.

Plugging and Reclamation—As indicated in the forecast of oil and gas activities in chapter 2, plugging and reclamation of wells is expected to be the primary oil and gas operation conducted in Big South Fork NRRA and Obed WSR during the life of this plan. Between both park units, approximately 50 wells are expected to be plugged and reclaimed, resulting in the reclamation of approximately 87 acres of land.

However, under alternative B the NPS would implement an oil and gas management plan that clearly articulates the CLPRs applicable to the exploration, production, and transportation of non-federal oil and gas resources in Big South Fork NRRA and Obed WSR. This includes a new management framework for plugging and reclamation of wells, which would allow the NPS and operators to efficiently complete the compliance process for the plugging and reclamation of inactive wells that represent potential threats to park resources and values. This new management framework also includes goals and specific activities for protecting park resources and values during plugging and reclamation activities. The new management framework for plugging and reclamation would promote the plugging and reclamation of wells to applicable standards, but the impacts are expected to be the same as under alternative A. Temporary effects on access, visual quality, noise, odors, and human health and safety would be short term, minor to moderate, and adverse. Under this alternative the long-term beneficial effects described under alternative A would be more likely to be realized sooner, including increased visitor access, reduced visual impacts, decreased noise disturbances, and reduced health and safety impacts.

Directionally Drilled Wells—Wells directionally drilled and produced from outside the park to bottomholes beneath the park, and the reclamation of these wells, could indirectly impact visitor use and experience in the park, as described for alternative A. Impacts on visitor use and experience in the park units could range from no impact to indirect, localized, short- to long-term, negligible to minor, adverse impacts, with a chance of major impacts if a blowout, fire or large uncontrolled release occurred close to the park. However, reclamation of wells directionally drilled from outside the park units to bottomholes beneath them would also result in long-term beneficial impacts.

Cumulative Impacts

Impacts on visitor use and experience from other actions that were considered under the cumulative impact scenario would be the same as described for alternative A. The effects of these actions, when combined with the short- and long-term negligible to moderate adverse impacts as well as the long-term beneficial effects of alternative B, would have short- and long-term minor adverse cumulative impacts on visitor use and experience. The actions under alternative B would contribute moderately to both adverse and beneficial cumulative impacts in and around the park units.

Conclusion

Similar to alternative A, it is expected that geophysical exploration under alternative B would result in short-term localized negligible to minor adverse impacts on park visitors as a result of temporary access restrictions and effects on visual quality, noise, odors, and human health and safety. In areas where non-federal oil and gas operations would be permitted in the park, drilling and production activities would have short- and long-term mostly minor adverse impacts on visitor use and experience as a result of impacts on access, visual quality, noise, odors, and health and safety, with possible short-term moderate adverse impacts due to unavoidable noise. Eventual reclamation of these sites at the cessation of operations would result in long-term localized beneficial impacts on visitor use and experience. Temporary effects on access, visual quality, noise, odors, and human health and safety would be short term, negligible to moderate, and adverse. Wells directionally drilled and produced from outside the park to bottomholes beneath the park, and the reclamation of these wells, could indirectly impact visitor use and experience in the park, with effects ranging from no impact to mostly indirect, localized, short- to long-term, negligible to moderate, adverse impacts. However, reclamation of wells directionally drilled from outside the park units to bottomholes beneath them would also result in long-term beneficial impacts. Although up to major short-term adverse effects could occur in the unlikely event of a well blowout, fire, or uncontrolled release, the risk of that occurring is less under alternative B due to increased monitoring and inspections.

Impacts on visitor use from other actions that were considered under the cumulative impact scenario would be the same as described for alternative A. The adverse and beneficial effects of the cumulative actions, when combined with the short- and long-term negligible to moderate adverse impacts as well as the long-term beneficial effects of alternative B, would have short- and long-term minor adverse cumulative impacts on visitor use and experience. The actions under alternative B would contribute moderately to both adverse and beneficial cumulative impacts.

Alternative C: Comprehensive Implementation of the 9B Regulations, a New Management Framework for Plugging and Reclamation, and Establishment of Special Management Areas

Analysis

Geophysical Exploration—Impacts associated with geophysical exploration under alternative C would be similar to the impacts described in alternatives A and B. However, under alternative C, with the establishment of SMAs to further protect resources and values, impacts would be reduced in these areas. Geophysical exploration would not be allowed in any of the SMAs or associated setbacks at Big South Fork NRRA, with the exception of the Special Scenery SMA unless approved in a plan of operations. Geophysical exploration would be allowed in this SMA at any time, while drilling activities in these areas would be limited during high visitor use periods (generally April through October). Since minimal geophysical exploration is expected and would include use of existing roads and pedestrian access, and would be limited to low visitor times during high visitor use periods, impacts on visitor use and experience associated with geophysical exploration in alternative C would be localized, short term, negligible, and adverse.

Drilling and Production—Under alternative C, actions would be limited or restricted in SMAs, unless otherwise approved in a plan of operations. Drilling and production would not be allowed in any of the SMAs or associated setbacks at Big South Fork NRRA As with geophysical exploration, timing stipulations for drilling and production would apply in the SMAs for visitor use/administrative areas, trails, and cemeteries at this park unit. Timing stipulations would also apply in the Special Scenery SMA for drilling operations. Production activities would be allowed in the Special Scenery SMA based on the outcome of the viewshed analysis required under this alternative. There would be a No Surface Use restriction in the Sensitive Geomorphic Feature SMA, and a 500-foot setback would be required for drilling and production operations. There would be a No Surface Use restriction in the Cliff Edge SMA, and a 100-foot setback would be required for all oil and gas operations (exploration, drilling, and production) unless an operator can demonstrate that these activities would not negatively impact the associated resources, and timing restrictions may be applied to drilling operations to minimize impacts on species of special concern and to avoid impacts on soils from rutting.

There would be a No Surface Use restriction in the Managed Fields SMA, and a 100-foot setback for drilling and production. There would be a No Surface Use restriction in the Visitor Use/Administrative Area SMA, and a 1,500-foot setback would be required from the outer boundary of the SMA for drilling and production. All operations in the Visitor Use/Administrative Area SMA would be limited to low visitor times during high visitor use or visitation periods (generally April through October) to minimize impacts on visitors. There would be a No Surface Use restriction in the Cultural Landscapes and Cemeteries SMA, and a 100-foot setback from cemeteries and a 1,500-foot setback from cultural landscapes would be required for all operations. All operations within the Cultural Landscapes and Cemeteries SMA would be limited during high visitor use or visitation periods (generally April through October) to minimize impacts on visitor use and experience. Trails would require a 300 foot setback for all operations. At Obed WSR, all federal property within the boundaries of the park unit would be subject to No Surface Use restrictions at all times of the year. Drilling and production activities would affect visitor use and experience as a result of restricted visitor access within Big South Fork NRRA; visual impacts on visitor experience from drilling and production operations, especially if wellpads were placed in relatively undisturbed settings where visitors would readily be able to see the operation and all associated equipment and tanks; site clearing, which would remove up to 1.5 acres of vegetation for each wellpad; access road construction, which would result in visible cuts through park vegetation; and lighting of the drilling rig, which could interfere with visitors' night-sky views; increased noise from construction activities (vehicles, chainsaws, and earthmoving equipment), drilling rigs, and the drilling crew; increased odors from drilling or production operations, especially if spills or leaks occurred; and increased human health and safety risks due to the potential exposure to hazardous and contaminating materials.

Under alternative C the NPS would implement an oil and gas management plan that clearly articulates the CLPRs applicable to the exploration, production, and transportation of non-federal oil and gas resources in Big South Fork NRRA and Obed WSR. In addition, SMAs with restrictions on oil and gas exploration, drilling, and production activities would be established. The 9B regulations would be enforced at any such sites, and operations found to pose a significant threat to federally owned or controlled lands or waters would be suspended by the superintendent until the threat is removed or remedied (see 36 CFR 9.33 and 9.51). As a result, although short-term and long-term impacts from drilling and production would still occur, this alternative would protect park resources and values, as well as visitor use and experience, better than alternatives A and B. Therefore, impacts on visitor use and experience due to drilling and production under alternative C would be less adverse than under alternative B as a result of establishing the SMAs. With the exception of the unlikely event of a blowout, fire, or large uncontrolled release, impacts on visitor use and experience are expected to be short term, localized, negligible to minor, and adverse during drilling, with some areas subject to short-term moderate adverse noise impacts; and long term, negligible to minor, and adverse on visual quality, noise, odors, and human health and safety during production.

Plugging and Reclamation—As indicated in the forecast of oil and gas activities in chapter 2, plugging and reclamation of wells is expected to be the primary oil and gas operation conducted in Big South Fork NRRA and Obed WSR during the life of this plan. Between both park units, approximately 50 wells are expected to be plugged and reclaimed, resulting in the reclamation of approximately 87 acres of land.

However, under alternative C the NPS would implement an oil and gas management plan that clearly articulates the CLPRs applicable to the exploration, production, and transportation of non-federal oil and gas resources in Big South Fork NRRA and Obed WSR, and would also establish several SMAs. Like alternative B, alternative C includes a new management framework for plugging and reclamation of wells, which would allow the NPS and operators to efficiently complete the compliance process for the plugging and reclamation of inactive wells that represent potential threats to park resources and values. SMAs would be used to prioritize the sites for plugging, and sites that present any hazard would be higher on the list for action. As a result, short-term impacts from these operations would still occur, but the new management framework for plugging and reclamation and SMA prioritization would increase the certainty that wells would be plugged and reclaimed to applicable standards and public hazards would be addressed quickly. Therefore, under this alternative, the long-term beneficial effects described under alternative A would be more likely to be realized sooner, including increased visitor access, reduced visual impacts, decreased noise disturbances, and reduced health and safety impacts.

Directionally Drilled Wells—Wells directionally drilled and produced from outside the park to bottomholes beneath the park, and the reclamation of these wells, could indirectly impact visitor use and experience in the park, as described for alternatives A and B. Impacts on visitor use and experience in the park units could range from no impact to indirect, localized, short- to long-term, negligible to moderate, adverse impacts, with a chance of major impacts if a blowout, fire or large uncontrolled release occurred close to the park. However, reclamation of wells directionally drilled from outside the park units to bottomholes beneath them would also result in long-term beneficial impacts.

Cumulative Impacts

Impacts on visitor use and experience from other actions that were considered under the cumulative impact scenario would be the same as described for alternative A. The effects of these actions, when combined with the short- and long-term negligible to mostly minor adverse impacts as well as the long-term beneficial effects of alternative C, would have short- and long-term negligible to minor adverse cumulative impacts on visitor use and experience. The actions under alternative C would contribute moderately to both adverse and beneficial cumulative impacts.

Conclusion

Under alternative C, with designation of SMAs and setbacks that preclude surface uses, it is expected that geophysical exploration would result in short-term localized negligible adverse impacts on park visitors as a result of temporary access restrictions and effects on visual quality, noise, odors, and human health and safety. With implementation of mitigation measures, and the establishment of SMAs with setbacks and/or timing to avoid high use visitor use periods, drilling and production activities would have short-term localized negligible to mostly minor adverse impacts on visitor use and experience during drilling, and long-term negligible to minor adverse impacts from the effects on visual quality, noise, odors, and human health and safety during production. Eventual reclamation of these sites at the cessation of operations would result in long-term localized beneficial impacts on visitor use and experience. Temporary effects on access, visual quality, noise, odors, and human health and safety would be localized, short term, negligible to minor, and adverse. Wells directionally drilled and produced from outside the park to bottomholes beneath the park, and the reclamation of these wells, could indirectly impact visitor use and experience in the park, with impacts ranging from no impact to indirect, localized, short- to long-term, negligible to minor, adverse impacts. However, reclamation of wells directionally drilled from outside the park units to bottomholes beneath them would also result in long-term beneficial impacts on visitor use and experience, including visual quality, noise, odors, and human health and safety. Although up to major short-term adverse effects could occur in the unlikely event of a well blowout, fire, or uncontrolled release, the risk of that occurring is less under alternative C due to increased monitoring and inspections.

Cumulative impacts would be similar to those described for alternative B, with short- and long-term negligible to minor adverse cumulative impacts on visitor use and experience. The actions under alternative C would contribute moderately to both adverse and beneficial cumulative impacts.

PARK MANAGEMENT AND OPERATIONS

GUIDING REGULATIONS AND POLICIES

Park management and operations refers to the current staff available to adequately protect and preserve vital park resources and provide for an effective visitor experience. This topic also includes the operating budget necessary to conduct park operations.

METHODOLOGY, ASSUMPTIONS, AND IMPACT THRESHOLDS

Impacts were qualitatively assessed by comparing where surface uses would be permitted for oil and gas development in the park and determining whether this could affect park staff's ability to manage permitting activities as well as other natural-resource-related activities mandated by law, regulation, agreement, or litigation. The revised RFD scenario and the forecast of oil and gas activities presented in chapter 2 projects the number of wells that are anticipated to develop the hydrocarbons underlying the park over the next 15–20 years. Specific locations of hydrocarbon accumulations in the park are unknown, and the NPS cannot speculate where operators would conduct their operations. Because of the uncertainties of the petroleum industry and the financial considerations inherent in each operation, it is not possible to quantify the impacts on park operations and facilities; therefore, the estimates of the intensity of impact (negligible, minor, moderate, and major) presented in the following section are qualitative.

As individual projects are proposed, site-specific impact analyses would be conducted (as required under NEPA), which would further refine the assessment of environmental effects. This assessment of impacts is based on best professional judgment. The impact analysis area for evaluating direct and indirect effects, in addition to cumulative effects, is the Big South Fork NRRA and Obed WSR (both park operations and facilities).

The impact intensity threshold definitions are based on the potential for changes to park management and operations characteristics, as follows:

Negligible: Actions would have no measurable impact on management or operation of the park units.

Minor: Actions would affect park management and operations in the park units in a way that would be difficult to measure. The impacts from oil and gas management would have little budgetary or material effect on other ongoing park management programs or operations, and would not be noticeable to the public.

Moderate: Actions would measurably affect park management and operations in the park units. Park staff workloads and priorities would need to be rearranged to implement oil and gas management actions. As a result, other ongoing park management programs or operations would be reduced in scope or potentially eliminated, and effects could be noticeable to the public.

Major: Management and operations in the park units would be noticeably affected, and would be markedly different from current conditions. Funding for management actions would exceed the current oil and gas management budget and would require additional personnel over and above what would normally be expected to be funded.

IMPACT OF THE ALTERNATIVES

Alternative A: No Action (Current Management Continued)

Analysis

Geophysical Exploration—As described in the forecast of oil and gas activities in chapter 2, minimal geophysical exploration is expected at Big South Fork NRRA, except for the limited possibility of conventional seismic lines in areas of existing roads where data could be acquired quickly and inexpensively, using seismic vibrator technology. Because of the restrictions at Obed WSR, these operations would not be allowed within the park unit. There would be an increased workload for NPS employees because of overseeing the permitting and compliance with all CLPRs and 9B regulations for these operations and conducting site inspections to monitor operator adherence to mitigation measures outlined in the approved plan of operations, which would result in short-term negligible to minor adverse impacts on park management and operations.

Drilling and Production—Drilling and production would be evaluated on a case-by-case basis to determine the effect on park resources, and problems, leaks, and violations would be handled through base workload inspections and monitoring, resulting in continued short-term minor to moderate adverse impacts on park management and operations, depending on the level of activity at any one time. The NPS recognizes that unplanned incidents associated with oil and gas operations such as well blowouts, fires, and major spills within the boundaries of the park could adversely impact park management and operations in the short-term and up to a major level of intensity, depending on the amount of response and staff resources needed. However, the incident rates for such incidents are low and are not a typical expectation of project implementation.

Protected areas that are identified based on the application of CLPRs and the 9B regulations would result in areas where there could be No Surface Use restrictions or timing stipulations, and other mitigation measures may also be applied to limit the noise or visual impacts from drilling and production on park facilities (see appendix B). Typically, a 500-foot setback would be required from park facilities, based on the 9B regulations (36 CFR 9.41a). Drilling and production crews may need to use park roads and infrastructure, depending on the access that is available, potentially causing periodic demands related to large truck traffic that would require park staff attention. However, as described in the forecast of oil and gas activities in chapter 2, only up to 20 new wells are expected in Big South Fork NRRA, and only up to 5 wells, directionally drilled from outside the park unit, are expected in Obed WSR. It is also assumed that 125 wells at Big South Fork NRRA and 2 wells at Obed WSR would be worked over or serviced. Depending on the number of operations occurring at one time within the park, there could be short-term minor to moderate adverse impacts on park operations and facilities.

Plugging and Reclamation—As indicated in the forecast of oil and gas activities in chapter 2, plugging and reclamation of wells is expected to be the primary oil and gas operation conducted in Big South Fork NRRA and Obed WSR during the life of this plan. Between both park units, approximately 50 wells are expected to be plugged and reclaimed, resulting in the reclamation of approximately 87 acres of land.

Under alternative A, the plugging and reclamation of these wells would involve processing plans of operation on a case-by-case basis and overseeing the outcome of reclamation, which would increase the workload of NPS staff. NPS staff would need to review and approve plans and applications (for exemptions with mitigation) and subsequently monitor well abandonment and site reclamation to ensure that park resources are returned to approximate predisturbance conditions and that natural conditions and processes are restored, resulting in short-term minor to moderate adverse impacts on park management and operations that would be spread out over time. Once wells are plugged and sites reclaimed, there would be long-term beneficial impacts due to preventing further pollution and degradation associated with the unplugged wells.

Directionally Drilled Wells—Wells directionally drilled and produced from outside the park to bottomholes beneath the park, and the reclamation of these wells, could indirectly impact park management and operations. If a drilling operation were conducted outside the park to access non-federal oil and gas underlying the park, there would be operational costs associated with monitoring impacts on resources within the park unless the operator is granted an exemption under 9.32(e) from all or a portion of the NPS 36 CFR 9B plan of operations requirements. The operator's impacts on park operational resources could be reduced because construction of access roads/channels and wellpads may be required outside the park boundary. NPS review and approval of plans and applications (for exemptions with mitigation) and subsequent monitoring of well abandonment and site reclamation is expected to ensure that any park resources are returned to approximate predisturbance conditions and that natural conditions and processes are restored. With the possible exception of response to major blowouts or spills that affect nearby park resources, oversight of directional drilling operations would result in short- to long-term negligible to minor adverse impacts on park management and operations.

Cumulative Impacts

With the continuing reduction of impacts from oil and gas activities in both park units stemming from increased plugging and reclamation, and a corresponding decrease in new drilling and production, impacts to park management and operations are expected to diminish and contribute less to cumulative impacts over time. However, several actions discussed in the "Cumulative Impacts Scenario" section of this chapter have the potential to contribute to adverse and beneficial cumulative effects on park management and operations at the park units. The NPS plans to plug and reclaim 14 abandoned oil and gas wells at Big South Fork NRRA through a cooperative agreement with the Tennessee Department of Environment and Conservation, Division of Water Pollution Control. The plugging and reclamation of these wells resulted in short-term negligible to minor adverse impacts on park management and operations due to the increased workload of NPS staff, as well as long-term beneficial impacts due to preventing further pollution and degradation associated with the unplugged wells. Another 39 inactive wells would be plugged using ARRA funding over the next few years. Impacts on park management and operations from these plugging operations are expected to be short term, minor to moderate, and adverse, due to the increased workload of NPS staff.

In addition to oil and gas mining operations, there are an estimated 100 abandoned deep coal mine openings and associated spoil piles within Big South Fork NRRA. Mine reclamation efforts, funded by the Office of Surface Mining, have concentrated on areas with visitor access. Reclamation of these abandoned mines would have short-term minor to moderate adverse impacts on park management and operations within Big South Fork NRRA. There are two abandoned strip mines and one abandoned deep mine within Obed WSR, but these mines are not scheduled for reclamation in the foreseeable future.

ORV use is presently only allowed within Big South Fork NRRA for the purpose of transporting big game during hunting seasons. Federal regulations require all ORVs to be restricted to designated routes on all federal lands. ORVs can legally be used on multiple-use trails during deer- and hog-hunting seasons if the operator is actively involved in hunting. Although recreational ORV riding has been identified in the GMP, actual designations for ORV use are still in the planning stages. ORV use is not permitted in Obed WSR. Impacts from ORV use on park management and operations are expected to be long term, negligible to minor, and adverse, due to the increased workload on NPS staff related to supervising and managing such use at the Big South Fork NRRA.

The purpose of the GMP for Big South Fork NRRA is to provide a clearly defined direction for resource protection and visitor use at the park unit for a period of 15 to 20 years (NPS 2005a). The GMP delineates several management zones within the park and outlines the desired resource conditions and setting, desired visitor experience, and the kinds/levels of management appropriate in each zone. The GMP outlines road and trail classifications and standards that were incorporated into the plugging and reclamation standards discussed in chapter 2, and that would also apply to any roads associated with current and new oil and gas operations. The GMP for Obed WSR established a management zone system representing area-specific applications of management objectives, a resource management strategy, enhanced and expanded visitor-oriented programs and facilities, and boundary expansion (NPS 1995a). Implementation of the GMPs for each park unit is expected to result in long-term negligible to minor adverse effects on park management and operations, because the workload may increase for NPS staff; however, the implementation of the GMPs would likely prevent further degradation of park resources, a long-term benefit on park resource management.

Visitor activities such as horseback riding, biking, hunting, recreational rock climbing, swimming, kayaking, hunting, and fishing all occur within Big South Fork NRRA and/or Obed WSR. Although visitor uses are not expected to change, visitation is expected to increase slightly over the life of this plan, with annual fluctuations. This expected increase in park visitation would likely result in long-term negligible to minor adverse effects on park management and operations.

The NPS has published an advance notice of proposed rulemaking in the Federal Register, seeking comments to assist the agency in developing a proposed rule to revise the 9B regulations governing non-federal oil and gas development within the boundaries of NPS units. Generally, the proposed changes focus on improving resource protection aspects of the regulations while accounting for advances in oil and gas technology and industry practices. These changes could have long-term minor adverse impacts on park management and operations due to the slightly increased workload for NPS staff that is expected to accompany the revised 9B regulations, with long-term benefits from the expected gradual increase in compliance and the reduced need for responding to problems or emergencies at unregulated sites.

The adverse and beneficial effects of these past, present, and reasonably foreseeable future actions, when combined with the short-term negligible to moderate adverse impacts of alternative A, would have short- and long-term minor to moderate adverse cumulative adverse impacts on park management and operations. The actions under alternative A would contribute moderately to both adverse and beneficial cumulative impacts.

Conclusion

Given the limited seismic surveys (if any) projected in the park units, it is expected that geophysical exploration would require a slight increase in costs and staff time needed to oversee the operations, which would result in short-term negligible to minor adverse impacts on park management and operations. Site inspections and monitoring would continue to require staff attention, so drilling and production impacts would depend on the incidents reported and the limited number of new wells projected. Given the need to review all plans of operations on a case-by-case basis, drilling and production activities could result in short-term localized minor to moderate adverse impacts on park management and operations. Demands for staff time for plugging and reclamation oversight would increase the workload of NPS staff, resulting in short-term minor to moderate adverse impacts on park management and operations that would be spread out over time. Once wells are plugged and sites reclaimed, there would be long-term beneficial impacts due to preventing further pollution and degradation associated with the unplugged wells. Wells directionally drilled and produced from outside the park to bottomholes beneath the park, and the reclamation of these wells, could indirectly impact park management and operations, resulting in short- to long-term negligible to minor adverse impacts. For both in-park and adjacent directionally drilled wells, up to major short-term adverse effects could occur in the unlikely event of a well blowout, fire, or uncontrolled release.

The adverse and beneficial effects of past, present, and reasonably foreseeable future actions, when combined with the short- and long-term negligible to moderate adverse impacts as well as the long-term beneficial effects of alternative A, would have short- and long-term minor to moderate adverse cumulative impacts on park management and operations. The actions under alternative A would contribute moderately to both adverse and beneficial cumulative impacts.

Alternative B: Comprehensive Implementation of the 9B Regulations and a New Management Framework for Plugging and Reclamation

Analysis

Geophysical Exploration—As with alternative A, minimal geophysical exploration is expected at Big South Fork NRRA, except for the limited possibility of conventional seismic lines in areas of existing roads where data could be acquired quickly and inexpensively, using seismic vibrator technology. The availability of a management plan may expedite the review of geophysical operations by making information available to operators from the beginning, and the park staff would still have very limited demands related to this phase given the minimal geophysical exploration expected at the park units. As a result, impacts associated with geophysical exploration in alternative B would be very similar to the impacts described in alternative A, and would be short term, negligible to minor, and adverse.

Drilling and Production—Because the forecast of oil and gas activities in chapter 2 applies to all alternatives, impacts associated with up to 20 new wells in Big South Fork NRRA and up to 5 wells directionally drilled from outside the park unit in Obed WSR and well workover/servicing would be very similar to the impacts described in alternative A. Under alternative B, the NPS would implement an oil and gas management plan that clearly articulates the CLPRs applicable to the exploration, production, and transportation of non-federal oil and gas resources in Big South Fork NRRA and Obed WSR. Additionally, increased inspections and monitoring under alternative B would proactively identify sites that may be impacting, or threatening to impact, park resources beyond the operations area. This increase in inspections and monitoring would require more staff time to implement, and additional seasonal or term staff would be requested under this alternative. The 9B regulations would be enforced at any such sites, and operations found to pose a significant threat to federally owned or controlled lands or waters would be suspended by the superintendent until the threat is removed or remedied (see 36 CFR 9.33 and 9.51). As a result, although short-term and long-term impacts from drilling and production would still occur, this alternative would protect park resources and values better than alternative A, which would place more of a demand on park management and operations but could also serve to reduce staff time spent dealing with emergencies or reported violations or releases/leaks as the plan is implemented over time.

Under alternative B, operations associated with drilling and production could be allowed in all areas of the park units, with the exception of protected areas identified by CLPRs. This includes prohibitions on oil and gas operations in the designated gorge area (Big South Fork NRRA); deed restrictions that require No Surface Use restrictions and the use of technically feasible methods that are least damaging, such as directional drilling (Obed WSR); and 500-foot setbacks from visitor use and administrative areas, as well as perennial, intermittent, or ephemeral watercourses, unless specifically authorized in an approved plan of operations (as required by 36 CFR 9.41). Typically, a 1,500-foot setback would be required from park facilities used for unit interpretations, based on the 9B regulations (36 CFR 9.41a). Drilling and production crews may use existing park roads and infrastructure, potentially causing periodic demands related to large truck traffic that would require park staff attention. However, as described in the forecast of oil and gas activities in chapter 2, only up to 20 new wells are expected in Big South Fork NRRA, and only up to 5 wells, directionally drilled from outside the park unit, are expected in Obed WSR.

Depending on the number of operations occurring at one time within the park, with the exception of the unlikely event of a blowout, fire, or large uncontrolled release, there could be short-term minor to moderate adverse impacts on park operations and facilities, and long-term moderate adverse impacts relating to the additional staff time needed for more proactive enforcement and monitoring of new and existing well sites and operations. Although up to major short-term adverse effects could occur in the unlikely event of a well blowout, fire, or uncontrolled release, the risk of that occurring is less under alternative B due to increased monitoring and inspections. Having consistent guidance on plan requirements provided to operators from the beginning would help reduce time required to process applications and address operator inquiries.

Plugging and Reclamation—As indicated in the forecast of oil and gas activities in chapter 2, plugging and reclamation of wells is expected to be the primary oil and gas operation conducted in Big South Fork NRRA and Obed WSR during the life of this plan. Between both park units, approximately 50 wells are expected to be plugged and reclaimed, resulting in the reclamation of approximately 87 acres of land.

However, under alternative B, the NPS would implement an oil and gas management plan that clearly articulates the CLPRs applicable to the exploration, production, and transportation of non-federal oil and gas resources in Big South Fork NRRA and Obed WSR. This includes a new management framework for plugging and reclamation of wells, which would allow the NPS and operators to efficiently complete the compliance process for the plugging and reclamation of inactive wells that represent potential threats to park resources and values. This new management framework also includes goals and specific activities for protecting park resources and values during plugging and reclamation activities.

As in alternative A, NPS review and approval of plans and applications (for exemptions with mitigation) and subsequent monitoring of well abandonment and site reclamation is expected to ensure that park resources are returned to approximate predisturbance conditions and that natural conditions and processes are restored. The proposed management framework would reduce staff time in handling the applications. Also, consistent guidance on reclamation requirements would be provided to operators, which could reduce staff time spent managing plugging and reclamation requirements, resulting in short-term minor adverse impacts.

Directionally Drilled Wells—Wells directionally drilled and produced from outside the park to bottomholes beneath the park, and the reclamation of these wells, could indirectly impact park management and operations. Similar to alternative A, with the possible exception of response to major blowouts or spills that affect nearby park resources, these actions would result in short-term negligible to minor adverse impacts on park management and operations.

Cumulative Impacts

Impacts on park management and operations from other actions that were considered under the cumulative impact scenario would be the same as described for alternative A. The effects of these actions, when combined with the short- and long-term negligible to moderate adverse impacts of alternative B, would have short- and long-term minor to moderate adverse cumulative impacts on park management and operations. The actions under alternative B would contribute moderately to both adverse and beneficial cumulative impacts, and having plan requirements clearly articulated to operators from the beginning should help reduce impacts on staff over time.

Conclusion

The costs associated with geophysical exploration under alternative B would be the same as under alternative A, as a result of NPS staff overseeing geophysical exploration projects as well as impacts on park infrastructure and resources due to an increase in oil and gas–related vehicular traffic. This could result in short-term negligible to minor adverse impacts on park management and operations. There would be an associated cost or time demand as a result of NPS staff implementing a proactive site inspection and monitoring program at regular intervals. Depending on the geographical extent of the area where drilling and production activities could occur and the ability of the park staff to conduct inspections, this could result in short-term minor to moderate adverse impacts on park management and operations, with reduced effects if staffing is increased from current levels. Having plan requirements readily available from the beginning should help reduce impacts on staff over time. The proposed management framework would reduce staff time spent in handling plugging and reclamation, resulting in short-term minor adverse impacts. Wells directionally drilled and produced from outside the park to bottomholes beneath the park, and the reclamation of these wells, could indirectly impact park management and operations, resulting in short- to long-term negligible to minor adverse impacts. Although up to major short-term adverse effects could occur in the unlikely event of a well blowout, fire, or uncontrolled release, the risk of that occurring is less under alternative B due to increased monitoring and inspections.

Impacts on park management and operations from other actions that were considered under the cumulative impacts scenario would be the same as described for alternative A. The adverse and beneficial effects of the cumulative actions, when combined with the short- and long-term negligible to moderate adverse impacts of alternative B, would have short- and long-term minor to moderate cumulative adverse impacts on park management and operations. The actions under alternative B would contribute moderately to both adverse and beneficial cumulative impacts.

Alternative C: Comprehensive Implementation of the 9B Regulations, a New Management Framework for Plugging and Reclamation, and Establishment of Special Management Areas

Analysis

Geophysical Exploration—Impacts associated with geophysical exploration under alternative C would be similar to the impacts described in alternatives A and B. However, under alternative C, SMAs would be established to further protect resources and values particularly susceptible to adverse impacts from oil and gas operations, or areas where certain resources are important to maintaining the ecological integrity of the park units. Under alternative C, geophysical exploration would not be allowed in any of the SMAs or associated setbacks at Big South Fork NRRA, with the exception of the Special Scenery SMA unless otherwise approved in a plan of operations. Geophysical exploration would be allowed in this SMA at any time, while drilling activities in these areas would be limited during high visitor use periods (generally April through October). Since minimal geophysical exploration is expected and would include use of existing roads and pedestrian access, and would be limited during high visitor use periods, impacts on park management and operations associated with geophysical exploration in alternative C would be short term, negligible, and adverse.

Drilling and Production—Under alternative C, the NPS would implement an oil and gas management plan that clearly articulates the CLPRs applicable to the exploration, production, and transportation of non-federal oil and gas resources in Big South Fork NRRA and Obed WSR, and would also establish SMAs where oil and gas exploration and drilling and production activities would be restricted unless otherwise approved in a plan of operations. The 9B regulations would be enforced at any such sites, and operations found to pose a significant threat to federally owned or controlled lands or waters would be suspended by the superintendent until the threat is removed or remedied (see 36 CFR 9.33 and 9.51). As a result, although short-term and long-term impacts from drilling and production would still occur, this alternative would protect park resources and values better than alternatives A and B, which would place more of a demand on park management and operations when compared to alternative A, but could serve to avoid staff time spent dealing with emergencies or unanticipated reports of violations or releases/leaks. Although up to major short-term adverse effects could occur in the unlikely event of a well blowout, fire, or uncontrolled release, the risk of that occurring is less under alternative CB due to increased monitoring and inspections.

Under alternative C drilling proposals would be evaluated based on SMAs and the increased setbacks recommended from their boundaries (typically, 1,500 feet). This would result in areas where there could be No Surface Use restrictions or timing stipulations, and other mitigation measures may also be applied to limit the noise or visual impacts from drilling and production on park facilities (see chapter 2). Typically, a 1,500-foot setback would be required from park facilities used for unit interpretations, based on the 9B regulations (36 CFR 9.41a). Drilling and production crews may use existing park roads and infrastructure, potentially causing periodic demands related to large truck traffic that would require park staff attention.

Similar to alternative B, depending on the number of operations occurring at one time within the park, there could be short-term minor to moderate adverse impacts on park operations and facilities, with reduced effects if staffing is increased from current levels. There would be a need for additional staff time for more proactive enforcement and monitoring of new and existing well sites and operations. However, alternative C would help to reduce the amount of staff time needed to identify and delineate sensitive areas to be avoided, and having consistent guidance on plan requirements provided to operators from the beginning would help reduce time required to process applications and address operator inquiries.

Plugging and Reclamation—As indicated in the forecast of oil and gas activities in chapter 2, plugging and reclamation of wells is expected to be the primary oil and gas operation conducted in Big South Fork NRRA and Obed WSR during the life of this plan. Between both park units, approximately 50 wells are expected to be plugged and reclaimed, resulting in the reclamation of approximately 87 acres of land.

As in alternatives A and B, NPS review and approval of plans and applications (for exemptions with mitigation) and subsequent monitoring of well abandonment and site reclamation is expected to ensure that park resources are returned to approximate predisturbance conditions and that natural conditions and processes are restored. However, under alternative C the NPS would implement an oil and gas management plan that clearly articulates the CLPRs applicable to the exploration, production, and transportation of non-federal oil and gas resources in Big South Fork NRRA and Obed WSR, and would also establish several SMAs. Like alternative B, alternative C includes a new management framework for plugging and reclamation of wells, which would allow the NPS and operators to efficiently complete the compliance process for the plugging and reclamation of inactive wells that represent potential threats to park resources and values. SMAs would be used to prioritize the sites for plugging, and sites that present any hazard would be higher on the list for action. As a result, short-term impacts from these operations would still occur, but the new management framework for plugging and reclamation and SMA prioritization would increase the certainty that wells would be plugged and reclaimed to applicable standards. Consistent guidance on reclamation requirements would be provided to operators, which would reduce staff time spent managing plugging and reclamation requirements. As a result, there would be short-term minor adverse impacts on park management and operations.

Directionally Drilled Wells—Wells directionally drilled and produced from outside the park to bottomholes beneath the park, and the reclamation of these wells, could indirectly impact park management and operations. Similar to alternatives A and B, with the possible exception of response to major blowouts or spills that affect nearby park resources, this would result in short-term negligible to minor adverse impacts on park management and operations.

Cumulative Impacts

Impacts on park management and operations from other actions that were considered under the cumulative impact scenario would be the same as described for alternative A. The effects of the cumulative actions, when combined with the short- and long-term negligible to moderate adverse impacts of alternative C, would have short- and long-term minor to moderate adverse cumulative impacts on park management and operations. The actions under alternative C would contribute moderately to both adverse and beneficial cumulative impacts.

Conclusion

Impacts on park management and operations under alternative C would be similar to those described for alternative B, but with additional effort needed to address proposed actions in the SMAs, especially for previously grandfathered operations. The costs associated with geophysical exploration under alternative C would be the same as under alternative B, as a result of NPS staff overseeing geophysical exploration projects as well as impacts on park infrastructure and resources due to an increase in oil and gas–related vehicular traffic. This could result in short-term minor adverse impacts on park management and operations. Similar to alternative B, there would be a need for additional staff time for more proactive enforcement and monitoring of new and existing wells sites and operations, which could have long-term minor to moderate adverse impacts. However, alternative C would help to reduce the amount of staff time needed to identify and delineate sensitive areas to be avoided, resulting in long-term minor adverse impacts. The proposed management framework would reduce staff time in handling plugging and reclamation, resulting in short-term minor adverse impacts. Wells directionally drilled and produced from outside the park to bottomholes beneath the park, and the reclamation of these wells, could indirectly impact park management and operations, resulting in short- to long-term negligible to minor adverse impacts. Although up to major short-term adverse effects could occur in the unlikely event of a well blowout, fire, or uncontrolled release, the risk of that occurring is less under alternative B due to increased monitoring and inspections.

Cumulative impacts would be the same as described for alternative B, with short- and long-term minor cumulative adverse impacts on park management and operations. The actions under alternative C would contribute moderately to both adverse and beneficial cumulative impacts.

SUSTAINABILITY AND LONG-TERM MANAGEMENT

Relationship between Local Short-term Uses of the Environment and Maintenance and Enhancement of Long-term Productivity

For all alternatives in this plan/EIS, many impacts would be relatively short-term and all impacts would be mitigated to avoid impairment of park resources and values. Land disturbed during oil and gas operations would be reclaimed, equipment and contamination or wastes removed, and the ground restored to its natural contours. However, some surface disturbances resulting from oil and gas development may cause long-term effects, if the areas are not totally reclaimed or are reclaimed after a very long period of time. For example, access roads may be used for more than one wellpad or for other multiple uses. In such cases, long-term productivity would likely decrease and possibly be lost in the areas used for access roads. Also, in the unlikely case that wetlands cannot be avoided and the mitigation required is not successful in compensating for the original productivity of areas lost, there could be a loss in long-term productivity in these areas. This would be the case if certain out-of-kind wetland mitigation would be approved for replacement of productive wetland acreage. Finally, short-term use related to oil and gas development could affect land and water resources and associated wildlife in the longer-term if substantial leaks or spills were to occur and require extended time for clean-up and remediation.

IRREVERSIBLE OR IRRETRIEVABLE COMMITMENTS OF RESOURCES

Irreversible impacts are those effects that cannot be changed over the long term or are permanent. An effect to a resource is irreversible if it (the resource) cannot be reclaimed, restored, or otherwise returned to its pre-disturbance condition. Use of nonrenewable resources (such as oil and gas) represents an irreversible commitment of resources. An irretrievable commitment of resources refers to losses of production, harvest, or use of renewable natural resources.

For all the alternatives, there would be an irreversible commitment of the hydrocarbon resources underlying the parks, since oil and gas is being depleted at a much faster rate than it is being formed in the subsurface. This irreversible commitment of resources is not considered an impairment to park resources because private oil and gas development is not subject to impairment under the NPS Organic Act. Rather, Congress recognized the parks for the outstanding natural, scenic, and recreational values they provide, while providing for the private property right to develop these resources.

Another irreversible commitment of resources would occur if any significant cultural resources were destroyed during any phase of oil and gas development. However, the use of the seismic vibrator technique instead of shotholes as the source of seismic waves would reduce the chances of irreversible impacts due to earth disturbance and drilling, although some resources could be lost within the wellbores during well drilling or from vibrations impacts. Based on the small size of the wellbores and the forecast for only a small amount of exploration and relatively few wells, impacts from well drilling would be relatively minor. If buried cultural resources cannot be avoided, impacts would be mitigated by the recovery of data (excavation) and preservation of recovered materials and associated records, an irreversible adverse impact. Where seismic vibration is proposed, park staff would identify areas that require subsurface surveying prior to operations commencing to minimize the chances of impact, although unknown resources could be irreversibly affected.

For all alternatives, there would be an irretrievable loss of undeveloped areas for visitor use and experience where the ground is cleared and disturbed for oil and gas exploration and development, including access roads and wellpads. For the RFD scenario wells, this involves up to approximately 36 acres of Big South Fork NRA, and no additional acreage for Obed WSR, since all wells there would be directionally drilled from outside that park. The potential for these lands to produce vegetation or be viewed in an undisturbed state would be irretrievably committed for the duration of the oil and gas development operations, and until the site(s) have been reclaimed.

UNAVOIDABLE ADVERSE IMPACTS

Unavoidable adverse impacts are adverse impacts that cannot be avoided and cannot be mitigated, and, therefore, would remain throughout the duration of the oil and gas operation. Under alternatives B and C, the implementation of this oil and gas management plan would provide clearer direction to the oil and gas operator and greater protection to park resources and values, thereby avoiding and mitigating potential damage to park resources and values. If an operator’s proposal could potentially lead to a major adverse impact or impairment of park resources, the NPS would not approve the proposed operation until adequate resource protection (mitigation) is integrated into the operation. Also, any variance from SMA requirements or restrictions would need to be approved in a plan of operations, which would provide for avoidance of adverse impacts.

For any of the alternatives, there may be unavoidable adverse impacts if the mitigation proposed for any impacted wetlands or water resources is not successful and/or does not compensate for the original wetland functions and values or loss of water-dependent species. All alternatives would require avoidance of wetlands as the first mitigation measure. In the unlikely case that avoidance is not possible, it may be difficult to ensure that either the restoration of wetlands required through compensation or the reclamation of the wetlands after operations would have similar functions or values. Water resources would be protected by adherence to regulatory requirements for spill prevention and clean-up, but unexpected releases that breach containment could cause unavoidable adverse impacts until response is initiated and completed.

There may also be unavoidable adverse impacts on visitor uses and experiences /natural soundscapes if the setbacks and other mitigation measures do not provide enough of a restricted area between oil and gas operations and visitor use areas. There is a distinct possibility that the noise from drilling rigs, compressors, and other oil and gas operations could adversely impact visitor experience especially on a short-term basis. This would depend on the specific location, intervening topography and vegetation, noise mitigation techniques utilized, and the existing background noise levels in the vicinity of the operation.

Finally, there may be unavoidable adverse impacts related to unplanned releases (blowouts, spills, leaks, and fires). As stated throughout the analysis, the NPS recognizes that unplanned incidents associated with oil and gas operations such as well blowouts, fires, and major spills within the boundaries of the park present a risk of release of contaminants that can adversely impact park resources and values, depending on the location of the release. However, the incident rates for such incidents are low and are not a typical expectation of project implementation. If such an incident did occur, required mitigation measures such as use of blowout preventers and implementation of SPCC plans would be expected to result in lessening the potential for spilled substances or a well fire to spread into the park, and for timely response and cleanup, so that there is a reasonable expectation that long term adverse impacts would not occur or be limited to minor to moderate levels of intensity, although there could be short-term major adverse effects during the release.

CHAPTER 5: CONSULTATION AND COORDINATION

The intent of the National Environmental Policy Act (NEPA) is to encourage the participation of federal and state-involved agencies and affected citizens in the assessment procedure, as appropriate. This section describes the consultation that occurred during development of this draft Oil and Gas Management Plan / Environmental Impact Statement, including consultation with scientific experts and other agencies. This chapter also includes a description of the public involvement process and a list of the recipients of the draft document.

HISTORY OF PUBLIC INVOLVEMENT

The public involvement activities for this draft Oil and Gas Management Plan / Environmental Impact Statement fulfill the requirements of the NEPA and National Park Service (NPS) Director's Order 12 (NPS 2001).

THE SCOPING PROCESS

The NPS divides the scoping process into two parts: internal scoping and external or public scoping. Internal scoping involved discussions among NPS personnel regarding the purpose of and need for management actions, issues, management alternatives, mitigation measures, the analysis boundary, appropriate level of documentation, available references and guidance, and other related topics.

Public scoping is the early involvement of the interested and affected public in the environmental analysis process. The public scoping process helps ensure that people have an opportunity to comment and contribute early in the decision-making process. For this planning document and impact statement, project information was distributed to individuals, agencies, and organizations early in the scoping process, and people were given opportunities to express concerns or views and to identify important issues or even other alternatives.

Taken together, internal and public scoping are essential elements of the NEPA planning process. The following sections describe the various ways scoping was conducted for this impact statement.

INTERNAL SCOPING

An internal scoping meeting was held from March 7–11, 2005, to discuss the management of nonfederal oil and gas operations at Big South Fork National River and Recreation Area and Obed Wild and Scenic River (see figure 1 for a location map) and to identify the purpose, need, objectives, and preliminary alternatives for these NPS units. During the 5-day meeting, NPS employees identified the purpose of and need for action, management objectives, issues, and impact topics. Various roles and responsibilities for developing the oil and gas management plan were also clarified. The results of the meetings were captured in an "Internal Scoping Report," now on file as part of the administrative record.

PUBLIC SCOPING

Public Notification

The notice of intent to prepare an environmental impact statement (EIS) was published in the *Federal Register* on May 31, 2006.

A Public Scoping Brochure was mailed in July 2006 to the project's preliminary mailing list of government agencies, organizations, businesses, and individuals. The brochure announced the public scoping meetings in August, and summarized the overview and background of the area, the purpose of and need for action, management objectives, an overview of "9B" regulations, and preliminary strategies.

Public Meetings and Comments

Public scoping efforts for this planning process focused on the means or processes to be used to include the public, the major interest groups, and local public entities. Based on past experience, park staff place a high priority on meeting the intent of public involvement in the NEPA process and giving the public an opportunity to comment on proposed actions.

On July 13, 2006, Big South Fork National River and Recreation Area and Obed Wild and Scenic River released the Public Scoping Brochure for the Oil and Gas Management Plan/EIS for public review and comment. The public was invited to submit comments on the scope of the planning process and potential alternatives through September 26, 2006. During the public scoping period, four public scoping workshops were held. The first meeting was held in Jamestown, Tennessee on August 7, the second was held in Huntsville, Tennessee on August 8, the third was held in Oak Ridge, Tennessee on August 9, and the fourth was held at the South Fork Inn in Whitely City, Kentucky on August 10. All four workshops presented information about the planning process. Park staff and other NPS specialists were on hand to answer questions and provide additional information to workshop participants. During the public scoping period, 57 pieces of correspondence were entered into the Planning, Environment, and Public Comment database either from direct entry by the commenter, or uploading of emails, faxes, and hard copy letters by NPS staff. The primary comments from the public included those expressing support for Special Management Areas and concern over the establishment of more access roads in the park. Many commenters called for better detection for oil spills and overall improvements to oversight of production activities.

AGENCY SCOPING AND CONSULTATION

The Kentucky Division of Oil and Gas Conservation

On October 17, 2006, a conference call was initiated to gather input from the Director of the Kentucky Division of Oil and Gas Conservation, Rick Bender. During this call, it was noted that the KY Division of Oil and Gas Conservation has a plugging fund, but lacks a reclamation fund. It was further noted that in Kentucky, if a surface is severed from a mineral site, the operator must submit an operation/reclamation plan, and it must be signed by the surface estate owner. If the surface owner is the federal government, a federal plan of operations can be used in lieu on the operation/reclamation plan. Additionally, gathering lines and flowlines require a permit, a plan of operations on where the line is, and a map of the site.

Tennessee Department of Environment and Conservation: Division of Water Pollution Control

A representative for the Tennessee Department of Environment and Conservation: Division of Water Pollution Control was also involved in the October 17, 2006 conference call. The representative gave some background regarding the cost of Tennessee State bonding requirements: Reclamation Bonds cost $1,500; Plugging Bonds const $2,000 per well, or $10,000 per a maximum of ten wells.

United States Fish and Wildlife Service

On October 18, 2006, a conference call was initiated to gather input from the U.S. Fish and Wildlife Service (USFWS). The USFWS recognized items which they believe should be included in the Oil and Gas Management Plan, most notably the following: equip open pits with nets to protect wildlife from falling in; working with the U.S. Environmental Protection Agency to enhance water quality standards; input on procedures to manage existing operations, specifically containment/brine pits and contaminants. A copy of this draft EIS is being provided for comment. Formal consultation is not completed for this programmatic plan, since no on-the-ground actions are authorized by approval of this plan. All plans of operation that are done pursuant to this plan for proposed oil and gas projects will need to have a biological survey completed if directed by the NPS, and the NPS will consult with the USFWS on a project-by-project basis per *Endangered Species Act* requirements for each project.

State Historic Preservation Offices

Copies of this plan/EIS will be sent to the Tennessee and Kentucky Historic Preservation Offices for comment, and tribal consultations have been completed (see Tribal Consultation, below). Since no on-the–ground actions are authorized by approval of this plan, the NPS will consult with State Historic Preservation Office on a project-by-project basis pursuant to section 106 of the *National Historic Preservation Act* to evaluate the adequacy of cultural resources information and to assess and mitigate effects of oil and gas projects on cultural resources.

TRIBAL CONSULTATION

On December 29, 2006 the Superintendent of Big South Fork National River and Recreation Area, Reed E. Detring, sent a letter to various American Indian tribes, as required by Section 106 of the National Historic Preservation Act of 1966, as amended, which requires consultation with federally recognized American Indian tribes on a government-to-government basis. This letter, which was written to the Cherokee Nation, the Chickasaw Nation, the Eastern Band of Cherokee Indians, the Eastern Shawnee Tribe of Oklahoma, the United Keetoowah Band of Cherokee Indians in Oklahoma, the Shawnee Tribe, and the Absentee-Shawnee Tribe of Oklahoma, invited each of these tribes to consult with the NPS regarding the proposed Oil and Gas Management Plan/EIS covering oil and gas operations in the BISO and Obed. Two responses were received. The United Keetowah Band of Cherokee Indians in Oklahoma merely requested continued consultation on the project. The Eastern Band of Cherokee Indians responded that the project area may have cultural, archeological, or religious significance to the Eastern Band of Cherokee. These letters and responses can be found in appendix N. A copy of this draft plan is also being provided to the seven tribes, with a letter updating the various alternatives, explaining the status of the Plan/EIS, and soliciting comment.

LIST OF RECIPIENTS OF THE DRAFT PLAN / ENVIRONMENTAL IMPACT STATEMENT

This *Draft Oil and Gas Management Plan / Environmental Impact Statement* will be sent to the following agencies, organizations, and businesses, as well as to other entities and individuals who requested a copy.

ELECTED OFFICIALS

- Bob Corker, U.S. Senate
- Mitch McConnell, U.S. Senate
- Lamar Alexander, U.S. Senate
- Rand Paul, U.S. Senate
- Scott DesJarlais, U.S. House of Representatives
- Harold Rogers, U.S. House of Representatives
- David L. Williams, Kentucky Senate
- Ken Upchurch, Kentucky House of Representatives
- Sara Beth Gregory, Kentucky House of Representatives
- Ken Yager, Tennessee Senate
- Charlotte Burks, Tennessee Senate
- John Mark Windle, Tennessee House of Representatives
- Kelly Keisling, Tennessee House of Representatives
- Cameron Sexton, Tennessee House of Representatives

FEDERAL DEPARTMENTS AND AGENCIES

- Department of the Interior
  - National Park Service
  - Bureau of Land Management
- United States Environmental Protection Agency
- United States Army Corps of Engineers
- United States Fish and Wildlife Service
- United States Forest Service
- United States Geological Survey

STATE AND LOCAL GOVERNMENTAL AGENCIES

- Kentucky Department of Natural Resources
- Kentucky Department of Agriculture
- Kentucky Department of Fish and Wildlife Resources
- Kentucky Department of Parks
- Kentucky Division of Forestry
- Kentucky Environmental Quality Commission
- Kentucky Farm Bureau
- Kentucky Heritage Council
- Kentucky Nature Preserves Commission
- Kentucky Resources
- Council McCreary County

- McCreary County Agricultural Extension Service
- Wayne County
- Wayne County Agricultural Extension Service
- Wayne County Farm Bureau
- City of Knoxville
- Division of Air Pollution Control
- East Tennessee Development District
- Ellington Agricultural Center
- Fall Creek Falls State Resort Park
- Fentress County
- Fentress County Agricultural Extension Service
- Fentress County Farm Bureau
- Morgan County
- Morgan County Agricultural Extension Service
- Morgan County Farm Bureau
- Pickett County
- Pickett County Agricultural Extension Service
- Pickett County Farm Bureau
- Pickett State Forest
- Pickett State Park
- Tennessee Department of Agriculture
- Tennessee Department of Conservation
- Tennessee Department of Economic and Community Development
- Tennessee Department of Environment and Conservation
- Tennessee Department of Transportation
- Tennessee Farm
- Bureau Tennessee State Parks
- Tennessee Wildlife Resources Agency
- Tennessee Advisory Council on Historic Preservation
- Town of Winfield
- Scott County
- Scott County Agricultural Extension Service
- Scott County Farm Bureau
- Scott State Forest
- Virginia Department of Game and Inland Fisheries

ORGANIZATIONS/OTHERS

- ABC Petroleum
- Ace Petroleum Company, Inc.

- B&B Roofing
- Bandy Creek Stables
- Bar BEE Ranch
- Big South Fork Bicycle Club
- Biglane Operating Company
- BioTest Inc.
- Blue Ridge Trail Riders
- Bluegrass Wildwater Association
- Bowater, Inc.
- Buckhorn Hunting and Fishing
- Camac Oil & Gas Company
- Cambridge Resources, Inc.
- Charit Creek Lodge
- Chattanooga Arabian Horse Club
- Clear Creek Bed & Breakfast
- Clowes & Ray Oil Producers
- Cone Oil Company, Inc.
- Cumberland Resources Corp.
- Double Arches
- Dunlap Freedom Riders
- East Tennessee Consultants, Inc.
- East Tennessee Development District
- East Tennessee Whitewater Association
- Eastern Kentucky University
- Eastern National
- Eastern Natural Gas Corporation
- Eastern Professional River Outfitters
- Elizabethton Trail Riders
- Environmental Operating, Inc.
- Fentress Co. Chamber of Commerce
- Fentress Courier
- First Radio
- Friends of the Big South Fork NRRA, Inc.
- GASPRO Inc.
- Gray Gables B&B
- Great Smoky Mountain Chapter of Trout Unlimited
- Green River Gas Company
- Highland Drilling & Exploration
- Historic Rugby

- International Mountain Bicycling Association
- Interstate Energy Corp. of Ten
- Jarvis Drilling, Inc.
- Jim Barna Log Systems
- Johnson Energy Inc.
- Kentucky Horse Council
- Kentucky Oil and Gas Association
- Kentucky Nature Conservancy
- Kingston Oil Corporation
- KnoxNews Sentinel
- Knoxville Arabian Horse Club
- KY-Tenn Oil, Inc.
- Lake Cumberland Area Development District
- Lakeview Hills Saddle Club
- Laurel County Hiking Club
- Leah Petroleum Corporation
- Lock 4 Trailblazers
- McCreary Co. Chamber of Commerce
- McCreary County Heritage Foundation
- McCreary County Public Library
- Mid South Oil & Gas, Inc.
- Miller & B'Jewco Drilling Co.
- Monticello Chamber of Commerce
- Morgan County Chamber of Commerce
- Mountain Agricultural Supply, Inc.
- National Parks & Conservation Association
- Norman Drilling Company
- Off-Road and Performance General Store
- Pickett County Chamber of Commerce
- Plateau Properties, Inc.
- Pleasure Walking Horse Association of Tennessee
- Rebel Oil Corporation
- Red Feather Gas & Oil, Inc.
- Roark's Pharmacy
- Saint Joseph Petroleum, Inc.
- Save Our Cumberland Mountains
- Scott County Chamber of Commerce
- Sheltowee Trace Outfitters
- Sierra Club

- Slickrock Expeditions
- Smoky Mountain Trail Riders
- Smoky Mountains Hiking Club
- Society for Species Management and Survival
- South & Eastern Kentucky Tourism Development Association
- Southeast Pack Trips Inc.
- Station Camp Horse Camp
- Stearns Museum
- Stout Development, Inc.
- Tartan Oil Company
- TENEXCO Company
- Tennessee Citizens for Wilderness Planning
- Tennessee Clean Water Network
- Tennessee Conservation League
- Tennessee Gas & Oil, Inc.
- Tennessee Oil & Gas Association
- Tennessee Parks and Greenway Foundation
- Tennessee Scenic Rivers Association
- Tennessee Trail Blazers
- Tennessee Trails Association
- Tennessee Wildlife Resources Agency
- The Access Fund
- The Nature Conservancy of Tennessee
- Timber Ridge Horse Campground
- Tennessee Valley Authority
- Union College
- United Mountain Defense
- University of Kentucky
- University of Tennessee, Southern App. Field Lab
- Upper Cumberland Development District
- Van Stockum Law Office
- Volunteer Drilling Company, Inc.
- W.W. Keeler & Sons
- Western Reserves Oil Company
- Windsor Resources (U.S.) Ltd.
- Woodford County Saddle Club

LIST OF PREPARERS AND CONSULTANTS

Name	Title
National Park Service, Environmental Quality Division	
Michael Edwards	Project Manager, Environmental Quality Division (EQD)
Shelly Clubb	Project Manager (former), Environmental Quality Division (EQD)
National Park Service, Big South Fork NRRA & Obed Wild and Scenic River	
Etta Spradlin	Biological Science Technician, Big South Fork NRRA
Tom Blount	Chief of Resource Management, Big South Fork, NRRA
Todd Knoedler	Geologist, Big South Fork NRRA
Tom Des Jean	Cultural Resource Specialist/Archeologist, Big South Fork NRRA
Ron Cornelius	GIS Specialist, Big South Fork NRRA
Rebecca Schapansky	Resource Management Specialist, Obed Wild and Scenic River
Phil Campbell	Former Unit Manager, Obed Wild and Scenic River
National Park Service, Southeast Region	
Mark Kinzer	Environmental Protection Specialist
National Park Service, Geologic Resource Division	
Pat O'Dell	Petroleum Engineer
Carol McCoy	Branch Chief, Washington Support Office
Eddie Kassman	Regulatory Specialist
Lisa Norby	Geologist
The Louis Berger Group	
Lucy Bambrey	Cultural Resource Specialist
Jeff Gutierrez	Environmental Planner
Nancy Van Dyke	Project Manager/Senior Consultant
Dan Niosi	Former Project Manager/Environmental Scientist
Landon Vine	Environmental Scientist

Name	Title
Chris Thomas	Ecologist/GIS Specialist
Laura Totten	Senior Ecologist
Dayna Sherwood	Environmental Planner
Joshua Schnabel	Environmental Planner/Deputy Project Manager
The Final Word	
Juanita Barboa	Technical Editor
Sherrie Bell	Technical Editor / Document Designer

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GLOSSARY

Abandonment—The termination of oil and gas production operations, removal of facilities, plugging of the well bore, and reclamation of surface disturbances.

Action alternative—An alternative that would involve a change from existing conditions, including changes to established trends or management direction.

Advisory Council on Historic Preservation(ACHP)—The ACHP is an independent federal agency that promotes the preservation, enhancement, and productive use of our nation's historic resources, and advises the President and Congress on national historic preservation policy.

Affected environment—Term used in the National Environmental Policy Act to denote surface or subsurface resources (including social and economic elements) within or adjacent to a geographic area that could potentially be affected by a proposed action; the environment of the area to be affected or created by the alternatives under consideration. (40 CFR § 1502.15).

Alternative—Combination of management prescriptions applied in specific amounts and locations to achieve desired management goals and objectives.

Annular space—The space surrounding one cylindrical object placed inside another, such as the space surrounding a tubular object placed in a wellbore.

Aquifer—A water-bearing rock, rock formation, or group of formations. Aquifers can be either unconfined or confined.

Arches—Natural geologic features which bear the properties of an archway, formed through erosion over an extended period of time. Natural arches are particularly sensitive to surface disturbances such as seismic activity which could compromise their strength.

Base floodplain—100-year floodplain.

Best management practices (BMPs)—BMPs are state-of-the-art mitigation measures applied to oil and natural gas drilling and production to help ensure that energy development and operations are conducted in an environmentally responsible manner. BMPs can be simple, such as choosing a paint color that helps oil and gas equipment blend in with the natural surroundings, while others involve cutting-edge monitoring and production technologies.

Biodiversity—The degree of variation of life forms within a given ecosystem, biome, or on an entire planet.

Blowout—An uncontrolled explosion of gas, oil, or other fluids from a drilling well. A blowout occurs when formation pressure exceeds the pressure applied to it by the column of drilling fluid and when blowout prevention equipment is absent or fails.

Blowout preventer (BOP)—One of several valves installed at the wellhead to prevent the escape of pressure either in the annular space between the casing and drill pipe or in open hole (i.e., hole with no drill pipe) during drilling or completion operations.

Bottomhole—The deepest portion of an oil well.

Brine—Water containing relatively large concentrations of dissolved salts, particularly sodium chloride. Brine has higher salt concentrations than ocean water.

Cement plug—A balanced plug of cement slurry placed in the wellbore. Cement plugs are used for a variety of applications including hydraulic isolation, provision of a secure platform, and in window-milling operations for sidetracking a new wellbore.

Chimneys—Natural geologic features which bear the properties of a chimney, formed through erosion over an extended period of time. Chimneys are particularly sensitive to surface disturbances such as seismic activity which could compromise their balance.

Christmas tree—The control valves, pressure gauges, and chokes assembled at the top of a well to control the flow of gas after the well has been completed.

Code of Federal Regulations (CFR)—A publication that codifies the general and permanent rules and regulations published in the Federal Register by the Executive Branch departments and agencies of the federal government, and which carry the force of law.

Completion—The activities and methods to prepare a well for production. Includes installation of equipment for production from an oil or gas well.

Conditions of approval (COAs)—Provisions or requirements under which a plan of operations is approved.

Containerized mud system—A fully containerized, closed-loop drilling fluid system that holds water, drilling mud and well cuttings. Inside a National Park Service unit, an operator must use a closed loop containerized mud system in place of an earthen reserve pit system.

Contaminating substance—Those substances, including but not limited to, saltwater or any other injurious or toxic chemical; waste oil or waste emulsified oil; basic sediment; mud with injurious or toxic substances produced or used in the drilling, development, production, transportation, or on-site storage, refining, and processing of oil and gas.

Critical habitat—The specific areas within the geographical area occupied by the species at the time it is listed in accordance with the provisions of Section 4 of the Endangered Species Act, on which are found those physical or biological features essential to the conservation of the species and which may require special management considerations or protection; and specific areas outside the geographical area occupied by the species at the time it is listed…upon a determination by the Secretary that such areas are essential for the conservation of the species.

Cultural landscape—A geographic area, including both cultural and natural resources and the wildlife and domestic animals therein, associated with a historic event, activity, or person or exhibiting other cultural or aesthetic values.

Cultural resource—Cultural resources include archeological sites; historic sites, buildings, and districts; cultural landscapes; and ethnographic resources.

Current Legal and Policy Requirements (CLPRs)—The current laws, regulations, orders, policies, directives, etc. that provide the legal restrictions and requirements that must be followed.

Deed—A conveyance of realty; a writing signed by a grantor, whereby title to realty is transferred from one to another.

Deed restrictions—Restrictions on deeded land that place limitations on the use of the property. Restrictive covenants are an example of deed restrictions. Deed restrictions are usually initiated by the developers - those who determined the purposed use of the land. Deed restrictions come with the property and usually cannot be changed or removed by subsequent owners.

Deferred property – Fee-simple private properties located within the legislative boundary of Big South Fork NRRA.

Designation of operator—Appointment or assignment denoting person or entity responsible for an oil and gas operation.

Director—The Director of the National Park Service.

Directional drilling—Intentional deviation of a wellbore from the vertical (90 degrees). Although wellbores are normally drilled vertically, it is sometimes necessary or advantageous to drill at an angle from the vertical to avoid surface resources.

Drilling fluid ("mud")—Circulating fluid, one function of which is to lift cuttings out of the wellbore and to the surface. While a mixture of clay, water, and other chemical additives is the most common drilling fluid, wells can also be drilled using oil-based muds, air, or water as the drilling fluid.

Dry hole—Any well incapable of producing oil or gas in commercial quantities. A dry hole may produce water, gas, or even oil, but not enough to justify production.

Effects—See "impacts."

Endangered species—Any species which is in danger of extinction throughout all or a significant portion of its range.

Environmental assessment (EA)—A concise public document prepared to provide sufficient evidence and analysis for determining whether to prepare an environmental impact statement or a finding of no significant impact. An EA includes a brief discussion of the need for a proposal, the alternatives considered, the environmental impacts of the proposed action and alternatives, and a list of agencies and individuals consulted.

Environmental impact statement (EIS)—A document prepared to analyze the impacts on the environment of a proposed project or action and released to the public for comment and review. EISs are prepared when there is the potential for major impacts on natural, cultural or socioeconomic resources. An EIS must meet the requirements of National Environmental Policy Act, Council on Environmental Quality, and the directives of the agency responsible for the proposed project or action.

Executive orders, memoranda, or proclamations—Regulations having the force of law issued by the President of the United States to the Executive branch of the federal government.

Federal Register—Daily publication of the National Archives and Records Administration that updates the Code of Federal Regulations, in which the public may review the regulations and legal notices issued by federal agencies.

Federally owned and controlled lands—Land that the United States possesses fee title through purchase, donation, public domain, or condemnation. It also includes land that the United States holds any interest, such as a lease, easement, rights-of-way, or cooperative agreement.

Federally owned and controlled waters—All surface waters in the boundaries of a National Park System unit without regard to whether the title to the submerged lands lies with the United States or another party.

Floodplain—The lowland and relatively flat areas adjoining inland and coastal waters including floodprone areas of offshore islands, and including at a minimum, that area subject to temporary inundation by a regulatory flood.

Flowlines and gathering lines—Lines or pipelines that transport produced fluids (e.g., oil, gas, brine) from the wellhead to storage, treatment or transportation facilities.

Gas—Any fluid, either combustible or noncombustible, which is produced in a natural state from the earth, and which maintains a gaseous or rarefied state at ordinary temperature and pressures (36 CFR § 9.31(m)).

Geophysical exploration—Geophysical exploration consists primarily of seismic operations and typically involves selective cutting of vegetation along source and receiver lines as needed, use of shotholes/explosives or seismic vibrators as a source of vibration, and recording the data generated from the soundwaves generated in the ground by the source.

Hydrocarbons—Organic compounds consisting of hydrogen and carbon, such as petroleum, crude oil or natural gas, whose densities, boiling points, and freezing points increase as their molecular weights increase. The smallest molecules of hydrocarbons are gaseous; the largest are solids. Petroleum is a mixture of many different hydrocarbons.

Impacts—The likely effects of an action upon specific natural, cultural, or socioeconomic resources. Impacts may be beneficial, or adverse and direct, indirect, and / or cumulative.

Impairment (NPS Policy)—As used in NPS Management Policies, "impairment" means an adverse impact on one or more park resources or values that interferes with the integrity of the park's resources or values, or the opportunities that otherwise would exist for the enjoyment of them, by the present or a future generation. Impairment may occur from visitor activities, NPS activities in managing a park, or activities undertaken by concessioners, contractors, and others operating in a park. As used here, the impairment of park resources and values has the same meaning as the phrase "derogation of the values and purposes for which these various areas have been established," as used in the General Authorities Act.

Impairment (Clean Water Act)—As used in conjunction with the Clean Water Act and associated state water quality programs, a water body is “impaired” if it does not meet one or more of the water quality standards established for it. This places the water body on the “impaired waters list”, also known as the “303(d) list” for those pollutants that exceed the water quality standard.

Lease—A legal document executed between a landowner, as lessor, and a company or individual, as lessee, that grants the right to develop the premises for minerals or other products.

Lessor—One who leases real property. Typically, in park units the lessor is the mineral owner.

Management policies—The *National Park Service Management Policies* set the basic servicewide policy of the National Park Service. They provide the overall foundation, set the framework, and provide direction for management decisions within the National Park Service. The management of the National Park System and National Park Service programs is guided by the U.S. Constitution, public laws, proclamations, executive orders, rules and regulations, and directives of the Secretary of the Interior and the Assistant Secretary for Fish and Wildlife and Parks. Other laws, regulations, and policies related to the administration of federal programs, although not cited, may also apply.

Microhabitat—An extremely localized, small-scale environment, as a cliff ledge or rock overhang.

Mitigation—“Mitigation” as defined in the National Environmental Policy Act (40 CFR § 1508.20), includes: avoiding the impact altogether by not taking a certain action or parts of an action; minimizing impacts by limiting the degree or magnitude of the action and its Implementation; rectifying the impact of repairing, rehabilitating, or restoring the affected environment; reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action; compensating for the impact by replacing or providing substitute resources or environments.

National park system—The total sum of the land and water now and hereafter administered by the Secretary of the Interior through the National Park Service for park, monument, historic, parkway, recreational, or other purposes.

Natural floodplain values—Attributes of floodplains which contribute to ecosystem quality, including soils, vegetation, wildlife habitat, dissipation of flood energy, sedimentation processes, ground water (including riparian ground water) recharge, etc.

Natural gas—Highly compressible, highly expandable mixture of hydrocarbons having a low specific gravity and occurring naturally in a gaseous form. Besides hydrocarbon gases, natural gas may contain appreciable quantities of nitrogen, helium, carbon dioxide, and contaminants.

No-action alternative—An alternative that maintains established trends or management direction. For an oil and gas operation, it typically means that the action as proposed would not occur or current management would continue.

No surface use stipulation—Access across the surface or use of the surface for nonfederal oil and gas operations would be limited or not permitted in areas with this stipulation, unless otherwise authorized in an approved plan of operations.

Nonfederal oil and gas rights—Rights to oil and gas not owned by the United states where access is on, across, or through federally owned or controlled lands or waters.

Oil—Any viscous, combustible liquid hydrocarbon or solid hydrocarbon substance easily liquefiable on warming, which occurs naturally in the earth, including drip gasoline or other natural condensates recovered from gas without resort to manufacturing processes.

Operations (oil and gas)—“All functions, work and activities within a unit in connection with exploration for and development of oil and gas resources.” (36 CFR § 9.31(c)). Operations include, but are not limited to: reconnaissance to gather natural and cultural resources information; line-of-sight surveying and staking; geophysical exploration; exploratory drilling; production, gathering, storage, processing, and transport of petroleum products; inspection, monitoring, and maintenance of equipment; well “work-over” activity; construction, maintenance, and use of pipelines; well plugging and abandonment; reclamation of the surface; and construction or use of roads, or other means of access or transportation, on, across, or through federally owned or controlled lands or waters.

Operator—Person(s) who may have rights to explore and develop non-federally-owned oil and gas in National Park Service units, including: owners: individuals, corporations, local and state governments, and Indian tribes (when the tribe owns the oil and gas in fee); lessees, such as individuals or corporations that lease oil and gas from the owner; and contractors, which are individuals or corporations under contract with the owner, lessee, or operator.

Organic Act—The law that established the National Park Service in 1916.

Permeability—The capacity to transmit fluids or gases through soil or rock materials; the degree of permeability depends upon the size and shape of the pore spaces and interconnections, and the extent of the interconnections.

Physiographic province—A geographic region with a specific geomorphology and often specific subsurface rock type or structural elements.

Plan of operations—Information submitted by an operator describing how proposed oil and gas operations would be conducted in a unit of the National Park System pursuant to the National Park Service's Nonfederal Oil and Gas Rights Regulations, 36 CFR 9B, and containing information requirements pertinent to the type of operations being proposed (36 CFR § 9.36(a) through (d)).

Play—An area in which hydrocarbon accumulations or prospects of a given type occur.

Plugging—Permanent closing of a well by removing the completion equipment; pumping cement across producing zones, placing cement plugs at various depths to protect freshwater zones, setting a plug at the surface to cap the well, and removing wellhead equipment.

Practicable—Capable of being done within existing constraints. The test of what is practicable depends upon the situation and includes consideration of the pertinent factors such as environment, cost, or technology.

Production—Phase of mineral extraction where minerals are made available for treatment and use.

Programmatic—Following a plan, policy, or program.

Public law—A law or statute of the United States.

R**easonably foreseeable development (RFD)**—An estimate of the undiscovered hydrocarbon resources in an area and a projection of the type and extent of new operations that could occur to develop these resources.

Reclamation—The process of returning disturbed land to a condition that will be approximately equivalent to the pre-disturbance condition terms of sustained support of functional physical processes, biological productivity, biological organisms, and land uses.

Recovery plan—Plan required for each listed threatened/endangered species and generated by a task force under the leadership of the U.S. Fish and Wildlife Service. The plan describes the specific management actions necessary to restore the threatened or endangered species to recovery status, including the estimated cost and time involved. The U.S. Fish and Wildlife Service coordinator oversees implementation of the plan.

Regional Director—Chief decision-maker in each of the seven regions of the National Park Service.

Regulations—Rules or orders prescribed by federal agencies to regulate conduct, and published in the CFR.

Regulatory floodplain—Specific floodplain which is subject to regulation by Executive Order 11988, “Floodplain Management,” and the National Park Service’s Floodplain Management Guideline (#93-4). For Class I Actions, the Base Floodplain (100-year) is the regulatory floodplain; for Class II Actions, the 500-year return period floodplain is the regulatory floodplain; for Class III Actions, the Extreme floodplain is the regulatory floodplain.

Revegetation—Reestablishment and development of self-sustaining plant cover. On disturbed sites, this normally requires human assistance, such as seedbed preparation, reseeding, and mulching.

Scoping—Scoping is done during the initial phase of project planning to seek input from a variety of sources. This input is used to identify issues, areas requiring additional study, alternative methods and locations, and topics to be analyzed in the National Environmental Policy Act document. Scoping is done internally with National Park Service staff and externally with the interested public, other agencies, and stakeholders.

Section 106—Section 106 of the National Historic Preservation Act of 1966 requires Federal agencies to take into account the effects of their undertakings on historic properties, and afford the Advisory Council on Historic Preservation a reasonable opportunity to comment. The historic preservation review process mandated by Section 106 is outlined in regulations issued by the Advisory Council on Historic Preservation.

Seismic surveying (see geophysical exploration)—Reflection seismology (or seismic reflection) is a method of exploration geophysics that uses the principles of seismology to estimate the properties of the Earth's subsurface from reflected seismic waves. The method requires a controlled seismic source of energy, such as dynamite/Tovex, a specialized air gun or a seismic vibrator. By noting the time it takes for a reflection to arrive at a receiver, it is possible to estimate the depth of the feature that generated the reflection.

Setback—A designated distance which is established to protect a sensitive feature or artifact from disturbance.

Shut-in well—An oil and gas well in which the inlet and outlet valves have been shut off so that it is capable of production but is temporarily not producing.

Split estate—Situation where the mineral estate is owned or controlled by a different party than the owner of the land surface in the same area.

Taking—In the United States, according to the Fifth Amendment of the Constitution, taking of private real or personal property for public use by the government.

Threatened species—Any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

Unit agreement—An agreement combining leased tracts on a fieldwide or reservoir wide scale so that many tracts may be treated as one to facilitate operations such as enhanced recovery projects.

United States Code (USC)—The systematic collection of the existing laws of the United States, organized under 50 separate titles. The citation 16 USC refers to section 1 of title 16.

Vertical drilling—Drilling of a well vertically (90 degrees) to reach a target zone straight underneath the surface location.

Viewshed—An area of land, water, or other environmental element that is visible to the human eye from a fixed vantage point.

Well—A producing well with oil as its primary commercial product. Oil wells almost always produce some gas and frequently produce water. Most oil wells eventually produce mostly gas or water.

Wellbore—The wellbore itself, including the openhole or uncased portion of the well.

Well types at Big South Fork NRRA—

- Unknown: wells for which the NPS does not have sufficient information to verify the location or status
- Actively producing wells: wells that are mechanically capable of being produced and have documented production in the past 12 months
- Inactive wells: wells that have no documented production in the past 12 months
- Plugged and abandoned wells: wells that have been permanently closed by placement of cement plugs
- Orphaned wells: wells that do not have a responsible party

Wetlands—Lands that are transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water. For purposes of this classification, wetlands must have one or more of the following three attributes: 1) at least periodically, the land supports predominantly hydrophytes; 2) the substrate is predominantly undrained hydric soil; and 3) the substrate is non-soil and is saturated with water or covered by shallow water at some time during the growing season of each year. (Classification of Wetlands and Deepwater Habitats of the United States by Cowardin et al. 1979).

Wild and Scenic River—A river designated under the National Wild and Scenic Rivers Act (Public Law 90-542; 16 USC. 1271 et seq.) as having outstanding natural, cultural, and recreational values in a free-flowing condition for the enjoyment of present and future generations. Rivers may be designated by Congress or, if certain requirements are met, the Secretary of the Interior. Each river is administered by either a federal or state agency. Designated segments need not include the entire river and may include tributaries.

Windows—Natural geologic features which bear the properties of a hole through rock resembling a window, formed through erosion over an extended period of time. Windows are particularly sensitive to surface disturbances such as seismic activity which could compromise their natural form.

Workover—Work performed on an existing well to improve, maintain, or restore a well’s production. A workover is done using a truck-mounted rig and typically lasts one to several weeks.

Workover rig—Specific motorized equipment required to perform a workover operation.

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APPENDIX A: 9B REGULATIONS AND APPLICATION OF THE REGULATIONS

36 C.F.R. PART 9 SUBPART B
NON-FEDERAL OIL AND GAS RIGHTS REGULATIONS

AUTHORITY: Act of August 25, 1916, 39 Stat. 535 (16 U.S.C. §§ 1, *et seq.*); and the acts establishing the units of the National Park System, including but not limited to: Act of April 25, 1947, 61 Stat. 54 (16 U.S.C. §§ 241, *et seq.*); Act of July 2, 1958, 72 Stat. 285 (16 U.S.C. §§ 410, *et seq.*); Act of October 27, 1972, 86 Stat. 1312 (16 U.S.C. §§ 460dd, *et seq.*); Act of October 11,1974, 88 Stat. 1256 (16 U.S.C. §§ 698 -- 698e); Act of October 11, 1974, 88 Stat. 1258 (16 U.S.C. §§ 698f -- 698m); Act of December 27,1974, 88 Stat. 1787 (16 U.S.C. §§ 460ff *et seq.*).

SOURCE: 43 FR 57825, Dec. 8, 1978, unless otherwise noted.

§ 9.30 Purpose and scope.

(a) These regulations control all activities within any unit of the National Park System in the exercise of rights to oil and gas not owned by the United States where access is on, across or through federally owned or controlled lands or waters. Such rights arise most frequently in one of two situations: (1) When the land is owned in fee, including the right to the oil and gas, or (2) When in a transfer of the surface estate to the United States, the grantor reserved the rights to the oil and gas. These regulations are designed to insure that activities undertaken pursuant to these rights are conducted in a manner consistent with the purposes for which the National Park System and each unit thereof were created, to prevent or minimize damage to the environment and other resource values, and to insure to the extent feasible that all units of the National Park System are left unimpaired for the enjoyment of future generations.

These regulations are not intended to result in the taking of a property interest, but rather to impose reasonable regulations on activities which involve and affect federally-owned lands.

(b) Regulations controlling the exercise of minerals rights obtained under the Mining Law of 1872 in units of the National Park System can be found at 36 C.F.R. Part 9, Subpart A. In area where oil and gas are owned by the United States, and leasing is authorized, the applicable regulations can be found at 43 C.F.R., Group 3100.

(c) These regulations allow operators the flexibility to design plans of operations only for that phase of operations contemplated. Each plan need only describe those functions for which the operator wants immediate approval. For instance, it is impossible to define, at the beginning of exploratory activity, the design that production facilities might take. For this reason, an operator may submit a plan which applies only to the exploratory phase, allowing careful preparation of a plan for the production phase after exploration is completed. This allows for phased reclamation and bonding at a level commensurate with the level of operations approved. However, it must be noted that because of potential cumulative impacts, and because of qualitative differences in the nature of the operations, approval of a plan of operations covering one phase of operations does not guarantee later approval of a plan of operations covering a subsequent phase.

[43 FR 57825, Dec. 8, 1978, as amended at 44 FR 37914, June 29, 1979]

§9.31 Definitions.

The terms used in this Subpart shall have the following meanings:

(a) Secretary. The Secretary of the Interior.

(b) Director. The Director of the National Park Service or his designee.

(c) Operations. All functions, work and activities within a unit in connection with exploration for and development of oil and gas resources, the right to which is not owned by the United States, including: gathering basic information required to comply with this subpart, prospecting, exploration, surveying, preproduction development and production; gathering, onsite storage, transport or processing of petroleum products; surveillance, inspection, monitoring, or maintenance of equipment; reclamation of the surface disturbed by such activities; and all activities and uses reasonably incident thereto performed within a unit, including construction or use of roads, pipelines, or other means of access or transportation on, across, or through federally owned or controlled lands and waters, regardless of whether such activities and uses take place on Federal, State or private lands.

(d) Operator. A person conducting or proposing to conduct operations.

(e) Person. Any individual, firm, partnership, corporation, association, or other entity.

(f) Superintendent. The Superintendent, or his designee, of the unit of the National Park System containing lands subject to the rights covered by these regulations.

(g) Commercial Vehicle. Any motorized equipment used in direct or indirect support of operations.

(h) Unit. Any National Park System area.

(i) Owner. The owner, or his legal representative, of the rights to oil and gas being exercised.

(j) Designated Roads. Those existing roads determined by the Superintendent in accordance with 36 C.F.R. 1.5 and § 4.19 to be open for the use of the general public or for the exclusive use of an operator.

(k) Oil. Any viscous combustible liquid hydrocarbon or solid hydrocarbon substance easily liquifiable on warming which occurs naturally in the earth, including drip gasoline or other natural condensates recovered from gas without resort to manufacturing process.

(l) Gas. Any fluid, either combustible or noncombustible, which is produced in a natural state from the earth and which maintains a gaseous or rarefied state at ordinary temperature and pressure conditions.

(m) Site. Those lands or waters on which operations are to be carried out.

(n) Contaminating substances. Those substances, including but not limited to, salt water or any other injurious or toxic chemical, waste oil or waste emulsified oil, basic sediment, mud with injurious or toxic additives, or injurious or toxic substances produced or used in the drilling, development, production, transportation, or on-site storage, refining, and processing of oil and gas.

(o) Statement for Management. A National Park Service planning document used to guide short- and long-term management of a unit; to determine the nature and extent of planning required to meet the unit's management objectives; and, in the absence of more specific planning documents, to provide a general framework for directing park operations and communicating park objectives to the public.

[43 F R 57825, Dec. 8, 1978; 44 FR 37914, June 29, 1979, as amended at 60 FR 55791, Nov. 3 1995; 62 FR 30234, June 3, 1997]

§ 9.32 Access.

(a) No access on, across or through lands or waters owned or controlled by the United States to a site for operations will be granted except for operations covered by § 9.33 and, except as provided by § 9.38, until the operator has filed a plan of operations pursuant to § 9.36 and has had the plan of operations approved in accordance with § 9.37. An approved plan of operations serves as the operator's access permit.

(b) No operations shall be conducted on a site within a unit, access to which is on, across or through federally owned or controlled lands or waters except in accordance with an approved plan of operations, the terms of § 9.33 or approval under § 9.38.

(c) Any operator intending to use aircraft of any kind for access to a federally-owned or controlled site must comply with these regulations. Failure of an operator to receive the proper approval under these regulations prior to using aircraft in this manner is a violation of both these regulations and 36 C.F.R. 2.17.

(d) No access to a site outside a unit will be permitted across unit lands unless such access is by foot, pack animal, or designated road. Persons using designated roads for access to such a site must comply with the terms of § 9.50 where applicable.

(e) Any operator on a site outside the boundaries of a unit must comply with these regulations if he is using directional drilling techniques which result in the drill hole crossing into the unit and passing under any land or water the surface of which is owned by the United States. Except, that the operator need not comply in those areas where, upon application of the operator or upon his own action, the Regional Director is able to determine from available data, that such operations pose no significant threat of damage to park resources, both surface and subsurface, resulting from surface subsidence fracture of geological formations with resultant fresh water aquifer contamination, or natural gas escape, or the like.

§ 9.33 Existing operations.

(a) Any person conducting operations on January 8, 1979 in accordance with a Federal or State issued permit may continue to do so as provided by this section. After expiration of such existing permits no operations shall be conducted except under an approved plan of operations, unless access is granted by the Regional Director under § 9.38.

(1) All Federal special use permits dealing with access on, across or through lands or waters owned or controlled by the United States to a site for the conduct of operations within any unit issued prior to January 8, 1979 shall expire according to their terms and shall not be renewed, unless by the terms of the existing permit it must be renewed.

(2) All operations on a site in a unit access to which is on, across, or through federally owned or controlled lands or waters conducted pursuant to a valid State access permit may be continued for the term of that permit, exclusive of any renewal period whether mandatory or discretionary, if conducted in accordance with the permit.

(b) Any person conducting operations on January 8, 1979 in a unit where Federal or State permits were not required prior to January 8, 1979 may continue those operations pending a final decision on his plan of operations; Provided, That:

(1) The operator (within thirty (30) days of January 8, 1979), notifies the Superintendent in writing of the nature and location of the operations; and

(2) Within sixty (60) days after such notification, the operator submits, in accordance with these regulations, a substantially complete proposed plan of operations for those operations;

(3) Failure to comply with § 9.33(b) (1) and (2) shall constitute grounds for the suspension of operations.

(c) At any time when operations which are allowed to continue under § 9.33 (a) and (b) pose an immediate threat of significant injury to federally owned or controlled lands or waters, the Superintendent shall require the operator to suspend operations immediately until the threat is removed or remedied. The Superintendent must, within five (5) days of this suspension notify the operator in writing of the reasons for the suspension and of his right to appeal the suspension under § 9.49.

[43 FR 57825, Dec. 8, 1978; 44 FR 37914, June 29, 1979]

§ 9.34 Transfers of interest.

(a) Whenever an owner of rights being exercised under an approved plan of operations sells, assigns, bequeaths, or otherwise conveys all or any part of those rights, he, his agent, executor, or representative must notify the Superintendent within sixty (60) days of the transfer of: the site(s) involved; the name and address of the person to whom an interest has been conveyed; and a description of the interest transferred. Failure to so notify the Superintendent shall render the approval of any previously approved plan of operations void.

(b) The transferring owner shall remain responsible for compliance with the plan of operations and shall remain liable under his bond until such time as the Superintendent is notified of the transfer in accordance with paragraph (a). At that time the Superintendent will prohibit the new owner from operating until such time as the new owner has filed with the Superintendent: (1) A statement ratifying the existing plan of operations and stating his intent to be bound thereby, or a new plan of operations, and (2) a suitable substitute performance bond which complies with the requirements of § 9.48.

§ 9.35 Use of water.

No operator may use for operations any water from a point of diversion which is within the boundaries of any unit unless authorized in writing by the Regional Director. The Regional Director shall not approve a plan of operations requiring the use of water from such source unless the operator shows either that his right to the use of the water is superior to any claim of the United States to the water, or where the operator's claim to the water is subordinate to that of the United States that the removal of the water from the water system will not damage the unit's resources. In either situation, the operator's use of water must comply with appropriate State water laws.

§ 9.36 Plan of operations.

(a) The proposed plan of operations shall include, as appropriate to the proposed operations, the following:

(1) The names and legal addresses of the following persons: The operator and the owner(s) or lessee(s) (if rights are State-owned) other than the operator;

(2) Copy of the lease, deed, designation of operator, or assignment of rights upon which the operator's right to conduct operations is based;

(3) A map or maps showing the location of the perimeter of the area where the operator has the right to conduct operations, as described in § 9.36(a)(2), referenced to the State plane coordinate system or other public land survey as acceptable to the Superintendent;

(4) A map or maps showing the location, as determined by a registered land surveyor or civil engineer, of a point within a site of operations showing its relationship to the perimeter of the area described in § 9.36(a)(2) and to the perimeter of the site of operations; the location of existing and proposed access roads or routes to the site; the boundaries of proposed surface disturbance; the location of proposed drilling; location and description of all surface facilities including sumps, reserve pits and ponds; location of tank batteries, production facilities and gathering, service and transmission lines; wellsite layout; sources of construction materials such as fill; and the location of ancillary facilities such as camps, sanitary facilities, water supply and disposal facilities, and airstrips. The point within the site of operations identified by registered land surveyor or civil engineer shall be marked with a permanent ground monument acceptable to the Superintendent, shall contain the point's State plane coordinate values, and shall be placed at least to an accuracy of third order, class I, unless otherwise authorized by the Superintendent;

(5) A description of the major equipment to be used in the operations, including a description of equipment and methods to be used for the transport of all waters used in or produced by operations, and of the proposed method of transporting such equipment to and from the site;

(6) An estimated timetable for any phase of operations for which approval is sought and the anticipated date of operation completion;

(7) The geologic name of the surface formation;

(8) The proposed drilling depth, and the estimated tops of important geologic markers;

(9) The estimated depths at which anticipated water, brines, oil, gas, or other mineral bearing formations are expected to be encountered;

(10) The nature and extent of the known deposit or reservoir to be produced and a description of the proposed operations, including:

(i) The proposed casing program, including the size, grade, and weight of each string, and whether it is new or used;

(ii) The proposed setting depth of each casing string, and the amount of type of cement, including additives, to be used;

(iii) The operator's minimum specifications for pressure control equipment which is to be used, a schematic diagram thereof showing sizes, pressure ratings, and the testing procedures and testing frequency;

(iv) The type and characteristics of the proposed circulating medium or mediums to be employed for rotary drilling and the quantities and types of mud and weighting material to be maintained;

(v) The testing, logging, and coring programs to be followed;

(vi) Anticipated abnormal pressures or temperatures expected to be encountered; or potential hazards to persons and the environment such as hydrogen sulfide gas or oil spills, along with plans for mitigation of such hazards;

(11) A description of the steps to be taken to comply with the applicable operating standards of § 9.41 of this subpart;

(12) Provisions for reclamation which will result in compliance with the requirements of § 9.39:

(13) A breakdown of the estimated costs to be incurred during the implementation of the reclamation plan;

(14) Methods for disposal of all rubbish and other solid and liquid wastes, and contaminating substances;

(15) An affidavit stating that the operations planned are in compliance with all applicable Federal, State and local laws and regulations

(16) Background information, including:

(i) A description of the natural, cultural, social and economic environments to be affected by operations, including a description and/or map(s) of the location of all water, abandoned, temporarily abandoned, disposal, production, and drilling wells of public record within a two-mile radius of the proposed site. Where such information is available from documents identified in § 9.36(d), specific reference to the document and the location within the document where such information can be found will be sufficient to satisfy this requirement

(ii) The anticipated direct and indirect effects of the operations on the unit's natural, cultural, social, and economic environment;

(iii) Steps to be taken to insure minimum surface disturbance and to mitigate any adverse environmental effects, and a discussion of the impacts which cannot be mitigated

(iv) Measures to protect surface and subsurface waters by means of casing and cement, etc.

(v) All reasonable technologically feasible alternative methods of operations their costs, and their environmental effects, and

(vi) The effects of the steps to be taken to achieve reclamation

(17) Any other facets of the proposed operations which the operator wishes to point out for consideration; and

(18) Any additional information that is required to enable the Superintendent to establish whether the operator has the right to conduct operations as specified in the plan of operations; to effectively analyze the effects that the operations will have on the preservation, management and public use of the unit, and to make a recommendation to the Regional Director regarding approval or disapproval of the plan of operations and the amount of the performance bond to be posted.

(b) Where any information required to be submitted as part of a proposed plan of operations has been submitted to the Superintendent in substantially the same form in a prior approved plan of operations, a specific cross-reference to that information contained in the prior approved plan of operations will be sufficient to incorporate it into the proposed plan and will satisfy the applicable requirement of this section.

(c) Information and materials submitted in compliance with this section will not constitute a plan of operations until information required by § 9.36(a) (1) through (18), which the Superintendent determines as pertinent to the type of operations proposed, has been submitted to and determined adequate by the Regional Director.

(d) In all cases the plan of operations must consider and discuss the unit's Statement for Management and other planning documents as furnished by the Superintendent, and activities to control, minimize or prevent damage to the recreational, biological physical, scientific, cultural, and scenic resources of the unit, and any reclamation procedures suggested by the Superintendent.

[43 FR 57825, Dec. 8, 1978; 44 FR 37914, June 29, 1979]

§ 9.37 Plan of operations approval.

(a) The Regional Director shall not approve a plan of operations:

(1) Until the operator shows that the operations will be conducted in a manner which utilizes technologically feasible methods least damaging to the federally-owned or controlled lands, waters and resources of the unit while assuring the protection of public health and safety.

(2) For operations at a site the surface estate of which is not owned by the federal government, where operations would constitute a nuisance to federal lands or waters in the vicinity of the operations, would significantly injure federally-owned or controlled lands and waters; or

(3) For operations at a site the surface estate of which is owned or controlled by the federal government, where operations would substantially interfere with management of the unit to ensure

the preservation of its natural and ecological integrity in perpetuity, or would significantly injure the federally-owned or controlled lands or waters; Provided, however, that if the application of this standard would under applicable law, constitute a taking of a property interest rather than an appropriate exercise of regulatory authority, the plan of operations may be approved if the operations would be conducted in accordance with paragraph (a)(1) of this section, unless a decision is made to acquire the mineral interest.

(4) Where the plan of operations does not satisfy each of the requirements of § 9.36 applicable to the operations proposed.

(b) Within sixty (60) days of the receipt of a plan of operations, the Regional Director shall make an environmental analysis of such plan, and:

(1) Notify the operator that the plan of operations has been approved or rejected, and, if rejected, the reasons for the rejection; or

(2) Notify the operator that the plan of operations has been conditionally approved, subject to the operator's acceptance of specific provisions and stipulations; or

(3) Notify the operator of any modification of the plan of operations which is necessary before such plan will be approved or of additional information needed to effectively analyze the effects that the operations will have on the preservation, management and use of the unit, and to make a decision regarding approval or disapproval of the plan of operations and the amount of the performance bond to be posted; or

(4) Notify the operator that the plan of operations is being reviewed, but that more time, not to exceed an additional thirty days, is necessary to complete such review, and setting forth the reasons why additional time is required. Provided, however, That days during which the area of operations is inaccessible for such reasons as inclement weather, natural catastrophe acts of God, etc., for inspection shall not be included when computing either this time period, or that in subsection (b) above; or

(5) Notify the operator that the plan of operations has been reviewed, but cannot be considered for approval until forty-five (45) days after a final environmental statement has been prepared and filed with the Environmental Protection Agency; or

(6) Notify the operator that the plan of operations is being reviewed, but that more time to provide opportunities for public participation in the plan of operations review and to provide sufficient time to analyze public comments received is necessary. Within thirty (30) days after closure of the public comment period specified by the Regional Director, he shall comply with § 9.37(b) (1) through (5).

(c) The Regional Director shall act as expeditiously as possible upon a proposed plan of operations consistent with the nature and scope of the operations proposed. Failure to act within the time limits specified in this section shall constitute a rejection of the plan of operations from which the operator shall have a right to appeal under § 9.49.

(d) The Regional Director's analysis shall include:

(1) An examination of all information submitted by the operator;

(2) An evaluation of measures and timing required to comply with reclamation requirements;

(3) An evaluation of necessary conditions and amount of the bond or security deposit (See § 9.48);

(4) An evaluation of the need for any additional requirements in the plan;

(5) A determination regarding the impact of this operation and cumulative impacts of all proposed and existing operations on the management of the unit; and

(6) A determination whether implementation by the operator of an approved plan of operations would be a major Federal action significantly affecting the quality of the human environment or would be sufficiently controversial to warrant preparation of an environmental statement pursuant to section 102(2)(c) of the National Environmental Policy Act of 1969.

(e) Prior to approval of a plan of operations, the Regional Director shall determine whether any properties included in, or eligible for inclusion in the National Register of Historic Places or National Registry of Natural Landmarks may be affected by the proposed operations. This determination will require the acquisition of adequate information, such as that resulting from field surveys, in order to properly determine the presence and significance of cultural resources within the areas to be affected by operations. Whenever National Register properties or properties eligible for inclusion in the National Register would be affected by operations, the Regional Director shall comply with Section 106 of the Historic Preservations Act of 1966 as implemented by 36 C.F.R. Part 800.

(f) Approval of each plan of operations is expressly conditioned upon the Superintendent having such reasonable access to the site as is necessary to properly monitor and insure compliance with the plan of operations.

[43 FR 57825, Dec. 8, 1978; 44 FR 37914, June 29, 1979]

§ 9.38 Temporary approval.

(a) The Regional Director may approve on a temporary basis:

(1) Access on, across or through federally-owned or controlled lands or waters for the purpose of collecting basic information necessary to enable timely compliance with these regulations. Such temporary approval shall be for a period not in excess of sixty (60) days.

(2) The continuance of existing operations, if their suspension would result in an unreasonable economic burden or injury to the operator; provided that such operations must be conducted in accordance with all applicable laws, and in a manner prescribed by the Regional Director designed to minimize or prevent significant environmental damage; and provided that within sixty (60) days of the granting of such temporary approval the operator either:

(i) Submits an initial substantially complete plan of operations; or

(ii) If a proposed plan of operations has been submitted, responds to any outstanding requests for additional information.

(b) The Regional Director may approve new operations on a temporary basis only when:

(1) The Regional Director finds that the operations will not cause significant environmental damage or result in significant new or additional surface disturbance to the unit; and either

(2) The operator can demonstrate a compelling reason for the failure to have had timely approval of a proposed plan of operations; or

(3) The operator can demonstrate that failure to grant such approval will result in an unreasonable economic burden or injury to the operator.

[43 FR 57825, Dec. 8, 1978, as amended at 44 FR 37914, June 29, 1979]

§ 9.39 Reclamation requirements.

(a) Within the time specified by the reclamation provisions of the plan of operations, which shall be as soon as possible after completion of approved operations and shall not be later than six (6) months thereafter unless a longer period of time is authorized in writing by the Regional Director, each operator shall initiate reclamation as follows:

(1) Where the Federal government does not own the surface estate, the operator shall at a minimum:

(i) Remove or neutralize any contaminating substances; and

(ii) Rehabilitate the area of operations to a condition which would not constitute a nuisance or would not adversely affect, injure, or damage federally-owned lands or waters, including removal of above ground structures and equipment used for operations, except that such structures and equipment may remain where they are to be used for continuing operations which are the subject of another approved plan of operations or of a plan which has been submitted for approval.

(2) On any site where the surface estate is owned or controlled by the Federal government, each operator must take steps to restore natural conditions and processes. These steps shall include but are not limited to:

(i) Removing all above ground structures, equipment and roads used for operations, except that such structures, equipment and roads may remain where they are to be used for continuing operations which are the subject of another approved plan of operations or of a plan which has been submitted for approval, or unless otherwise authorized by the Regional Director consistent with the unit purpose and management objectives;

(ii) Removing all other man-made debris resulting from operations;

(iii) Removing or neutralizing any contaminating substances;

(iv) Plugging and capping all nonproductive wells and filling dump holes, ditches, reserve pits and other excavations;

(v) Grading to reasonably conform the contour of the area of operations to a contour similar to that which existed prior to the initiation of operations, where such grading will not jeopardize reclamation;

(vi) Replacing the natural topsoil necessary for vegetative restoration; and

(vii) Reestablishing native vegetative communities.

(b) Reclamation under paragraph (a)(2) of this section is unacceptable unless it provides for the safe movement of native wildlife, the reestablishment of native vegetative communities, the normal flow of surface and reasonable flow of subsurface waters, and the return of the area to a condition which does not jeopardize visitor safety or public use of the unit.

§ 9.40 Supplementation or revision of plan of operations.

(a) A proposal to supplement or revise an approved plan of operations may be made by either the operator or the Regional Director to adjust the plan to changed conditions or to address conditions not previously contemplated by notifying the appropriate party in writing of the proposed alteration and the justification therefore.

(b) Any proposed supplementation or revision of a plan of operations initiated under paragraph (a) of this section by either party shall be reviewed and acted on by the Regional Director in accordance with § 9.37. If failure to implement proposed changes would not pose an immediate threat of significant injury to federally-owned or controlled lands or waters, the operator will be notified in writing sixty (60) days prior to the date such changes become effective, during which time the operator may submit comments on proposed changes. If failure to implement proposed changes would pose immediate threat of significant injury to federally-owned or controlled lands or waters, the provisions of § 9.33(c) apply.

§ 9.41 Operating Standards.

The following standards shall apply to operations within a unit:

(a) Surface operations shall at no time be conducted within 500 feet of the banks of perennial, intermittent or ephemeral watercourses; or within 500 feet of the high pool shoreline of natural or man-made impoundments; or within 500 feet of the mean high tide line; or within 500 feet of any structure or facility (excluding roads) used for unit interpretation, public recreation or for administration of the unit unless specifically authorized by an approved plan of operations.

(b) The operator shall protect all survey monuments, witness corners, reference monuments and bearing trees against destruction, obliteration, or damage from operations and shall be responsible for the reestablishment, restoration, or referencing of any monuments, corners and bearing trees which are destroyed, obliterated, or damaged by such operations.

(c) Whenever drilling or producing operations are suspended for 24 hours or more, but less than 30 days, the wells shall be shut in by closing wellhead valves or blowout prevention equipment. When producing operations are suspended for 30 days or more, a suitable plug or other fittings acceptable to the Superintendent shall be used to close the wells.

(d) The operator shall mark each and every operating derrick or well in a conspicuous place with his name or the name of the owner, and the number and location of the well, and shall take all necessary means and precautions to preserve these markings.

(e) Around existing or future installations, *e.g.*, well, storage tanks, all high pressure facilities, fences shall be built for protection of unit visitors and wildlife, and protection of said facilities unless otherwise authorized by the Superintendent. Fences erected for protection of unit visitors and wildlife shall be of a design and material acceptable to the Superintendent, and where appropriate, shall have at least one gate which is of sufficient width to allow access by fire trucks. Hazards within visitor use areas will be clearly marked with warning signs acceptable to the Superintendent.

(f) The operator shall carry on all operations and maintain the site at all times in a safe and workmanlike manner, having due regard for the preservation of the environment of the unit. The operator shall take reasonable steps to prevent and shall remove accumulations of oil or other materials deemed to be fire hazards from the vicinity of well locations and lease tanks, and shall remove from the property or store in an orderly manner all scrap or other materials not in use.

(g) Operators will be held fully accountable for their contractor's or subcontractor's compliance with the requirements of the approved plan of operations.

[43 FR 57825, Dec. 8, 1978; 44 FR 37915, June 29, 1979]

§ 9.42 Well records and reports, plots and maps, samples, tests and surveys.

Any technical data gathered during the drilling of any well, including daily drilling reports and geological reports, which are submitted to the State pursuant to State regulations, or to any other bureau or agency of the Federal government shall be available for inspection by the Superintendent upon his request.

§ 9.43 Precautions necessary in areas where high pressures are likely to exist.

When drilling in "wildcat" territory, or in any field where high pressures are likely to exist, the operator shall take all necessary precautions for keeping the well under control at all times and shall install and maintain the proper high-pressure fittings and equipment to assure proper well control. Under such conditions the surface string must be cemented through its length, unless another procedure is authorized or prescribed by the Superintendent, and all strings of casing must be securely anchored.

§ 9.44 Open flows and control of "wild" wells.

The operator shall take all technologically feasible precautions to prevent any oil, gas, or water well from blowing open or becoming "wild," and shall take immediate steps and exercise due diligence to bring under control any "wild" well, or burning oil or gas well.

§ 9.45 Handling of wastes.

Oilfield brine, and all other waste and contaminating substances must be kept in the smallest practicable area, must be confined so as to prevent escape as a result of percolation, rain high water or other causes, and such wastes must be stored and disposed of or removed from the area as quickly as practicable in such a manner as to prevent contamination, pollution, damage or injury to the lands, water (surface and subsurface), facilities, cultural resources, wildlife, and vegetation of or visitors of the unit.

§ 9.46 Accidents and fires.

The operator shall take technologically feasible precautions to prevent accidents and fires, shall notify the Superintendent within 24 hours of all accidents involving serious personal injury or death, or fires on the site, and shall submit a full written report thereon within ninety (90) days. This report supersedes the requirement outlined in 36 C.F.R. 2.17, but does not relieve persons from the responsibility of making any other accident reports which may be required under State or local laws.

§ 9.47 Cultural resource protection.

(a) Where the surface estate of the site is owned by the United States, the operator shall not, without written authorization of the Superintendent, injure, alter, destroy, or collect any site, structure, object, or other value of historical, archeological, or other cultural scientific importance in violation of the Antiquities Act (16 U.S.C. 431-433 (See 43 C.F.R. Part 3).

(b) Once approved operations have commenced, the operator shall immediately bring to the attention of the Superintendent any cultural or scientific resource encountered that might be altered or destroyed by his operation and shall leave such discovery intact until told to proceed by the Superintendent. The Superintendent will evaluate the discoveries brought to his attention, and will determine within ten (10) working days what action will be taken with respect to such discoveries.

§ 9.48 Performance bond.

(a) Prior to approval of a plan of operations, the operator shall be required to file a suitable performance bond with satisfactory surety, payable to the Secretary or his designee. The bond shall be conditioned upon faithful compliance with applicable regulations, and the plan of operations as approved, revised or supplemented. This performance bond is in addition to and not in lieu of any bond or security deposit required by other regulatory authorities.

(b) In lieu of a performance bond, an operator may elect to deposit with the Secretary or his designee, cash or negotiable bonds of the U.S. Government. The cash deposit or the market value of such securities shall be at least equal to the required sum of the bond. When bonds are to serve as security, there must be provided to the Secretary a power of attorney.

(c) In the event that an approved plan of operations is revised or supplemented in accordance with § 9.40, the Regional Director may adjust the amount of the bond or security deposit to conform to the modified plan of operations.

(d) The bond or security deposit shall be in an amount:

(1) Equal to the estimated cost of reclaiming the site, either in its entirety or in phases, that has been damaged or destroyed as a result of operations conducted in accordance with an approved, supplemented, plan of operations; plus

(2) An amount set by the Superintendent consistent with the type of operations proposed, to bond against the liability imposed by § 9.51(a); to provide the means for rapid and effective cleanup; and to minimize damages resulting from an oil spill, the escape of gas, wastes, contaminating substances, or fire caused by operations. This amount shall not exceed twenty-five thousand dollars ($25,000) for geophysical surveys when using more than one field party or five thousand dollars ($5,000) when operating with only one field party, and shall not exceed fifty thousand dollars ($50,000) for each wellsite or other operation.

(3) When an operator's total bond or security deposit with the National Park Service amounts to two hundred thousand dollars ($200,000) for activities conducted within a given unit, no further

bond requirements shall be collected for additional activities conducted within that unit, and the operator may substitute a blanket bond of two hundred thousand dollars ($200,000) for all operations conducted within the unit.

(e) The operator's and his surety's responsibility and liability under the bond or security deposit shall continue until such time as the Superintendent determines that successful reclamation of the area of operations has occurred and, where a well has been drilled, the well has been properly plugged and abandoned. If all efforts to secure the operator's compliance with pertinent provisions of the approved plan of operations are unsuccessful, the operator's surety company will be required to perform reclamation in accordance with the approved plan of operations.

(f) Within thirty (30) days after determining that all reclamation requirements of an approved plan of operations are completed, including proper abandonment of the well, the Regional Director shall notify the operator that the period of liability under the bond or security deposit has been terminated.

[43 FR 57825, Dec. 8, 1978; 44 FR 37915 June 29, 1979]

§ 9.49 Appeals.

(a) Any operator aggrieved by a decision of the Regional Director in connection with the regulations in this Subpart may file with the Regional Director a written statement setting forth in detail the respects in which the decision is contrary to, or is in conflict with the facts, the law, or these regulations, or is otherwise in error. No such appeal will be considered unless it is filed with the Regional Director within thirty (30) days after the date of notification to the operator of the action or decision complained of. Upon receipt of such written statement from the aggrieved operator, the Regional Director shall promptly review the action or decision and either reverse his original decision or prepare his own statement, explaining that decision and the reasons therefor, and forward the statement and record on appeal to the Director for review and decision. Copies of the Regional Director's statement shall be furnished to the aggrieved operator, who shall have thirty (30) days within which to file exceptions to the Regional Director's decision. The Department has the discretion to initiate a hearing before the Office of Hearing and Appeals in a particular case (See 43 C.F.R. 4.700).

(b) The official files of the National Park Service on the proposed plan of operations and any testimony and documents submitted by the parties on which the decision of the Regional Director was based shall constitute the record on appeal. The Regional Director shall maintain the record under separate cover and shall certify that it was the record on which his decision was based at the time it was forwarded to the Director of the National Park Service. The National Park Service shall make the record available to the operator upon request.

(c) If the Director considers the record inadequate to support the decision on appeal, he may provide for the production of such additional evidence or information as may be appropriate, or may remand the case to the Regional Director, with appropriate instructions for further action.

(d) On or before the expiration of forty-five (45) days after his receipt of the exceptions to the Regional Director's decision, the Director shall make his decision in writing: provided however, that if more than forty-five (45) days are required for a decision after the exceptions are received, the Director shall notify the parties to the appeal and specify the reason(s) for delay. The decision of the Director shall include: (1) A statement of facts; (2) conclusions; and (3) reasons upon which the conclusions are based. The decision of the Director shall be the final administrative action of the agency on a proposed plan of operations.

(e) A decision of the Regional Director from which an appeal is taken shall not be automatically stayed by the filing of a statement of appeal. A request for a stay may accompany the statement of appeal or may be directed to the Director. The Director shall promptly rule on requests for stays. A decision of the Director on request for a stay shall constitute a final administrative decision.

(f) Where, under this Subpart, the Superintendent has the authority to make the original decision, appeals may be taken in the manner provided by this section, as if the decision had been made by the Regional Director, except that the original statement of appeal shall be filed with the Superintendent, and if he decides not to reverse his original decision, the Regional Director shall have, except as noted below, the final review authority. The only decision of a Regional Director under this paragraph which shall be appealable by the Director is an appeal from a suspension under § 9.51(b). Such an appeal shall follow the procedure of paragraphs (a)-(3) of this section.

[43 FR 57825, Dec. 8, 1978; 44 FR 37915, June 29, 1979]

§ 9.50 Use of roads by commercial vehicles.

(a) After January 8, 1978, no commercial vehicle shall use roads administered by the National Park Service without being registered with the Superintendent. Roads must be used in accordance with procedures outlined in an approved plan of operations.

(1) A fee shall be charged for such registration and use based upon a posted fee schedule. The fee schedule posted shall be subject to change upon sixty (60) days of notice.
(2) An adjustment of the fee may be made at the discretion of the Superintendent where a cooperative maintenance agreement is entered into with the operator.

(b) No commercial vehicle which exceeds roadway load limits specified by the Superintendent shall be used on roads administered by the National Park Service unless authorized in writing by the Superintendent, or unless authorized by an approved plan of operations.

(c) Should a commercial vehicle used in operations cause damage to roads, resources or other facilities of the National Park Service, the operator shall be liable for all damages so caused.

§ 9.51 Damages and penalties.

(a) The operator shall be held liable for any damages to federally-owned or controlled lands, waters, or resources resulting from his failure to comply with either his plan of operations, or where operations are continued pursuant to § 9.33, failure to comply with the applicable permit or, where operations are temporarily approved under § 9.38, failure to comply with the terms of that approval.

(b) The operator agrees, as a condition for receiving an approved plan of operations, that he will hold harmless the United States and its employees from any damages or claims for injury or death of persons and damage or loss of property by any person or persons arising out of any acts or omissions by the operator, his agents, employees or subcontractors done in the course of operations.

(c) Undertaking any operations within the boundaries of any unit in violation of this Subpart shall be deemed a trespass against the United States and shall be cause for revocation of approval of the plan of operations.

(1) When a violation by an operator under an approved plan of operations is discovered, and if it does not pose an immediate threat of significant injury to federally-owned or controlled lands or waters, the operator will be notified in writing by the Superintendent and will be given ten (10) days to correct the violation; if the violation is not corrected within ten (10) days approval of the plan of operations will be suspended until such time as the violation is corrected.

(2) If the violation poses an immediate threat of significant injury to federally-owned or controlled lands or waters, approval of the plan of operations will be immediately suspended until such time as the violation is corrected. The operator will be notified in writing within five (5) days of any suspension and shall have the right to appeal that decision under § 9.48.

(3) Failure to correct any violation or damage to federally owned or controlled lands, waters or resources caused by such violations will result in revocation of plan of operations approval.

[43 FR 57825, Dec. 8, 1978; 44 FR 37915, June 29, 1979]

§ 9.52 Public inspection of documents.

(a) When a Superintendent receives a request for permission for access on, across or through federally-owned or controlled lands or waters for the purpose of conducting operations, the Superintendent shall publish a notice of this request in a newspaper of general circulation in the county(s) in which the lands are situated, or in such publications as deemed appropriate by the Superintendent.

(b) Upon receipt of the plan of operations in accordance with § 9.35(c), the Superintendent shall publish a notice in the FEDERAL REGISTER advising the availability of the plan for public review and comment. Written comments received within thirty (30) days will become a part of the official record. As a result of comments received or if otherwise deemed appropriate by the Superintendent, he may provide additional opportunity for public participation to review the plan of operations.

(c) Any document required to be submitted pursuant to the regulations in this Subpart shall be made available for public inspection at the office of the Superintendent during normal business hours, unless otherwise available pursuant to § 9.51(b). This does not include those records only made available for the Superintendent's inspection under § 9.41 of this Subpart or those records determined by the Superintendent to contain proprietary or confidential information. The availability of such records for inspection shall be governed by the rules and regulations found at 43 C.F.R. Part 2.

[43 FR 57825, Dec. 8, 1978; 44 FR 37915, June 29, 1979]

APPLICATION OF THE 9B REGULATIONS

The 9B regulations provide the NPS with an existing regulatory framework to manage the effects of oil and gas operations within the parks. The application and implementation of these regulations must be assessed parkwide as well as for each site specific oil and gas activity to determine if these activities have the potential to impair park resources and values. As mentioned previously, these regulations apply to operations that require access on or through federally owned or controlled lands or waters in connection with nonfederally owned oil and gas in all National Park system units (36 CFR § 9.30(a)). "Operations" is broadly defined under the regulations to include all activities associated with the exploration for and production of nonfederally owned or controlled oil and gas, from gathering basic information to comply with the regulations to the transport of petroleum products (36 CFR § 9.31(c)). "Access" means any and all ways of entering, going over, across, or underneath an area of land or water. It includes travel by vehicle, watercraft, fixed-wing aircraft, helicopter, off-road vehicle, mobile heavy equipment, snowmobile, pack animal, and by foot. It also includes travel of the drill bit during drilling operations (NPS 2006c).

In applying the NPS Nonfederal Oil and Gas Rights Regulations, the NPS respects the constitutionally guaranteed property rights of mineral owners. As set forth in the Fifth Amendment to the Constitution, "...no person shall be deprived of property without due process of law; nor shall private property be taken for public use without just compensation." In two places, §§ 9.30(a) and 9.37(a)(3), the 9B regulations emphasize that they are not intended to result in the taking of a property interest, but rather are designed to impose reasonable regulations on activities that involve and affect federally-owned lands. Furthermore, the NPS has complied fully, and will continue to comply fully, with Exec. Order No. 12,630, 3 CFR 554 (1989), "Governmental Actions and Interference with Constitutionally Protected Property Rights." Any alternative selected and applied to oil and gas activities in the park as a result of this planning process would be subject to the NPS's statutory mandates, regulatory provisions, policies, and Executive Orders, including the above described limitations regarding the taking of private property interests.

If the National Park Service determines that the proposed oil and gas operation within a park unit would conflict with preservation, management, or use of the parks, or would impair park resources or values, the 36 CFR 9B regulations and NEPA process would result in identifying measures to mitigate impacts. Mitigation measures may be applied to the Plan of Operations as conditions of approval, subject to the operator's acceptance of specific provisions and operating stipulations (36 CFR § 9.37(b)(2)). However, if the Service determines that the proposed mineral development would impair park resources, values, or purposes, or does not meet approval standards under applicable NPS regulations and cannot be sufficiently modified to meet those standards, the Service will seek to extinguish the associated mineral right through acquisition, unless otherwise directed by Congress.

PLANS OF OPERATIONS

The critical component of the regulations is the requirement that an operator submit and obtain NPS approval of a proposed plan of operations before commencing oil and gas exploration or production activities (36 CFR § 9.36). Such plans are essentially a prospective operator's "blueprint" for conducting activities including impact mitigation and site reclamation. Operators are responsible for preparing a plan of operations that addresses all information requirements applicable to proposed operations. Operators must supply this information in sufficient detail to enable the NPS to effectively analyze the impacts of the proposed operations on the particular unit's resources and values, and to determine whether to approve the proposed plan (36 CFR § 9.36(c)). The NPS reviews the operator's plan to make sure that the information is complete and, in turn, to ensure that park resources will be protected. Once the NPS has completed its review and environmental compliance responsibilities, it may approve the operator's plan. The approved plan allows the operator to conducts operations in a unit of the National Park system.

36 CFR 9B Plan of Operations Process

Under the 36 CFR 9B regulations, each operator requiring access on, across, or through NPS lands or water may conduct activities only under a Plan of Operations approved by the NPS. Once a Plan of Operations is approved, it serves as the operator's permit to operate in the park. Through the plan, the operator must show that the "…operations will be conducted in a manner which utilizes technologically feasible methods least damaging to the federally owned or controlled lands, waters and resources of the unit while assuring the protection of public health and safety" (36 CFR § 9.37(a)(1)). However, some nonfederal oil and gas operations in NPS units may qualify for an exemption to the Plan of Operations requirement. These exemptions are described in appendix A.

A key component of preparing the Plan of Operations is a detailed description of the environment that will be affected by the proposed activities. Operators first conduct plant, animal, cultural, hydrological, and topographic surveys as needed to adequately describe the resources in the areas in which they plan to work. Once the environmental conditions are known, operators must plan the use of methods and equipment that are least damaging to park resources. The surveys also provide a basis for designing reclamation activities.

Based on the scale of operations, the Plan of Operations preparation can be in the range of $1,000 and up to and exceeding $45,000. The wide range in costs to prepare a Plan of Operations demonstrates the differences in a plan's scope and content, variations in the number and types of environmental surveys needed, and the operator's approach to planning (in-house or contracted).

Next, operators may need to modify proposed activities from their standard methods to minimize environmental impacts. For example, to avoid harming certain resources, an operator may need to construct a longer access road or use directional drilling techniques. Sometimes avoidance of areas (such as wetlands or sensitive vegetation communities) is necessary to protect park resources. Disposing of wastes and contaminants at an approved disposal facility outside of the park is another method used to protect park resources. These and other modifications can add to the overall project cost.

Some upfront project costs may prevent the need for operators to do costly clean-up and remediation activities in future. For example, the NPS requires dikes or berms around drilling and production operations and impermeable barriers underneath these operations to provide secondary containment in the event of a spill. An uncontained spill or unnoticed leaks from a tank can contaminate large areas, flow into nearby surface waters, and seep into the groundwater. Clean-up and restoration of the damaged area to meet federal and state requirements could cost the operator hundreds of thousands of dollars.

The NPS also commonly requires operators to take a more active role in reclamation of the site compared with areas outside of the park. Following proper plugging of wells and removal of surface equipment, operators must clean up contaminated soil; remove debris and non-native materials used in operations; re-establish natural contours and vegetation; and monitor the results of the reclamation operations.

Maintaining a performance bond to guarantee compliance with the Plan of Operations is an annual cost to the operator. The 36 CFR 9B regulations limit the maximum bond amount to $200,000 for a single operation or multiple operations by the same operator in a given park. Annual costs to maintain bonds through a surety company range from 1 to 3 percent of face value, or up to 70 percent, depending on the operator. Operators typically file a corporate surety bond but may elect to file other types of acceptable securities such as an irrevocable letter of credit, cash, certified check, certificates of deposit, or government bonds. The bond or security required by the NPS is in addition to and not in lieu of any bond or security deposit required by other regulatory authorities.

Another issue facing operators in NPS units is the length of time it takes to obtain a permit. Table A-1 provides an explanation of the Plan of Operations permitting process and associated timeframes. Under current management practices, the NPS looks at each individual oil and gas proposal under the 36 CFR 9B regulations, and processing time is typically 3 to 4 months.

Under the NPS 36 CFR 9B regulations, the NPS has jurisdiction to regulate nonfederal oil and gas operations occurring within park boundaries. Activities located outside park boundaries but connected to operations occurring within a park are beyond the jurisdiction of the NPS. This means that the NPS cannot assert regulatory control over them. Nonetheless, the NPS can work cooperatively with the operator and permitting agencies with jurisdiction to get park protection concerns addressed. In the event that activities outside park boundaries damage or destroy park resources or values, Congress has given the NPS a means for recovering monetary damages under 16 USC § 19jj as discussed in appendix C.

TABLE A-1. NPS PROCESSING TIME FOR A 36 CFR 9B PLAN OF OPERATIONS

Action	NPS Response Time	Limiting Factor
Operator contacts park regarding interest in conducting oil and gas operations. Operator provides the NPS with written documentation demonstrating right to conduct operations.	Same day	Subject to park staff availability
Park provides operator copies of 36 CFR 9B regulations, performance standards, plan of operations requirements, and other information as necessary.	Same day	Subject to park staff availability
Operator meets with park staff to discuss proposed operation, scope resource issues relevant to the proposed operation, determine resources that could be affected by the operation; identify environmental planning and compliance requirements; and determine affected local, state and federal agencies.	Variable – NPS provides assistance as needed. Scoping meeting typically lasts one day.	Subject to park staff and operator availability
Operator meets with park staff and affected federal, state, and local agencies to identify resource issues, permitting requirements, and impact mitigation strategies.	Variable – NPS provides assistance as needed.	Subject to park staff, other agency staff, and operator availability
Operator submits written request for temporary access to gather basic information needed to complete the plan of operations.	Variable - NPS provides assistance as needed.	Subject to operator response
Park issues 60-day data collection permit with park resource/visitor protection requirements; and publishes a notice in the local newspaper pursuant to 36 CFR § 9.52(a).	1 - 2 days	Subject to park staff availability
Operator conducts necessary surveys, including natural and cultural surveys, as applicable and surveys/stakes the operations area.	Variable - NPS provides assistance as needed.	Subject to operator response or timing requirements
Operator submits draft plan of operations to park.	Variable - NPS provides assistance as needed.	Subject to operator response
NPS performs a completeness and technical review of the plan of operations. Park accepts plan of operations as complete or returns it to the operator with specific directions on how to revise the plan.	30 days	NPS policy from NPS procedures governing nonfederal oil and gas rights, 1992; and 36 CFR § 9.36(c)

TABLE A-1. NPS PROCESSING TIME FOR A 36 CFR 9B PLAN OF OPERATIONS

Action	NPS Response Time	Limiting Factor
Operator revises plan of operations, as necessary.	Variable - NPS provides assistance as needed.	Subject to operator response
Park staff prepares NEPA document (EA or EIS) or adopts operator's (or consultant-prepared) NEPA document, incorporates other environmental compliance (ESA, NHPA, wetlands, floodplains, CZM etc.), and initiates mandated consultations with other agencies. Park completes public review process, finalizes decision documents, and notifies the operator if the plan has been approved, conditionally approved, or rejected.	60 days (includes 30-day public review of EA)	36 CFR § 9.37, 36 CFR § 9.52(b), NPS DO-77.1 for wetlands compliance, NPS DO 77.2, and DO-12 for NEPA compliance. Operator notified if additional time is needed per 36 CFR § 9.37(b)(6)
Operator agrees to any conditions of approval (if any), submits applicable state and federal permits, and files suitable performance bond with the NPS.	Variable	Subject to operator response
TOTAL NPS RESPONSE TIME	Minimum of 3 to 4 months	Dependent on compliance requirements

PERFORMANCE BONDS

The 9B regulations require the filing of a performance bond or other acceptable type of security payable to the NPS for all types and phases of nonfederal oil and gas operations. This bond, in addition to any bonds required by other regulatory agencies (e.g., the states of Kentucky and Tennessee), can be used only to pay for damages caused when an operator fails to comply with the conditions in a plan of operations, and is currently capped at $200,000. These bonds are set by the NPS regional director, taking into consideration the cost of reclamation as well as the liability amount. For further details on how bonds are set, including specific information regarding the considerations for the cost of reclamation and the liability amount, see the NPS Operators Handbook for Nonfederal Oil and Gas Development in Units of the National Park System (NPS 2006a).

Other key provisions of the 9B regulations include requirements for:

- Demonstrating ownership rights before granting temporary approval, reviewing a plan of operations, or evaluating an application under 36 CFR 9.32(3) for directional drilling (a well drilled underneath the park from a surface location outside the park);
- The scope of the plan of operations;
- Reclamation;
- Directional drilling;
- Changing plans of operations;
- Selling or transferring of an operation;
- Exemptions to the regulations;
- Administrative appeal of an NPS decision; and
- Damages and penalties.

EXEMPTIONS

The 9B regulations do not apply to every oil and gas operation in a park unit. Operations that do not fall under the regulations include those that do not require access across federally controlled lands or waters (36 CFR 9.30(b)); operations on federal leases (36 CFR 9.30(b)); operations on mining claims (36 CFR 9.30(b)); or transportation pipelines associated with rights-of-way (discussed further below under "Applicability of 9B Regulations to Transpark Pipelines"). In addition other exemptions from the 9B regulations may be granted to existing operations and operations involving directional drilling.

Existing Operations

Under the 9B regulations, an operator conducting "existing operations" may continue without submitting a plan of operations or filing a performance bond or security deposit. These operations are "grandfathered" (36 CFR 9.33) if the operator was conducting operations under a valid state or federal permit as of January 8, 1979 (effective date of the 9B regulations), when the area became a new park unit, or when the area came into the national park system by expansion of an existing unit.

If an operator was not required to obtain a federal or state permit prior to January 8, 1979, prior to the establishment of a new park unit, or prior to the expansion of an existing unit, he/she must come into compliance with the 9B regulations in accordance with the provisions of 36 CFR 9.33(b).

Situations may arise where an existing operation can lose its grandfathered status and an operation must comply with the 9B regulations, including filing a plan of operations and submitting a performance bond, as well as when a valid state or federal permit expires by its own terms (e.g., when an operation has a change in operator, when well work requires new state approval, or when an operator proposes activities that would disturb new land). Operators proposing to plug and reclaim existing operations require a new state permit, and as a result must file a plan of operations covering these activities, received NPS approval, and submit a performance bond (NPS 2006a).

In addition, under 36 CFR 9.33(c), the superintendent of a national park may require an operator to suspend operations if there are immediate threats of "significant injury" to federally owned or controlled lands, such as the escape of toxic or noxious gases, disturbances outside the area currently approved for the operation, uncontained or chronic spills, well blow-out, leaching or release of contaminants, fire or fire hazard, unmaintained storage tanks that lack secondary containment such as berms, inadequate safeguards for controlling well pressures; inadequate safeguards for protecting visitors and wildlife from serious injury, or damage to cultural resources.

Directional Drilling

Section 9.32(e) of the 9B regulations governs operators that propose to develop their nonfederal oil and gas rights in any unit of the National Park System by directionally drilling a well from a surface location outside unit boundaries to a location under federally owned or controlled lands within park boundaries. Per section 9.32(e), an operator may obtain an exemption from the 9B regulations if the Regional Director is able to determine from available data that a proposed drilling operation under the park poses "no significant threat of damage to park resources, both surface and subsurface, resulting from surface subsidence, fracture of geological formations with resultant fresh water [aquifer] contamination or natural gas escape or the like." It is limited in scope to those aspects of the directional drilling operation occurring within park boundaries. Operators seeking an exemption to the 9B regulations must submit a section 9.32(e) Application for Directional Drilling. Further guidance on the NPS's directional drilling provision under section 9.32(e) is provided in the following sections.

36 CFR 9.32(d) Application Process

Section 9.32(e) of the 9B regulations governs operators that propose to develop their nonfederal oil and gas rights in a park unit by directionally drilling a well from a surface location outside unit boundaries to a location under federally-owned or controlled lands or waters within park boundaries. It is limited in scope to those aspects of the directional drilling operation occurring within park boundaries.

Per § 9.32(e), an operator may obtain an exemption from the 9B regulations if a Regional Director is able to determine from available data that a proposed drilling operation under the park poses “no significant threat of damage to park resources, both surface and subsurface, resulting from surface subsidence, fracture of geological formations with resultant fresh water acquifer [sic] contamination or natural gas escape or the like." The regulations define operations as "all functions, work and activities within a unit in connection with exploration for and development of oil and gas resources, the right to which is not owned by the United States..." (36 CFR § 9.31(c), underlining added). The potential impacts considered in the § 9.32(e) exemption process relate only to effects on park resources from downhole activities occurring within the boundary of the park, not threats to park resources associated with the operation outside park boundaries.

Under the regulations, the NPS may determine that an operator: (1) qualifies for an exemption from the regulations with no needed mitigation to protect park resources from activities occurring within park boundaries; (2) qualifies for an exemption from the regulations with needed mitigation to protect subsurface park resources from activities occurring within park boundaries; or (3) must submit a proposed plan of operations and a bond to the NPS for approval. These legally permissible options are briefly described as follows:

Exemption with No Mitigation (no approval or permit issued)—The NPS determines that the proposed operation inside the park qualifies for an exemption under § 9.32(e) without any mitigation or conditions required by the NPS on the downhole activities. This option will arise when there is no potential for surface or subsurface impacts in the park from the downhole activities (e.g., the wellbore does not intercept an aquifer within the park). Under this option, the NPS is not granting an approval or issuing a permit.

Exemption with Mitigation (no approval or permit issued)—The NPS determines that the proposed operation inside the park qualifies for an exemption under § 9.32(e) if there is no potential for surface impacts to park resources from downhole operations in the park and the operator adopts mitigation measures or conditions that reduce potential impacts on subsurface resources (e.g., an aquifer) to "no measurable effect." As in option #1 above, the NPS is not granting an approval or issuing a permit.

Plan of Operations (approval and "permit" issued)—This regulatory option would apply if NPS determines that it cannot make the requisite finding for a § 9.32(e) exemption because (1) impacts to surface resources are involved, or (2) impacts to subsurface resources cannot be adequately mitigated to yield "no measurable effect." This option would also apply if an operator does not apply for an exemption and the NPS does not consider granting an exemption on its own initiative. In these cases a prospective operator must submit and obtain NPS approval of a proposed plan of operations and file a bond before commencing directional drilling activities inside a park. The required plan and bond will be limited in scope to those aspects of the directional drilling operation that occur within park boundaries. As a result, many of the general plan information requirements set forth under § 9.36 will not apply. Mitigation measures and/or conditions of approval would be integral to this option. Mitigation measures would protect cultural resources, cave/karst resources, aquifers, floodplains, wetlands and other surface resources from operations occurring inside the park. Under this option, an operator must have NPS approval of a proposed plan before commencing any activity in the boundaries of the park. The approved plan constitutes the operator's "permit".

Applicability of NEPA—For purposes of public disclosure and education, NPS prepares NEPA documents on all directional drilling proposals submitted to the NPS. Through its NEPA analysis, the NPS assesses impacts both in and outside of the park associated with the downhole operations in addition to the connected actions outside of the park. The downhole activities occurring in the park are analyzed to determine if there is a significant threat to park resources and if a § 9.32(e) exemption should be granted. As required by NEPA, the analysis of the impacts from the connected actions occurring outside of the park are presented in addition to the downhole operations both inside and outside of the park to disclose to the public all of the potential impacts on the human environment. Cumulative impacts are presented for the analysis area which includes areas inside and outside of the park. Table A-2 summarizes the applicability of NEPA, the Endangered Species Act (ESA), the National Historic Preservation Act (NHPA), Executive Order 11988 – Floodplain Management, and Executive Order 11990 – Protection of Wetlands, as well as mitigation measures, to directional drilling applications

TABLE A-2. SUMMARY OF COMPLIANCE REQUIREMENTS FOR DIRECTIONAL DRILLING PROPOSALS FROM SURFACE LOCATIONS OUTSIDE A PARK

Option	Scope of NEPA Analysis	Endangered Species Act	National Historic Preservation Act	Floodplains Executive Order	Wetlands Executive Order	Mitigation Measures
Exemption with No Mitigation	The NEPA analysis (most likely an EA) would focus on environmental effects from the downhole operations in the park. The potential impacts of the connected actions on park resources and values would also be disclosed. Impacts outside the park would be assessed.	Granting an exemption is non-discretionary under this option. ESA § 7 consultation for activities occurring in the park is not required because there would be no effect on federally listed threatened and endangered species and/or critical habitat. In the event that connected operations outside the park could affect a T&E species or critical habitat in or outside the park, consultation and mitigation under the ESA would be required. The NPS would be the lead federal agency carrying out the ESA consultations outside of the park if there is no other federal entity with broader regulatory involvement.	There is no potential for impact on cultural resources in the park from the downhole operations in the park. The NPS has no Section 106 responsibility with respect to the National Historic Preservation Act of 1966, as amended, for wells that originate on non-federal lands located outside the Unit, for which the wellbores would cross through the Unit to extract non-federally owned hydrocarbons from beneath the Unit. The Advisory Council on Historic Preservation concurred with this finding on September 13, 2004.	There is no potential for impact to federally-owned or controlled floodplains in the park from the downhole operations in the park. No action is required by the NPS under the Executive Order. Other federal agencies having broader permitting authority for the proposal would need to comply with the Executive Order if floodplains would be affected by the operation.	There is no potential for impact to federally-owned or controlled wetlands in the park from the downhole operations in the park. No action is required by the NPS under the Executive Order. Other federal agencies having broader permitting authority for the proposal would need to comply with the Executive Order if wetlands would be affected by the operation.	• NPS mitigation measures/ conditions would not be applied to the exemption. • The operator can voluntarily apply mitigation measures to reduce indirect impacts on park resources and values from connected actions outside the park. • The NPS will work cooperatively with other agencies during their permitting processes to identify potential impacts on park resources and values and recommend mitigation measures/conditions of approval. • If NPS is "lead" federal agency following ESA § 7 consultation, the Service may require mitigation measures/ conditions to protect threatened and endangered species and habitat both inside and outside the park.

TABLE A-2. SUMMARY OF COMPLIANCE REQUIREMENTS FOR DIRECTIONAL DRILLING PROPOSALS FROM SURFACE LOCATIONS OUTSIDE A PARK

Option	Scope of NEPA Analysis	Endangered Species Act	National Historic Preservation Act	Floodplains Executive Order	Wetlands Executive Order	Mitigation Measures
Exemption with Mitigation	Same as Option #1	Granting an exemption is discretionary under this option. NPS is required to determine if federally listed threatened and endangered species and/or critical habitat may be affected inside the park from in-park operations. The NPS would be the lead federal agency carrying out the consultations both inside and outside of the park if there is no other federal entity with broader regulatory involvement.	Same as Option #1	Mitigation/conditions applied to ensure the integrity of downhole operations in the park reduces the likelihood of impacts to floodplains in the park; no action is required by the NPS under the Floodplains Executive Order.	Mitigation/conditions applied to ensure the integrity of downhole operations in the park reduces the likelihood of impacts to wetlands in the park; no action is required by the NPS under the Wetlands Executive Order.	The compliance responsibilities are the same as Option # 1, except: NPS may require mitigation measures/conditions to reduce impacts to subsurface park resources associated with downhole operations inside the park.
Plan of Operations	Same as Option #1	Same as Option #2.	If potential impacts to cultural resources could not be mitigated, the NPS would follow its standard procedures for conducting consultations with the SHPO/THPO but focus its consultation on the downhole operations inside the park.	Same as Option #2. If potential impacts to floodplains could not be mitigated, the NPS must follow its standard procedures in the NPS Director's Order/ Procedures Manual and prepare a *Floodplains Statement of Finding*s pertaining to the downhole operations within the park.	Same as Option #2. If potential impacts to wetlands could not be mitigated, the NPS must follow its standard procedures in the NPS Director's Order/ Procedures Manual and prepare a *Wetlands Statement of Finding*s pertaining to the downhole operations within the park.	Same as Option #2.

Collection of Resource Information by Prospective Operators—The NPS may only require a prospective operator of a directional drilling operation to conduct resource surveys inside a park when there is a correlation between downhole operations within the park and potential impacts on park resources and values. In contrast, the NPS may request, but cannot require, operators to conduct resource surveys inside a park associated with operations outside the park but connected to the downhole activities in the park or to conduct resource surveys outside the park. Overall costs and timeframes for the operator to prepare a § 9.32(e) application and timeframes for NPS review and approval should be less than for a Plan of Operations, in part because less data will be collected and used in the NEPA analysis.

When the NPS is the "lead" federal agency responsible for consultation under section 7 of the Endangered Species Act (ESA), the NPS may require biological surveys both inside and outside the park if, during consultation, it is determined that these surveys are needed. The ability to require biological surveys stems from authority under the ESA, not the 9B regulations.

Access to Surface Location Outside Park Boundaries—If the United States does not own the surface estate where operations are located outside the park, NPS access to these operations must be coordinated with the operator, including obtaining the operator's permission to be on location. NPS access also must relate to obtaining information to complete the needed compliance work or to ensuring compliance with mitigation measures related to downhole operations inside the park. The 9B regulations provide no authority for requiring an operator to grant the NPS access for the purpose of observing compliance with terms unrelated to the downhole activities in the park.

Monitoring—The NPS's ability to monitor and inspect directional drilling operations is limited to downhole operations within the park (e.g., surface casing, cementing, plugging operations, etc.). As a practical matter, monitoring of downhole activities inside the park can only be accomplished from the surface location outside the park. As a result, the NPS may need to access the surface location and should make such access a condition of an exemption under option #2 or a condition of approval under option #3. The NPS must coordinate the timing of such access with the operator. The 9B regulations provide no authority to require an operator to grant the NPS access for the purpose of observing compliance with terms unrelated to the downhole activities inside the park. When the NPS has made an upfront determination that a directional drilling operation is exempt without conditions from the regulations because of the lack of impacts, there is no 9B regulatory reason to access the surface location outside the park.

To ensure that directional drilling operations inside a park are being conducted in accordance with an exemption determination or an approved plan, the NPS has two monitoring options. The Service can have a qualified individual (NPS employee or a mutually agreed upon third-party contractor hired by the operator) on location to witness the well casing, cementing and well plugging programs within the park, or the NPS can require the operator to submit drilling records that demonstrate that the well casing, cementing program, and plugging program were completed as proposed. Selection of the appropriate option or combination of options should be worked out with the operator.

Applicability of the 9B Regulations to Transpark Pipelines

Existing transpark oil and gas pipelines and their rights-of-way lie outside the scope of the 9B regulations. Transpark oil and gas pipelines have their point of origin and end point outside national parks, and, for the most part are not supporting nonfederal oil and gas operations in parks. As a result, they are not subject to the existing 9B regulations. However, if a nonfederal oil and gas operation in a park connects to such a pipeline via a flowline or a gathering line, that portion of the flowline or gathering line crossing the park would be subject to the 9B regulations, including the Plan of Operations requirement.

While most transpark oil and gas pipelines are not subject to the 9B regulations, they are either subject to federal Department of Transportation (DOT) regulations at 49 CFR Parts 190-199 or State of Texas requirements, and all other applicable federal and state laws. The DOT regulations govern safety and environmental protection considerations affiliated with interstate pipelines. Specifically, the DOT regulations cover testing, reporting, inspection, maintenance, corrosion control, and spill contingency plans of these pipelines. State regulations often mirror the federal requirements and govern intrastate pipelines. The Railroad Commission of Texas administers state requirements on all oil and gas pipelines under Texas law (see TX. Rev. Stat. S81.011(a) et seq.). Transpark pipeline operators should note that if park system resources are damaged from the operation of their pipeline in a park unit, the NPS can exercise its authority under the Act of July 27, 1990, PL No. 101-337, 104 Stat. 379, codified as amended at 16 USC 19jj through 19jj-4 (2000), to undertake all necessary actions to protect park system resources. Operators will be held liable to the United States for its response costs as well as for any damages to park system resources (see section 19jj-1).

APPENDIX B: SUMMARY OF NON-FEDERAL OIL AND GAS OPERATIONS LEGAL AND POLICY MANDATES

COMPILED BY:
Lisa Norby, Petroleum Geologist[1]
Geologic Resources Division
National Park Service, Denver, Colorado
updated January 2007

This appendix summarizes many, but not all, of the legal and policy mandates that pertain to the exercise of nonfederal oil and gas rights in units of the National Park System. The first five laws pertain specifically to the National Park Service. They are followed by:

- Other federal laws and regulations,
- Executive Orders,
- NPS policies, guidelines, and procedures, and
- Selected Kentucky and Tennessee laws and regulations relevant to oil and gas operations.

The following summaries are intended to acquaint the reader with many of the legal and policy requirements that apply to nonfederal oil and gas operations in National Park System units and are not meant as legal interpretations. They cannot be relied upon to create any rights, substantive or procedural, enforceable by any party in litigation with the United States. Congress may change statutes and agencies may update their regulations and policies. <u>During project planning, operators are responsible for ensuring they have current and complete information on legal and policy requirements for nonfederal oil and gas operations on NPS lands.</u>

Table B.1, summarizes many, but not all, of the legal and policy mandates governing the exercise of nonfederal oil and gas operations in national park units. These include statutes, regulations, executive orders and policies. This appendix contains summary descriptions of many of the Current Legal and Policy Requirements listed in the following table.

[1] The following persons have contributed to this appendix: Lisa Norby, Petroleum Geologist, NPS; Pat O'Dell, Petroleum Engineer, NPS; Edward Kassman, regulatory specialist, NPS; Madoline Wallace, environmental protection specialist, former NPS employee; Sandy Hamilton, environmental protection specialist, NPS; and Michael Graetz, law student, NPS.

Table B.1. Legal and Policy Mandates Pertaining to Nonfederal Oil and Gas Operations

AUTHORITIES	RESOURCES AND VALUES AFFORDED PROTECTION
National Park Service Statutes and Applicable Regulations	
NPS Organic Act of 1916, as amended, 16 U.S.C. §§ 1 *et seq.*	All resources, including air resources, cultural and historic resources, natural resources, biological diversity, human health and safety, endangered and threatened species, visitor use and experience, and visual resources
National Park System General Authorities Act, 16 U.S.C. §§ 1a-1 *et seq.*	All resources, including air resources, cultural and historic resources, natural resources, biological diversity, human health and safety, endangered and threatened species, visitor use and experience, and visual resources
National Park Service Omnibus Management Act of 1998, 16 U.S.C. §§ 5901 *et seq.*	Any living or non-living resource
NPS Nonfederal Oil and Gas Rights regulations – 36 C.F.R. Part 9, Subpart B	All, *e.g.*, air resources, cultural and historic resources, natural resources, biological diversity, human health and safety, T&E species, visitor use and experience
Park System Resource Protection Act, 16 U.S.C. § 19jj	Any living or non-living resource that is located within the boundaries of a unit of the National Park System, except for resources owned by a nonfederal entity
Other Applicable Federal Laws and Regulations	
American Indian Religious Freedom Act, as amended, 42 U.S.C. §§ 1996 – 1996a; 43 C.F.R. Part 7	Cultural and historic resources
Antiquities Act of 1906, 16 U.S.C. §§ 431-433; 43 C.F.R. Part 3	Cultural, historic, archeological, paleontological resources
Archeological Resources Protection Act of 1979, 16 U.S.C. §§ 470aa – 470mm; 18 C.F.R. Part 1312; 36 C.F.R. Part 296; 43 C.F.R. Part 7	Archeological resources
Clean Air Act, as amended, 42 U.S.C. §§ 7401-7671q; 40 C.F.R. Parts 23, 50, 51, 52, 58, 60, 61, 82, and 93; 48 C.F.R. Part 23	Air resources
Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended, 42 U.S.C. §§ 9601-9675; 40 C.F.R. Parts 279, 300, 302, 307, 355, and 373	Human health and welfare and the environment
Endangered Species Act of 1973, as amended, 16 U.S.C. §§ 1531-1544; 36 C.F.R. Part 13; 50 C.F.R. Parts 10, 17, 23, 81, 217, 222, 225, 402, and 450	Plant and animal species or subspecies and their habitat, which have been listed as threatened or endangered by the U.S. Fish and Wildlife Service (FWS) or the National Marine Fisheries Service (NMFS).
Farmland Protection Policy Act, 7 U.S.C. §§ 4201-4209, 7 C.F.R. Part 658	Prime and unique farmland and soils
Federal Insecticide, Fungicide, and Rodenticide Act, as amended (commonly referred to as Federal Environmental Pesticide Control Act of 1972), 7 U.S.C. §§ 136 *et. seq.;* 40 C.F.R. Parts 152-180, except Part 157	Human health and safety and the environment
Federal Land Policy and Management Act of 1976, 43 U.S.C. §§ 1701 *et seq.;* 43 C.F.R. Part 2200 for land exchanges and 43 C.F.R. Parts 1700-9000 for all other BLM activities	Federal lands and resources administered by the Bureau of Land Management
Federal Water Pollution Control Act of 1972 (commonly referred to as Clean Water Act), 33 U.S.C. §§ 1251 *et seq.;* 33 C.F.R. Parts 320-330; 40 C.F.R. Parts 110, 112, 116, 117, 122, and 230-232	Water resources, wetlands, and waters of the U.S.
Fish and Wildlife Coordination Act, 16 U.S.C. §§ 661 – 666c	Water resources, fish and wildlife

AUTHORITIES	RESOURCES AND VALUES AFFORDED PROTECTION
Historic Sites, Buildings, and Antiquities Act (Historic Sites Act of 1935), 16 U.S.C. §§ 461-467; 18 C.F.R. Part 6; 36 C.F.R. Parts 1, 62, 63, and 65	Historic sites, buildings and objects
Lacey Act, as amended, 16 U.S.C. §§ 3371 *et seq.;* 15 C.F.R. § 904; 50 C.F.R. Parts 10, 11, 12, 14, and 300	Fish and wildlife, vegetation
Migratory Bird Treaty Act, as amended, 16 U.S.C. §§ 703-712; 50 C.F.R. Parts 10, 12, 20, and 21	Migratory birds
National Environmental Policy Act of 1969, 42 U.S.C. §§ 4321 *et seq.;* 40 C.F.R. Parts 1500-1508	Human environment (cultural and historic resources, natural resources, biodiversity, human health and safety, socioeconomic environment, visitor use and experience)
National Historic Preservation Act of 1966, as amended, 16 U.S.C. §§ 470 et seq.; 36 C.F.R. Parts 18, 60, 63, 78, 79, 800	Cultural and historic properties listed in or determined to be eligible for listing in the National Register of Historic Places
Native American Graves Protection and Repatriation Act, 25 U.S.C. §§ 3001-3013; 43 C.F.R. Part 10	Native American human remains, funerary objects, sacred objects, objects of cultural patrimony
Noise Control Act of 1972, 42 U.S.C. §§ 4901-4918; 40 C.F.R. Part 211	Human health and welfare
Oil Pollution Act, 33 U.S.C. §§ 2701-2762; 15 C.F.R. Part 990; 30 C.F.R. Part 253; 33 C.F.R. Parts 135 and 150; 40 C.F.R. Part 112	Water resources, natural resources
Pipeline Safety Act of 1992, 49 U.S.C. §§ 60101 *et seq*.; 49 C.F.R. Parts 190-199	Human health and safety, the environment
Resource Conservation and Recovery Act, 42 U.S.C. §§ 6901 *et. seq*.; 40 C.F.R. Parts 240-282; 49 C.F.R. Parts 171-179	Natural resources, human health and safety
Rivers and Harbors Act of 1899, as amended, 33 U.S.C. §§ 401 *et. seq*.; 33 C.F.R. Parts 114, 115, 116, 320-325, and 333	Shorelines and navigable waterways, tidal waters, wetlands
Safe Drinking Water Act of 1974, 42 U.S.C. §§ 300f *et seq*.; 40 C.F.R. Parts 141-148	Human health, water resources
Wild and Scenic Rivers Act of 1968, 16 U.S.C. §§1271 *et seq*.; 36 C.F.R. Part 297	Water resources, recreational values, geologic resources, fish and wildlife, historic, cultural and other similar values
Enabling Act for Big South Fork National River and Recreation Area (Water Resources Act of 1974) 16 USC § 460ee	Cultural, historic, geologic, fish, wildlife, and archeologic resources; scenic and recreational values
Enabling Act for Obed Wild and Scenic River, P.L. 90-542, 16 USC § 1274	Rivers, geologic, fish and wildlife, historic, cultural resources; and recreational and scenic values
Executive Orders	
Executive Order No. 11593 – Protection and Enhancement of the Cultural Environment, 36 Fed. Reg. 8921 (1971), 3 C.F.R. 1971 Comp., 36 C.F.R. §§ 60, 61, 63, 800	Cultural resources
Executive Order No. 11644 – Use of Off-Road Vehicles on the Public Lands, 37 Fed Reg. 2877 (1972) reprinted in 42 U.S.C. § 4321, as amended by Executive Order No. 11989 (1977), 42 Fed. Reg. 26959; Executive Order No. 12608 (1987), § 21, 52 Fed. Reg. 34617	Natural and cultural resources, aesthetic and scenic values
Executive Order No. 11988 – Floodplain Management, 42 Fed. Reg. 26951 (1977), 3 C.F.R. 121 Comp., as amended by Executive Order No. 12148 (1979), 44 Fed. Reg. 43239, 3 C.F.R. 1979 Comp., p. 412	Floodplains, human health, safety, and welfare
Executive Order No. 11990 – Protection of Wetlands, 42 Fed. Reg. 26961 (1977), 3 C.F.R. 121	Wetlands
Executive Order No. 12088 – Federal Compliance with Pollution Control Standards, 43 Fed. Reg. 47707 (1978); as amended by Executive Order No. 12580 – Superfund Implementation, 52 Fed. Reg. 2923 (1987)	Natural resources, human health and safety

AUTHORITIES	RESOURCES AND VALUES AFFORDED PROTECTION
Executive Order No. 12630 – Governmental Actions and Interference with Constitutionally Protected Property Rights, 53 Fed. Reg. 8859 (1988)	Private property rights, public funds
Executive Order No. 12898 – Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, amended by Executive Order No. 12948, 60 Fed. Reg. 6379 (1995)	Human health and safety
Executive Order No. 13007 – Indian Sacred Sites, 61 Fed. Reg. 26771 (1996)	Native Americans' sacred sites
Executive Order No. 13112 – Invasive Species, 64 Fed. Reg. 6183 (1999), as amended by Executive Order 13286, 68 Fed. Reg. 10619 (2003)	Vegetation and wildlife
Executive Order No. 13186 – Responsibilities of Federal Agencies to Protect Migratory Birds, 66 Fed. Reg. 3853 (2001)	Migratory birds
Executive Order No. 13212 – Actions to Expedite Energy-Related Projects, 66 Fed. Reg. 28357 (2001), as amended by Executive Order No. 13302, 68 Fed. Reg. 27429 (2003)	Production, transmission, conservation of energy
Executive Order No. 13352 – Facilitation of Cooperative Conservation, 69 Fed. Reg. 52989 (2004)	Natural resources, property rights, public health and safety
Federal Policies, Guidelines and Procedures	
NPS Management Policies (2006)	All resources including air resources, cultural and historic resources, natural resources, biological diversity, human health and safety, endangered and threatened species, visitor use and experience, visual resources
Dept. of the Interior, Departmental Manual, 516 DM 1 - 15 –NEPA policies (2005)	All resources including cultural resources, historic resources, natural resources, human health and safety
Dept. of the Interior, Departmental Manual, 517 DM 1 - Pesticides (1981)	Human health and safety, the environment
Dept. of the Interior, Departmental Manual, 519 DM 1 - 2 – Protection of the Cultural Environment (1994)	Archeological, prehistoric resources, historic resources, Native American human remains, cultural objects
Department of the Interior, Departmental Manual, 520 DM 1 – Protection of the Natural Environment - Floodplain Management and Wetlands Protection Procedures (2001)	Floodplains and wetlands
Dept. of the Interior, Onshore Oil and Gas Order Number 2, Section III, Drilling Abandonment Requirements, 53 Fed. Reg. 46,810 - 46,811 (1988)	Human health and safety
NPS Director's Order 12 and Handbook – Conservation Planning, Environmental Impact Analysis, and Decision Making (2001)	All resources including natural resources, cultural resources, human health and safety, socioeconomic environment, visitor use
NPS Director's Order 28 – Cultural Resource Management (1998)	Cultural, historic, and ethnographic resources
NPS Director's Order 28A – Archeology (2004)	Archeological resources
NPS Director's Order 47 – Sound Preservation and Noise Management (2000)	Natural soundscapes
NPS Director's Order and Reference Manual 53 – Special Park Uses (2005)	All resources, including air resources, cultural and historic resources, natural resources, biological diversity, human health and safety, endangered and threatened species, visitor use and experience, visual resources.
RM 77 – Natural Resources Management (2004)	Natural resources
NPS Director's Order and Procedural Manual 77-1 – Wetland Protection (2002)	Wetlands
NPS Director's Order and Procedural Manual 77-2 – Floodplain Management (2003)	Floodplains

AUTHORITIES	RESOURCES AND VALUES AFFORDED PROTECTION
Secretary of the Interior's Standards and Guidelines for Archeology and Historic Preservation," 48 Fed. Reg. 44716 (1983), also published as Appendix C of NPS Director's Order 28 – Cultural Resource Management	Cultural and historic resources
Government-to-Government Relations with Native American Tribal Governments, Presidential Memorandum (April 29, 1994)	Native Americans – Tribal rights and interests
Selected Kentucky and Tennessee Laws and Regulations	
Tenn. Code, Title 60, Oil and Gas (2006)	Permitting and operations – public health and safety
Tenn. Code, Title 68, Health and Safety and Environmental Protection (2006)	Permitting and operations – all resources, public health and safety
Tenn. Code, title 70, Wildlife Resources (2006)	Plants and wildlife
KY Rev. Stat. Title 28, Mines and Minerals (2005) Title 805 §§ 040 - 170	Permitting and operations – public health and safety
KY Rev. Stat., Title 12, Conservation and State Development (2005)	All resources, public health and safety

NATIONAL PARK SERVICE LAWS

NATIONAL PARK SERVICE ORGANIC ACT OF 1916, as amended, 16 U.S.C. §§ 1 et seq.

Resources afforded protection: all resources including air resources, cultural and historic resources, natural resources, biological diversity, human health and safety, endangered and threatened species, visitor use and experience, visual resources
Applicable regulation(s): 36 C.F.R. Parts 1-10, 12-14, 20, 21, 25, 28, 30, 34, and 51

Through this Act, Congress established the National Park Service and mandated that it "shall promote and regulate the use of federal areas known as national parks, monuments…by such means and measures as conform to the fundamental purpose of said parks, monuments…which purpose is to conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations."

Section 3 of the Organic Act provides the Secretary of the Interior with the authority to adopt rules and regulations to govern the use and the management of park units. Through this provision of the Organic Act, the NPS promulgated regulations governing the exercise of nonfederal oil and gas rights at 36 C.F.R. Part 9, Subpart B. These regulations control all activities during the exercise of rights to oil and gas not owned by the United States where access is on, across or through federally owned or controlled lands or waters within any NPS unit. The NPS does not intend the regulations to result in the taking of a property interest, but rather to impose reasonable regulations on activities that involve and affect federally owned lands. These regulations are written to ensure that operators conduct oil and gas activities in a manner consistent with the purposes for which Congress created the NPS unit. Likewise, the regulations prevent or minimize damage to the environment and other resource values and insure that all NPS units remain unimpaired for the enjoyment of future generations.

The courts have consistently interpreted the Organic Act and its amendments to elevate resource conservation above visitor recreation. Michigan United Conservation Clubs v. Lujan, 949 F.2d 202, 206 (6th Cir. 1991) states, "Congress placed specific emphasis on conservation." National Rifle Association of America v. Potter, 628 F. Supp. 903, 909 (D.D.C. 1986) states, "In the Organic Act Congress speaks of but a single purpose, namely, conservation." The NPS Management Policies (NPS 2006) also recognize that resource conservation takes precedence over visitor recreation. The policy dictates, "when there is a conflict between conserving resources and values and providing for enjoyment of them, conservation is to be predominant."

Because conservation remains predominant, the NPS seeks to avoid or minimize adverse impacts on park resources and values; however, the NPS has the discretion to allow impacts when necessary to fulfill park purposes (NPS 2006, §§ 1.4.3, 1.4.3.1). While some actions and activities cause impacts, the NPS cannot allow an adverse impact that constitutes resource impairment (NPS 2006, § 1.4.3). The Organic Act prohibits actions that impair park resources unless a law directly and specifically allows for the acts (16 U.S.C. § 1a-1). An action constitutes an impairment when its impacts "harm the integrity of park resources or values, including the opportunities that otherwise would be present for the enjoyment of those resources or values" (NPS 2006, § 1.4.5). An impact on any park resource or value may constitute an impairment, but an impact would be more likely to constitute an impairment to the extent that it has a major adverse effect on a resource or value whose conservation is:

- necessary to fulfill specific purposes identified in the establishing legislation or proclamation of the park, or
- key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park, or
- identified in the park's general management plan or other relevant NPS planning documents as being of significance. (NPS 2006 § 1.4.5)

To determine impairment, the NPS must evaluate "the particular resources and values that would be affected, the severity, duration, and timing of the impact, the direct and indirect effects of the impact, and the cumulative effects of the impact in question and other impacts" (NPS 2006, § 1.4.5).

NATIONAL PARK SYSTEM GENERAL AUTHORITIES ACT, 16 U.S.C. §§ 1a-1 et seq.

Resources afforded protection: all resources, including air resources, cultural and historic resources, natural resources, biological diversity, human health and safety, endangered and threatened species, visitor use and experience, visual resources
Applicable regulation(s): 36 C.F.R. Parts 1-199

This act affirmed that while all national park system units remain "distinct in character," they are "united through their interrelated purposes and resources into one national park system as cumulative expressions of a single national heritage." The purpose of this act was "to include all such areas in the system and to clarify the authorities applicable to the system." The act made it clear that the NPS Organic Act and other protective mandates apply equally to all units of the system. Further, amendments stated that NPS management of park units should not "derogat[e] ...the purposes and values for which these various areas have been established."

NATIONAL PARK SERVICE OMNIBUS MANAGEMENT ACT OF 1998, 16 U.S.C. §§ 5901 et seq.

Resources afforded protection: any living or non-living resource
Applicable regulation(s): none

This statute requires the Secretary of the Interior to continually improve the NPS's ability to provide management, protection and interpretation of National Park System resources. The statute directs the NPS to manage the units by employing high quality science and information; to inventory the system's resources to create baseline information so that NPS can monitor and analyze future data to determine trends in the resources' conditions; and to use the results of the scientific studies for park management. In the oil and gas context, this requires operators to support their plans of operations with scientific data. Further, it requires the operators to monitor their operations area to ensure that their operations do not adversely impact the park's resources.

PARK SYSTEM RESOURCE PROTECTION ACT, 16 U.S.C. § 19jj

Resources afforded protection: any living or non-living resource that is located within the boundaries of a unit of the National Park System, except for resources owned by a nonfederal entity
Applicable regulation(s): none

The Park System Resource Protection Act makes any person who destroys, causes the loss of, or injures any park system resource strictly liable to the United States for response costs and for damages resulting from such destruction, loss, or injury. A park system resource includes any living or non-living resource located within the boundaries of a NPS unit, except for resources owned by a non-federal entity. Because the statute imposes strict liability the only defenses arise when an act of god or war caused the damage, a third party who constituted neither an employee or nor an agent of the owner/operator caused solely the damage, or an activity authorized by federal or state law caused the damage.

The Park System Resources Protection Act authorizes the Secretary of the Interior to request the Department of Justice to file a civil action for the costs of replacing, restoring or acquiring the equivalent of a park system resource; the value of any use loss pending its restoration; replacement, or acquisition, the cost of damage assessments; and the cost of response including actions to prevent, to minimize, or to abate injury. Response costs include actions taken by the NPS "…to prevent or minimize destruction, loss of, or injury to park system resources; to abate or minimize the imminent risk of such destruction, loss or injury; or to monitor ongoing effects of incidents causing such destruction, loss or injury."

The Park System Resource Protection Act applies to nonfederal oil and gas activities in units of the National Park System. Operators need to make sure that they operate within the specifications of their approved 9B plan, comply with all other relevant legal requirements, and take precautions to avoid actions that may damage park system resources.

NOTE: The 36 CFR Part 9 Subpart B Nonfederal Oil and Gas Rights regulations are described in Chapter 2 of the Plan/EIS.

OTHER APPLICABLE FEDERAL LAWS AND REGULATIONS

AMERICAN INDIAN RELIGIOUS FREEDOM ACT, as amended, 42 U.S.C. §§ 1996 –1996a

Resources afforded protection: cultural and historic resources
Applicable regulation(s): 43 C.F.R. Part 7

This Act requires the federal government to protect and to preserve Native Americans', Eskimos', Aleuts', and Native Hawaiians' inherent right to believe, to express, and to exercise their traditional religions. It allows them to access, to use, and to possess sacred objects and gives them the freedom to worship through ceremonials and traditional rites. It further directs various federal departments, agencies, and other administrative bodies to evaluate their policies and procedures in consultation with native traditional religious leaders to determine changes necessary to protect and preserve Native American religious cultural rights and practices.

If the NPS anticipates a conflict between proposed oil and gas operations and tribal religious rights, it will consult with the tribe as part of the 9B plan approval process. To ensure compliance with this Act, the NPS will consult with tribes during the plan of operations approval process.

Antiquities Act of 1906, 16 U.S.C. §§ 431 – 433

Resources afforded protection: cultural, historic, archeological and paleontological resources
Applicable regulation(s): 43 C.F.R. Part 3

As the Archeological Resources Protection Act's forerunner, the Antiquities Act constituted the first general act providing protection for archeological resources. It protects all historic and prehistoric ruins or monuments on federal lands and prohibits their excavation, destruction, injury or appropriation without the departmental secretary's permission. It also authorizes the President of the United States' to proclaim as national monuments public lands having historic landmarks, historic and prehistoric structures, and other objects of historic or of scientific interest. The Antiquities Act also authorizes the President to reserve federal lands, to accept private lands, and to accept relinquishment of unperfected claims for that purpose.

The Act authorizes the departmental secretary to issue permits to qualified institutions to examine ruins, excavate archeological sites, and gather objects of antiquity. Regulations at 43 C.F.R. Part 3 establish procedures for permitting the excavation or collection of prehistoric and historic objects on federal lands. ARPA permits replace Antiquities Act permits.

Operators who excavate, injure, destroy or appropriate any "object of antiquity" while engaging in mineral activities on federal lands without or contrary to an approved plan of operations violate the Antiquities Act and trigger its penalties.

ARCHEOLOGICAL RESOURCES PROTECTION ACT OF 1979, 16 U.S.C. §§ 470aa –470mm

Resources afforded protection: archeological resources
Applicable regulation(s): 18 C.F.R. § 1312; 36 C.F.R. Part 79, 296; 43 C.F.R. Part 7

Congress enacted the Archeological Resources Protection Act (ARPA) to preserve and protect archeological resources and sites on federal and Indian lands. The law makes it illegal to excavate or to remove from federal or Indian lands any archeological resources without a permit from the federal land manager. It also prohibits the removal, sale, receipt, and interstate transport of archeological resources obtained illegally (*i.e.*, without permits) from federal or Indian lands.

Agencies may issue permits only to educational or to scientific institutions if the resulting activities will increase knowledge about archeological resources. The law defines archeological resources as material remains of past human life or activities that are of archeological interest and are at least 100 years old. All materials collected on federal lands as a result of permitted activities remain the property of the United States. Those excavated from Indian lands remain the property of the Indian or Indian tribe having rights of ownership over such resources.

Congress amended the law to require development of plans for surveying public lands for archeological resources and of systems for reporting incidents of suspected violations.

ARPA also fosters cooperation between governmental authorities, professionals, and the public. The ARPA permit process ensures that individuals and organizations wishing to work with federal resources have the necessary professional qualifications and that these persons follow federal standards and guidelines for research and curation. The process allows the State Historic Preservation Officer (SHPO) to review and comment on ARPA permit applications. Federal agencies do not issue ARPA permits to themselves or to their contractors. The scope of work and contractor's proposal, which constitute the contract, insures that contractors comply with federal standards and guidelines. The ARPA permit replaces the permit required by the Antiquities Act of 1906.

ARPA imposes severe criminal and civil penalties on anyone who excavates, removes, damages, or otherwise alters or defaces archeological resources without a permit. However, ARPA applies only to lands owned by the United States and lands held in trust by the United States for Indian tribes and individual Indians. ARPA does not apply on the nonfederal surface estate.

A contractor hired by an operator to conduct a cultural resource survey that involves any collection of archeological resources, whether or not excavation or subsurface testing is involved, must obtain an ARPA permit. Operations under an approved 9B plan do not need an ARPA permit for incidental disturbance of archeological resources because these operations occur exclusively for purposes other than excavation or removal of archeological resources. General earth-moving excavations performed under an approved plan of operations do not constitute "excavation or removal" of archeological resources. However, agencies require an ARPA permit before an operator under 36 C.F.R. Part 9B salvages previously unknown archeological resources discovered during operations.

ARPA regulations appear at 43 C.F.R. Part 7, Subparts A and B. Subpart A - "Protection of Archeological Resources, Uniform Regulations," promulgated pursuant to ARPA's section 10(a) jointly by the Secretaries of Interior, Agriculture, and Defense, and the Chairman of the Board of the Tennessee Valley Authority, establishes the uniform definitions, standards, and procedures that all federal land managers must follow when providing protection for archeological resources located on public and on Indian lands. Subpart B - "Department of the Interior Supplemental Regulations," provides definitions, standards, and procedures for federal land managers to protect archeological resources and provides further guidance for Interior bureaus concerning definitions, permitting procedures, and civil penalty hearings. In addition, NPS regulations at 36 C.F.R. § 9.47 discuss 9B plans and archeological resources.

Operators who remove, excavate, damage, alter, or deface archeological resources without or contrary to an approved plan of operations, while on federal property violate ARPA and trigger both its civil and criminal penalties.

CLEAN AIR ACT, as amended, 42 U.S.C. §§ 7401 – 7671q

Resources afforded protection: air resources
Applicable regulation(s): 40 C.F.R. Parts 23, 50, 51, 52, 58, 60, 61, 82, and 93; and 48 C.F.R. Part 23

The Clean Air Act (CAA) seeks to “protect and enhance” the quality of the nation’s air resources; to promote the public health and welfare and the productive capacity of its population; to initiate and to accelerate a national research and development program to achieve the prevention and control of air pollution; to provide technical and financial assistance to state and local governments for aid in their development and execution of air pollution programs; and to encourage and to assist the development and the operation of regional air pollution control programs.

The Act requires the U.S. Environmental Protection Agency (EPA) to establish national primary standards to protect human health and more stringent national secondary standards to protect human welfare (National Ambient Air Quality Standards or NAAQS). The statute makes states and local governments responsible for the prevention or control of air pollution. NAAQS exist for sulfur dioxide, particulate matter, ozone, nitrogen dioxide, carbon monoxide, and lead.

Divided into air quality control regions, states must submit Implementation Plans for EPA approval. These plans provide strategies for the implementation, maintenance, and enforcement of national primary and secondary ambient air quality standards for each air quality control region.

Other provisions of the Act include: new source review permit programs, standards of performance for new stationary sources (NSPS), motor vehicle emission and fuel standards, national emission standards for hazardous air pollutants (NESHAPS), studies of particulate emissions from motor vehicles, studies of the cumulative effect of all substances and activities that may affect the stratosphere (especially ozone in the stratosphere), programs to Prevent Significant air quality Deterioration (PSD) in areas attaining the NAAQS, and programs to protect visibility in large national parks and wilderness areas.

All sources of air pollution, including publicly or privately owned facilities, must meet all federal, state, and local requirements under the CAA. In most cases, States and local authorities regulate air pollution control. For the National Park Service, the Prevention of Significant Deterioration of Air Quality (PSD) (42 U.S.C. §§ 7470-7475) and the Visibility Protection (42 U.S.C. § 7479) constitute the most important CAA sections.

The PSD provisions establish a classification system for the United States’ clean air areas, which include those designated as Class I, Class II or Class III. National Park System units are designated as Class I or Class II areas. This classification indicates the additional increment of air quality degradation from particulate matter, sulfur dioxide ($S0_2$), nitrogen dioxide (NO_2), allowed in that area. Class I areas may only degrade by a very small increment of new pollution while Class III areas can degrade substantially. There are currently no Class III areas designated in the country.

As part of the Prevention of Significant Deterioration (PSD) program, Congress designated many National Parks and wilderness areas (including U.S. Fish and Wildlife Service and U.S. Forest Service wilderness areas) mandatory Class I areas. Because states may not redesignate these areas, Congress provided those areas with maximum protection from future air quality degradation. EPA designated all other parts of the country where air quality did not violate the national ambient air quality standards Class II areas where moderate pollution increases may occur. States or Indian tribes may reclassify Class II areas as Class III, thus, allowing significant pollution increases. However, no entity can designate certain Class ll areas, such as national monuments and national recreation areas, as Class III but only Class II, or, at the option of the state, Class I.

Generally, the PSD rules apply only to major new or expanding facilities planning to locate or expand operations in clean air areas. An operator of a facility seeking a new source permit for location or for expansion in a clean air area must meet several requirements including National Ambient Air Quality Standards; PSD Classes I, II and III air pollution increments; and, a special "adverse impact determination" for Class I areas.

To protect the scenic value of visibility in National Parks and wilderness areas, Congress established a national visibility goal in section 169A of the CAA. Congress stated the agencies' goals as "the prevention of any future, and the remedying of any existing, impairment of visibility in mandatory class I federal areas which impairment results from manmade air pollution". Under current EPA regulations, the thirty-six states with mandatory Class I areas must assure reasonable progress toward the national visibility goal with respect to impairment reasonably attributed to major stationary sources of air pollution. EPA reviews new major stationary sources under permitting programs (*i.e.*, PSD and nonattainment area new source review) to assure visibility protection of Class I areas from potential future emissions.

These permitting programs also require that new major sources analyze visibility and other air quality impacts in the general area affected by the new source's emissions regardless of the classification of the area as Class I or Class II. If oil and gas development and operations result in major emissions of air pollutants as defined in PSD and nonattainment area permitting provisions, then such major emitting facilities would need to comply with these requirements as well as any other applicable, federal, state, and local air quality rules and regulations. EPA issued new regulations in July 1999 to address visibility impairment caused by regional haze, but implementation of this program will not occur for several more years.

The Clean Air Act Amendments of 1990 required EPA to promulgate rules to ensure that federal actions conform to appropriate nonattainment area SIPs. These rules prohibit federal agencies from taking any action that causes or contributes to any new violation of the NAAQS, increases the frequency or severity of an existing violation, or delays the timely attainment of a standard. The NPS will need to make a conformity determination for any oil and gas permitting decisions made under this management plan as it pertains to existing ozone nonattainment SIPs applicable in the area of the parks.

COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION, AND LIABILITY ACT OF 1980, as amended, 42 U.S.C. §§ 9601 – 9675

Resources afforded protection: human health and welfare and the environment
Applicable regulation(s): 40 C.F.R. Parts 279, 300, 302, 307, 355, and 373

The Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), also known as "Superfund," provides for cleanup of sites contaminated by hazardous substances in the United States. CERCLA defines "hazardous substance" as any substance: listed under the Resources Conservation and Recovery Act (42 U.S.C. § 6921) as hazardous waste or having the characteristics identified under that section; listed under the Clean Water Act (33 U.S.C. § 1321(b)(2)(a)) as a hazardous substance or (33 U.S.C. § 1317(a)) as a toxic pollutant; listed under the Clean Air Act (42 U.S.C. § 7412) as a hazardous air pollutant; listed under the Toxic Substances Control Act (15 U.S.C. § 2606) as an imminently hazardous chemical substance or mixture; or listed under CERCLA (42 U.S.C. § 9602) as a hazardous substance.

CERCLA explicitly excludes petroleum from the definition of hazardous substance, including crude oil or any fraction of petroleum that is not otherwise specifically listed or designated as a hazardous substance under statutory provisions listed above. It also excludes natural gas, natural gas liquids, liquefied natural gas, or synthetic gas usable as fuel from the definition of hazardous substances. (42 U.S.C. § 9601(14)).

Owners or operators of a facility that stored, treated, or disposed of hazardous substances must notify EPA of the location and of the type of waste at the site. EPA puts the most seriously contaminated sites on a National Priorities List (NPL) and updates it annually. Sites on the NPL are eligible for long-term clean up actions funded by the EPA administered Superfund program.

CERCLA also includes reporting requirements for spills or other releases of hazardous substances. CERCLA requires persons in charge of a vessel or facility to report releases (except federally permitted releases) of hazardous substances into the environment to the National Response Center. If releases constitute less than the reportable quantity established by EPA (40 C.F.R. § 302.4), then it does not have to be reported. Failure to report a reportable quantity release warrants a fine of up to $10,000 and imprisonment not to exceed one year (42 U.S.C. § 9603). "Release" means any spilling, leaking, pumping, pouring, emitting, emptying, discharging, injecting, dumping or disposing into the environment. "Release" also includes the abandonment of barrels or containers that contain hazardous substances.

CERCLA directs the president to revise and to publish a National Contingency Plan (NCP) for the cleanup of petroleum and hazardous waste spills. EPA developed the original NCP under section 311 of the Clean Water Act. The NCP details how the EPA will respond to spills of oil or hazardous substances regulated under CERCLA and/or the Clean Water Act. EPA publishes the plan, called the National Oil and Hazardous Substances Pollution Contingency Plan, at 40 C.F.R. Part 300.

CERCLA authorizes the EPA to clean up sites using the Superfund, to issue administrative orders requiring potentially responsible parties (PRPs) to clean up sites, and to obtain court orders requiring PRPs to clean up sites. If EPA uses the Superfund, then CERCLA authorizes EPA to sue PRPs to recover costs of the cleanup. PRPs who have incurred costs cleaning up may sue other PRP’s to recover part of the cost of the cleanup.

Under CERCLA, the EPA tries to find all PRPs, including the present owner or operator of a vessel or facility that released or threatened a release of hazardous substances, past owners or operators of a vessel or facility at the time of disposal of the hazardous substance; persons who arranged for disposal of the hazardous substance at the facility; and persons who transported a hazardous substance to the facility.

However, if the PRP can establish that the release or threatened release and the resulting damages occurred solely by an act of God, an act of war, or an unforeseen act or omission of a third party who neither constituted an agent nor an employee of the PRP, then no liability attaches. CERCLA provides an innocent landowner defense under limited circumstances.

Persons liable under CERCLA remain responsible for all response costs incurred by the United States, a state or an Indian tribe. They may also incur liability for damages for injury to, destruction of, or loss of natural resources, including the reasonable costs of assessing the injury, and for the destruction or loss of natural resources. Furthermore they may be responsible for costs of certain health assessments or studies.

CERCLA imposes strict liability meaning the government does not have to prove that the person intended to release, acted negligently in releasing, or caused the release of a hazardous substance into the environment. Moreover, in most cases, any of the liable parties may be held responsible for the entire cost of the cleanup. To recover part of the cleanup costs, the party then sues other liable parties for contribution.
Operators and their contractors should thoroughly investigate waste disposal sites before sending hazardous substances. They should check to make sure disposal sites have the relevant state and federal permits and that the disposal company has provided enough money to properly close the site. If a release occurs from the disposal site, then the persons who disposed of hazardous substances could incur large cleanup bills.

Operators should avoid releases of hazardous substances. Release of an operator's performance bond required under 36 C.F.R. § 9.48 does not affect possible subsequent liability under CERCLA for releases of a hazardous substance into the environment.

ENDANGERED SPECIES ACT OF 1973, as amended, 16 U.S.C. §§ 1531 – 1544

Resources afforded protection: plant and animal species or subspecies and their habitat, which have been listed as threatened or endangered by the U.S. Fish and Wildlife Service (FWS) or the National Marine Fisheries Service (NMFS). Distinct population segments of species of vertebrate fish or wildlife, which interbreed when mature, may also be listed as threatened or endangered, and are afforded protection.
Applicable regulation(s): 36 C.F.R. Part 13; and 50 C.F.R. Parts 10, 17, 23, 81, 217, 222, 225 402, and 450

The Endangered Species Act (ESA) requires federal agencies to ensure that their activities (authorized, funded, or carried out) will not jeopardize the continued existence of any listed threatened or endangered species or result in the destruction or adverse modification of critical habitat of such species. The FWS and NMFS administer the Act. The ESA makes it illegal to "take" an endangered species of fish or wildlife without a permit from the FWS or NMFS. "Taking" includes direct killing, hurting, trapping, or harassing. It also includes disrupting a habitat critical to the species' survival. Protective regulations issued at the time of listing for a threatened species of fish or wildlife may also prohibit or limit taking of the species without a permit.

Other federal agencies must formally consult with the FWS or NMFS when they believe that their own actions (including permitting) may affect a listed or a proposed threatened or endangered (T & E) species. The ESA prohibits agency actions occurring within the United States that jeopardize the continued existence of a T & E species and/or destroy or adversely affect designated critical habitat necessary for the species' survival.

When an operator submits a proposed plan of operations, the NPS and operators must comply with the requirements of the Endangered Species Act and the regulations FWS and NMFS have promulgated to implement it (50 C.F.R. Part 402). First, the NPS requests the FWS or NMFS to provide a list of proposed or listed species and proposed or designated critical habitat in the proposed operations area.

If the FWS or NMFS advises the NPS that listed or proposed T&E species may be present, then the NPS must prepare a biological assessment (BA). The BA evaluates the potential effects of the action on listed and proposed species and designated and proposed critical habitat. The BA will be concurrently released for public review and comment with the National Environmental Policy Act (NEPA) document (most likely an environmental assessment). The BA should include a list of listed and proposed threatened or endangered species occurring in the project area; impacts the project could have on these species and their habitat; project measures intended to mitigate, or reduce adverse impacts to these species and their habitat; and a description of the formal and informal consultation with the FWS or NMFS.

If the BA indicates that the action will not adversely affect any remaining listed species or designated critical habitat and the FWS or NMFS concurs, then formal consultation is not required. Likewise, if the BA indicates that the action is not likely to jeopardize the continued existence of proposed species or result in the destruction or adverse modification of proposed critical habitat, and FWS or NMFS concurs, then a conference is not required.

However, if the BA indicates that the action will adversely affect a listed species or critical habitat, then the NPS must formally consult with the FWS or NMFS. At the end of the consultation, the FWS or NMFS provides the NPS and the applicant with its "biological opinion." If the opinion finds the proposed action will jeopardize the continued existence of the species or result in the destruction or adverse modification of designated critical habitat, then the FWS or NMFS must suggest reasonable and prudent alternatives to the proposed action. If the FWS or NMFS cannot develop any reasonable and prudent alternatives, then it will indicate that to the best of its knowledge there are no reasonable and prudent alternatives exist. The FWS or NMFS may also formulate conservation recommendations, which will help the NPS reduce or eliminate the impacts the proposed action may have on listed species or designated critical habitat. The NPS will comply with prescribed alternatives when approving the plan of operations or implementing any other related action.

The NPS cannot approve a plan of operations if the FWS or NMFS has found that, no matter how the proposed operation is modified, it will result in "jeopardy" to a listed species or "destruction or adverse modification to habitat" critical to a listed species. Jeopardizing a listed species or habitat critical to a listed species' survival constitutes a "significant injury to federal lands" in the meaning of 36 C.F.R. Part 9B. The 36 C.F.R. Part 9B regulations do not allow the NPS to approve proposed plan of operations that will result in a "significant injury to federal lands."

FARMLAND PROTECTION POLICY ACT, 7 U.S.C. §§ 4201, 4209

Resources afforded protection: prime and unique farmland and soils
Applicable regulation(s): 7 C.F.R. Part 658

Federal agencies must assess the effects of their actions on prime or unique farmland and land of statewide or local importance classified by the U.S. Department of Agriculture's Natural Resources Conservation Service. The FPPA does not authorize the Federal Government to regulate the use of private or nonfederal land or, in any way, affect the property rights of owners. Projects are subject to FPPA requirements if they may irreversibly convert farmland (directly or indirectly) to nonagricultural use and are completed by a Federal agency or with assistance from a Federal agency. Farmland subject to FPPA requirements does not have to be currently used for cropland. It can be forest land, pastureland, cropland, or other land, but not water or urban built-up land. Prime farmland is land that has the physical and chemical characteristics for producing food, feed, fiber, forage, oilseed, and other agricultural crops. Prime farmland includes land that possesses the above characteristics but is being used currently to produce livestock and timber. Unique farmland is land other than prime farmland that is used for production of specific high-value food and fiber crops, such as citrus, tree nuts, olives, cranberries, fruits, and vegetables. Farmland that is of statewide or local importance for the production of food feed, fiber, forage, or oilseed crops, as determined by the appropriate state or unit of local government agency or agencies, and that the Secretary determines should be considered as farmland for the purposes of this subtitle.

FEDERAL INSECTICIDE, FUNGICIDE, AND RODENTICIDE ACT, as amended (commonly referred to as FEDERAL ENVIRONMENTAL PESTICIDE CONTROL ACT OF 1972), 7 U.S.C. §§ 136 *et. seq*.

Resources afforded protection: human health and safety, and the environment
Applicable regulation(s): 40 C.F.R. Parts 152-180, except Part 157

The Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), as amended, regulates pesticides in the United States. FIFRA prohibits the distribution or sale of unregistered pesticides and establishes procedures for registering pesticides with the EPA. EPA has the authority to suspend or to cancel registrations for pesticides, which cause unreasonable adverse effects on the environment. To gain registration approval, a pesticide must meet EPA criteria regarding efficacy, labeling, and environmental safety. The statute makes it illegal to use a pesticide in a manner inconsistent with its labeling. EPA determines whether it should classify pesticides for general or restricted use. People may only use pesticides classified for restricted use under the direct supervision of a certified applicator or subject to other restrictions imposed by regulation.

FIFRA also requires EPA to establish regulations for storage and disposal of pesticide containers, excess pesticides, and pesticides with canceled registration. The Act also outlines penalties, indemnities, and administrative procedures. In addition, EPA may exempt from any provision of the Act any federal or state agency, if it determines emergency conditions, requiring such exemption, exist.

The appropriate NPS pesticide specialist must review and approve use of pesticides, including herbicides and rodenticides, before anyone can use them in units of the National Park System, including those where nonfederal oil and gas operations occur. An NPS Integrated Pest Management Specialist must review and approve the proposed use of herbicides for clearing areas for oil and gas operations. The parks follow Department of the Interior Departmental Manual - 517; Reference Manual – 77, Natural Resources Management; and NPS Procedures for Pesticide Use Requests when considering proposals for pesticide use in NPS units.

FEDERAL LAND POLICY AND MANAGEMENT ACT OF 1976, 43 U.S.C. §§ 1701 et seq.

Resources afforded protection: federal lands and resources administered by the Bureau of Land Management
Applicable regulation(s): 43 C.F.R. Part 2200 for land exchanges and 43 C.F.R. Parts 1700-9000 for all other BLM activities

The Federal Land Policy and Management Act (FLPMA), also known as the "BLM Organic Act", controls Bureau of Land Management's (BLM) administration of more than three hundred million acres of federal lands in the western United States and Alaska. FLPMA also contains a land exchange authority (43 U.S.C. § 1716) under which the Secretary of the Interior may exchange federal lands or interests outside National Park System units for nonfederal lands or interests within National Park System units. When appropriate, the NPS and BLM may use this exchange authority to acquire private mineral interests in National Park System units.

BLM regulations at 43 C.F.R. Part 2200 govern federal land exchanges authorized by FLPMA. The regulations describe the appraisal and other procedures BLM uses while conducting land exchanges. However, if the enabling or exchange act for a unit remains inconsistent with these regulations, then the enabling or exchange act applies.

FEDERAL WATER POLLUTION CONTROL ACT OF 1972, (commonly referred to as Clean Water Act), 33 U.S.C. §§ 1251 *et. seq.*

Resources afforded protection: water resources, wetlands, and waters of the U.S.
Applicable regulation(s): 33 C.F.R. §§ 320-330; and 40 C.F.R. Parts 110, 112, 116, 117, 122, and 230-232

Originally titled the Federal Water Pollution Control Act of 1972 (FWPCA) and significantly amended in 1977 and 1987, the Clean Water Act established a federal policy to restore and to maintain the chemical, physical, and biological integrity of the nation's waters; to enhance the quality of water resources; and to prevent, control and abate water pollution.

To achieve this objective, the FWPCA establishes the ultimate goal of eliminating the discharge of pollutants into navigable waters of the United States and the interim goal of maintaining water quality that provides for the protection and propagation of fish, shellfish, and wildlife, and for recreation in and on the water. The FWPCA prohibits the discharge of toxic pollutants in toxic amounts; provides federal assistance to construct publicly owned waste treatment works; develops and implements area-wide waste treatment management processes to assure adequate control of source pollutants in each state; makes a major research and demonstration effort to develop technology necessary to eliminate the discharge of pollutants into navigable waters, waters of the contiguous zone, and the oceans; and develops and implements programs for the control of nonpoint sources of pollution to control both point and nonpoint sources of pollution.

As with most environmental programs, the FWPCA requires that states set and enforce water quality standards to meet minimum federal (EPA) requirements, including: effluent limitations for point sources of pollution; permits for discharges of pollutants into waters of the United States; and permits for discharges of dredged or fill material into waters of the U.S., including wetlands.

The following sections of the CWA remain relevant to oil and gas operators in National Park System units: Section 311 - spill reporting and spill control; Section 401 - state certification of project compliance; Section 402 - National Pollutant Discharge Elimination System (NPDES); Section 404 - Corps of Engineers dredge and fill permits.

<u>Section 311 (33 U.S.C. § 1321)</u>
Under section 311 no person can discharge oil or hazardous substances in harmful quantities into or upon navigable waters of the U.S., into or upon adjoining shorelines, or into or upon waters of the contiguous zone. Likewise, a person cannot discharge in connection with activities under the Outer Continental Shelf Lands Act or the Deepwater Port Act of 1974. For oil, a harmful quantity (*i.e.*, quantity that requires reporting) equals that amount which causes a violation of the applicable water quality standard or that amount which causes a film, sheen, or discoloration of the water surface. Persons who discharge a reportable quantity" must report the spill as soon as possible to the U.S. Coast Guard, EPA, and/or state agency, which agency depends on the geographic location of the spill and the type of substance spilled.

Hazardous substances are handled differently. Title 40 C.F.R. Part 116 lists about 300 hazardous substances. Title 40 C.F.R. Part 117 defines the reportable quantities for each substance. The reporting requirements of 40 C.F.R. Part 117 do not apply to permitted discharges. (See Section 402 permits below.) Failure to report a discharge can result in criminal penalties including fines and imprisonment. Section 311 also provides for federal cleanup of the spill and places the costs of cleanup on the entity that caused the spill. The section also protects the person in charge who reports the spill from criminal prosecution, but offers no immunity from civil penalties that may apply.

Under section 311, EPA issued regulations (40 C.F.R. Part 112) to prevent the discharge of oil and hazardous substances into the navigable waters of the United States. These regulations require that any of the facilities described below prepare a Spill Prevention Control and Countermeasure Plan (SPCCP). 40 C.F.R. Part 112 addresses the requirements for a SPCC Plan.

The SPCCP requirement applies to non-transportation related onshore and offshore facilities that drill, produce, gather, store, process, refine, transfer, distribute or consume oil or oil products. It only applies if the facilities due to their location, could potentially discharge oil in harmful quantities into or on the navigable waters of the United States or the adjoining shoreline. (Note: facilities with an underground storage capacity less than 42,000 gallons, or facilities with an above-ground storage capacity less than 1,320 gallons, are exempt from this requirement.)

Under its regulations at 36 C.F.R. Part 9B, the NPS requires a nonfederal oil and gas operator to submit a Spill Control and Emergency Preparedness Plan to deal with oil spills and other environmental hazards. A copy of the SPCCP, if one is required under 40 C.F.R. Part 112, will often meet most of the requirements for the Spill Control and Emergency Preparedness Plan under 36 C.F.R. Part 9B.

<u>Section 401 Water Quality Certification (33 U.S.C. § 1341)</u>
Section 401 requires certification from the state or interstate water control agency that a proposed activity complies with established effluent limitations and water quality standards. Applicants for federal permits or licenses must obtain this certification from the state agency that has been delegated authority to administer the FWPCA.

Section 402 Permits (33 U.S.C. § 1342(l)(2))
Under the National Pollutant Discharge Elimination System (NPDES), the EPA controls the discharges of pollutants from their point source into waters of the United States by using a permitting system. A "point source" could be a tank battery, for example. Any entity proposing to or discharging waste flows into U. S. waters needs a NDPES permit. EPA or states with EPA-approved programs issue NDPES permits.

The NPDES permit sets specific discharge limits. The limits rely on most recent pollution control technology, water quality standards, and government imposed schedules for installation of new pollution control equipment. The permit gives directions to the operator for monitoring and reporting discharges. The regulations provide for individual permits, group permits for like facilities, and general permits.

The Water Quality Act of 1987 amended the CWA to address stormwater runoff from industrial facilities. EPA requires a NPDES stormwater runoff permit for runoff that may touch machinery or contaminated material onsite and cause contamination of adjacent property. Industrial facilities include oil and gas exploration, production and development operations. The EPA published its rule on NPDES permit application regulations for storm water discharges at 55 Fed. Reg. 47990 (November 16, 1990).

The CWA exempts mining and oil and gas operations from the Section 402 stormwater permit requirements if,

"…discharges of stormwater runoff from mining operations, oil and gas exploration, production, processing, or treatment operations or transmission facilities, [are] composed entirely of flows which are from conveyances or systems of conveyances (including but not limited to pipes, conduits, ditches, and channels) used for collecting and conveying precipitation runoff and…are not contaminated by contact with, or do not come into contact with, any overburden, raw material, intermediate products, finished product, by-product, or waste products located on the site of such operations." (33 U.S.C. § 1342(l)(2))

"Contaminated storm water runoff" includes runoff containing a hazardous substance in excess of reporting quantities established at 40 C.F.R. § 117.3 or 40 C.F.R. § 302.4, containing oil in excess of the reporting quantity established at 40 C.F.R. § 110.3 (*e.g.*, causes a visible sheen), or contributing to a violation of a water quality standard.

The EPA issued a Final Rule on June 12, 2006 that permanently exempts the NPDES stormwater permitting requirements for oil and gas construction activities under Section 402 of the Act (Federal Register Vol. 71 No. 112 6/12/2006). Discharges containing contaminated stormwater run-off require NPDES permits. The Final rule additionally clarifies that stormwater containing sediment run-off (associated with gas well construction activities) is not considered contaminated and will not trigger NPDES permitting requirements (40 C.F.R. § 122.26(a)(2)(ii).

Section 404 Permits (33 U.S.C. § 1344)
Under section 404, anyone who discharges dredge or fill material into navigable waters needs a permit from the U.S. Army Corps of Engineers. "Navigable waters" mean "…those waters that are subject to the ebb and flow of the tide and/or are presently used, or have been used in the past, or may be susceptible for use to transport interstate or foreign commerce." (33 C.F.R. § 329.4)

A determination of navigability, once made, applies over the entire surface of the waterbody and remains in effect even if later actions or events impede or destroy its navigability.

Section 404 regulates discharges into virtually all surface waters where the use, degradation, or destruction of these waters could affect interstate commerce. It also applies to all tributaries and adjacent wetlands of such waters. The COE defines wetlands as areas “inundated or saturated by surface or ground water at a frequency and duration sufficient to support and under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions…” (33 C.F.R. § 328.3(b).

The Corps of Engineers may issue individual permits or general permits on a state, regional, or nationwide basis. It issues general permits for certain kinds of similar activities in wetlands that will cause only minimal adverse effects on the environment. General permits do not cover many operators of nonfederal oil and gas properties in National Parks. They must obtain an individual "404" permit to conduct any operations that involve dredging or discharge of fill material into wetlands.

Under the 404 permit program, the COE may issue individual permits or general permits on a state, regional, or nationwide basis. COE uses general permits for certain categories of activities that have only minimal adverse and cumulative effects on the environment. Many operators of nonfederal oil and gas properties in National Parks do not hold general permits. Operators must obtain an individual “404” permit to conduct operations that involve dredging or discharging fill material into wetlands.

Before the issuance of either a NPDES or section 404 permit, the applicant must obtain a section 401 certification. This declaration states that any discharge complies with all applicable effluent limitations and water quality standards.

The NPS cannot waive CWA requirements for oil and gas operators. An operator has full responsibility for obtaining section 402 (NPDES) or/and section 404 (dredge and fill) permits and for reporting spills of oil, or other contaminating and hazardous substances.

FISH AND WILDLIFE COORDINATION ACT,
16 U.S.C. §§ 661 – 666c 1935), 16 U.S.C. §§ 461 – 467

Resources afforded protection: water resources, fish and wildlife
Applicable regulation(s): none

This Act applies to major federal water resources development plans (impounding, diverting, deepening the channel, or otherwise controlling or modifying streams or other bodies of water). Requires federal agencies to consult with the Fish and Wildlife Service and applicable state agencies whenever such plans result in alteration of a body of water. The Act requires that wildlife conservation receive equal consideration with other features of water resource development. It also triggers coordination with the Fish and Wildlife Service upon application for a 404 permit.

HISTORIC SITES, BUILDINGS, AND ANTIQUITIES ACT (Historic Sites Act of 1935), 16 U.S.C. §§ 461 – 467

Resources afforded protection: historic sites, buildings and objects
Applicable regulation(s): 18 C.F.R. Part 6; and 36 C.F.R. Parts 1, 62, 63, and 65

This Act establishes a national policy "to preserve for public use, historic sites, buildings, and objects of national significance for the inspiration and benefit" of the American people. The Act authorizes the designation of national historic sites and landmarks, authorizes interagency efforts to preserve historic resources, and establishes fines for violations of the Act. It authorizes surveys of historic and archeological sites, buildings, and objects to determine which remain significant, and provides for the restoration, reconstruction, rehabilitation, preservation, and maintenance of historic and prehistoric properties of national significance. The Act authorizes the Secretary of the Interior, through the National Park Service, to conduct surveys and studies, to collect information, and purchase significant historic properties. The Secretary may also restore, preserve, maintain, and rehabilitate structures and sites; establish museums; and operate and manage historic sites, and develop educational programs.

LACEY ACT, as amended, 16 U.S.C. §§ 3371 *et seq.*

Resources afforded protection: fish and wildlife, vegetation
Applicable regulation(s): 15 C.F.R. 904; 50 C.F.R. Parts 10, 11, 12, 14, and 300

The Lacey Act prohibits the import, export, transport, sales, receipt, acquisition, or purchase of fish, wildlife, or plants that are taken, possessed, transported, or sold in violation of any federal law, treaty, regulation or Indian tribal law. The act also makes illegal importing, exporting, transporting, selling, receiving, acquiring, or purchasing in interstate or foreign commerce any fish, wildlife or plants taken, possessed, transported or sold in violation of a state law or state regulation (or foreign law for fish and wildlife, but not for plants). The Act also establishes marking requirements for containers or packages containing fish or wildlife.

The 1981 amendments to the Act strengthened federal laws and improved federal assistance to states and foreign governments for enforcement of fish and wildlife laws. The Act has significant civil and criminal penalties for violations and has emerged as a vital tool in efforts to control smuggling and trade in illegally taken fish and wildlife.

The U.S. Fish and Wildlife Service regulations implementing the Lacey Act and other related laws describe the procedures for the assessment of civil penalties (50 C.F.R. Part 11) and for government seizure and forfeiture (50 C.F.R. Part 12).

MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT, 16 U.S.C. § 1801

Resources afforded protection: commercial and recreational fisheries, fish habitat
Applicable regulation(s): none

The Magnuson Act provides for the management of the nations' fisheries within the exclusive economic zone. Regulations on commercial fishing activities are prescribed consistent with the terms of fishery management plans adopted through a collaborative process involving regional fishery management councils. Although the restrictions on commercial and recreational fishing activities are enforceable against those activities through criminal and civil sanctions, the Magnuson Act does not impose prohibitions on activities other than commercial and recreational fishing. To improve the conservation of any essential fish habitat identified by the Secretary of Commerce, the Magnuson Act requires that each “federal agency shall consult with the Secretary with respect to any action authorized, funded, or undertaken, or proposed to be authorized, funded, or undertaken, by such agency that may adversely affect any essential fish habitat...” 16 U.S.C. § 1855(b)(2). This consultation requirement provides the Secretary of Commerce with the opportunity to offer recommendations to the federal action agency on ways to avoid, mitigate, or offset the impact of the proposed action on essential habitat. While the federal agency is not bound to implement such recommendations, it must explain its reasons for not following them.

MARINE MAMMAL PROTECTION ACT (MMPA), as amended, 16 U.S.C. §§ 1361 – 1407

Resources afforded protection: marine mammals
Applicable regulation(s): none

The MMPA, enacted in 1972, was the first modern wildlife conservation law adopted at the federal level. Using dramatic, broad-scale moratoria on the taking and importation of marine mammals and marine mammal products, as well as the imposition of an absolute preemption on all state laws that relate to the taking of marine mammals (subject to an opportunity for transfer of management authority), the Congress adopted the MMPA to conserve these species and their marine habitats. The MMPA prohibits the taking of marine mammals within the United States (both territorial and resource jurisdiction) and on the high seas (for persons subject to U.S. jurisdiction). No permit or authorization may be issued for the taking of a marine mammal (for activities other than commercial fishing) unless one of the following exceptions applies:

1. The permitted taking would be for public display purposes (non-depleted marine mammals only), scientific research, photography for educational or commercial purposes (harassment take only), or enhancing the survival or recovery of a marine mammal species or stock, consistent with the requirements of Section 104.
2. The Secretary of the Interior (or Commerce for cetaceans and pinnipeds other than walruses) decides to waive the taking moratorium for a particular marine mammal species or stock after determining that such species or stock is at its “optimum sustainable population” level and adopts regulations for such taking under Section 103 pursuant to the formal rulemaking requirements of the APA [agency rulemaking on the record with an opportunity for a formal hearing before an administrative law judge].
3. The activity involves the non-lethal deterrence of marine mammals to prevent damage to fishing gear or catch or to other private or public property, consistent with guidelines adopted by the Secretary under Section 101(a)(4).
4. Incidental take of small numbers of marine mammals may be authorized by regulation for specified activities that occur within a specific geographic area for a period of not more than 5 years, provided that the total of such taking will have a negligible impact on the species or stock and will not have an unmitigable adverse impact on the availability of the species for the subsistence uses of Alaska natives (if the incidental take involves harassment only, regulations are not necessary and the Secretary may issue annual authorizations). In the event of a conflict between the terms of the Endangered Species

Act and the Marine Mammal Protection Act, the more restrictive requirement of the MMPA takes precedence (16 U.S.C. § 1543).

MIGRATORY BIRD TREATY ACT, as amended, 16 U.S.C. §§ 703 – 712

Resources afforded protection: migratory birds
Applicable regulation(s): 50 C.F.R. Parts 10, 12, 20, and 21

The Migratory Bird Treaty Act (MBTA) implements various treaties and conventions between the United States, Canada, Japan, Mexico, and Russia for the protection of migratory birds. Unless permitted by regulations, under the MBTA a person cannot attempt or succeed at pursuing, hunting, taking, capturing, or killing, possessing, offering to sell, selling, bartering, purchasing, delivering, shipping, exporting, importing, transporting, carrying or receiving any migratory bird, body part (*e.g.* feathers), nest, egg, or product. The U.S. Fish and Wildlife Service regulations provide procedures for obtaining a migratory bird permit (50 C.F.R. Part 21). Regulations at 50 C.F.R. 20 cover hunting of migratory birds, and regulations at 50 C.F.R. Part 12 cover seizure and forfeiture procedures.

Operators and their employees should avoid actions with respect to migratory birds that could violate the Migratory Bird Treaty Act (*e.g.* destroying nests and eggs or picking up dead birds).

NATIONAL ENVIRONMENTAL POLICY ACT OF 1969, 42 U.S.C. §§ 4321 et seq.

Resources afforded protection: human environment (*e.g.* cultural and historic resources, natural resources, biodiversity, human health and safety, socioeconomic environment, visitor use and experience)
Applicable regulation(s): 40 C.F.R. Parts 1500-1508

The National Environmental Policy Act (NEPA) mandates that federal agencies assess the environmental effects of a proposed action and engage the public in the analyses of environmental impacts before agencies make decisions affecting the human environment. NEPA requires that federal agencies "utilize a systematic interdisciplinary approach" to ensure the integrated use of resource information in federal decision-making affecting the environment. Federal agencies must complete all analyses, public input, and NEPA documentation in time to aid decision-making. Initiating or completing environmental analysis after making a decision, whether formally or informally, violates both the spirit and the letter of NEPA.

Besides setting environmental planning policy goals, NEPA created the Council on Environmental Quality (CEQ), an agency of the president's office, as the "caretaker" of NEPA. CEQ published NEPA regulations in 1978 (40 C.F.R. Parts 1500-1508). The CEQ regulations apply to all federal agencies and require each agency to "implement procedures to make the NEPA process more useful to agency decision-makers and the public" (40 C.F.R. 1500.2). Agencies must review and update their regulations as necessary. In 1981 CEQ also published a guidance document titled "Forty Most Asked Questions Concerning CEQ's NEPA Regulations" (46 Fed. Reg. 18026, (1981)). Director's Order 12 and Handbook (2001) is the National Park Service's guidance on implementing NEPA.

The NEPA process constitutes an essential component of conservation planning and resource management through the integration of scientific and technical information into management decisions. In order to be effective, agencies cannot fulfill NEPA compliance by conducting an after-the-fact "compliance" effort. A well-crafted NEPA analysis provides useful information about the environmental pros and cons (*i.e.* impacts) of a variety of reasonable choices (alternatives), similar to an economic cost-benefit analysis, technical planning, or logistical planning. It remains an essential prelude to the effective management of park resources.

NEPA represents a procedural or process-oriented statute rather than a substantive or substance-oriented statute. Other substantive laws may prevent an agency from taking action or components of an action which have “too great” an impact on a particular resource. Within the NPS, the process of environmental analysis under NEPA provides the needed information to make substantive decisions for the long-term conservation of resources.

NEPA has a broad reach. NEPA is triggered whenever there is a major federal action, regardless of who proposes the action (NPS, private individuals, federal agencies, states, or local governments) or whether the action could impact the human environment. Even though the CEQ regulations give less emphasis to the socioeconomic environment than the physical or natural environment, the NPS considers the socioeconomic environment as an integral part of the human environment. Consequently, NPS will do NEPA analysis even if the impacts remain primarily socioeconomic, including potential impacts on minority and low-income communities (see Executive Order No. 12948, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations).

The National Park Service undertakes its environmental analyses in a number of ways. When the NPS considers taking a “major federal action”, it prepares an environmental assessment (EA) to assess the impacts of the proposed operation and to determine if the NPS must prepare an environmental impact statement (EIS). If, based on the EA’s analysis and public comments, the NPS determines that the proposed action would not significantly affect the human environment, the NPS would prepare a decision document called a Finding of No Significant Impact (FONSI). Conversely, if NPS determines the proposed action would likely cause significant affects on the human environment, then it prepares an EIS. The NPS may prepare an EIS, without first preparing an EA if the action will likely cause significant environmental impacts. If the proposal has been previously analyzed in site-specific detail, a “memo to files” may be prepared. Some actions or types of proposals fall under a NEPA “categorical exclusion” (CE). A categorical exclusion is used where the proposal meets specific criteria defined under Department of the Interior regulations and NPS Director’s Order 12, for activities that do not have the potential for measurable impacts on park resources.

NATIONAL HISTORIC PRESERVATION ACT OF 1966, as amended, 16 U.S.C. §§ 470 – 470x-6

Resources afforded protection: cultural and historic properties listed in or determined to be eligible for listing in the National Register of Historic Places
Applicable regulation(s): 36 C.F.R. Parts 60, 63, 65, 78, 79, 800, 801, and 810

The National Historic Preservation Act (NHPA) declared a national policy of historic preservation. It encouraged preservation on the state and the private levels, authorized the Secretary of the Interior to expand and to maintain a National Register of Historic Places, established the Advisory Council on Historic Preservation, and required federal agencies to conduct studies of potential effects of their proposed actions on National Register properties and to provide the Advisory Council opportunities to comment (§ 106). The Advisory Council has promulgated regulations, “Protection of Historic and Cultural Properties,” at 36 C.F.R. Part 800, to implement section 106 and presidential directives issued under it.

The NHPA also required federal agencies to identify, evaluate, and nominate cultural resources for inclusion in the National Register. Likewise, agencies must manage for preservation those National Register eligible or listed properties that under their jurisdiction or control.

In 1980 Congress passed a series of amendments to the NHPA and other preservation legislation. These amendments: codified portions of Executive Order No. 11593, which required inventories of federal resources and federal agency programs to protect historic resources; clarified that federal agencies can exclude inventory and evaluation of resources from the one percent fund limit under the 1974 amendments to the Reservoir Salvage Act; and authorizes federal agencies to charge federal permittees and licensees reasonable costs for protection activities.

The 1992 amendments to the Act explicitly call for Native American consultations when potential traditional cultural properties may be on federal lands. If such properties are discovered through the consultations, they should be evaluated for possible eligibility and/or listing in the National Register of Historic Places.

The NPS must consider the potential effects of any proposed oil and gas activities on cultural resources listed on or eligible for listing on the National Register. This responsibility cannot be delegated to nonfederal parties. NPS regulations at 36 C.F.R. § 9.37(e) state that the regional director may not approve a proposed plan of operations until the NPS complies with the NHPA. NPS regulations also require that operators provide the information needed for the NPS to make the determinations required under the NHPA. Operators must submit, as part of the environmental section in a proposed plan of operations, a description of the environment to be affected, including the natural and cultural environment.

In general, the NPS will have surveyed its lands as required by section 110 of the NHPA. The NPS cultural resource survey typically constitutes a careful inspection of the ground surface. The NPS uses standard archeological methodology that may include exploratory subsurface testing. The data from the survey indicate whether the lands fulfill the eligibility requirements for listing on the National Register. Operators may obtain data gathered during NPS surveys for the environmental section of the proposed plan.

When an operator submits a proposed plan of operations, the NPS reviews the cultural resources section. Based upon that review, the staff’s knowledge of the affected area's history and prehistory, and the NPS cultural resource surveys, the regional director determines if the operations would affect a property listed or eligible for listing on the National Register.

If the NPS finds that the operations would not affect a property listed or eligible for listing, the NPS consults with the State Historic Preservation Officer (SHPO) to obtain agreement. If the SHPO agrees with the NPS, then the regional director may issue an archeological clearance for any ground-disturbing operations on federal park lands.

However, if the NPS finds that operations would affect listed or eligible properties, then the NPS prepares an "Assessment of Effect on Cultural Resources". The NPS then consults with the SHPO to determine what steps to take to protect the site. If the NPS and the SHPO cannot agree on a course of action, then the matter is referred to the Advisory Council on Historic Preservation (ACHP). If the operation may affect a park also designated a National Historic Landmark, then the NPS must automatically consult with the ACHP.

Even if the property is listed on the National Register, private surface owners may take any lawful action they want on their own property. Under the authority of the NPS Organic Act and certain unit enabling legislation directing the NPS to regulate mineral activities to protect natural and cultural resources, the NPS can include stipulations in its plan approval to protect cultural resources on private property inside unit boundaries during the course of mineral operations.

NPS regulations at 36 C.F.R. § 9.47 require operators to stop all operations and to notify the superintendent if cultural resources are “discovered during operations. For the NPS to meet its obligations under the NHPA and the NPS Organic Act, an operator must notify the NPS of cultural resources that may be destroyed by a NPS-approved oil and gas operation. The notification requirement applies even though the operator may own the cultural resources. Notification gives the NPS an opportunity to judge the historic value of the resources, and, if warranted, acquire them from the owner.

An operator under 36 C.F.R. Part 9B may have to salvage cultural resources discovered in the course of operations. The operator may salvage the resources only after the NPS, in consultation with the SHPO, approves a mitigation and salvage plan and chooses a contractor to do the data recovery.

NATIVE AMERICAN GRAVES PROTECTION AND REPATRIATION ACT, 25 U.S.C. §§ 3001 – 3013

Resources afforded protection: Native American human remains, funerary objects, sacred objects, and objects of cultural patrimony
Applicable regulation(s): 43 C.F.R. Part 10

The Native American Graves Protection and Repatriation Act (NAGPRA) protects Native American and Native Hawaiian cultural items and establishes a process for the authorized removal of human remains, funerary objects, sacred objects, and objects of cultural patrimony for sites located on lands owned or controlled by the federal government. The Act also provides for the transfer of ownership of cultural objects to Native American or Native Hawaiian individuals, organizations, or tribes. It addresses the recovery, treatment, and repatriation of Native American and Native Hawaiian cultural items by federal agencies and museums. NAGPRA contains data gathering, reporting, consultation, and permitting provisions. The Act emphasizes consultation with Native American and Native Hawaiian organizations to ensure that these entities play a major role in the treatment of specific cultural objects.

Regulations at 43 C.F.R. Part 10 address the rights of lineal descendants, Indian tribes, and Native Hawaiian organizations to Native American human remains, funerary objects, sacred objects, and objects of cultural patrimony. They require federal agencies and institutions that receive federal funds to provide information about these items to these people and, upon presentation of a valid request, to dispose of or to repatriate these objects to them. Section 10.4 describes the regulatory requirements under NAGPRA for inadvertent discoveries of human these items.

Appendix R - “NAGPRA Compliance,” in NPS Director’s Order 28 - Cultural Resources Management, describe NPS-specific guidance for implementing NAGPRA. If NPS anticipates an operation may impact Native American human remains, funerary objects, sacred objects, or objects of cultural patrimony protected by NAGPRA, then it will consult with the appropriate Native American or Native Hawaiian organization as part of the 9B plan approval process.

NOISE CONTROL ACT OF 1972, 42 U.S.C. §§ 4901 – 4918

Resources afforded protection: human health and welfare
Applicable regulation(s): 40 C.F.R. Part 211

The Act establishes a national policy to promote an environment free from noise that jeopardizes the public’s health and welfare. To accomplish this, the Act provides for the coordination of federal research and activities to control noise, authorizes the establishment of federal noise emission standards for products distributed in commerce, and provides information to the public respecting the noise emission reduction characteristics of such products.

The Act authorizes and directs that federal agencies carry out the programs within their control in a manner that furthers the Act’s policies. Agencies having jurisdiction over any property or facility or engaged in any activity resulting or potentially resulting in increased noise must comply with federal, state, interstate, or local requirements. Agencies must, upon request, furnish information to the EPA regarding the nature, scope, and results of noise research and noise control programs and must consult with EPA in prescribing standards or regulations respecting noise. The Act also provides for citizen lawsuits. Any person may commence civil action against the United States or any government instrumentality or agency that violates any noise control requirement.

Operators must ensure that their facilities, equipment, and operations comply with all applicable federal, state, interstate, or local noise emission requirements. NPS management policies provide that the NPS will strive to preserve the natural quiet and natural sounds associated with the physical and biological resources of the parks (*e.g.* waves breaking on the shore, wind in the trees, and bird and wildlife sounds). NPS should prevent or minimize unnatural sounds that adversely affect park resources or values or the visitors’ enjoyment of them.

OIL POLLUTION ACT, 33 U.S.C. §§ 2701 – 2762

Resources afforded protection: water resources, natural resources
Applicable regulation(s): 15 C.F.R. Part 990; 30 C.F.R. Part 253; 33 C.F.R. Parts 135 and 150; 40 C.F.R. Part 112

The Oil Pollution Act (OPA) expands the federal role in spill response, establishes contingency planning requirements for vessels and certain facilities, establishes the Oil Spill Liability Trust Fund, increases liability for spills of oil or hazardous substances from vessels and facilities, creates requirements for double hulls on new tankers, and increases requirements for research and development of spill response technologies.
OPA imposes liability for removal costs and damages resulting from discharge of oil into the U.S.’s navigable waters, its adjoining shorelines, or the exclusive economic zone. Damages

incurred include injuries to natural resources, loss of natural resources, and loss of use of natural resources. Natural resources include land, fish, wildlife, biota, air, water, groundwater, drinking water supplies, and other resources belonging to the United States, state, local, foreign governments or Indian tribes.

Liability does not apply to discharges allowed by a permit issued under a federal, state or local law. In addition, liability does not apply if the responsible party establishes that the discharge, damages, or removal costs occurred solely because of an act of God, an act of war, or a third party who constitutes neither an agent nor employee of the responsible party. However, despite these defenses, the responsible party remains liable if he fails to report the incident, help or cooperate as requested, or comply with certain orders. Also, OPA has increased penalties for regulatory noncompliance, broadened the response and enforcement authorities of the federal government, and preserved state authority to establish law governing oil spill prevention and response.

OPA provides new requirements for government and industry oil spill contingency planning. The “National Oil and Hazardous Substances Pollution Contingency Plan” (NCP) was expanded to encompass a three-tiered approach. The federal government directs all public and private response efforts for certain types of spill events. Area committees, composed of federal, state, and local government officials, must develop detailed, location-specific Area Contingency Plans. Owners or operators of vessels and certain facilities that pose a serious threat to the environment must prepare their own facility response plans.

OPA may require operators of nonfederal oil and gas operations in units of the National Park System to develop contingency plans. Contingency plans developed to meet the requirements of OPA may also satisfy the NPS 9B requirement for a contingency plan. NPS would determine if the OPA required plan meets NPS requirements as part of the 9B plan approval process.

PIPELINE SAFETY ACT OF 1992, 49 U.S.C. §§ 60101 et seq.

Resources Afforded Protection: human health and safety, and the environment
Applicable Regulation(s): 49 C.F.R. Parts 190-199

This Act allows the Department of Transportation (DOT) to create and to enforce oil and gas pipeline safety regulations. The act creates design, construction, maintenance, and testing standards for all new, changed, or relocated interstate and intrastate pipelines. DOT’s Office of Pipeline Safety regulates interstate pipeline safety but state agencies may also be approved to regulate intrastate pipelines. States that get approval to implement the program may enforce stricter standards than those in the Act. Violations of the Act can lead to civil and criminal penalties. The Act replaced the Hazardous Liquid Pipeline Safety Act of 1979, the Hazardous Materials Transportation Act, and the Natural Gas Pipeline Safety Act of 1968.

Oil and gas pipelines exist within several units of the National Park System. Operators of oil and gas pipelines crossing NPS units must comply with the Pipeline Safety Act of 1992. NPS regulations at 36 C.F.R. 9B require a 9B plan of operations for the construction or use of oil and gas pipelines (flowlines and gathering lines) in connection with nonfederal oil and gas operations within a NPS unit. Transpark pipelines (those owned and operated by persons or entities exercising rights not tied to the oil and gas ownership within the park boundary) located in rights-of-way that predate the establishment of the park unit do not qualify as an existing operations exempted from a plan of operations by 36 C.F.R. § 9.33. Rather, the NPS will issue a Special Use Permit (SUP) to regulate maintenance activities along the right-of-way corridor, including but not limited to mowing and trimming vegetation, pipeline inspection and testing, removal of fluids from oil and gas pipelines, and installing, shutting down, or replacing pipelines (36 C.F.R. § 1.6).

RESOURCE CONSERVATION AND RECOVERY ACT, 42 U.S.C. §§ 6901 et seq.

Resources afforded protection: natural resources, human health and safety
Applicable regulation(s): 40 C.F.R. 240-282 and 49 C.F.R. Parts 171-179

The Resource Conservation and Recovery Act (RCRA) seeks to promote the protection of health and the environment and to conserve valuable material and energy resources. RCRA regulates the management of hazardous waste from generation to final disposal. The law consists of nine subtitles. Two subtitles create significant regulatory programs: Subtitle C establishes a hazardous waste program from generation to disposal; Subtitle D addresses disposal of nonhazardous solid waste. "Solid waste" includes garbage, refuse, and other discarded materials. It includes solids, liquids, and containerized gases.

The requirements of Subtitle C apply if the waste falls under EPA's criteria governing hazardous waste. EPA codified the regulatory criteria for hazardous waste at 40 C.F.R. Parts 260 and 261. EPA codified a list of hazardous wastes (known as listed wastes) in Subpart D of Part 261. Subpart C of Part 261 establishes the criteria for determining whether a solid waste constitutes a hazardous waste by exhibiting a characteristic of corrosivity, reactivity, ignitability, or toxicity (known as characteristic waste). EPA can regulate a solid waste because it either appears on the hazardous waste lists or displays a characteristic of a hazardous waste.

The 1980 amendments to RCRA excluded certain oil, gas, and geothermal drilling and production wastes from the hazardous waste requirements of Subtitle C. The amendments specifically exempt drilling fluids, produced water, and other drilling and production wastes. In 1988, the EPA decided to keep the exemption for oil and gas exploration and production wastes. State agencies regulate the exempted wastes under the less strict Subtitle D governing nonhazardous waste.

Oil field workers must understand how RCRA works because mistakes can be costly for operators. The Act dictates that when Subtitle C and Subtitle D wastes are mixed, the mixture becomes a Subtitle C hazardous waste. It does not matter if the mixture loses all of its hazardous characteristics. For example, if the rig mechanic dumps used motor oil into the reserve pit, the entire volume of drilling muds, cuttings, rig wash, excess cement, and completion fluids becomes a hazardous waste. This remains true even if it does not exhibit hazardous properties.

RCRA provides for strict civil and criminal penalties. Persons who do not comply with RCRA will receive fines of as much as $25,000 per day per violation. It does not matter whether or not EPA first served the person with a compliance order. It is up to the operator to know and comply with RCRA. The operator cannot wait to receive a compliance order and make corrections to avoid a penalty. Also, RCRA’s criminal penalties can fine an operator as much as $50,000 and imprison the operator for as many as two years if they "knowingly" cause transportation of hazardous materials without a manifest.

In addition, the RCRA exemption from Subtitle C for oil and gas drilling and production waste does not exclude these wastes from the operation of RCRA section 7003. Section 7003 allows EPA to compel any person who contributed or contributes to the handling, storage, treatment, transportation or disposal of the hazardous waste in a manner that causes an imminent and substantial danger to take any action to protect human health and the environment. Because this can include expensive cleanup actions to protect human health and the environment, operators should handle waste from their operations in such a way that it does not contaminate the environment either now or in the future.

Regardless of oil and gas exploration and production wastes' exemption from Subtitle C regulation, the NPS will likely require operators to dispose of all wastes associated with the oil and gas operation outside of the park. NPS requirements for waste disposal in an operator's plan of operations will provide for the strict protection of park resources and values.

RIVERS AND HARBORS ACT OF 1899, As Amended, 33 U.S.C. §§ 401 *et seq.*

Resources afforded protection: shorelines and navigable waterways, tidal waters, wetlands
Applicable regulation(s): 33 C.F.R. Parts 114, 115, 116, 320 -325, and 333

Section 10 of the Rivers and Harbors Act of 1899 prohibits the unauthorized obstruction or alteration of any navigable waterway of the United States. In order to obstruct or alter the waterway, a person must obtain a permit from the Army Corps of Engineers. Activities requiring a permit include constructing structures in or over any waters of the U.S., excavating material from the water, conducting stream channelization, and depositing materials in such waters.

SAFE DRINKING WATER ACT OF 1974, 42 U.S.C. §§ 300f *et seq.*

Resources afforded protection: human health, water resources
Applicable regulation(s): 40 C.F.R. Parts 141-148

The Safe Drinking Water Act (SDWA) protects the safety of drinking water supplies throughout the United States by establishing national standards enforceable by each state. The Act provides for the establishment of primary regulations to protect human health and of secondary regulations relating to the taste, odor, and appearance of drinking water. Primary drinking water regulations include either a maximum contaminant level (MCL) or a prescribed treatment technique that prevents adverse health effects to humans. A MCL constitutes the permissible level of a contaminant in water delivered to any user of a public water system. States should only use prescribed treatment techniques when a MCL remains uneconomical or technologically infeasible.

The Act's 1986 amendments require EPA to publish a list of contaminants every three years, which EPA knows or anticipates will occur in public water systems.
The most important part of the SDWA as far as the NPS and petroleum operators are concerned is the Underground Injection Control (UIC) permit program. Under the program, the EPA regulates underground injection of wastes or other materials. The EPA has authorized many states to administer the UIC permit program.

Owners of underground injection wells must obtain permits or be authorized by rule under the UIC program to operate the wells. The permit holder must prove to the state or federal permitting agency that, through sound and prudent practice and well construction, the underground injection will not endanger drinking water sources. The NPS will approve a plan of operations involving underground injection only when the wells have valid UIC permits.

The UIC program defines five classes of underground injection wells. Class II wells may relate to oil and gas operations in National Parks. The following fluids may be injected into Class II wells: 1). waste fluids produced by oil and gas operations and that are exempt from the hazardous waste requirements of RCRA, subtitle C (for example, produced brine, recovered treatment fluids, and waste waters from gas plants), 2). fluids used for enhanced recovery of oil and natural gas, and 3). fluids for below ground storage of hydrocarbons.

WILD AND SCENIC RIVERS ACT, as amended 16 U.S.C. §§ 1271 et seq.

Resources afforded protection: water resources, recreational values, geologic resources, fish and wildlife, historic, cultural and other similar values
Applicable regulation(s): 36 C.F.R. § 297

The Wild and Scenic Rivers Act (Act) was passed by Congress in October 1968. The Act establishes a policy that certain rivers in the U.S. which, with their immediate environments, possess outstanding remarkable scenic, recreational, geologic, fish, and wildlife, historic, cultural and other similar values shall be preserved in free-flowing condition, and that their immediate environments shall be protected for the benefit and enjoyment of present and future generations. The Act identifies specific river reaches for designation as wild and scenic, and provides criteria to be used for classifying additional river reaches. “Wild river areas” are those rivers or sections of rivers that are free from impoundments and generally are inaccessible except by trail, with watersheds or shorelines essentially primitive and the waters are unpolluted. “Scenic river areas” are those rivers or sections of rivers that are free from impoundments, with shorelines or watersheds that are still largely primitive and shorelines undeveloped, but the river is accessible in places by roads. “Recreational river areas” are rivers or sections of rivers that are readily accessible by road or railroad, that may have some development along their shorelines, and that may have undergone some impoundment or diversion in the past.

The national Wild and Scenic River system was established to protect the environmental values of free-flowing streams from degradation by impacting activities, including water resources projects. The system is jointly administered by the U.S. Forest Service and the National Park Service. U. S. Army Corps of Engineers activities on the streams included in the system are subject to review by whichever of these agencies is responsible for the specific stream. In all planning for the use and development of water and related land resources, consideration shall be given to potential national wild, scenic, and recreational river areas, and all river basin and project plan reports submitted to Congress shall consider and discuss such potential.
Under the Wild and Scenic Rivers Act, valid existing mineral rights within the Wild and Scenic river boundary remain in effect, and activities may be allowed if the projects avoid or minimize surface disturbance, water sedimentation, pollution, and visual impairment. Based on the park’s enabling statute and applicable regulations, reasonable access to develop nonfederal oil and gas rights will be permitted. Compliance with the Clean Water Act or non-degradation of existing

water quality, whichever is more protective is required, including the development and implementation of management actions that protect and enhance water quality.

EXECUTIVE ORDERS

EXECUTIVE ORDER NO. 11593 – PROTECTION AND ENHANCEMENT OF THE CULTURAL ENVIRONMENT, 36 Fed. Reg. 8921 (1971)

Resources afforded protection: cultural resources
Applicable regulation(s): 3 C.F.R. 1971 Comp., 36 C.F.R. §§ 60, 61, 63, 800

Executive Order No. 11593 instructs all federal agencies to support the preservation of cultural properties. It directs them to identify and nominate cultural properties under their jurisdiction to the National Register. Moreover, the executive order states that federal agencies must "exercise caution…to assure that any federally owned property that might qualify for nomination is not inadvertently transferred, sold, demolished, or substantially altered."

EXECUTIVE ORDER NO. 11644 – USE OF OFF-ROAD VEHICLES ON THE PUBLIC LANDS, 37 FR 2877 (1972), reprinted in 42 U.S.C. § 4321, as amended by Executive Order No. 11989 (1977), 42 Fed. Reg. 26959; Executive Order No. 12608 (1987), § 21, 52 Fed. Reg. 34617

Resources afforded protection: natural resources, aesthetic and scenic values

The order establishes a uniform federal policy to ensure that use of off-road vehicles on public lands are controlled and directed to protect resources, promote safety of all users of those lands and to minimize conflicts among users. Areas and trails shall be located in units of the National Park System only if the director determines that such use in those areas will not adversely affect their natural, aesthetic or scenic values. Within six months of the date of this order, each respective director shall designate specific areas and trails on public lands on which the use of off-road vehicles may be permitted, and areas in which the use of off-road vehicles may not be permitted, and set a date by which such designation of all public lands shall be completed. Those regulations shall direct that the designation of such areas and trails will be based upon the protection of the resources of the public lands, promotion of the safety of all users of those lands, and minimization of conflicts among the various uses of those lands.

Executive Order No. 11989 promulgates guidelines for the controlled use of off-road vehicles on public lands. The order directs that agency heads shall, whenever he determines that the use of off-road vehicles will cause or is causing considerable adverse effects on the soil, vegetation, wildlife, wildlife habitat or cultural or historic resources of particular areas or trails of the public lands, immediately close such areas or trails to the type of off-road vehicle causing such effects, until such time as he determines that such adverse effects have been eliminated and that measures have been implemented to prevent future recurrence.

EXECUTIVE ORDER NO. 11988 – FLOODPLAIN MANAGEMENT OF 1977, 42 FED. REG. 26951 (1977), as amended by Executive Order No. 12148 (1979), 44 Fed. Reg. 43239, 3 C.F.R. 1979 COMP., P. 412

Resources afforded protection: floodplains, human health, safety, and welfare

Executive Order No. 11988 seeks to avoid, where practicable alternatives exist, the short-term and long-term adverse impacts associated with floodplain development. In carrying out agency responsibilities, federal agencies must reduce the risk of flood losses, minimize the impacts of floods on human safety, health, and welfare, and restore and preserve the natural and beneficial values served by floodplains. If an agency proposes an action in a floodplain, then the agency must consider alternatives to avoid adverse effects and incompatible development in the floodplain. Agencies must also provide opportunity for early public review of any plans for actions in floodplains.

EXECUTIVE ORDER NO. 11990 – PROTECTION OF WETLANDS, 42 Fed. Reg. 26961 (1977)

Resources afforded protection: wetlands

Executive Order No. 11990 seeks to avoid adverse impacts on wetlands when there is a practicable alternative. Executive agencies, in carrying out their land management responsibilities, must minimize wetlands destruction, loss, or degradation and preserve and enhance the wetlands' natural and beneficial values.

EXECUTIVE ORDER NO. 12088 – FEDERAL COMPLIANCE WITH POLLUTION CONTROL STANDARDS, 43 Fed. Reg. 47707 (1978), amended by Executive Order No. 12580, Superfund Implementation, 52 Fed. Reg. 2923 (1987)

Resources afforded protection: natural resources, human health and safety

Executive Order No. 12088 delegates each executive agency head the responsibility for taking all necessary actions to prevent, control, and abate environmental pollution. It gives the EPA authority to conduct reviews and inspections for the purpose of monitoring federal facility compliance with pollution control standards. Section 1-101 requires prevention, control, and abatement of pollution from federal facilities. Section 1-201 requires federal agencies to cooperate with state, interstate, and local agencies to prevent, to control, and to abate environmental pollution.

EXECUTIVE ORDER NO. 12630 – GOVERNMENTAL ACTIONS AND INTERFERENCE WITH CONSTITUTIONALLY PROTECTED PROPERTY RIGHTS, 53 Fed. Reg. 8859 (1988)

Resources afforded protection: private property rights, public funds

Executive Order No. 12630 seeks the following: to assist agencies in reviewing their actions to prevent unnecessary takings and in proposing, planning, and implementing agency actions with due regard for the constitutional protections provided by the 5th Amendment to the U.S. Constitution; to account in decision-making for those takings necessitated by statutory mandate; and to reduce the risk of undue or inadvertent burdens on the federal treasury resulting from lawful government action.

When an agency requires a private party to obtain a permit to undertake a specific use of private property, any conditions imposed on the permit must substantially advance the governmental interest that is impacted by the land use. The permitting processes must be kept to the minimum necessary so that the government does not interfere with the use of private property during the process.

EXECUTIVE ORDER NO. 12898 – FEDERAL ACTIONS TO ADDRESS ENVIRONMENTAL JUSTICE IN MINORITY POPULATIONS AND LOW-INCOME POPULATIONS, as amended by Executive Order No. 12948, 60 Fed. Reg. 6379 (1995)

Resources afforded protection: human health and safety

This executive order requires that federal agencies incorporate environmental justice into their mission. Environmental justice promotes the fair treatment of people of all races, incomes, and cultures with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Fair treatment implies that no person or group of people should receive a disproportionate share of the negative environmental impacts from the execution of this country's domestic and foreign policy programs.

EXECUTIVE ORDER NO. 13007 – INDIAN SACRED SITES, 61 Fed. Reg. 26771 (1996)

Resources afforded protection: Native Americans’ sacred sites

To the extent practicable, permitted, and consistent with essential agency functions, all federal land management agencies must accommodate access to and ceremonial use of Indian sacred sites by Indian religious practitioners and avoid adversely affecting the physical integrity of such sacred sites. Consistent with this executive order, if a proposed plan of operations may affect the physical integrity of, the ceremonial use of or the access to these sites by Native American religious practitioners in federally recognized tribes, then the superintendent will consult with the tribe as part of the 9B approval process.

EXECUTIVE ORDER NO. 13112 – INVASIVE SPECIES, 64 Fed. Reg. 6183 (1999), as amended by Executive Order 13286, 68 Fed. Reg. 10619 (2003)

Resources afforded protection: vegetation and wildlife

This executive order seeks to prevent the introduction of invasive species, to provide for their control, and to minimize the economic, ecological, and human health impacts they cause. It outlines federal agency duties, creates a new Invasive Species Council, defines the council’s duties, and authorizes the creation an Invasive Species Management Plan. Executive Order No. 13112 also creates a framework for planning and for coordination involving all stakeholders, which it defines as states, tribal entities, local government agencies, academic institutions, scientific communities, and non-governmental entities such as environmental groups, agricultural groups, conservation organizations, trade groups, commercial interests, and private landowners.

Federal agencies should use the programs and authorities to prevent the introduction of invasive species; detect and respond rapidly to control populations of such species in a cost-effective and an environmentally sound manner; monitor invasive species populations accurately and reliably; provide for restoration of native species and habitat conditions in invaded ecosystems; conduct research on invasive species and develop technologies to prevent their introduction; provide environmentally sound control of invasive species; promote public education on invasive species and means to address them.

The order directs agencies not to authorize, fund, or carry out any action likely to cause or promote the introduction or the spread of invasive species in the United States or elsewhere. However, agencies can determine that the benefits outweigh the potential harm and ensure that they take prudent measures to minimize harm. Federal agencies should consult with the Invasive Species Council and undertake actions consistent with the Invasive Species Management Plan with the cooperation of stakeholders.

EXECUTIVE ORDER NO. 13186 – RESPONSIBILITIES OF FEDERAL AGENCIES TO PROTECT MIGRATORY BIRDS, 66 Fed. Reg. 3853 (2001)

Resources afforded protection: migratory birds

This executive order defines federal agency responsibilities to protect migratory bird populations, in furtherance of the purposes of the migratory bird conventions, the Migratory Bird Treaty Act (16 U.S.C. §§ 703-711), the Bald and Golden Eagle Protection Acts (16 U.S.C. §§ 668-668d), the Fish and Wildlife Coordination Act (16 U.S.C. §§ 661-666c), the Endangered Species Act of 1973 (16 U.S.C. §§ 1531-1544), the National Environmental Policy Act of 1969 (42 U.S.C. §§ 4321-4347), and other pertinent statutes.

This executive order directs each federal agency taking actions that have, or are likely to have, a measurable negative effect on migratory bird populations to develop and implement, within two years, a Memorandum of Understanding (MOU) with the Fish and Wildlife Service that shall promote the conservation of migratory bird populations.

EXECUTIVE ORDER NO. 13212 – ACTIONS TO EXPEDITE ENERGY – RELATED PROJECTS, 66 Fed. Reg. 28357 (2001), as amended by Executive Order 13302, 68 Fed. Reg. 27429 (2003)

Resources afforded protection: all resources, production, transmission, and conservation of energy

This executive order establishes an interagency task force to coordinate, monitor, and assist executive departments and federal agencies to expedite the increased production, transmission, and conservation of energy, in a safe and environmentally sound manner. Specifically, it provides for executive departments and federal agencies where appropriate to expedite their review of permits or take other actions as necessary to accelerate the completion of such projects, while maintaining safety, public health, and environmental protections, to the extent permitted by law and regulations.

EXECUTIVE ORDER 13352 – FACILITATION OF COOPERATIVE CONSERVATION, 69 Fed. Reg. 52989 (2004)

Resources afforded protection: natural resources, property rights, public health and safety

This order seeks to ensure that laws relating to the environment and natural resources are implemented "in a manner that promotes cooperative conservation, with an emphasis on appropriate inclusion of local participation in Federal decision making." The Secretary of the Interior is directed to implement laws in a way that: "(i) facilitates cooperative conservation; (ii) takes appropriate account of and respects the interests of persons with ownership or other legally recognized interests in land and other natural resources; (iii) properly accommodates local participation in Federal decision making; and (iv) provides that the programs, projects, and activities are consistent with protecting public health and safety."

POLICIES, GUIDELINES, AND PROCEDURES

NATIONAL PARK SERVICE MANAGEMENT POLICIES (2006)

Resources afforded protection: all resources including air resources, cultural and historic resources, natural resources, biological diversity, human health and safety, endangered and threatened species, visitor use and experience, visual resources

The NPS Management Policies is the service-wide policy document of the National Park Service. These policies provide the overall foundation, set the framework, and provide direction for management decisions within the NPS. Management policy direction may be general or specific; it may prescribe the process through which decisions are made, how an action is to be accomplished, or the results to be achieved. Management Policies guide NPS staff to manage National Park System units consistently and professionally to achieve the Congressional mandate of the National Park System. Adherence to NPS policy is mandatory, unless specifically waived or modified by the Secretary, the Assistant Secretary, or the Director of the NPS.

These policies cover park system planning, land protection, natural resource management, cultural resource management, wilderness preservation and management, interpretation and education, use of the parks, park facilities, and commercial visitor services.

The second tier of NPS policies (level 2 guidance) are Director's Orders which clarify or supplement the NPS Management Policies. As they are completed, Director's Orders will replace existing NPS guidelines and special directives. The most detailed and comprehensive guidance implementing service-wide policy, called level 3 guidance, are handbooks or reference manuals and are a compilation of legal references, operating policies, standards, procedures, general information, recommendations, and examples to assist field staff in carrying out the NPS Management Policies.

DEPARTMENT OF THE INTERIOR, DEPARTMENTAL MANUAL, 516 DM 1 – 15 – NATIONAL ENVIRONMENTAL POLICY ACT OF 1969 (2005)

Resources afforded protection: all resources including cultural resources, historic resources, natural resources, human health and safety

Section 516 of the Departmental Manual establishes the Department of Interior's policies for implementing the National Environmental Policy Act. It includes policies about initiating the NEPA process, categorical exclusions, and preparing environmental assessments and environmental impact statements.

DEPARTMENT OF THE INTERIOR, DEPARTMENTAL MANUAL, 517 DM 1 – PESTICIDES (1981)

Resources afforded protection: human health and safety and the environment

DM 517 establishes Department of the Interior policy for the use of pesticides on the lands and waters under its jurisdiction and for compliance with the Federal Insecticide, Fungicide, and Rodenticide Act.

DEPARTMENT OF THE INTERIOR, DEPARTMENTAL MANUAL, 519 DM 1 - 2 – PROTECTION OF THE CULTURAL ENVIRONMENT (1994)

Resources afforded protection: archeological, prehistoric resources, historic resources, Native American human remains, and cultural objects

DM 519 describes the policies and responsibilities of the Department of the Interior for managing, preserving, and protecting prehistoric resources, historic resources, Native American human remains, and Native American cultural objects located on Indian and public lands administered by the Department.

DEPARTMENT OF THE INTERIOR, DEPARTMENT MANUAL, 520 DM 1 – PROTECTION OF THE NATURAL ENVIRONMENT – FLOODPLAIN MANAGEMENT AND WETLANDS PROTECTION PROCEDURES (2001)

Resources afforded protection: wetlands and floodplains

DM 520 describes the policies and responsibilities of the Department of the Interior for implementing Executive Order No. 11988, Floodplain Management (May 24, 1977) and Executive Order No. 1199, Protection of Wetlands (May 24, 1977).The Department's policy is to:

A. Exercise leadership and take action to avoid, to the extent possible, the long- and short-term adverse impacts associated with the occupancy and modification of wetlands and floodplains;

B. Avoid the direct or indirect support of wetland or floodplain development whenever there is a practicable alternative;

C. Reduce the risk of flood loss and minimize the impact of floods on human health, safety and welfare;

D. Restore and preserve the natural and beneficial values served by floodplains and wetlands;

E. Develop an integrated process to involve the public in the floodplain management decision making process;

F. Incorporate the Unified National Program for Floodplain Management into relevant Departmental programs.

NPS DIRECTOR'S ORDER 12 AND HANDBOOK – CONSERVATION PLANNING, ENVIRONMENTAL IMPACT ANALYSIS, AND DECISION MAKING (2001)

Resources afforded protection: all resources including natural resources, cultural resources, human health and safety, socioeconomic environment, visitor use

Director's Order 12 and Handbook sets forth policy and procedures for the NPS to comply with the National Environmental Policy Act (NEPA), including direction on the analysis process and documentation of environmental impact assessments. The Director's Order and handbook are derived in whole or part from the CEQ regulations and Department of Interior NEPA guidelines. Director's Order 12 and the handbook include specific NPS requirements beyond those imposed by CEQ to help facilitate the mandates of the Organic Act, other laws and policies that guide NPS actions, and to help NPS managers and staff make day-to-day decisions related to implementation of the NEPA.

NPS DIRECTOR'S ORDER 28 – CULTURAL RESOURCE MANAGEMENT (1998)

Resources afforded protection: cultural, historic, and ethnographic resources

Director's Order 28 is the comprehensive guideline for management of cultural resources in units of the National Park Service. It elaborates on the policies articulated in the "NPS Management Policies" and offers guidance in applying federal laws and the Secretary's Standards to establish, to maintain, and to refine park cultural resource programs. Director's Order 28 also establishes procedures for complying with NHPA sections 10 and 106.

Director's Order 28, Appendix R: NAGPRA Compliance provides direction on complying with the Native American Graves Protection and Repatriation Act. Appendix R requires that an operator who inadvertently discovers human remains, funerary objects, sacred objects, or objects of cultural patrimony immediately notify the park's superintendent first by telephone and then in writing. The operator must stop activity in the area of the discovery for a specified time and make a reasonable effort to protect the human remains or objects. The superintendent will notify the appropriate Native American tribes or Native Hawaiian organizations and begin consultation about the disposition of the items.

DIRECTOR'S ORDER 28A – ARCHEOLOGY (2004)

Resources afforded protection: archeological resources

DO 28A promotes a common management framework for planning, reviewing and undertaking archeological activities and other activities that may affect archeological resources within the National Park System. This DO also addresses the manner in which the Service will meet its archeological assistance responsibilities outside the national parks. General archeological requirements are covered in DO-28: Cultural Resource Management (http://www.nps.gov/policy/DOrders/DOrder28.html), and the Cultural Resource Management Guideline Release No. 5 (http://www.cr.nps.gov/history/online_books/nps28/28contents.htm).

DIRECTOR'S ORDER 47 – SOUND PRESERVATION AND NOISE MANAGEMENT (2000)

Resources afforded protection: natural soundscapes

The purpose of this Director's Order is to articulate National Park Service operational policies that will require, to the fullest extent practicable, the protection, maintenance, or restoration of the natural soundscape resource in a condition unimpaired by inappropriate or excessive noise sources. For nonfederal oil and gas operations, soundscape management goals are to reduce noise to minimum levels consistent with the appropriate service or activity, as long as that service or activity continues to be needed.

DIRECTOR'S ORDER 53 AND REFERENCE MANUAL 53 – SPECIAL PARK USES (2005)

Resources afforded protection: all resources including air resources, cultural and historic resources, natural resources, biological diversity, human health and safety, endangered and threatened species, visitor use and experience, visual resources

DO 53 defines and clarifies legal and policy requirements for special uses in NPS units and describes Special Use Permit (SUP) requirements and provisions. Applicable regulations for Special Use Permits are 36 C.F.R. Parts 1 – 5.

Special park uses are defined as activities that take place in a unit of the National Park System and: provide a benefit to an individual, group or organization, rather than the public at large; require written authorization and some degree of management control from the NPS in order to protect park resources and the public interest; are not prohibited by law or regulation; and are neither initiated, sponsored, nor conducted by the NPS. A special park use may involve either rights or privileges, and may or may not support the purposes for which a park was established.

The NPS applies the Special Use Permit regulations at 36 C.F.R. Parts 1 – 5 and guidance in Director's Order/Reference Manual 53 to control activities within rights-of-way associated with transpark oil and gas pipelines. Mowing and trimming vegetation, inspection or testing pipelines, removal of fluids from oil and gas pipelines and installing, shutting down or replacing pipelines, are common activities in pipeline rights-of-way requiring an approved NPS Special Use Permit. Special Use Permits for transpark pipelines must be approved before these activities can occur. The SUP must include a performance bond and mitigation measures to protect park resources, values, and ensure the protection of public health and safety.

REFERENCE MANUAL 77 – NATURAL RESOURCE MANAGEMENT (2004)

Resources afforded protection: all natural resources

Natural Resource Management Reference Manual 77 offers comprehensive guidance to National Park Service employees responsible for managing, preserving, and protecting the natural resources found in National Park System units. It guides the actions of park managers so that natural resource activities comply with federal law, federal regulation, Department of Interior policy, and National Park Service policy. Natural resources include native plants, native animals, water, air, soils, topographic features, geologic features, paleontologic resources, natural quiet, and clear night skies. Reference Manual 77 covers natural resources management, uses in parks, planning, and program administration and management. A listing of topics included in RM 77 can be found at: http://www.nature.nps.gov/rm77/.

Reference Manual 77 serves as the primary "Level 3" guidance on natural resource management in units of the National Park System, replacing NPS-77, The Natural Resource Management Guideline, issued in 1991 under the previous NPS guideline series. The transition of NPS-77 into Reference Manual 77 is still in progress. Some sections are still being revised while others have undergone a field review with comments from the field incorporated as applicable.

NPS DIRECTOR'S ORDER AND PROCEDURAL MANUAL 77-1 – WETLAND PROTECTION (2002)

Resources afforded protection: wetlands

NPS Director's Order 77-1 and Procedural Manual implement Executive Order No. 11990, Protection of Wetlands. They establish policies, requirements, and standards to protect wetlands. Operators must perform a wetlands delineation when proposed operations could potentially cause direct and/or indirect impacts to wetlands. The Corps of Engineers and the NPS review the wetlands delineation for adequacy. When proposed operations cannot avoid direct and/or indirect impacts on wetlands, the operator must compensate for these impacts by restoring a disturbed wetlands area in the unit at a minimum 1:1 compensation ratio. The compensation ratio can be greater if the functional values of the site being impacted are high and the restored wetlands will be of a lower functional value. Operators must perform the compensation before or concurrently with the occurrence of impacts associated with approved oil and gas operations. When operations are completed, the operator must restore the site to its pre-impact wetlands condition.

NPS must comply with Executive Order No. 11990 and the NPS Wetland Protection Guideline (DO 77-1) as part of the 36 C.F.R. 9B procedure for approving a plan of operations for nonfederal oil and gas operations within a unit of the National Park System.

NPS DIRECTOR'S ORDER AND PROCEDURAL MANUAL 77-2 – FLOODPLAIN MANAGEMENT (2003)

Resources afforded protection: floodplains

Director's Order and Procedural Manual 77-2 replaces NPS Special Directive 93-4 and provides NPS policies and procedures for implementing Executive Order No. 11988, Floodplain Management. NPS policy seeks to reduce the risk of flood loss, minimize the impact of floods on human safety, health and welfare; and restore and preserve the natural and beneficial values served by floodplains.

The NPS will protect and preserve the natural resources and functions of floodplains; avoid the long- and short-term environmental effects associated with the occupancy and modification of floodplains; avoid direct and indirect support of floodplain development and actions that could adversely affect the natural resources and functions of floodplains or increase flood risks; and restore, when practicable natural floodplain values previously affected by land use activities within floodplains. If it is not practicable to locate or relocate development or inappropriate human activities outside the floodplain, the NPS will, prepare a Statement of Findings in accordance with the Procedural Manual 77-2; take all reasonable actions to minimize the impact to the natural resources in floodplains; use nonstructural methods to reduce hazards to human life and property; and ensure that structures and facilities located in floodplains are designed to be consistent with the intent of the standards and criteria of the National Flood Insurance Program (44 C.F.R. Part 60).

The Director's Order requires the NPS to classify proposed actions into one of three action classes - the 100-year (base floodplain), 500-year, or extreme regulatory floodplain. If a preliminary floodplain assessment shows that the area may experience flooding, then the applicable regulatory floodplain must be shown on a map, and information on flood conditions and hazards must be developed.

During project planning, the NPS identifies and evaluates practicable alternative sites for the proposal outside of the regulatory floodplain. If practicable sites are identified, NPS policy gives preference to locating the proposed action at a site outside the regulatory floodplain. If there is no practicable alternative site for the proposal, then the NPS will apply mitigation measures to protect floodplain resources, values, and human life and property.

NPS must comply with Executive Order No. 11988 and the NPS Floodplain Management Guideline as part of the 36 C.F.R. 9B process for approving a plan of operations for nonfederal oil and gas operations within a unit of the National Park System.

SECRETARY OF THE INTERIOR'S "STANDARDS AND GUIDELINES FOR ARCHEOLOGY AND HISTORIC PRESERVATION," 48 FR 44716 (1983) (also published as Appendix C of NPS Director's Order 28 – Cultural Resource Management)

Resources afforded protection: cultural and historic resources

Prepared under the authority of sections 101(f), (g), and (h) and 110 of the National Historic Preservation Act, the Standards and Guidelines provide basic technical standards, guidelines, and advice about archeological and historical preservation activities and methods. While the standards and guidelines are not regulatory, NPS Director's Order 28 requires the NPS to comply with their substantive and procedural requirements.

GOVERNMENT-TO-GOVERNMENT RELATIONS WITH NATIVE AMERICAN TRIBAL GOVERNMENTS, Presidential Memorandum signed April 29, 1994

Resources afforded protection: Native Americans

In order to ensure that NPS recognizes and respects the rights of sovereign tribal governments, this memorandum instructs each executive department and agency to operate in a government-to-government relationship with federally recognized tribes and to consult with tribal governments prior to taking any action that might affect them. The memorandum directs agencies to assess the impacts of their programs and policies on tribes and to take their rights and concerns into consideration during development of any plan, programs, or projects. NPS must also remove any impediments to working directly with tribal governments in designing agency plans, programs, and projects. Finally, it instructs agencies to try to work cooperatively to carry out the intent of the memorandum and to tailor federal programs to meet the unique needs of tribal communities.

SELECTED TENNESSEE AND KENTUCKY LAWS AND REGULATIONS

TENN. CODE, TITLE 60, OIL AND GAS, CHAPTER 1, PART 1 (2006)
Production of Oil and Gas: General Provisions

This part of the Tennessee code provides a general overview for operational requisites including permitting (section 103), mandatory record compilation and reporting (section 104). Section 102 prohibits production methods that result in waste. Section 106 provides well spacing requirements.

TENN. CODE, TITLE 60, OIL AND GAS, CHAPTER 1, PART 2 (2006)
Production of Oil and Gas: Oil and Gas Board

The Oil and Gas Board has vested authority to regulate oil and gas operations within the State of Tennessee. Oil and Gas Board rules, regulations and forms are published in Tennessee Compiled Rules and Regulations §1040-1-1-.01 through §1040-8-1 (2006). Oil and gas permit applicants must provide surface owners of oil and gas estates with notice of the applicant's intent to drill. (§ 209).

The following is a list of statewide rules promulgated by the Oil and Gas Board. Additional statewide rules may apply in conjunction with other relevant legal and policy mandates for oil and gas operations.

Rules of the Tennessee Oil and Gas Board, Statewide Order No. 2, Terms:

- Chapter 1040-1-1, Definitions

Rules of the Tennessee Oil and Gas Board, Statewide Order No. 2, Drilling, Re-Entering, Plugging and Abandoning Exploratory and Exploitation Oil Gas Wells:

- Chapter 1040-2-1, Bond
- Chapter 1040-2-2, Permits
- Chapter 1040-2-3, Well Location Plats
- Chapter 1040-2-4, Well Spacing
- Chapter 1040-2-5, Well Identification
- Chapter 1040-2-6, Drilling Wells
- Chapter 1040-2-7, Casing Program
- Chapter 1040-2-8, Directional Drilling
- Chapter 1040-2-9, Well Abandonment
- Chapter 1040-2-10, Filing of Well Data, Reports and Maps
- Chapter 1040-2-11, Exceptions and Hearings
- Chapter 1040-2-12, Violations – Penalties – Notice - Hearing

Rules of the Tennessee Oil and Gas Board, Statewide Order No. 2, Testing and Completing Wells for Production:

- Chapter 1040-3-1, Completion, Recompletion, and Related Downhole Work
- Chapter 1040-3-2, Tubing and Well Equipment

Chapter 1040-3-3, Prevention of Hazards and Pollution
Rules of the Tennessee Oil and Gas Board, Statewide Order No. 2, Production:
Chapter 1040-4-1, Pollution and Safety Controls
Chapter 1040-4-2, Procedures and Equipment for Metering, Measuring and Producing Oil Condensate and Gas
Chapter 1040-4-3, Requirements for Reporting the Volume and Disposition of Oil and Gas Produced
Chapter 1040-4-4, Ratable Take
Chapter 1040-4-5, Commingling and Automatic Custody Transfer of Hydrocarbons
Chapter 1040-4-6, Limiting Production
Chapter 1040-4-7, Regulating High Gas/Oil Ratio Wells and Preventing Waste of Gas
Chapter 1040-4-8, Subterranean Gas Storage
Chapter 1040-4-9, Pressure Maintenance Projects and Secondary Recovery
Rules of the Tennessee Oil and Gas Board, Statewide Order No. 2, Unitization:
Chapter 1040-5-1, Unit Operations
Rules of the Tennessee Oil and Gas Board, Statewide Order No. 2, Administrative Procedures:
Chapter 1040-6-1, Hearings and Administrative Approval
Chapter 1040-6-2, Rules of Procedure for Hearing Contested Cases
Rules of the Tennessee Oil and Gas Board, Statewide Order No. 2, Forms:
Chapter 1040-7-1, List of Forms
Rules of the Tennessee Oil and Gas Board, Statewide Order No. 2, NGPA Processing
Chapter 1040-8, Determinations Under Federal Natural Gas Policy Act of 1978

TENN. CODE, TITLE 60, OIL AND GAS, CHAPTER 1, PART 5 (2006) Production of Oil and Gas: Mineral Test Hole Regulatory Act

This part codifies the Mineral Test Hole Regulatory Act of 1982 and authorizes regulation of mineral test hole drilling in order to prevent surface and subsurface pollution from natural brines, oil, gas, or mineralized waters.

TENN. CODE, TITLE 60, OIL AND GAS, CHAPTER 1, PART 6 (2006) Production of Oil and Gas: Oil and Gas Surface Owners Compensation

This part codifies the Oil and Gas Surface Owners Compensation Act of 1984. Oil and gas developers must compensate surface owners for damages and deprivations resulting from drilling operations.

TENN. CODE, TITLE 60, OIL AND GAS, CHAPTER 1, PART 7 (2006) Production of Oil and Gas: Environmental Protection

Operators must take measures that prevent or minimize soil erosion and surface water pollution from the time a drilling or re-entry well permit is granted until the well is abandoned.

TENN. CODE, TITLE 68, HEALTH SAFETY AND ENVIRONMENTAL PROTECTION, CHAPTER 216 (2006)
Environmental Protection: Oil Spill Cleanup

This Chapter codifies the Tennessee Oil Spill Cleanup and Environmental Preservation Act of 1995. Statute imposes liability on operators for oil spills.

TENN. CODE, TITLE 70, WILDLIFE RESOURCES, CHAPTER 8, PART 1 (2006)
Species Protection and Conservation: Nongame and Endangered Species

This part codifies the Tennessee Nongame and Endangered or Threatened Wildlife Species Conservation Act of 1974 and prohibits takings of listed endangered animal species.

TENN. CODE, TITLE 70, WILDLIFE RESOURCES, CHAPTER 8, PART 3 (2006)
Rare Plant Protection and Conservation

This part codifies the Rare Plant Protection and Conservation Act of 1985 and prohibits takings of listed endangered plant species.

KY. REV. STAT., TITLE 28, MINES AND MINERALS, CHAPTER 353 (2005)
Mineral Conservation and Development

§353.010, Definitions for Chapter
§353.020, Oil and Gas Lease or Contract, When Lessor May Avoid
§353.030, Nonproductive Well, When Lease or Contract Satisfied By
§353.040, When Offset Wells to Be Drilled
§353.050, Plat, Showing Well, to Be Filed If well Is to Extend Through Coal-Bearing Strata - Copies to Certain Persons
§353.060, Objections to Location of Well - Hearing
§353.070, Index of Plats - Agreement Permitting Well Operator to Select Location
§353.080, Drilling Through Coal Bed
§353.090, Gas Found Beneath or Between Coal Beds
§353.100, Casings to Remain In Place During Life of Productive Well
§353.110, Abandonment of Well Drilled Through Coal Strata - Plugging of Well
-- Incorporates Regulation: Public Protection and Reg. Cabinet Dep't of Mines and Minerals, Title 805, §1:070, Plugging Wells; Coal-Bearing Strata
§353.120, Method of Plugging Well Drilled Through Coal-Bearing Strata
-- Incorporates Regulation: Public Protection and Reg. Cabinet Dep't of Mines and Minerals, Title 805, §1:070, Plugging Wells; Coal-Bearing Strata
§353.130, Alternative Methods That May Be Used When Strata Shot
§353.140, Gas Escape Pipe, When to Be Used
§353.150, Unused Oil, Gas or Salt Water Well to Be Closed To Prevent Waste
§353.160, Gas Waste to Be Prevented - Presumption of Negligence
§353.170, Putting Pressure on Strata - Wells May Remain Open If Conforming to Federal Safe Drinking Water Act.
§353.180, Requirements for Plugging Abandoned Well - Bids - Remedy for Possessor of Adjacent Land or for Department
§353.190, Salt and Saltpetre Works to Be Inclosed - Liability

§353.200, Department of Mines and Minerals to Enforce Oil and Gas Law – Hearings
§353.205, Department to Release Production Data on Crude Oil and Natural Gas
§353.210, Agreement Consolidating Oil and Gas Leases May Be Executed by Trustee Representing Contingent Future Interests
§353.220, Nature of Agreement
§353.230, Petition for Court Approval - Affidavits - Guardian Ad Litem - Order of Approval
§353.240, Agreement Consolidating Oil and Gas Leases May be Executed by Guardian.
§353.250, Nature of Agreement
§353.260, Petition for Court Approval - Affidavits - Guardian Ad Litem - Order of Approval
§353.300, Appointment of Trustee to Execute Mineral Lease Where Contingent Future Interests are Involved.
§353.310, Jurisdiction of court
§353.320, Who May Institute Proceedings
§353.330, Parties - Representation of Minors, Mentally Disabled, and Persons Not in Being
§353.340, Alignment of Parties - Process
§353.350, Bond of Trustee - Terms of sale of Lease
§353.360, Execution of Sale of Lease - Report - Confirmation
§353.370, Separate Lease By Guardian or Conservator Unnecessary
§353.380, Disposition of Proceeds

KY. REV. STAT., TITLE 28, MINES AND MINERALS, CHAPTER 353 (2005) Mineral Conservation and Development: Severed Mineral Interests of Unknown or Missing Owners

§353.460, Definitions
§353.462, Jurisdiction in Circuit Court.
§353.464, When Court May Declare Trust and Appoint Trustee - Persons Authorized to Institute Proceedings
§353.466, Persons to Be Joined as Defendants - Verified Petition Showing Effort to Locate Owners - Advertisement and Lis Pendens Notice, Contents - Trustee Ad Litem
§353.468, If Advantageous to Unknown or Missing Owner, Court May Declare Trust - Bond of Trustee - Sale of Lease - Trustee's Report - When Court Not to Authorize Trustee's Lease - Trustee to Use Percentage of Funds to Search for Owner - Period During Which Unknown or Missing Owner May Establish Identity and Title
§353.470, When Trustee May Convey Title in Mineral Interest to Surface Owner - Payment to Surface Owner - Final Report of Trustee - Termination of Trust
§353.472, Payment to Surface Owner When Leased mineral Never Produced Commercially
§353.474, Payment of Attorneys' Fees, Expenses, and Court Costs
§353.476, When Action by Unknown or Missing Owner is Barred

KY. REV. STAT., TITLE 28, MINES AND MINERALS, CHAPTER 353 (2005) Mineral Conservation and Development: Oil and Gas Conservation

§353.500, Declaration of Policy of KRS 353.500 to 353.720
-- Incorporates Regulation: Public Protection and Reg. Cabinet Dep't of Mines and Minerals, Title 805, §1:080, Gas Storage Reservoirs; Drilling, Plugging in Vicinity
-- Incorporates Regulation: Public Protection and Reg. Cabinet Dep't of Mines and Minerals, Title 805, §1:160, Posting of a Danger Sign on a Facility Used for the Storage of Oil
-- Incorporates Regulation: Public Protection and Reg. Cabinet Dep't of Mines and Minerals, Title 805, §1:190, Gathering Lines
§353.510, Definitions for KRS 353.500 to 353.720
§353.520, Territorial Application of KRS 353.500 to 353.720 - Waste of Oil and Gas Prohibited
-- Incorporates Regulation: Public Protection and R. Cabinet Dep't of Mines and Minerals, Title 805, §1:020, Protection of Fresh Water Zones
-- Incorporates Regulation: Public Protection and Reg. Cabinet Dep't of Mines and Minerals, Title 805, §1:080, Gas Storage Reservoirs; Drilling, Plugging in Vicinity
-- Incorporates Regulation: Public Protection and Reg. Cabinet Dep't of Mines and Minerals, Title 805, §1:110, Underground Injection Control
-- Incorporates Regulation: Public Protection and Reg. Cabinet Dep't of Mines and Minerals, Title 805, §1:120, Operating or Deepening Existing Wells and Drilling Deeper Than the Permitted Depth.
-- Incorporates Regulation: Public Protection and Reg. Cabinet Dep't of Mines and Minerals, Title 805, §1:130, Deep Well Administrative Regulation Relating to Casing, Cementing, Plugging, Gas Detection and Blow-Out Prevention
-- Incorporates Regulation: Public Protection and Reg. Cabinet Dep't of Mines and Minerals, Title 805, §1:140, Directional and Horizontal Wells
-- Incorporates Regulation: Public Protection and Reg. Cabinet Dep't of Mines and Minerals, Title 805, §1:170, Content of the Operations and Reclamation Proposal; form on Which the Proposal is Filed
§353.530, Director of Division of Oil and Gas Conservation - Qualifications – Duties - Oath.
§353.540, Authority of Department - Jurisdiction
-- Incorporates Regulation: Public Protection and Reg. Cabinet Dep't of Mines and Minerals, Title 805, §1:080, Gas Storage Reservoirs; Drilling, Plugging in Vicinity
§353.550, Specific Authority over Oil and Gas Operators
-- Incorporates Regulation: Public Protection and Reg. Cabinet Dep't of Mines and Minerals, Title 805, §1:030, Well Location Plat, Preparation, Form and Contents
-- Incorporates Regulation: Public Protection and Reg. Cabinet Dep't of Mines and Minerals, Title 805, §1:060, Plugging wells; noncoal-Bearing Strata
-- Incorporates Regulation: Public Protection and Reg. Cabinet Dep't of Mines and Minerals, Title 805, §1:070, Plugging Wells; Coal-Bearing Strata
-- Incorporates Regulation: Public Protection and Reg. Cabinet Dep't of Mines and Minerals, Title 805, §1:080, Gas Storage Reservoirs; Drilling, Plugging in Vicinity

-- Incorporates Regulation: Public Protection and Reg. Cabinet Dep't of Mines and Minerals, Title 805, §1:180, Production Reporting

§353.560, Further Authority

-- Incorporates Regulation: Public Protection and Reg. Cabinet Dep't of Mines and Minerals, Title 805, §1:040, Vacuums; use of

-- Incorporates Regulation: Public Protection and Reg. Cabinet Dep't of Mines and Minerals, Title 805, §1:080, Gas Storage Reservoirs; Drilling, Plugging in Vicinity

§353.565, Kentucky Oil and Gas Conservation Commission

§353.570, Permit Required - May Authorize Operation Prior to Issuance of Permit

-- Incorporates Regulation: Public Protection and Reg. Cabinet Dep't of Mines and Minerals, Title 805, §1:170, Content of the Operations and Reclamation Proposal; form on Which the Proposal is Filed

§353.575, Duty of Applicant to Meet and Confer with Permittee if Drilling Will Disturb Permitted Area.

§353.580, Expiration of Permit - Extensions

§353.590, Application for permit - Fees - Plat - Bond to Insure Plugging - Use of Forfeited Funds - Wells Not Included in "Water Supply Well"

-- Incorporates Regulation: Public Protection and Reg. Cabinet Dep't of Mines and Minerals, Title 805, §1:050, Surety Bonds; Requirements, Cancellation

-- Incorporates Regulation: Public Protection and Reg. Cabinet Dep't of Mines and Minerals, Title 805, §1:170, Content of the Operations and Reclamation Proposal; form on Which the Proposal is Filed

§353.5901, Operations and Reclamation Proposal for Land with Complete Severance - Contents, Distribution, and Agreement or Mediation - Mediation Report

-- Incorporates Regulation: Public Protection and Reg. Cabinet Dep't of Mines and Minerals, Title 805, §1:170, Content of the Operations and Reclamation Proposal; form on Which the Proposal is Filed

-- Incorporates Regulation: Public Protection and Reg. Cabinet Dep't of Mines and Minerals, Title 805, §1:190, Gathering Lines

§353.591, Purpose and Application of KRS 353.592 and 353.593

§353.592, Powers of the Department.

§353.593, Appeals

§353.595, Notice to Surface Owner of Intent to Drill Oil or Gas Well – Compensation for Damage to Surface - Restoration of Surface

-- Incorporates Regulation: Public Protection and Reg. Cabinet Dep't of Mines and Minerals, Title 805, §1:170, Content of the Operations and Reclamation Proposal; Form on Which the Proposal is Filed

§353.597, Replacement of Disrupted Water Supply by Well Operator

-- Incorporates Regulation: Public Protection and Reg. Cabinet Dep't of Mines and Minerals, Title 805, §1:170, Content of the Operations and Reclamation Proposal; form on Which the Proposal is Filed

§353.610, Conditions under Which Permits May be Issued - Exceptions

§353.620, Variance from Requirements of KRS 353.610

§353.630, Pooling of Oil and Gas Interests - Conditions

§353.640, Pooling Order - Notice - Provisions - Surrender or Sharing of Interest – Limited Participation

§353.645, Operation and Development as a Unit of Oil and Gas Interests in a Pool or Pools - Application for Unit - Hearing - Unitization Order

§353.650, Exclusion of Royalty Interest in Computing Share of Production –

Limitation
§353.651, Deep Wells - Establishment and Regulation of Drilling Units - Pooling of Interests - Exceptions.
-- Incorporates Regulation: Public Protection and Reg. Cabinet Dep't of Mines and Minerals, Title 805, §1:100, Commission's Rules of Procedure; Spacing of Deep Well Drilling; Wildcat Wells and Pooling of Interests
§353.652, Unit Operation of Pool - Procedure
-- Incorporates Regulation: Public Protection and Reg. Cabinet Dep't of Mines and Minerals, Title 805, §1:100, Commission's Rules of Procedure; Spacing of Deep Well Drilling; Wildcat Wells and Pooling of Interests
§353.653, Share of Production from Drilling Unit or Unitized Pool
§353.654, Drilling Without Consent of Landowner Prohibited
§353.655, Use of Shackle Rods or Related Cables
§353.656, Display of Danger Signs on Oil Storage facilities
-- Incorporates Regulation: Public Protection and Reg. Cabinet Dep't of Mines and Minerals, Title 805, §1:160, Posting of a Danger Sign on a Facility Used for the Storage of Oil
§353.660, Report Required After Termination of Operations - Contents – Confidentiality of Information - Exceptions
§353.670, Promulgation of Regulations - Hearing - Written Record of Hearing
§353.690, Production of Evidence - Failure to Comply
§353.700, Review of Order of Department by Civil Action - Appeal
§353.710, Suit to Enjoin Violation - By Department, Person Adversely Affected, Attorney General
§353.720, Construction of KRS 353.500 to 353.720
§353.730, Investigation of Abandoned Wells - Application - Report - Bond

**KY. REV. STAT., TITLE 28, MINES AND MINERALS, CHAPTER 353 (2005)
Mineral Conservation and Development: Kentucky Gas Pipeline Authority**

§353.750, Definitions for KRS 353.750 to 353.776.
§353.752, Kentucky Gas Pipeline Authority Established - Membership
§353.754, Procedure and Organization - Regulations
§353.756, Purpose of Authority - Powers of the Authority
§353.758, Issuance of Revenue Bonds - Proceeds of Bonds - Notes or Temporary Bonds
§353.760, Bonds of Authority Not Debts of Commonwealth
§353.762, Discretionary Securing of Bonds by Trust Indentures
§353.764, Enforcement of Rights by Bond Holder or Trustee of Trust Indenture
§353.766, Status of Authority Bonds as Securities
§353.768, Issuance of Revenue Refunding Bonds
§353.770, Treatment of Moneys Received
§353.772, Exemptions from Taxation
§353.774, KRS 45A.045 Not Applicable to Authority Projects
§353.776, Reporting of Activities

KY. REV. STAT., TITLE 28, MINES AND MINERALS, CHAPTER 353 (2005)
Mineral Conservation and Development: Penalties

§353.990, Penalties
§353.991, Penalties for Violation of KRS 353.500 to 353.720
§353.992, Penalties

KY. REV. STAT., TITLE 12, CONSERVATION AND STATE DEVELOPMENT, CHAPTER 146 (2005)
Natural Resources and Environmental Protection Cabinet: Endangered and Threatened Plants

APPENDIX C: AIR QUALITY AND OIL AND GAS DEVELOPMENT AT BIG SOUTH FORK NATIONAL RECREATION AREA AND OBED WILD AND SCENIC RIVER

Our nation's air quality is protected under several provisions of the *Clean Air Act*, including the national ambient air quality standards (NAAQS) and the prevention of significant deterioration (PSD) program. The NAAQS consist of numerical standards for air pollution promulgated by the U.S. Environmental Protection Agency (EPA). They are broken into "Primary" and "Secondary" standards for the purpose of protecting public health and public welfare, respectively. Both Big South Fork NRRA and Obed WSR are located in the Tennessee River Valley-Cumberland Mountains Air Quality Control Region, which is currently in attainment of the NAAQS.

The PSD permitting program is administered by Tennessee Department of Environment and Conservation Division of Air Pollution Control, and the Kentucky Department for Environmental Protection Division of Air Quality. The program applies to defined categories of new or modified sources of air pollution with emissions greater than 100 tons per year and all other sources greater than 250 tons per year. Emissions from pollution sources affecting the park units are considered on a project-by-project basis in the assessment of air quality impacts required under the PSD program. Petroleum storage and transfer facilities exceeding a 300,000 barrel capacity, for instance, would be subject to PSD permitting. Based on the level of emissions, oil and gas wells, including pump jacks, would not be subject to PSD permitting. However, the regulatory thresholds are relevant benchmarks to consider in impact analysis.

The PSD program is designed to "preserve, protect, and enhance the air quality in national parks, national wilderness areas, national monuments, national seashores, and other areas of special national or regional natural, recreational, scenic, or historic value" (EPA 2010). Under this program, park units and other areas that are in attainment or unclassifiable under the NAAQS are designated as either Class I or Class II areas. Class I areas are areas of special national or regional natural, scenic, recreational, or historic value for which the PSD regulations provide special protection. The *Clean Air Act* mandates Federal Class I areas as certain national parks (over 6,000 acres), wilderness areas (over 5,000 acres), national memorial parks (over 5,000 acres), and international parks that were in existence as of August 7, 1977. Class II areas include park units that do not fit the above criteria. Both Big South Fork NRRA and Obed WSR are designated Class II air quality areas under the PSD program which protects air quality in the park units by allowing limited increases (i.e., allowable increments) over baseline concentrations of pollution for sulfur dioxide (SO_2), nitrogen dioxide, and particulate matter, provided that the NAAQS, established by the EPA, are not exceeded.

From the perspective of the NPS, the air pollutants most relevant to park resources are those that have the potential to result in the greatest effects to ecosystems. Plant damage resulting from high concentrations of ozone, for instance, can result in chlorosis, the symptoms of which include browning on leaves that occurs in a mottled pattern. Ozone damage can also result in slow growth and severe leaf browning, followed by premature leaf drop (Hales n.d.). A risk assessment carried out for the Appalachian Highlands Network of parks (NPS 2004d) found that the risk of ozone-related foliar injury to plants in both Big South Fork NRRA and Obed WSR is high. Secondary pollutants such as sulfates and nitrates, which are produced by industrial sources and automobile emissions, can result in the deterioration of visibility in park units and contribute to acid deposition which leads to impacts in forests. The main chemical precursors leading to acidic conditions are atmospheric concentrations of SO_2 and nitrogen oxides (NOx). When these two compounds react with water, oxygen, carbon dioxide, and sunlight in the atmosphere, the result is sulfuric and nitric acids, the primary agents of acid deposition (ESA 2000). While there are currently no standards for levels of sulfates or nitrates in ambient air, these pollutants present a major concern for ecosystem health in park units. Regional studies have shown that sulfates are the primary pollutant contributing to visibility degradation in the southeast, and that the majority of the primary SO_2 emissions come from utilities and industries (Vistas 2007). Excess nitrogen deposition in soils can also contribute to the spread of exotic and invasive plant species (Vasquez et al. 2008).

Current air quality conditions for Big South Fork NRRA and Obed WSR can be interpreted from recent air quality estimates for Big South Fork NRRA and Obed WSR for the 2004-2008 reporting period (NPS 2008h). Interpolated data for this period show that, for Big South Fork NRRA, average 4th max ozone is 75.2 ppb, total-N wet deposition is 5 kg/ha/yr, total-S wet deposition is 6.5 kg/ha/yr and the group 50 visibility condition minus natural conditions is 13.6 DV.

Given the programmatic nature of this plan, the exact locations of future operations are unknown. Therefore, a quantitative screening analysis of impacts was undertaken to determine if air quality impacts would exceed minor levels and if the topic of air quality would be carried forward for further analysis. The NPS ARD has issued guidance for determining the appropriate level of air quality analysis necessary for the proposed action, with appropriate screening levels (NPS 2010c). Therefore, the NPS performed a screening-level emissions inventory for Big South Fork NRRA and Obed WSR in which it was assumed that the reasonably foreseeable oil and gas activities would occur in a similar distribution as compared to locations of existing activities. Other assumptions included an average of one new well drilled per year, 36 currently active wells, 6 workovers per year, and 2 open well casings. All future assumptions were based on the reasonably foreseeable development (RFD) scenario as described in chapter 4 and used throughout the impact analysis.

The screening thresholds used to assess level of impacts in an attainment area as indicated by emissions inventory calculations are shown in table 1.

TABLE 1. EMISSION THRESHOLDS - ATTAINMENT AREAS

Impact Level Proposed Action (Emissions) Current Air Quality	Proposed Action (Emissions)	Duration
Negligible	<50 tons per year (TPY) (any pollutant)	One to several days or very low daily emissions over an annual period.
Minor	>50 & <100 TPY (any pollutant)	Several days to weeks or very low daily emissions over an annual period.
Moderate	>100 TPY (any pollutant)	Several weeks to months
Major	>250 TPY (any pollutant)	Long-term, one year to several years

Emissions inventory calculations were completed to determine potential NOx and volatile organic compound (VOC) emissions from various sources at the parks (NPS 2010d). VOCs are precursors of ozone, and could be a pollutant of concern as to known ozone impacts on vegetation and health effects for visitors and park employees. The sources analyzed included active wells, oil storage and venting from active wells, drilling, workovers, and leaking /capped wells. The sources and methodology are briefly described below:

- **Active Wells**—Emissions from active wells were estimated using emissions from an emission inventory and subsequent air quality modeling project performed for the Four Corners Air Quality Task Force (Stoeckinius et al. 2009). The Four Corners work provides a reasonably robust data set on which to base a Big South Fork NRRA and Obed WSR estimate with 152 engines of less than 100 hp that reflects a variety of engine ages and emission characteristics.

Average per engine emissions were derived from the Four Corners data which is 0.578 tons per year (tpy) for NOx and 0.026 tpy for VOCs. These were then scaled based on hours of operation, an average of 5,629 for the Four Corners as compared to 1095 for Big South Fork NRRA and Obed WSR. Therefore, this is a per engine estimate of 0.112 tpy for NOx and 0.005 tpy for VOC. With 36 engines in this size classification, an estimate of total NOx emitted would be about four tpy and would be about 0.2 tpy for VOC.

- **Drilling Operations**—The following equation from various Western Regional Air Partnership characterizations of drilling activities was used (Stoeckenius et al. 2009).

$$E = (EF \times HP \times LF \times t) / 907,185$$

where

E = emissions from a drill rig engine
EF = emission factor for such an engine
HP = engine horsepower
LF = load factor
t = number of hours on the engine per spud

The emission factor was taken from the Texas Commission on Environmental Quality work cited above, while a typical horsepower of 350 hp and how long it takes to drill a well, seven days, are from best judgment of observed drilling operations. Assuming an average of one well per year, emissions from drilling operations would be about 0.7 tpy of NOx. VOC emissions would be minimal.

- **Workovers**—Using the same approach as above with similar engines (350 hp) and load factor (0.75) and assuming there would be six workovers a year lasting perhaps three days results in per workover emissions estimates of 0.3 tons of NOx with minimal levels of VOC. An average of six of these per year would result in 1.8 tpy of NOx. These estimates are based on best professional judgment from observations in and around Big South Fork NRRA and Obed WSR
- **Oil Storage and Venting from Active Wells**—Based on information from Arrow engines for a small pumpjack engine and 100% load, natural gas consumed would be approximately 60 square cubic feet (scf) per hour. Assuming an average of three hours a day of operation per well, daily natural gas used in pumpjacks would be 180 scf. Expanded to 36 wells, the total would be 6,480 scf per day.
- As a conservative assumption, it was assumed that all remaining gas contained in oil pumped to the surface is released either through venting at the wellhead or while stored prior to transport. Based on best judgment it was assumed all wells in Big South Fork NRRA and Obed WSR produce 40 barrels per day. Based on how the oil is produced and best professional judgment, the gas oil ratio was estimated at 350 scf/STB. This would then total 14,000 scf of natural gas, of which the 6,480 scf from above is used in engines, so that the remaining 7,520 scf is released to the atmosphere either through venting or off-gassed during storage. Assuming conservatively that all natural gas is volatile, the annual VOC emissions from storage tanks and venting would be about 61 tpy.
- **Open Casing and Shut-In Wells**—Estimates were conducted for the two open casing situations; it was estimated that 3,400 scf/day is released to the atmosphere. Using the same assumptions as above, VOC emissions from open casing wells would be about 28 tpy. Seventeen leaking shut-in wells were also estimated to release 3,400 scf/day, which would then also result in about 28 tpy emitted. As a result of a current project to plug leaking wells, these emissions will be eliminated. The results are summarized in table 2.

TABLE 2. SUMMARY OF EMISSIONS

Source	NOx Emissions (tpy)	VOC Emissions (tpy)
Active Wells	4.0	0.2
Drilling	0.7	
Workovers	1.8	
Storage & Venting		61.0
Leaking Wells		56.0
Capped Wells		-56.0*
TOTAL	6.5	61.2

* These emissions will be eliminated as a result of a current project to plug leaking wells

As can be seen, screening calculations completed to determine potential NOx VOC emissions from oil and gas activities in the park under the RFD scenario resulted in a total estimated 61.2 tons per year of VOCs and 6.5 tons per year of NOx emissions from all sources. These levels would be considered minor (>50 and <100 tpy of any pollutant) under the current ARD guidance for evaluating emissions from NEPA projects. Also, emissions from oil and gas activities in the park under the RFD scenario indicated that there would be 56 tons per year of VOC emissions from open casing and leaking shut-in wells, but all of these would be eliminated as a result of a current project to plug leaking wells, and similar reductions would occur as other wells are plugged in the future.

At the site-specific level, operations under the proposed plan would comply with the recommended mitigation measures contained in appendix D, such as spraying existing gravel roads and access routes with freshwater and reducing vehicle speeds to minimize dust, as well as using properly designed, maintained, and operated equipment to reduce emissions. Operations would also have to comply with NPS requirements in order to receive approval for the Plan of Operations; therefore, operators inside the park would be required to follow operating procedures to minimize emissions. These include use of blowout preventers; a prohibition on burning of vegetation, construction debris, or site-produced wastes; use of clean (i.e., low sulfur) fuels; proper maintenance of engines; use of pollution control devices on vehicles (e.g., catalytic converters); and inspection and maintenance of flares and treater facilities.

Finally, there are very few wells forecast for development under the RFD scenario: only up to 20 wells total over a 15 to 20 year period at Big South Fork NRRA, and only up to 5 wells at Obed WSR. Overall, the actions expected under this plan would have a minor or less impact because of both the extensive plugging and reclamation that would be expected and because of the low estimated number of existing and new wells (over the course of the life of the plan). Given this, the site-specific mitigations that would be included in any plan of operations, and the low level of emission predicted by the screening level analysis, air quality was not further analyzed in this EIS.

APPENDIX D: SOCIOECONOMIC IMPACTS ANALYSIS

Big South Fork National River and Recreation Area (2/1/2008)

Past, present and potential future oil and gas development and production from resources underlying the Big South Fork National River and Recreation Area are linked to the social and economic environment of the surrounding community. Although the economic costs of compliance with the proposed regulations may accelerate shutdown and reclamation of older, marginal wells and defer development of some new wells within the Big South Fork NRRA, the overall impacts on regional social and economic conditions would be very limited in scope and economic importance when considered in the context of the overall regional economy. As a result, the net effects on social and economic conditions associated with implementation would be negligible, and therefore eliminated from detailed consideration.

Sufficient description of the affected environment and consideration of the potential impacts on social and economic conditions in the region to support the preceding conclusion are presented below.

Social and Economic Conditions

The area of influence for socioeconomics for purposes of the oil and gas management plan is comprised of five counties: McCreary, Kentucky and Fentress, Morgan, Pickett and Scott counties in Tennessee. These five counties encompass all federal surface lands and the federal oil and gas estate within the Congressionally-approved boundaries of the Big South Fork National River and Recreation Area. Most of the surface lands and federal oil and gas estate are located in Scott and Morgan counties. The entire area is predominately rural in character, with settlement patterns, land use, and economic activity influenced heavily by terrain, natural resources, and transportation networks.

The resident populations of the individual counties in 2006 ranged from 4,855 in Pickett County to 21,926 in Scott County, with a five-county total of 81,723 residents – see **Table 1**. The five-county total represents a net increase of 2,189 residents, or 2.8 percent, since 2000. Fentress and Scott counties both registered solid population gains since 2000, together accounting for more than 75 percent of the total regional growth. More modest gains occurred in Morgan and McCreary counties, while Pickett County experienced a net decline of 90 residents during the same period.

Table 1. Population Change, 2000 to 2006, BISO Socioeconomic Influence Area

	Fentress, TN	Morgan, TN	Pickett, TN	Scott, TN	McCreary, KY	Regional Total
Population, 2000	16,625	19,757	4,945	21,127	17,080	79,534
Population, 2006	17,480	20,108	4,855	21,926	17,354	81,723
Population change, 2000 to 2006	855	351	-90	799	274	2,189
Percent change, 2000 to 2006	5.1%	1.8%	-1.8%	3.8%	1.6%	2.8%

Sources: U.S. Census Bureau, 2002, U.S. Census Bureau, 2006(a), and U.S. Census Bureau 2006(b)

The majority of the region's residents live in unincorporated areas. The largest communities in the region are Oneida (2006 pop. of 3,682), Helenwood (2000 pop. of 856), Huntsville (2006 pop. of 1,033), and Winfield (2006 pop. of 988) in Scott County, Jamestown (2006 pop. of 1,898) in Fentress County, Wartburg (2006 pop. of 909) in Morgan County, and Byrdstown (2006 pop. of 880) in Pickett County. In McCreary County the largest nearby communities are Pine Knot (2000 pop. of 1,680) and Whitley City (2000 pop. of 1,111), although neither is an incorporated municipality.

Whitley City, Pine Knot, Oneida, Helenwood, Huntsville, and Wartburg, along with several other smaller communities, are all east of BISO, generally along the U.S. highway 27 that runs north-south through the area. Jamestown lies to the west on U.S. highway 127. Oneida is the local commercial and industrial center in the area, and along with Jamestown are the primary gateway communities to the southern half of BISO via Tennessee highway 297.

Knoxville, about 65 miles southeast of BISO, is the nearest major metropolitan area, providing job opportunities for some local residents who chose to commute, and also serving as the major trade, services, and entertainment center for the region. The city of Oak Ridge and Oak Ridge National Laboratory, about 55 miles southeast, is another job center for some local residents. Individuals and households employed in the two locations but interested in a more rural lifestyle factor into the recent population growth in the region, particularly in Scott and Morgan counties.

Residents of Pickett and Fentress counties tend to be older, as is characterized by larger shares of residents over 65 and higher median ages -- see **Table 2**. Among the five counties, McCreary County has the lowest share of seniors and lowest median age, both of which are below the statewide averages.

Table 2. Selected Demographic Characteristics, BISO Socioeconomic Influence Area

	Fentress, TN	Morgan, TN	Pickett, TN	Scott, TN	McCreary, KY	Regional Total
DEMOGRAPHICS						
Persons 65 years & older, 2000 Number / Percent of Total	2,270 / 13.7%	2,277 / 11.5%	878 / 17.8%	2,384 / 11.3%	1,810 / 10.6%	9,619 / 12.1%
Median Age (years), 2000	38.0	36.5	41.6	34.7	34.2	n.a.
Total Housing Units, 2000	7,598	7,714	2,956	8,909	7,405	34,582
Housing, Percent vacant	11.9%	9.4%	29.3%	7.9%	12.0%	11.8%
Median Household Income, 2004	$25,926	$30,387	$27,101	$26,868	$21,822	NA
Individuals in Poverty, 2004	21.9%	18.7%	17.1%	21.1%	30.1%	NA

Sources: U.S. Census Bureau, 2002, U.S. Census Bureau, 2007(a), and U.S. Census Bureau 2007(b)

In 2000, the housing inventory in the five county region totaled 34,582 units. Scott County, with 8,909 units, accounted for the single largest share of the total, Pickett the smallest. Homeownership rates range from 75.7 percent (McCreary) to 84.3 percent (Pickett), higher than the respective statewide averages. Overall occupancy averaged 88.2 percent. Vacancy rates ranged from 7.9 percent in Scott County to 29.3 percent in Pickett County. The high vacancy rate in Pickett County is primarily a reflection of the large number of cabins and homes held for seasonal use; more than 20 percent of the county's total housing inventory. The Census Bureau estimates a net addition of approximately 1,300 housing units from 2000 to 2006, with the largest increments in Scott (390 units) and Fentress (324 units).

Personal income in the area, as measured by the median household income, tends to be below the respective statewide averages, with correspondingly higher than average poverty rates. Morgan County's median household income of $30,387 in 2004 was 22 percent below the statewide median of $38,945, and the local poverty rate (18.7%) was 25 percent higher than the statewide figure (15%). In Fentress County, the median household income was 37 percent below the statewide median and the poverty rate was 46 percent higher. Among the five counties, McCreary County residents have the lowest median income and highest rates of poverty, the former more than 41 percent below the statewide average and the latter 85 percent higher.

The economies of the five counties in the study area differ in scale, composition, and other characteristics. Total employment in Scott County was 8,957 in 2004; more than four times that of the 1,902 jobs in Pickett (see **Table 3**) and also 30 percent of all jobs in the region. Farm employment accounted for 23 percent of all employment in Pickett County, less than three percent in McCreary County and 6.3 percent of the regional total. The high share of public land in McCreary, including lands in BISO, the Daniel Boone National Forest, lands managed by the U.S. Army Corps of Engineers, and state lands, contribute to the relatively low level of farm employment in McCreary County. Farm and other proprietors accounted for 40 percent of all employment in the region, and between 29 percent and 48 percent of all employment in the individual counties. The overall level of proprietorship activity is double the 20 percent for Tennessee and 19 percent for the state of Kentucky as a whole. Although proprietorship activity can be correlated with entrepreneurialism and is often viewed as a positive sign for economic development, economic income data suggest that many local proprietorships are secondary or part-time endeavors, yielding average earnings of only about half of the statewide averages.

Private sector employment accounts for between 61 percent and 82 percent of the employment and government jobs provide between 12 percent and 26 percent of all jobs in the individual counties. Most of the public sector jobs are in local government, however, state agencies provide a significant number of jobs in Morgan County and Federal employment, primarily associated with the Federal penitentiary, is important in McCreary County.

Table 3. Selected Economic Characteristics, BISO Socioeconomic Influence Area

	Fentress, TN	Morgan, TN	Pickett, TN	Scott, TN	McCreary, KY	Regional Total
ECONOMICS						
Total employment, 2004	7,886	6,133	1,902	8,957	4,752	29,630
Farm employment, percent of total, 2004	8%	7%	23%	3%	3%	7%
Private employment, percent of total, 2004	80%	67%	61%	82%	71%	75%
Government, percent of total, 2004	12%	26%	16%	15%	26%	18%
Labor force, 2005	7,062	8,103	1,911	8,434	6,066	31,576
Average unemployment, 2005	503	624	160	601	547	2,435
Annual unemployment rate, 2005	7.1%	7.7%	8.4%	7.1%	9.0%	7.7%
Net Flow of Workers, 2000	Net 1,353 out	Net 3,620 out	Net 295 out	Net 33 out	Net 1,390 out	NA
Per Capita Income, 2004	$21,847	$17,975	$18,790	$18,375	$16,381	NA
Average earnings per job, 2004	$23,814	$21,363	$17,056	$26,378	$26,189	NA

Sources: U.S. Census Bureau, 2002, U.S. Census Bureau, 2007(a), and U.S. Census Bureau 2007(b)

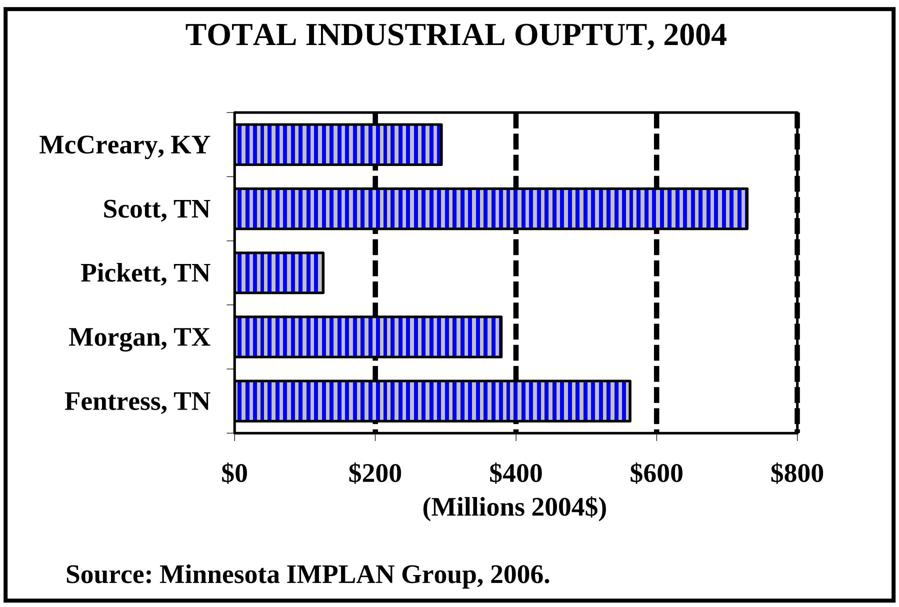
Continuing long-standing trends, local unemployment rates, which ranged from 7.1 percent in Fentress and Scott counties to 9.0 percent in McCreary County in 2005, are higher than the respective statewide averages.

Workforce commuting plays an important role in the local economies, as many local residents avail themselves of job opportunities in nearby communities while maintaining their local place of residence. Data from the 2000 Census indicated some level of commuting into these counties by non-residents, as well as out-commuting by local residences. The net flow was outward in all five counties, with significant outflows in Morgan, McCreary and Fentress counties. The net outflow in Morgan County was 3,620 workers, the equivalent of nearly 60 percent of the total employment based in the county. The net income inflows associated with such commuting is substantial, ranging from more than $15 million in Pickett County to $114 million in Morgan County in 2005, and help support local trade and services industries.

Among the five counties, residents of Fentress County had the highest per capita income in 2004, $21,847, while those of McCreary County had the lowest, $16,381. Average earnings per job in the same year ranged from $17,056 in Pickett County, to $26,378 in Scott County. Both measures of economic well-being trailed the respective statewide averages: $29,641 and $39,446 in Tennessee and $27,020 and $36,670 in Kentucky.

Differences in the scale and composition of the local county economies are apparent in their respective economic production. Farms, private businesses and governmental agencies in Pickett County produced goods and services with a combined value of $126 million in 2004 (see Figure 1 and **Table 4**). Scott County, the largest economy in terms of output, had total output of good and services valued at $729 million in 2004; nearly six times the size of neighboring Pickett County. The five-county region had a total annual economic of $2.1 billion in 2004.

Figure 1. Total Economic Output in 2004, By County



In terms of economic output, manufacturing, government services, health and social services, retail trade and utilities were the five largest industries in the region, together producing 69 percent of the total regional output of goods and services (see **Table 4**). Manufacturing alone, anchored by the more than $310 million in output in Scott County accounted for 27 percent of the annual output; $563 million. Wood products, fabricated metals, miscellaneous durable goods and textile and leather product manufacturing were the three largest manufacturing sub-sectors.

Government was the second largest sector in terms of annual output, at nearly $427 million in 2004.[1] McCreary, Scott and Morgan counties each had more than $100 million in government services. The third

[1] The total includes a small amount of output associated with establishments that were not classified in one of the North American Industry Classification Scheme (NAICS).

through fifth ranked health care and social services, utilities and retail trade sectors had combined total output of $442 million, just $15 million higher than the second-ranked government sector.

The top five sectors in terms of economic output in Scott and McCreary counties were the same as those on the regional level. The government and utilities sectors industries also rank among the top five industries in the other three counties as well. A factor contributing to the high ranking of the utilities sector are billings to commercial, industrial and residential consumers by local electrical, gas and telephone utilities, including deliveries by Citizens Gas Utility District of locally produced gas. Agricultural services and forestry is among the top five in Fentress, Morgan and Pickett counties, and other services completes the top five ranking in Morgan County.

Table 4. Total Economic Output, 2004 (Millions of 2004$)
(Sorted in descending order of the Regional Total)

	Fentress, TN	**Morgan, TN**	**Pickett, TN**	**Scott, TN**	**McCreary, KY**	**Regional Total**
Manufacturing	$10.10	**$49.00**	**$29.10**	**$310.70**	**$64.40**	**$563.30**
Government and non-NAICS establishments	**$85.50**	**$101.90**	**$21.70**	**$101.00**	**$116.50**	**$426.60**
Health and social services	**$62.70**	$17.30	$ -	**$53.00**	**$17.20**	**$150.20**
Utilities	**$51.30**	**$33.00**	**$14.80**	**$33.90**	**$13.00**	**$146.00**
Retail Trade	**$46.80**	$19.00	**$10.60**	**$42.90**	**$26.70**	**$146.00**
Ag., Forestry, Fishing & Hunting	**$64.10**	**$26.10**	**$15.00**	$10.80	$3.00	$119.00
Other Services	$34.80	**$35.60**	$4.60	$30.30	$2.80	$108.10
Finance & Insurance	$33.20	$15.80	$5.80	$20.30	$11.80	$86.90
Transportation & Warehousing	$14.70	$12.70	$2.50	$34.90	$6.20	$71.00
Construction	$3.70	$14.40	$2.00	$25.10	$2.90	$48.10
Real estate and rental	$10.50	$16.40	$7.40	$4.50	$3.80	$42.60
Accommodation & Food Services	$10.80	$4.90	$2.30	$16.10	$8.00	$42.10
Professional, scientific and technical services	$14.60	$4.20	$1.10	$9.00	$4.30	$33.20
Wholesale Trade	$5.90	$8.90	$0.40	$12.20	$5.70	$33.10
Mining, including Oil and Gas	$4.40	$2.90	$ -	$16.90	$0.40	$24.60
Information	$2.10	$8.10	$0.40	$2.90	$5.50	$19.00
Administrative & Waste Services	$4.00	$3.80	$0.90	$3.40	$0.60	$12.70
Arts, entertainment & recreation	$2.10	$3.30	$2.90	$0.30	$0.30	$8.90
Educational Services	$0.80	$0.60	$4.30	$0.10	$0.70	$6.50
Management of Companies	$ -	$1.00	$ -	$0.20	$ -	$1.20
TOTALS	$ 562.1	$ 378.9	$ 125.8	$ 728.5	$ 293.8	$ 2,089.1

Note: Shaded cells indicate the top 5 industrial sectors in each county and the region, based on estimated economic output in 2004.

Source: Minnesota IMPLAN Group, 2006.

Tourism and outdoor recreation are important to the regional economies. BISO and other recreation and tourism attractions and opportunities in the region attract visitors from outside the region, as well as use by year-round and seasonal residents. These other attractions include the Big South Fork Scenic Railway, Pickett State Park and Rustic Forest and Scott State Forest, and the Daniel Boone National Forest, all of which attract visitors from outside the region, as well as use by year-round and seasonal residents. Much of the economic stimulus associated with tourism and recreation is captured in the arts, entertainment and recreation and accommodation and food services industries. Establishments in those sectors generated total output of $51 million in 2004. Although also serving demands of local residents, a substantial portion of that output was associated with tourism.

Not readily apparent in **Table 4** is the economic contribution of BISO within the regional economy. BISO hosted 622,807 recreation visitors in 2006, nearly 69,000 of which were overnight stays. Those visitors spent an estimated $21.9 million in the local economy, supporting 375 jobs and $ 6.5 million in personal income. In addition, the park had $ 3.5 million in annual payroll, plus other on-going operating outlays which directly and indirectly supported 71 jobs and $ 4.0 million in personal income within the economy (NPS 2007). The synergies between BISO and these other attractions likely compound the economic contributions of BISO beyond those directly associated with its operations and expenditures of visitors.

BISO staff report an increase in dispersed recreation use, including hiking, horseback riding, cross-country skiing, and OHV use, in southern portion of the park. Much of this use is believed to be associated with increasing residential development near the park, with homes being marketed as principal homes for year-round occupancy but also as seasonal/second homes for households whose primary residence is in Knoxville, Nashville, or elsewhere. Having the national recreation area as a “backyard” neighbor is likely viewed as an amenity because it diminishes (eliminates?) future development potential in the area and is also seen as offering relatively quick and easy access to trails and other recreation opportunities. Recent oil and gas development and related production and maintenance activities within the recreation area factor into the increased visitor use because the roads improve access into interior portions of the recreation area.

In 2004, the local mining sector in the region produced $24.6 million in output, approximately 1.2% of the total regional output, two-thirds of that occurring in Scott County. Natural gas and crude oil production, including that from wells within the boundaries of BISO accounts for a substantial but undisclosed portion of the mining output in Scott County. The economic significance of the local mining industry, including oil and gas, is limited in the other counties, with total output ranging from $0.4 million in McCreary County to $4.4 million in Fentress County. Data on recent oil and gas production data are not available for the local counties, however, data published by the U.S. Energy Information Administration indicates that statewide production of oil and gas in Tennessee has declined over the past several years. Crude oil production in Kentucky has also been declining, but natural gas production has been increasing.

Detailed data on the local oil and gas industry is not published due to its small size. However, available data suggest 6 to 8 oil and gas drilling, production and services firms, with a total of 40 to 50 employees based in the Scott and Morgan counties (Tennessee Department of Labor and Workforce Development, 2007 and Dun & Bradstreet 2006). Those firms and employees are, however, not strictly tied to development and production related to resources underlying BISO due to other existing oil and gas development and production in the surrounding area. Neither is new oil and gas development confined to the recreation area, but rather is also occurring on private fee lands in surrounding areas. Some of that development is readily visible along public roads in the area and also near some of the new residential developments.

Other potential social and economic linkages with local oil and gas production include contributions to local natural gas supply, tax revenues, and royalty income for private mineral rights owners.

With respect to the relationship to natural gas supply, most all local production flows into a local gathering system which is then marketed regionally. Little if any locally produced gas flows into the interstate market because Tennessee is a net importer of natural gas; the 400 producing gas wells in the state produced about 2.66 billion cubic feet of gas, just over one percent of statewide consumption in 2006 (EIA 2007). Approximately 40 percent of the total statewide natural gas production was from Morgan, Scott or Fentress counties (Tennessee Energy Division 2007). Neither the portion of that total from resources underlying BISO, nor the share of regional consumption supplied by BISO-related gas is known. Local production does not meet all demand and Citizens Gas Utility District, the local gas utility has tie-ins to several existing pipelines. Thus, were local production to be restricted, the local market would not be left without a source of natural gas, although local consumers might experience some increases in energy prices. The magnitude of those price effects is indeterminate due to uncertainty regarding the potential extent of effects on production and overall future energy supply and demand conditions. However, based on the areal extent of potentially affected production, the effects would be expected to be minor.

Statewide crude oil production in 2006 was 261,575 barrels. Of that, 107,442 barrels (41% of the total) was produced in Morgan, Scott or Fentress Counties (Tennessee Energy Division 2007). Crude is initially stored in on-site tank batteries, from where it is collected via tanker truck. Local production is thought to be trucked to a refinery in Kentucky (unverified at this time).

Tennessee imposes a 3 percent severance tax on the sale prices of crude oil and gas produced in the state. The tax is allocated two-thirds to the state general fund and one-third to the county in which the wellhead is located. For fiscal year 2006/07, total statewide receipts were about $1,041,000; a 28 percent increase as compared to 2004/05 due primarily to higher prices. Data on the distributions to local governments is not available, but assuming pro-rata distribution based on production would result in total distributions of about $400,000 to Morgan, Fentress and Scott counties, a nontrivial sum, but relatively limited given the combined general fund revenues of more than $21 million for these counties and in comparison to local property and local option sales taxes (Tennessee Comptroller 2007). Furthermore, only a portion of the production and the revenues are associated with resources underlying BISO. Consequently any constraints to future production from resources underlying BISO would likely have little adverse impact on county budgets.

A final consideration in this determination is the potential that some local residents could see a reduction in income associated with the loss of royalty/lease revenue from production. The number and distribution of mineral royalty/lease recipients associated with the BISO-related wells is unknown. Given the following: 1) such royalties/lease payments are a fractional share of the total value of production, 2) the approximate value of all local crude oil and natural gas production, based on recent production and energy prices, is $10 to $13 million per year, 3) not all royalty/lease recipients would be expected to be local residents, 4) not all production would be affected, and 5) the combined personal income of the two counties exceeds $1.5 billion annually with nearly $181 million in dividends, interest and rent, then, it is reasonable to conclude that any prospective reduction associated with the oil and gas management plan would not constitute more than a negligible impact to income in the local economy, though one or more individuals may experience a more substantial adverse income impact.

The economic impact of compliance on the local oil and gas industry

There is insufficient data available on which to estimate the potential economic effects of the higher compliance costs. Instead, the analysis focuses on how the costs may impact existing and future development.

Compliance with the 9B regulations imposes additional economic costs on owners/operators of existing wells and factors into the overall economic feasibility assessment for prospective future wells. In the case of the former, these costs affect an owner/operator's assessment of continued production and operation versus plugging and reclamation. For the latter, the compliance costs affect the cost of new well development and expected returns, and hence, the investment decision about whether to proceed.

There are four major elements of the overall compliance costs: (1) plan preparation, (2) compliance with reclamation standards, (3) compliance with operating standards, and (4) performance bonding. Actual costs associated with each element will vary in response to topography, access and other site conditions, and the expected extent of necessary natural and cultural surveys. Furthermore, the overall costs are comprised of both one-time and recurrent costs, with some one-time outlays required upfront and others coming at the end of a well's economic production life during plugging and reclamation. Cost estimates prepared by the NPS suggest a range of one-time costs of $13K to $38K and $3.5K in annual costs, on a per well basis. The majority of the one-time costs, $10K - $30K, are associated with elements (1), (2) and (3) and would be incurred in conjunction with initial compliance, that is, to bring an existing well into compliance or developing a new well. An estimated $3K to $8K would be incurred as part of final plugging and reclamation. A decision to plug and reclaim a marginal well would avoid the recurrent costs.

In the case of existing wells, foreseeable effects include decisions by operators of marginal properties, i.e., low volume producers, to plug and reclaim these wells. In the short-term such a decision would temporarily support a higher level of employment activity, but would thereafter result in marginal reductions in local economic activity over the long-term. Temporary boosts in activity would also result in conjunction with the initial compliance work for existing wells with current and anticipated rates of production adequate to justify the initial investments and recurrent costs.

Once a new well is completed and initial compliance achieved, the future decisions regarding sustaining production versus plugging and reclaiming would be largely a function of production rates, gas prices and the operating expenses. By definition, an operator’s decision to plug and abandon a well would come into play primarily with wells at or near the end of their productive lives. All other things being equal, principally future production and gross revenues, one could reasonably expect the net impact of higher recurrent and reclamation costs to be a decision to plug and reclaim a well several years sooner than would otherwise have occurred. Consequently, the net effects would be limited as they relate to local economic output, the level of local production available for marketing within the region, the income and profitability of operators and mineral interest owners, local employment in the oil and gas industry, and state and local government taxes.

The impacts of compliance on future development is uncertain as such development is contingent upon numerous factors, including the prospects for successful well development, the anticipated production, other development costs, and market prices of oil and natural gas. Many of these factors are beyond the control of the operators, mineral interest owners, or the National Park Service. Given these factors, the likely effects of the higher compliance costs, particularly the one-time upfront costs, would be to delay/defer the development of some new wells within the Park, shifting more development interest to other locations. This would occur in cases where the expected return on investment is unsatisfactory. In general, the higher the share of total well development costs represented by the $10K to $30K, the more pronounced the impacts.

In instances when an operator decides to proceed with a new well, such wells would be subject to ongoing assessment of economic viability, given the recurrent costs and pending plugging and reclamation costs. Once operational, the economic impact of the compliance requirements would be to reduce long-term operator profitability. However, the overall reduction in profitability may not accrue locally. On one hand, reductions in profitability would result due to the need to hire additional staff or contractors to conduct the compliance assessments, complete the requisite actions identified in the assessments, and complete the ongoing reporting and monitoring activities. The increased costs would translate into lower investment in the industry and lower income for operators and owners, an unknown portion of which accrues locally. On the other hand, reductions in profitability would be largely manifest in terms of marginally higher employment and labor income during well development and operations. Such employment and income effects would accrue primarily within the local economy, offsetting some or much of the reduction in profitability with respect to the local economy.

Despite the offset between wage and salary earnings of workers and the reduced profitability for operators and owners, some members of the latter group would experience declines in income and economic welfare due to the higher compliance. The number of individuals affected, the magnitude of the impacts, and overall effect of these declines is uncertain. In individual instances, typically affecting more marginal operations, the effects could be dramatic, potentially resulting in a complete cessation of operations.

The potential adverse impacts on some individual operations notwithstanding, the net economic effects of the compliance regulations are likely to be negligible in the short-term and long-term given current production levels and the size and structure of the regional oil and gas industry.

Overall Conclusion

The regulations would affect only a segment of the industry’s operations. The oil and gas industry has only a limited presence in the regional economy. Current oil and gas production levels in the region are relatively low, less than 110,000 barrels of oil and about 1.0 billion cubic feet of natural gas in 2006.[2] Much, if not most, of the current production is from outside of the Big South Fork National River and Recreation Area and the industry is actively engaged in new drilling outside of the Park. Thus, although the costs of compliance with the proposed regulations may accelerate the shutdown of older, marginal wells and defer development of some new wells within the Big South Fork NRRA, the overall impacts on regional social and economic conditions would be very limited in scope and economic importance when considered in the context of the regional economy. As a result, the net effects on social and economic conditions associated with implementation would be negligible.

[2] Production is for the Morgan, Scott, Fentress and Pickett counties. Production data for McCreary County is not available.

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Obed Wild and Scenic River (2/1/2008)

Past, present and potential future oil and gas development and production from resources underlying the Obed Wild and Scenic River are linked to the social and economic environment of the surrounding community. Although the economic costs of compliance with the proposed regulations may accelerate shutdown and reclamation of older, marginal wells and defer development of some new wells within the Obed WSR, the overall impacts on regional social and economic conditions would be very limited in scope and economic importance when considered in the context of the overall regional economy. As a result, the net effects on social and economic conditions associated with implementation would be negligible, and therefore eliminated from detailed consideration.

Sufficient description of the affected environment and consideration of the potential impacts on social and economic conditions in the region to support the preceding conclusion are presented below.

Social and Economic Conditions

Cumberland and Morgan counties would comprise the influence area for socioeconomics for purposes of the oil and gas management plan. These two counties encompass all federal surface lands and the federal oil and gas estate within the Congressionally-approved boundaries of the Obed Wild and Scenic River. Both counties are predominately rural in character, with settlement patterns, land use, and economic activity influenced heavily by terrain, natural resources, and transportation networks.

Cumberland County had an estimated 51,346 residents in 2005, an increase of nearly 10 percent since 2000 and double the statewide population growth of 4.8 percent during the same period. Of the residents in 2005, 10,547 lived in Crossville, the county seat, with approximately twice that number living in the nearby surrounding unincorporated area. Much of the remaining population resides in and around several unincorporated communities situated along the U.S. 70 corridor to the west and southeast of Crossville, and in an area known as Fairfield Glade south/southwest of the Obed River.

Morgan County had 20,157 residents in 2005, a modest 2.0 increase over the population in 2000 (see Table 5 below). About 900 of these residents lived in Wartburg, the county seat and largest community in the county. The remaining population tends to be relatively more concentrated in the southern portion of the county, south and southeast of the Obed River, due to its proximity to Oak Ridge, Knoxville and the I-40 corridor.

Table 5. Selected Demographic Characteristics, Obed Socioeconomic Influence Area

Demographic Measure	Cumberland, TN	Morgan, TN	Total
Population, 2000	46,802	19,757	66,559
Population, 2005 Estimate	51,346	20,157	71,503
Population, change, 2000 to 2005	4,544 / 9.7%	400 / 2.0%	4,944 / 7.4%
Persons 65 years & older, 2000	9,615 / 20.5%	2,277 / 11.5%	11,892 / 17.9%
Median age (years), 2000	42.5	36.5	35.9
Total Housing Units, 2000	22,442	7,714	30,156
Housing, Percent vacant (2000)	13.1%	9.4%	12.1%
Median Household Income, 2004	$34,061	$30,387	NA
Percent of Population in Poverty, 2004	14.7%	18.7%	NA

Sources: U.S. Census Bureau, 2002, U.S. Census Bureau, 2006(a), and U.S. Census Bureau 2006(b)

More than 80 percent of all households in the two counties own their homes. Residents of Cumberland County tend to be older and have higher incomes than those in Morgan County. However, the 2004 median income in Cumberland County ($34,061) was 13% below the statewide figure of $38,945. The overall poverty rate in Cumberland County (14.7%) was lower than both Morgan County (18.67%) and the statewide average of 15 percent. In 2000, there were nearly 3,000 vacant housing units in Cumberland County, of which 1,400 were for seasonal, recreational, or other occasional use.

Home ownership among Morgan County households was 83 percent. However, the median income of $30,387 in 2004 was 22 percent below the statewide median of $38,945, and the local poverty rate (18.7%) was 25 percent higher than the statewide figure (15%). In 2000, housing vacancy rates averaged 9.4 percent in Morgan County, however, unlike in Cumberland County, relatively few of these units were for seasonal, recreational or other occasional use. Rather they were primarily vacant rental units.

The economies of Cumberland and Morgan counties differ in scale, composition, and other characteristics. Total employment in Cumberland County was 24,376 in 2004; nearly four times the 6,133 jobs in Morgan County (see Table 6). Farm and other proprietors accounted for 28 percent of all employment in Cumberland County and 53 percent in Morgan County. Farm and other proprietors accounted for 20 percent of all employment statewide.

Table 6. Selected Economic Characteristics, Obed Socioeconomic Influence Area

Economic Measure	Cumberland, TN	Morgan, TN	Total
Total employment, 2004	24,376	6,133	30,509
Farm employment, percent of total 2004	3.8%	6.9%	4.4%
Private non-farm employment, percent of total, 2004	87.2%	67.0%	83.1%
Government, percent of total, 2004	9.0%	26.1%	12.4%
Total Personal Income (millions), 2004	$ 1,174.3	$ 372.9	$ 1,547.2
Per Capita Income, 2004	$23,671	$17,975	NA
Average earnings per job, 2004	$28,283	$21,363	NA
Labor force, 2005	22,163	8,103	30,266
Average unemployment, 2005	1,417	624	2,041
Annual unemployment rate, 2005	6.4%	7.7%	6.7%
Net flow of workers, 2000	Net 456 out	Net 3,620 out	NA

Sources: U.S. Bureau of Economic Analysis, 2006 and U.S. Bureau of Labor Statistics, 2006.

The relatively large difference in jobs, when compared to the relative difference in population, is accounted for by the fact that many Morgan County residents commute to work in Oak Ridge and Knoxville – in 2000, 3,620 more residents commuted to work elsewhere than commuted into Morgan County for jobs. A net outflow of workers also occurred in Cumberland County, but at a much lower rate.

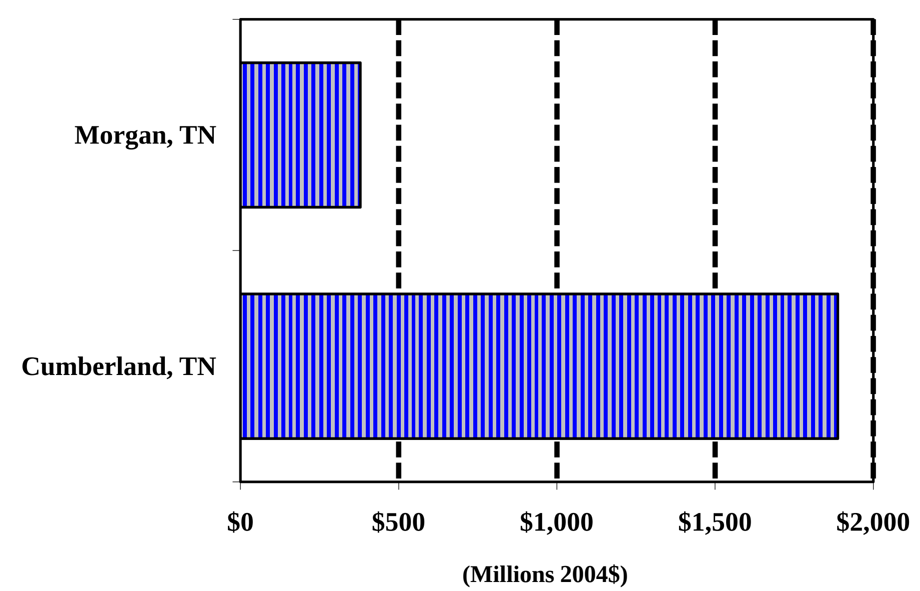
The per capita incomes of residents and average earnings per job in Cumberland County are each higher than the corresponding measures in Morgan County (see Table 6), but much lower than the statewide averages of $29,641 and $39,446, respectively.

Continuing a long-standing trend, average annual unemployment rates in 2005 were 6.4 percent and 7.7 percent in Cumberland and Morgan counties, respectively, above the statewide average of 5.6 percent.

The two counties are differentiated from one another in terms of economic structure. Private non-farm employment accounted for 87.2 percent of all jobs in Cumberland County in 2004. Farm and government positions accounted for 3.8 and 9.0 percent of the jobs, respectively. In Morgan County, private non-farm jobs accounted for 67 percent of employment, while farm and public sector jobs accounted for 6.9 percent and 26.1 percent of jobs, respectively. Statewide, private non-farm jobs represented 84.9 percent of the total.

Differences in the scale and composition of the two county economies are also apparent in their respective economic production. Farms, private businesses and governmental agencies in Cumberland County produced goods and services with a combined value of $1.89 billion in 2004 (see Figure 2). The corresponding measure of the output of good and services in Morgan County in 2004 was $379 million; one-fifth that of its neighbor.

Figure 2. Total Annual Economic Output in 2004



Source: Minnesota IMPLAN Group, 2006.

In terms of economic output, manufacturing, government services, retail trade, health and social services, and utilities were the five largest industries in Cumberland County, together producing 60 percent of the annual value of goods and services (see Table 7). Manufacturing by itself accounted for 22 percent of the annual output, with ceramic, glass and motor vehicle parts the three largest sub-sectors. The five largest industries in terms of economic output in Morgan County are government, manufacturing, other services (e.g. equipment repair, dry-cleaning, pet care and photofinishing services), utilities, and agriculture, forestry, fishing and hunting. These five industry groups accounted for 65 percent of the total annual local output of goods and services.

Not readily apparent in Table 7 is the economic contribution of OBRI within the regional economy. OBRI hosted 184,573 recreation visitors in 2005. It is estimated that those visitors spent $ 7.1 million in the local economy, supporting 139 jobs and $ 2.6 million in personal income. In addition, the park had $ 0.5 million in annual payroll, plus other on-going operating outlays which directly and indirectly supported 23 jobs and $ 0.6 million in personal income within the economy. (NPS 2006)

Table 7. Total Economic Output, 2004 (Millions of 2004$) *(Sorted in descending order of the Regional Total)*			
Major Industrial Sector	**Cumberland, TN**	**Morgan, TN**	**Regional Total**
Manufacturing	$407.50	$49.00	$456.50
Government and non-NAICS establishments	$234.30	$101.90	$336.20
Retail Trade	$175.60	$19.00	$194.60
Health and social services	$169.10	$17.30	$186.40
Utilities	$151.50	$33.00	$184.50
Real estate and rental	$121.10	$16.40	$137.50
Other Services	$71.40	$35.60	$107.00
Transportation & Warehousing	$81.10	$12.70	$93.80
Accommodation & Food Services	$72.40	$4.90	$77.30
Information	$67.20	$8.10	$75.30
Finance & Insurance	$59.20	$15.80	$75.00
Ag., Forestry, Fishing & Hunting	$46.50	$26.10	$72.60
Wholesale Trade	$53.30	$8.90	$62.20
Mining, including Oil and Gas	$47.30	$2.90	$50.20
Professional, scientific and technical services	$45.90	$4.20	$50.10
Arts, entertainment & recreation	$34.90	$3.30	$38.20
Administrative & Waste Services	$30.00	$3.80	$33.80
Construction	$14.10	$14.40	$28.50
Management of Companies	$3.90	$1.00	$4.90
Educational Services	$1.50	$0.60	$2.10
TOTALS	**$ 1,887.8**	**$ 378.9**	**$ 2,266.7**

Source: Minnesota IMPLAN Group, 2006.

The local mining sector in Cumberland County produced $47.3 million in output, approximately 2.5% of the county total, most of that was from coal, stone and sand and gravel. Data for the local oil and gas industry are not published due to its small size. However, available data suggest 1 or 2 oil and gas production firms and 1 or 2 drilling or other oil and gas service firms, with a total of 15 to 25 employees based in the county (Tennessee Department of Labor and Workforce Development, 2007 and Dun & Bradstreet 2006). Those firms and employees are, however, not strictly tied to development and production related to resources underlying OBRI due to other development and production in the surrounding area.

The economic significance of the local mining industry, including oil and gas, is even more limited in Morgan County. In 2004, the industry's total annual output was $2.9 million, 0.8 percent of the county total. As in Cumberland County, stone quarries account for a substantial portion of that total. Available data again suggest 3 or 4 small oil and gas production and/or service establishments with local operations (Tennessee Department of Labor and Workforce Development, 2007 and Dun & Bradstreet 2006).

Other firms/operators are thought to be active in the area. However, the inference from the available data is that their activities are supported from locations outside of Cumberland and Morgan Counties, which would further diminish the relative significance of potential social and economic effects of potential actions associated with the oil and gas management plan.

Other potential social and economic linkages with local oil and gas production include contributions to local natural gas supply, tax revenues, and royalty income for private mineral rights owners.

With respect to the relationship to natural gas supply, most all local production flows into a local gathering system which is then marketed regionally. Little if any locally produced gas flows into the interstate market because Tennessee is a net importer of natural gas; the 400 producing gas wells in the state produced about 2.66 billion cubic feet of gas, just over one percent of statewide consumption in 2006 (EIA 2007). Approximately 27 percent of the total statewide natural gas production was from Morgan County. None of the production occurred in Cumberland County. (Tennessee Energy Division 2007). Neither the portion of that total from resources underlying OBRI, nor the share of regional consumption supplied by OBRI-related gas is known.

Local production does not meet all demand and Citizens Gas Utility District, the local gas utility has tie-ins to several existing pipelines. Thus, were local production to be restricted, the local market would not be left without a source of natural gas, although local consumers might experience some increases in energy prices. The magnitude of those price effects is indeterminate due to uncertainty regarding the potential extent of effects on production and overall future energy supply and demand conditions. However, based on the areal extent of potentially affected production, the effects would be expected to be minor.

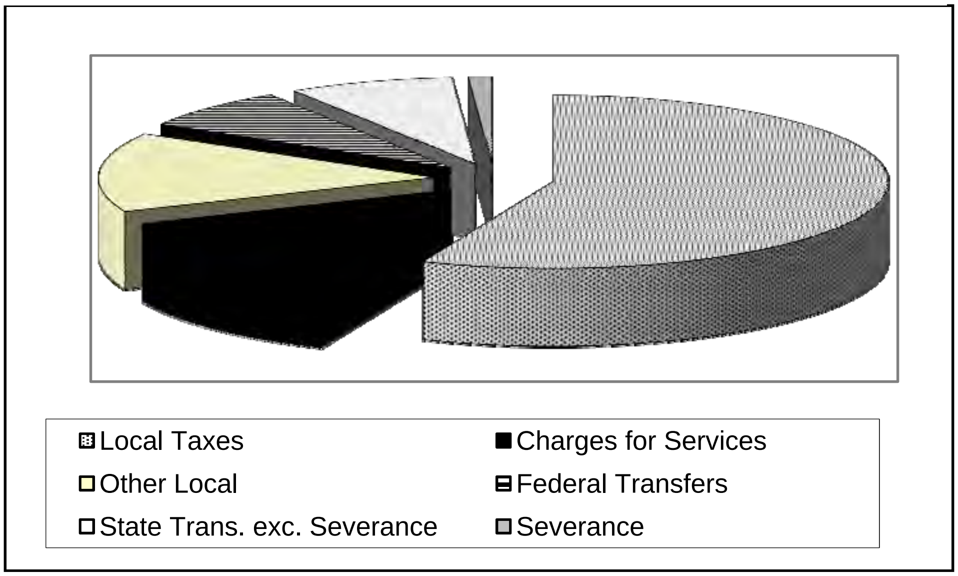
Statewide crude oil production in 2006 was 261,575 barrels. Of that, 203 barrels (less than 0.1%) were produced in Cumberland County with 49,963 barrels (19%) produced in Morgan County (Tennessee Energy Division 2007). Crude is initially stored in on-site tank batteries, from where it is collected via tanker truck. Local production is thought to be trucked to a refinery in Kentucky (unverified at this time).

Tennessee imposes a 3 percent severance tax on the sale prices of crude oil and gas produced in the state. The tax is allocated two-thirds to the state general fund and one-third to the county in which the wellhead is located. For fiscal year 2006/07, total statewide receipts were about $1,041,000; a 28 percent increase as compared to 2004/05 due primarily to higher prices.

Data on the distributions to local governments is not available, but pro-rata distribution suggest annual oil and gas severance revenues to Morgan County, based on all oil and gas production in the county,[3] of $60,000 to $70,000 per year. Such revenues are about 1.1 percent of the county's annual general fund budget of $5.8 million; nontrivial but limited as compared to local property and local option sales taxes (see Figure 3) (Tennessee Comptroller 2007). Cumberland County receives little or no oil and gas severance taxes due to the limited production in the county.

[3] A total of approximately 324,000 barrels of crude oil were produced in Tennessee that same year, 16 percent of that from within Morgan County (Tennessee Energy Division 2007).

Figure 3. Morgan County General Fund Revenues 2005



Once again, any limitations on future production from resources underlying OBRI would likely have little adverse impact on the county's budget.

A final consideration in this determination is the potential that some local residents could see a reduction in income associated with the loss of royalty/lease revenue from production. The number and distribution of mineral royalty/lease recipients associated with the OBRI-related wells is unknown. Given the following: 1) such royalties/lease payments are a fractional share of the total value of production, 2) the approximate value of all local crude oil and natural gas production, based on recent production and energy prices, is $5 to $8 million per year, 3) not all recipients would be expected to be local residents, 4) not all production would be affected, and 5) the combined personal income of the two counties exceeds $1.5 billion annually with more than $236 million in dividends, interest and rent, then, it is reasonable to conclude that any prospective reduction associated with the oil and gas management plan would not constitute more than a negligible impact to income in the local economy, though one or more individuals may experience a more severe adverse income impact.

The economic impact of compliance on the local oil and gas industry

There is insufficient data available on which to estimate the potential economic effects of the higher compliance costs. Instead, the analysis focuses on how the costs may impact existing and future development.

Compliance with the 9B regulations imposes additional economic costs on owners/operators of existing wells and factors into the overall economic feasibility assessment for prospective future wells. In the case of the former, these costs affect an owner/operator's assessment of continued production and operation versus plugging and reclamation. For the latter, the compliance costs affect the cost of new well development and expected returns, and hence, the investment decision about whether to proceed.

There are four major elements of the overall compliance costs: (1) plan preparation, (2) compliance with reclamation standards, (3) compliance with operating standards, and (4) performance bonding. Actual costs associated with each element will vary in response to topography, access and other site conditions, and the expected extent of necessary natural and cultural surveys. Furthermore, the overall costs are comprised of both one-time and recurrent costs, with some one-time outlays required upfront and others coming at the end of a well's economic production life during plugging and reclamation. Cost estimates prepared by the NPS suggest a range of one-time costs of $13K to $38K and $3.5K in annual costs, on a per well basis. The majority of the one-time costs, $10K - $30K, are associated with elements (1), (2) and (3) and would be incurred in conjunction with initial compliance, that is, to bring an existing well into compliance or developing a new well. An estimated $3K to $8K would be incurred as part of final plugging and reclamation. A decision to plug and reclaim a marginal well would avoid the recurrent costs.

In the case of existing wells, foreseeable effects include decisions by operators of marginal properties, i.e., low volume producers, to plug and reclaim these wells. In the short-term such a decision would temporarily support a higher level of employment activity, but would thereafter result in marginal reductions in local economic activity over the long-term. Temporary boosts in activity would also result in conjunction with the initial compliance work for existing wells with current and anticipated rates of production adequate to justify the initial investments and recurrent costs.

Once a new well is completed and initial compliance achieved, the future decisions regarding sustaining production versus plugging and reclaiming would be largely a function of production rates, gas prices and the operating expenses. By definition, an operator’s decision to plug and abandon a well would come into play primarily with wells at or near the end of their productive lives. All other things being equal, principally future production and gross revenues, one could reasonably expect the net impact of higher recurrent and reclamation costs to be a decision to plug and reclaim a well several years sooner than would otherwise have occurred. Consequently, the net effects would be limited as they relate to local economic output, the level of local production available for marketing within the region, the income and profitability of operators and mineral interest owners, local employment in the oil and gas industry, and state and local government taxes.

The impacts of compliance on future development is uncertain as such development is contingent upon numerous factors, including the prospects for successful well development, the anticipated production, other development costs, and market prices of oil and natural gas. Many of these factors are beyond the control of the operators, mineral interest owners, or the National Park Service. Given these factors, the likely effects of the higher compliance costs, particularly the one-time upfront costs, would be to delay/defer the development of some new wells within the Park, shifting more development interest to other locations. This would occur in cases where the expected return on investment is unsatisfactory. In general, the higher the share of total well development costs represented by the $10K to $30K, the more pronounced the impacts.

In instances when an operator decides to proceed with a new well, such wells would be subject to ongoing assessment of economic viability, given the recurrent costs and pending plugging and reclamation costs. Once operational, the economic impact of the compliance requirements would be to reduce long-term operator profitability. However, the overall reduction in profitability may not accrue locally. On one hand, reductions in profitability would result due to the need to hire additional staff or contractors to conduct the compliance assessments, complete the requisite actions identified in the assessments, and complete the ongoing reporting and monitoring activities. The increased costs would translate into lower investment in the industry and lower income for operators and owners, an unknown portion of which accrues locally. On the other hand, reductions in profitability would be largely manifest in terms of marginally higher employment and labor income during well development and operations. Such employment and income effects would accrue primarily within the local economy, offsetting some or much of the reduction in profitability with respect to the local economy.

Despite the offset between wage and salary earnings of workers and the reduced profitability for operators and owners, some members of the latter group would experience declines in income and economic welfare due to the higher compliance. The number of individuals affected, the magnitude of the impacts, and overall effect of these declines is uncertain. In individual instances, typically affecting more marginal operations, the effects could be dramatic, potentially resulting in a complete cessation of operations.

The potential adverse impacts on some individual operations notwithstanding, the net economic effects of the compliance regulations are likely to be negligible in the short-term and long-term given current production levels and the size and structure of the regional oil and gas industry.

Overall Conclusion

The regulations would affect only a segment of the industry's operations. The oil and gas industry has only a limited presence in the regional economy. Current oil and gas production levels in the region are relatively low, less than 50,000 barrels of oil and about 717 million cubic feet of natural gas in 2006.[4] Much, if not most, of the current production is from outside of the Obed Wild and Scenic River and the industry is actively engaged in new drilling outside of the Park. Thus, although the costs of compliance with the proposed regulations may accelerate the shutdown of older, marginal wells and defer development of some new wells within the Obed Wild and Scenic River, the overall impacts on regional social and economic conditions would be very limited in scope and economic importance when considered in the context of the regional economy. As a result, the net effects on social and economic conditions associated with implementation would be negligible.

[4] Production is for the Morgan and Cumberland counties.

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APPENDIX E: NON-IMPAIRMENT DETERMINATION

FIRST DRAFT

In addition to determining the environmental consequences of implementing the preferred and other alternatives, NPS *Management Policies 2006* (section 1.4) requires analysis of potential effects to determine whether or not the preferred alternative would impair a park's resources and values. The preferred alternative in this plan/EIS is alternative C.

The fundamental purpose of the national park system, established by the *Organic Act* and reaffirmed by the *General Authorities Act*, as amended, begins with a mandate to conserve park resources and values. NPS managers must always seek ways to avoid, or to minimize to the greatest degree practicable, adverse impacts on park resources and values. However, the laws do give the NPS the management discretion to allow impacts on park resources and values when necessary and appropriate to fulfill the purposes of the park. That discretion is limited by the statutory requirement that the NPS must leave resources and values unimpaired unless a particular law directly and specifically provides otherwise.

The prohibited impairment is an impact that, in the professional judgment of the responsible NPS manager, would harm the integrity of park resources or values, including the opportunities that otherwise would be present for the enjoyment of those resources or values (NPS *Management Policies 2006*). Whether an impact meets this definition depends on the particular resources that would be affected; the severity, duration, and timing of the impact; the direct and indirect effects of the impact; and the cumulative effects of the impact in question and other impacts.

An impact on any park resource or value may, but does not necessarily, constitute impairment. An impact would be more likely to constitute impairment to the extent that it affects a resource or value whose conservation is:

- necessary to fulfill specific purposes identified in the establishing legislation or proclamation of the park, or
- key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park, or
- identified in the park's general management plan or other relevant NPS planning documents as being of significance.

An impact would be less likely to constitute impairment if it is an unavoidable result of an action necessary to preserve or restore the integrity of park resources or values and it cannot be further mitigated.

Impairment may result from visitor activities, NPS administrative activities, or activities undertaken by concessioners, contractors, and others operating in the park. Impairment may also result from sources or activities outside the park.

A determination of impairment is made for each of the resource impact topics carried forward and analyzed in the environmental impact statement for the preferred alternative. Impairment findings are not necessary for visitor experience, public health and safety, environmental justice, and park operations. These impact areas are not generally considered to be park resources or values according to the *Organic Act*, and cannot be impaired the same way that an action can impair park resources and values.

The park purpose and significance were used as a basis for determining if the preferred alternative would cause impairment.

The following describes each resource or value for which impairment is assessed and the reasons why impairment would not occur. **However, for all the resources listed below:**

- In the case of Big South Fork NRRA, the park's enabling legislation states that the Secretary of the Interior shall allow mineral exploration and development, subject to appropriate regulations. Thus, the NPS must provide for these activities while protecting resources for the enjoyment of future generations.
- A site-specific analysis of the potential for impairment of park resources and values will be required on all proposed oil and gas projects in the park. The analysis must be included in the *National Environmental Policy Act* document on the plan of operations for all oil and gas projects and would ensure that impairment of resources would not occur. Also, under all alternatives, if mitigation measures are not adequately applied during the conduct of nonfederal oil and gas operations, there could be impacts on park resources and values. If this were to occur, the NPS would be required to suspend the operation until appropriate mitigation is applied. If mitigation is not technically feasible to avoid the impairment, the oil and gas operation would not be allowed to continue.
- If an accidental spill of hydrocarbons or other contaminating substance were to occur in the park, there could be major, short-term, adverse impacts particularly to water, vegetation, wetlands, soils, fish and wildlife resources. Even if there were a catastrophic spill, the site would be remediated and would not result in an impairment of park resources and values.
- Special Management Areas (SMAs) have been designated in alternative C that would protect resources and values particularly susceptible to adverse impacts from oil and gas operations. Geology and soils, water resources, floodplains, wetlands, sensitive vegetation communities, and specific visitor use areas would be provided specific protection. Operating stipulations in SMAs, including setbacks and a No Surface Use stipulation (unless otherwise authorized in a plan of operations) would be required to avoid or minimize adverse impacts and would further reduce the likelihood of impairment of resources and values in the park.
- Due to the designation of SMAs under alternative C, more wells may be directionally drilled from outside the park to develop hydrocarbons underlying the park. While indirect impacts on park resources and values could be greater from directional wells drilled from outside the park compared to operations inside the park, park resources and values would not be impaired by directional drilling and production. In some cases, directional drilling proposals would involve other federal agencies applying other permitting requirements (i.e., *Clean Water Act* Section 504 permitting). The NPS would participate with the other federal entity through its permitting process to request any necessary mitigation measures be applied to reduce the potential for major adverse impacts on park resources and values. If NPS is the only federal entity involved, and a directional drilling and production proposal could pose major adverse impacts on park resources and values, the NPS would need to base its § 9.32(e) exemption on the findings of an EIS. In most cases, operators would preclude the need to prepare an EIS by locating directional wells a sufficient distance from the park, and applying other necessary mitigation measures to reduce impacts.

Geology and Soils

Both parks are located in the Cumberland Plateau, which is characterized by flat or rolling upland areas, deeply incised river gorges, and a long line of cliffs that separate it from the lower elevations of the Ridge and Valley Province, which begins at the Cumberland Plateau's eastern escarpment. Both parks have soils that are representative of the Cumberland Plateau with a wide range of compaction, erodability, and runoff characteristics. Both parks are also known for their significant geologic features including prominent rock formations, as well as the massive gorges and accompanying bluffs.

The parks' geologic qualities and features are necessary to fulfill the purposes for which the parks were established and are key to the natural integrity of the park. Geologic resources and geologic features of the parks, including the gorge, bluffs, cliff lines, arches, and other geologic formations, are specifically identified in the parks' enabling legislation and planning documents. Actions in the preferred alternative include oil and gas exploration and development that would cause both short-term and long-term adverse impacts on soils and geological features. The designation of SMAs would limit the effects on geology and soils within SMA boundaries. Limiting drilling and production operations in the Sensitive Geomorphic Feature and Cliff Edge SMAs would reduce the degree of adverse impacts on soils and sensitive geomorphic features susceptible to adverse impacts from oil and gas operations. However, the construction and maintenance of access roads, wellpads, flowlines, and pipelines could erode, compact, and rut soils; introduce non-native construction materials; and reduce soil permeability; and releases of hazardous or contaminating substances during drilling or production operations could adversely affect soils. Additionally, the new management framework for plugging and reclamation would promote efficient plugging and reclamation of abandoned wells to applicable standards. This would ultimately enhance natural conditions in the park.

Adverse impacts would be negligible to minor, localized, and would affect up to 36 acres of the park surface – a small fraction (0.03 percent) of the 130,000 acres within the park units. Long-term impacts would be mitigated through site reclamation, and the preferred alternative includes actions to plug and reclaim existing sites that would reclaim up to 87 acres and provide long-term beneficial impacts. In addition, alternative C would make only a minor contribution to overall adverse cumulative impacts on geology and soils.

Because adverse impacts of the preferred alternative on geology and soils would be long-term and minor and the contribution to overall adverse cumulative impacts would be limited, there would be no impairment of geology and soils under alternative C.

Water Resources

One of the primary reasons the Big South Fork NRRA was established was to preserve the Big South Fork of the Cumberland River as a natural, free-flowing stream for the benefit and enjoyment of present and future generations. The Big South Fork River is formed by the New River and the Clear Fork, and drains the northern portion of the Cumberland Plateau in Tennessee. As the Big South Fork flows from south to north, it is fed by a variety of sources ranging from perennial streams, such as North White Oak Creek, to many ephemeral creeks. The Obed River flows east for approximately 45 miles to its junction with the Emory River, of which it is the largest tributary (NPS 1998b). The Obed River drains approximately 520 square miles at its mouth (NPS 1998b). The two principal tributaries of the Obed River—Clear Creek and Daddys Creek—join the Obed River within the Obed WSR area.

The parks' water resources are necessary to fulfill the purposes for which the parks were established and are key to the natural integrity of the parks. The significance of Big South Fork NRRA includes the free-flowing river system with a wide variety of habitats, including a world-class mussel assemblage. It is designated as a Tier III Outstanding Natural Water under the *Clean Water Act*. The significance of the Obed River's Wild and Scenic River (WSR) designation is described in its Strategic Plan. It is one of the last remaining wild rivers in the eastern United States, and is designated as a Tier II Outstanding Natural Water under the *Clean Water Act* because of its superior water quality.

Gorge restrictions at Big South Fork NRRA, deed restrictions at Obed WSR, and the regulatory requirement that surface operations shall at no time be conducted within 500 feet of the banks of perennial, intermittent, or ephemeral watercourses or within 500 feet of the high pool shoreline of natural or man-made impoundments (36 CFR 9.41(a)) would provide protection for park waters. In locations where water bodies fall within the 1,500-foot buffer provided for visitor use and administrative areas, additional protection of water resources could be anticipated. Establishing the Obed WSR SMA would preclude non-federal oil and gas operations (exploration, drilling, and production) on all federal lands in the park unit, providing protection of water resources here.

Actions in the preferred alternative include oil and gas exploration and development that would cause both short-term negligible to moderate adverse impacts to water resources. The long-term impacts of well development would be mitigated through site reclamation, and the preferred alternative includes actions to plug and reclaim existing sites that would remove sources of contamination and provide long-term beneficial impacts. Additionally, the new management framework for plugging and reclamation would promote efficient plugging and reclamation of abandoned wells to applicable standards. This would ultimately enhance natural conditions in the park. In the event of catastrophic well failure or uncontrolled release, long-term or major adverse impacts to water resources would be unlikely because production sites would be placed at least 500 feet from water sources and remediation would be required. In addition, alternative C would make only limited contributions to overall adverse cumulative impacts on water resources.

Because adverse impacts of the preferred alternative on water resources would be short-term and negligible to moderate, and the contribution to overall adverse cumulative impacts would be limited, there would be no impairment of water resources under alternative C.

Floodplains

Floodplains have not been delineated in Big South Fork National River and Recreation Area. However, there are narrow floodplains in the gorge area, and small ones throughout the rest of the property. In the headwater areas of the major rivers within the area, slopes are steep, and floodplains are therefore not well-formed. Floodplains of limited extent increase in occurrence farther downstream. As with Big South Fork NRRA, floodplains have not been delineated within Obed WSR. However, the extremely narrow, confined nature of this valley, and the associated high-energy water regimes, place a firm limit on the extent of natural floodplain development within the Obed WSR. Seasonally flooded habitat does exist, but it is on alluvial point bars, rather than on floodplains.

Although floodplains are not specifically identified as significant in the purpose and significance statements included in the enabling legislation or park planning documents, floodplains are important to the parks' free flowing systems and ecosystem health. Oil and gas operations could cause short and long-term, negligible to minor adverse effects on floodplains, mainly through road development, and the preferred alternative includes actions to plug and reclaim existing wells, which would remove sources of contamination and structures in floodplains, and provide long-term beneficial impacts. While none of the SMAs were developed to specifically protect floodplains, SMA restrictions would provide more consistent direct protection of floodplains. Specifically, the 500-foot setback from rivers and streams would provide a great deal of floodplain protection. In locations where floodplains occur within the 1,500-foot buffer provided for visitor use and administrative areas, additional protection of floodplain functions could be anticipated. However, oil and gas development on lands adjacent to floodplains d continue to have indirect effects. Additionally, the new management framework for plugging and reclamation would promote efficient plugging and reclamation of abandoned wells to applicable standards. This would ultimately enhance natural conditions in the park. In addition, alternative C would make only a minor contribution to overall adverse cumulative impacts on floodplain functions. In the event of catastrophic well failure or uncontrolled release, impacts to floodplains would be unlikely because production sites would be set back from water courses.

Because long-term adverse impacts of the preferred alternative on floodplains would be no greater than long-term and minor, and the contribution to overall adverse cumulative impacts would be limited, there would be no impairment of floodplains under alternative C.

Wetlands

The parks contain approximately 2,800 acres of wetlands, the vast majority of which are associated with the parks' rivers (riverine) or lakes (lacustrine) and are permanently flooded. In addition, palustrine wetlands (vegetated with varying inundation periods) comprise just over 4 percent of the total wetland acreage. Although wetlands are not specifically identified as significant in the purpose and significance statements included in the enabling legislation or park planning documents, wetlands are and important habitat and critical to ecosystem health.

Oil and gas operations could cause up to long-term minor adverse effects on wetlands, mainly through indirect impacts of potential sediment deposition from drilling, production, plugging, and reclamation activities. While none of the SMAs were developed to specifically protect wetlands, wetlands would indirectly benefit from the SMAs and setbacks located in or near wetlands, or on the edges of the gorge, where spills could reach wetlands in the gorge. Oil and gas activities would not be expected to directly affect wetlands because gorge restrictions at Big South Fork NRRA, deed restrictions at Obed WSR, and the regulatory requirement that surface operations shall at no time be conducted within 500 feet of the banks of perennial, intermittent, or ephemeral watercourses or within 500 feet of the high pool shoreline of natural or man-made impoundments (36 CFR 9.41(a)) would provide protection for park wetlands, most of which are associated with river and stream channels. Additionally, the new management framework for plugging and reclamation would promote efficient plugging and reclamation of abandoned wells to applicable standards. This would ultimately enhance natural conditions in the park. In the event of catastrophic well failure or uncontrolled release, long- term major adverse impacts would be unlikely, as wetlands would be protected by setback distances and spill prevention and required clean-up/remediation measures. In addition, alternative C would make a minimal contribution to overall adverse cumulative impacts on wetlands and wetland functions.

Because long-term adverse impacts of the preferred alternative on wetlands would be no greater than long-term and minor, and the contribution to overall adverse cumulative impacts would be limited, there would be no impairment of wetlands under alternative C.

Vegetation

Both parks are located in the Cumberland Plateau, which is characterized by flat or rolling uplands, deep river gorges, and a long line of cliffs. A wide variety of vegetation communities occur in the parks – from coniferous forests to hardwood forests to deciduous shrublands – depending on elevation, slope, soils, and water availability. As described above in the Geology and Soils finding, up to 36 acres of park lands would be disturbed by oil and gas activities, with 87 acres reclaimed.

Although vegetation is not specifically identified as significant in the purpose and significance statements included in the enabling legislation or park planning documents, vegetative communities are important as wildlife habitat and for ecosystem function and health. While none of the SMAs were developed to specifically protect vegetation in general, vegetative communities in many of the SMAs would benefit from new requirements. Oil and gas operations could cause localized, short and long-term, minor adverse effects on approximately 0.03 percent of the parks' native vegetation, mainly through road development, drilling, and production activities. Long-term impacts would be mitigated through site reclamation, of up to 87 acres, providing long-term benefits to vegetation. The new management framework for plugging and reclamation would promote efficient reclamation of abandoned wells to applicable standards. This would ultimately enhance natural conditions in the park. In addition, alternative C would make a beneficial, long-term contribution to overall cumulative impacts on native vegetation. In the event of catastrophic well failure or uncontrolled release, impacts would be localized, and damaged sites would be reclaimed and replanted.

Because long-term adverse impacts of the preferred alternative on native vegetation would be no greater than minor, and the contribution to overall adverse cumulative impacts would be beneficial, there would be no impairment of vegetation under alternative C.

Wildlife and Aquatic Species

One of the reasons the Big South Fork NRRA was established was to conserve and interpret the unique wildlife of the gorges and valleys. A wide variety of vegetation communities occur in the parks, along with a corresponding wide variety of terrestrial and aquatic wildlife species. A total of 48 mammalian species, 180 bird species, and 28 reptiles inhabit the terrestrial acreage of the parks. Freshwater aquatic species include a diverse assemblage of fishes and aquatic invertebrates – including several mussel and crayfish species.

The Managed Fields SMA was developed partly to enhance wildlife habitat, and the SMA for Honey Creek and Twin Arches state natural areas was set aside primarily for their rich, undisturbed forest community. In general, there would be no surface use in these areas. Wildlife in the SMAs would benefit directly from restricted oils and gas access, restoration of disturbed lands, and enhanced habitat protection. Oil and gas operations could cause localized, short and long-term, minor adverse effects on wildlife. Terrestrial species would be disturbed and experience small amounts of habitat loss (up to 36 acres). Long-term habitat impacts would be mitigated through habitat reclamation of up to 87 acres. The new management framework for plugging and reclamation would promote efficient reclamation of abandoned wells to applicable standards. This would ultimately enhance natural conditions in the park. In addition, alternative C would make a limited contribution to overall adverse cumulative impacts on wildlife. In the event of catastrophic well failure or uncontrolled release, impacts to wildlife would be localized, and damaged habitats would be reclaimed and replanted.

Aquatic species would be adversely affected by short-term changes in water quality, producing localized minor adverse impacts. In the event of catastrophic well failure or uncontrolled release, long- term major adverse impacts to aquatic species would be unlikely, as aquatic environments would be protected by setback distances and spill prevention and required clean-up/remediation measures. In addition, alternative C would make a limited contribution to overall adverse cumulative impacts on aquatic species.

Because long-term adverse impacts of the preferred alternative on wildlife and aquatic species would be no greater than minor, and the contribution to overall adverse cumulative impacts would be limited, there would be no impairment of vegetation under alternative C.

Federally Listed Threatened and Endangered Species

Big South Fork NRRA is home to 17 species that are protected under the *Endangered Species Act*. Of these, there are ten freshwater mussel species and three fishes in park waters. Listed terrestrial species include four plants. Critical habitat within the park has been designated in stream reaches inhabited by a variety of mussel species. Within the Obed WSR, six listed species occur – one fish, two mussels, two plants, and one bat. The entire length of the Obed WSR has been designated as critical habitat for the spotfin chub. In addition, NPS policy requires that state-listed species, and others identified as species of special concern by the park, are to be managed in park units in a manner similar to those that are federally listed (NPS 2006c) (See "Species of Special Concern" below.).

Within the SMAs, 500-foot setbacks from water bodies would provide a high level of protection for wildlife inhabiting water, and wetland vegetation within this protective zone which supports many listed species. The Cliff Edge SMA would also protect listed species found in that location. Through project-specific consultation with USFWS under the ESA, and scoping with other state agency biologists, the setback could be increased. The 500-foot standard setback would provide primary protection to all of the fish and mussel species described in chapter 3, including the duskytail darter, blackside dace, spotfin chub, Cumberland bean mussel, little-winged pearlymussel, purple bean mussel, dromedary pearlymussel, and the spectaclecase mussel. Additional protection of these habitats would be provided by the wetlands and floodplains Executive Orders, NPS Director's Orders, and project-specific permitting requirements.

Listed species that occupy upland areas outside the 500-foot shoreline setbacks include bats (gray bat) and upland plants (Cumberland sandwort). Bat species could be affected by the presence of seismic crews and the noise associated with the surveys, but there would be little if any trimming of vegetation or clearing required. All these species would be protected by consultation required under the ESA.

Through the regulatory process under the ESA, required biological surveys and consultations with USFWS and TWRA or other state agency biologists would result in identification of potential impacts on listed species and their habitat, and the implementation of an oil and gas management plan, the designation of SMAs, and the application of mitigation measures would result in short- to long-term negligible to minor adverse impacts on listed species. A limited risk of major adverse effects from spills or leaks would also be possible, but no long –term major adverse effects would be expected given the required setbacks and remediation requirements. Additionally, the new management framework for plugging and reclamation would increase the certainty that wells would be plugged and reclaimed to applicable standards. This would ultimately enhance natural conditions in the parks. In addition, the preferred alternative would make a limited contribution to overall adverse cumulative impacts on listed species and their habitats.

Because long-term adverse impacts of the preferred alternative on threatened and endangered wildlife and critical habitat would be no greater than minor, and the contribution to overall adverse cumulative impacts would be limited, there would be no impairment of threatened and endangered species and critical habitat under alternative C.

Species of Special Concern

Together, the parks are home to a variety of state-listed species of special concern – eight mammals, ten birds, one reptile, two amphibians, ten aquatic invertebrates (mussels), nine fishes, and 44 plants. These species have been identified by the states of Tennessee and Kentucky as warranting special management concern, because they may become threatened in the future through habitat loss, commercial exploitation or other means. NPS policy requires that state-listed species, and others identified as species of special concern by the park, are to be managed in park units in a manner similar to those that are federally listed (NPS 2006c).

Undertaking the required biological surveys and consultations with state agency biologists before approving a plan of operations, and beginning drilling and production activities, would result in identification of potential impacts on species of special concern and their habitat. As described for threatened and endangered species above, implementation of alternative C would include the designation of SMAs, and the application of mitigation measures. Designation of the Cliff Edge SMA, Sensitive

Geomorphic features SMA, and Managed fields SMA would help protect state-listed species found in those locations. Impacts on species of special concern would be short to long term, negligible to minor, and adverse. Additionally, the new management framework for plugging and reclamation would increase the certainty that wells would be plugged and reclaimed to applicable standards. This would ultimately enhance natural conditions in the park. In addition, the preferred alternative would make a limited contribution to overall adverse cumulative impacts on species of special concern.

Because long-term adverse impacts of the preferred alternative on species of special concern would be no greater than minor, and the contribution to overall adverse cumulative impacts would be limited, there would be no impairment of species of special concern under alternative C.

Soundscapes

The natural sounds within a park unit are frequently cited as an important part of the visitor experience, and protecting parks from high levels of intrusive sounds is a growing concern. Although no formal studies of the parks' acoustic environments have been conducted, using data from the nearby Great Smoky Mountains, it is assumed that ambient sounds range from 26 to 43 dBA. These sound levels are a mixture of natural sounds associated with forest and shrubland habitats. The natural soundscapes of both Big South Fork NRRA and Obed WSR are affected primarily by vehicular noise, both inside and outside the park boundaries. Oil and gas exploration and production also affect the natural soundscape locally and for limited periods of time.

Because management actions, particularly road building and drilling, could continue over a period of months, impacts would be considered both short and long-term. During exploration, drilling, production, and site reclamation, oil and gas operations would have the potential to affect the integrity of the natural sounds within the park. However, impacts would be no greater than moderate (i.e., unnatural sounds from oil and gas operations would not mask natural sounds for extended periods of time such that they would be commonly present throughout the park over the life of the management plan), and a maximum of 20 new wells are planned within the parks. SMAs and associated setbacks would reduce noise levels within the SMAs because the noise source would be located further from the sensitive resources within the SMA. Elevated noise levels would continue to occur in operational locations. There would also be long-term beneficial impacts on soundscapes in the park from the restoration of vegetation (in areas where depleted wells are plugged) that would aid in attenuation of unnatural sounds. The preferred alternative would make a limited contribution to overall adverse cumulative impacts on the natural soundscapes within the parks.

Because long-term adverse impacts of the preferred alternative on soundscapes would be localized and no greater than moderate, and the contribution to overall adverse cumulative impacts would be limited, there would be no impairment of soundscapes under alternative C.

Cultural Resources

One of the primary reasons the Big South Fork NRRA was established was to protect the cultural heritage of Cumberland Plateau and the record of human habitation contained therein. Humans have occupied the area for approximately 12,000 years, and the parks contain a rich and diversified cultural context. Archeological resources include ancient rock shelters, seasonal hunting camps, and more modern gristmills, moonshine stills, coal mines and saltworks. Historic structures and resources in the parks include farmsteads, transportation routes (railroads and canals), mines, and other engineering structures, all listed on or eligible for inclusion on the National Register of Historic Places. Cultural landscapes are defined based on associated with historic events or persons. Big South Fork NRRA includes the overall Big South Fork Rural Historic District, the Charit Creek Farmstead, and the abandoned townsite of No

Business. In addition, the parks contain “ethnographic resources” that are of significance to American Indian Tribes.

Several of the SMAs proposed for alternative C were developed to protect cultural resources. The Sensitive Geomorphic Feature, Cliff Edge, Cultural Landscapes and Cemeteries and Managed Fields SMA all include No Surface Use measures to preserve these irreplaceable resources, and up to 1,500-foot setback for exploration near sensitive sites. A qualified third-party monitor would be present during drilling and plugging activities, consultation with seven American Indian tribes would be conducted as project-specific plans for oil and gas operations are developed, and setbacks required in the SMAs would be enforced or else mitigation would be provided in approved plans of operation that would provide comparable resource protection. With consultation and mitigation, impacts to cultural resources would be localized (to a total of 36 acres), long-term, and no more than moderate. There would also be long-term beneficial impacts to cultural landscapes from the restoration of vegetation. In addition, the preferred alternative would make a limited contribution to overall adverse cumulative impacts on the cultural resources

Because long-term adverse impacts of the preferred alternative on cultural resources would be localized and no greater than moderate, and the contribution to overall adverse cumulative impacts would be limited, there would be no impairment of cultural resources under alternative C.

Summary

The NPS has determined that the implementation of the NPS preferred alternative (alternative C) will not constitute an impairment of the resources or values of Big South Fork National River and Recreation Area or to Obed WSR. As described above, adverse impacts anticipated as a result of implementing the preferred alternative on a resource or value whose conservation is necessary to fulfill specific purposes identified in the establishing legislation or proclamation of the park, key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park, or identified as significant in the park’s GMP or other relevant NPS planning documents, would not rise to levels that would constitute impairment. This conclusion is based on consideration of each parks’ purpose and significance, a thorough analysis of the environmental impacts described in the EIS, relevant scientific studies, the comments provided by the public and others, and the professional judgment of the decision-maker guided by the direction of the NPS *Management Policies 2006*.

APPENDIX F: SUMMARY OF NPS *MANAGEMENT POLICIES 2006* OIL AND GAS OPERATIONS GUIDANCE

The following sections summarize the guidance provided in NPS *Management Policies 2006* that relate to oil and gas operations. The first section discussed is dedicated to mineral exploration and development (section 8.7). The remainder of the sections focuses on guidance in NPS *Management Policies 2006* that influence performance standards for protecting parks from oil and gas operations. These sections are organized by resource topic as some of them span more than one section of the NPS *Management Policies 2006*.

MINERAL EXPLORATION AND DEVELOPMENT

Section 8.7 of NPS *Management Policies 2006* addresses mineral exploration and development in units of the National Park system, limiting these activities to prospective operators that can demonstrate that they hold rights to valid mining claims, federal mineral leases or nonfederally owned minerals. This section provides guidance regarding the ability of the NPS to acquire mineral rights if it is determined that proposed mineral developments would impair park resources or values, would be inconsistent with park purposes, or do not meet the standards of applicable NPS regulations and cannot be modified to meet such standards (NPS 2006c).

Section 8.7.3 of NPS *Management Policies 2006* specifically addresses nonfederally owned minerals, which include nonfederal oil and gas interests underlying Big South Fork National River and Recreation Area and Obed Wild and Scenic River. This section states that nonfederal oil and gas interests must be approved under the standards and procedures of 36 CFR 9B, and reiterates the ability of the NPS to acquire rights should an operator's plan fail to meet these standards. NPS *Management Policies 2006* also make clear that the application of the 9B regulations is not intended to result in the taking of the property interest, but rather to impose reasonable regulation of the activity (NPS 2006c).

AIR QUALITY

Section 4.7.1 of NPS *Management Policies 2006* states that the NPS "will seek to perpetuate the best possible air quality in parks to (1) preserve natural resources and systems; (2) preserve cultural resources; and (3) sustain visitor enjoyment, human health, and scenic vistas." The NPS will also actively promote and pursue measures to protect air quality-related values (e.g., resources sensitive to air pollution, including vegetation, visibility, water quality, wildlife, historic and prehistoric structures and objects, and cultural landscapes) from adverse impacts of air pollution (NPS 2006c).

AIR QUALITY PERFORMANCE STANDARD

Design and conduct operations in a manner that minimizes air pollution emissions and impacts.

Soil Resource Management

Per section 4.8.2.4, "The Service will actively seek to understand and preserve the soil resources of parks, and to prevent, to the extent possible, the unnatural erosion, physical removal, or contamination of the soil, or its contamination of other resources" (NPS 2006c).

Soil Resources Performance Standards

- Avoid or minimize soil compaction.
- Avoid or minimize soil loss or removal.
- Avoid or minimize soil erosion.
- Prevent soil contamination.
- Re-establish contours and soil chemistry to support and sustain native vegetative communities that existed prior to the initiation of operations.

WATER RESOURCE MANAGEMENT

Per section 4.6.1, “The National Park Service will perpetuate surface waters and groundwaters as integral components of park aquatic and terrestrial ecosystems.” Also, section 4.6.2 states, “Park surface waters or groundwater will be withdrawn for consumptive use only when such withdrawal is absolutely necessary for the use and management of the park.” Finally, section 4.6.3 states, “The Service will determine the quality of park surface and groundwater resources and avoid, whenever possible, the pollution of park waters by human activities occurring within and outside the parks.”

SURFACE WATER PERFORMANCE STANDARDS

- Maintain existing quality of all surface waters.
- Avoid diminishing the quantity of surface waters.
- Avoid altering drainage characteristics of the area or hydrology of the soils.

GROUNDWATER PERFORMANCE STANDARDS

- Maintain the existing quality of groundwater.
- Avoid diminishing the quantity of groundwater.
- Avoid altering the natural movement of groundwater.

FLOODPLAINS

In accordance with section 4.6.4 of NPS *Management Policies 2006*, “In managing floodplains on park lands, the National Park Service will (1) manage for the preservation of floodplain values; (2) minimize potentially hazardous conditions associated with flooding; and (3) comply with the NPS Organic Act and all other federal laws and Executive Orders related to the management of activities in flood-prone areas, including Executive Order 11988 (Floodplain Management), NEPA, applicable provisions of the Clean Water Act, and the Rivers and Harbors Appropriation Act of 1899” (NPS 2006c).

FLOODPLAIN PERFORMANCE STANDARDS

- Restore and preserve natural floodplain values.
- Avoid the long- and short-term environmental impacts associated with the occupancy and modification of floodplains.

- Avoid direct and indirect support of floodplain development wherever there is a practical alternative. When no practical alternative exists, avoid adverse environmental impacts as well as risk to life and property through appropriate mitigation utilizing nonstructural methods when possible.

WETLANDS

Section 4.6.5 of NPS *Management Policies 2006* states "The Service will (1) provide leadership and take action to prevent the destruction, loss, or degradation of wetlands; (2) preserve and enhance the natural and beneficial values of wetlands; and (3) avoid direct and indirect support of new construction in wetlands unless there are no practicable alternatives and the proposed action includes all practicable measures to minimize harm to wetlands" (NPS 2006c).

The NPS will also implement a "no net loss of wetlands" policy, "and will strive to achieve a longer-term goal of net gain of wetlands across the National Park system through restoration of previously degraded or destroyed wetlands" (NPS 2006). To the extent practicable, wetlands will be restored to predisturbance conditions, and compensation for wetland impacts or losses will require that at least 1 acre of wetlands be restored for each acre destroyed or degraded (NPS 2006c).

WETLAND PERFORMANCE STANDARDS

- Avoid to the extent possible the long- and short-term adverse impacts associated with the destruction or modification of wetlands.
- Avoid direct or indirect support of new construction in wetlands wherever there is a practicable alternative.
- Preserve the natural and beneficial values of wetlands.

VEGETATION, FISH, AND WILDLIFE

In accordance with section 4.4.1 of NPS *Management Policies 2006*, the NPS will "maintain as parts of the natural ecosystems of parks all plants and animals native to park ecosystems." The NPS will achieve this by:

- "Preserving and restoring the natural abundances, diversities, dynamics, distributions, habitats, and behaviors of native plant and animal populations and their communities and ecosystems in which they occur;
- Restoring native plant and animal populations in parks when they have been extirpated by past human-caused actions; and
- Minimizing human impacts on native plants, animals, populations, communities, and ecosystems, and the processes that sustain them" (NPS 2006c).

In addition, the NPS will seek to return areas disturbed by humans to the natural conditions and processes characteristic of the ecological zone in which the damaged resources are situated (NPS 2006c, section 4.1.5).

(Also refer to the Species of Special Concern section in this appendix.)

VEGETATION PERFORMANCE STANDARDS

- Avoid or minimize damage to or removal of vegetation communities, particularly rare or imperiled plants communities identified by the states of Kentucky and Tennessee.
- Reclaim all disturbed areas to a condition that will be approximately equivalent to the pre-disturbance condition in terms of sustained support of functional physical processes, biological productivity, biological organisms, and land uses.
- Prevent establishment of non-native (exotic) vegetation in all disturbed areas.

FISH AND WILDLIFE PERFORMANCE STANDARDS

- Avoid or minimize disturbances to native fish and wildlife habitat.
- Prevent fish and wildlife exposure to contaminants.
- Avoid or minimize injury or death to fish and wildlife.
- Reclaim disturbed fish and wildlife habitat to provide for their survival.

SPECIES OF SPECIAL CONCERN

Per section 4.4.2.3 of NPS *Management Policies 2006*, "The Service will survey for, protect, and strive to recover all species native to national park system units that are listed under the Endangered Species Act. The Service will fully meet its obligations under the NPS Organic Act and the Endangered Species Act to both proactively conserve listed species and prevent detrimental effects on these species."

In addition, the NPS will inventory, monitor, and manage state and locally listed species in a manner similar to its treatment of federally listed species to the greatest extent possible. The NPS will also inventory other native species that are of special management concern to parks (such as rare, declining, sensitive, or unique species and their habitats) and will manage them to maintain their natural distribution and abundance. Finally, the NPS will determine all management actions for the protection and perpetuation of federally, state, or locally listed species through the park management planning process, and will include consultation with lead federal and state agencies as appropriate (NPS 2006c).

SPECIES OF SPECIAL CONCERN PERFORMANCE STANDARDS

- Avoid adverse impacts on state and federally listed threatened, endangered, rare, declining, sensitive, and candidate plant and animal species and their habitats.
- Ensure the continued existence of state and federally listed threatened, endangered, rare, declining, sensitive, and candidate plant and animal species and their habitats.
- Ensure that permitted operations aid in the recovery of state and federally listed threatened, endangered, rare, declining, sensitive, and candidate plant and animal species and their habitats.

CULTURAL RESOURCES

Per chapter 5 of NPS *Management Policies 2006*, the NPS is the steward of many of America's most important cultural resources. These resources are categorized as archeological resources, cultural landscapes, ethnographic resources, historic and prehistoric structures, and museum collections (see definitions in the Glossary of this plan/EIS). The NPS's cultural resource management program involves:

- Research to identify, evaluate, document, register, and establish basic information about cultural resources and traditionally associated peoples;
- Planning to ensure that management processes for making decisions and setting priorities integrate information about cultural resources, and provide for consultation and collaboration with outside entities; and
- Stewardship to ensure that cultural resources are preserved and protected, receive appropriate treatments (including maintenance) to achieve desired conditions, and are made available for public understanding and enjoyment.

The cultural resource management policies of the NPS are derived from a suite of historic preservation, environmental, and other laws, proclamations, executive orders, and regulations. A comprehensive list can be found in the Cultural Resource Management Handbook issued pursuant to Director's Order 28. Taken collectively, they provide the NPS with the authority and responsibility for managing cultural resources in every unit of the national park system so that those resources may be preserved "unimpaired" for future generations.

CULTURAL RESOURCES PERFORMANCE STANDARDS

- Provide for the protection of all cultural resources by preventing the destruction, alteration, or impairment of all or part of the cultural property.
- Prevent the isolation from or alteration to cultural resources with its surrounding environment.
- Prevent the alteration or introduction of visual, audible, or atmospheric elements that are out of character with the cultural resources property or its setting.

ARCHEOLOGICAL SURVEYS

The NPS has developed the following approach for archeological surveys to identify, evaluate, and protect historic properties in compliance with the National Historical Preservation Act, other statutes, and NPS policy and be feasible for the operators in NPS units:

- Any activities that do not qualify as ground disturbing (i.e., hand-held drilling of shot holes of 3-inch diameter or less, and non-rutting vehicles) will not require an archeological survey.
- Wells and related facilities will not be allowed on any historic properties within an appropriate distance of these properties to avoid direct or indirect impacts to the integrity of such resources.
- Archeological surveys (including shovel testing) will be conducted prior to any ground-disturbing activities. Ground disturbance is defined as earth moving activities (blading, rutting, etc.) below 2 inches of the present ground surface. Particular care should be taken in areas where there is a high probability of archeological sites occurring. Areas of ground disturbance typically include access roads, storage areas, heavy equipment parking areas, well and production pads, and other related use areas, including areas where fill has been removed or brought in to create roads or wellpads.

> Areas of disturbance should be restricted to an absolute minimum required for safe operation and construction of facilities.

When a cultural resource survey is required, the operator shall provide the NPS the necessary cultural resources survey of the project area or area of potential effect. The cultural resource survey may include identification and evaluation of archeological sites, historic structures, cultural landscapes, and traditional cultural properties, and must be conducted by professionally qualified cultural resource experts who have knowledge of the specific resource type in question. The NPS will provide operators with existing site-specific cultural resource information, where available.

Operator surveys will result in a final report that allows the NPS to determine National Register eligibility and effect. All newly discovered archeological sites will be recorded both on State of Tennessee site survey forms and NPS Archeological Sites Management Information System (ASMIS) forms. Global positioning system locations (requested in North American Datum (NAD) 83) and site location maps will also be required.

Operators shall employ a qualified archeologist to monitor all ground-disturbing activities. Qualified archeologists are those who meet the Secretary of Interior standards and guidelines for Archeology and Historic Preservation.

UNANTICIPATED DISCOVERY

The NPS is responsible, under 36 CFR 800.11, for providing a plan of action to address properties discovered during project implementation.

If any unknown cultural resource is discovered during the conduct of approved operations, and such resource might be altered or destroyed by the operations, the operator must immediately cease operations in the immediate area and notify the superintendent. The operator must leave the discovery intact until the superintendent grants permission to proceed with the operations (36 CFR 9.47(b)). Before any further activities occur, a qualified cultural resource expert will assess the cultural resources, evaluate their National Register eligibility, and consult with the State Historic Preservation Officer. Minor recordation, stabilization, or data recovery may be necessary during this action and will be conducted at the operator’s expense. Until eligibility of the discovered historic properties can be determined, no further disturbance to the cultural resources may occur. Any plans for mitigating the negative impacts on historic properties will be subject to approval of the NPS, and it is the operator’s responsibility to provide for any necessary mitigation measures.

DAMAGE TO PREVIOUSLY IDENTIFIED SITES

This stipulation applies to situations where operations have damaged a previously identified cultural resource that was visible on the ground surface. If, in its operations, a nonfederal oil and gas operator damages, or is found to have damaged, any historic or prehistoric ruin, monument, or site, or any object of antiquity subject to the Antiquities Act of 1906 or the Archaeological Resources Protection Act of 1979 (16 USC 470) and the National Historic Preservation Act, as amended, the operator will prepare and implement a data recovery plan at his/her expense. The operator will obtain at his/her expense, a qualified permitted archeologist to carry out the specific NPS requirements.

A qualified cultural resource monitor may be required during operations or reclamation activities if the work is located in a particularly sensitive area and/or reclamation was not done immediately following operations. Additionally, the NPS may require an archeologist to inspect reroutes to determine if cultural sites were successfully avoided. If required, this information shall be included in a monitoring report submitted to the NPS, along with an assessment of the damage, if any, to the cultural resources that were to be avoided.

The operator's employees and subcontractors must be made aware that any collection of artifacts is punishable by law and that the company is liable under trespass regulations, the Antiquities Act, and the Archaeological Resources Protection Act for fines and possible costs for any cultural resources damaged by vehicular traffic or collection.

VISITOR USE AND EXPERIENCE: LIGHTSCAPE AND SOUNDSCAPE MANAGEMENT

In accordance with section 4.10 of NPS *Management Policies 2006*, "The Service will preserve, to the greatest extent possible, the natural lightscapes of parks, which are natural resources and values that exist in the absence of human-caused light…Recognizing the roles that light and dark periods and darkness play in natural resource processes and the evolution of species, the Service will protect natural darkness and other components of the natural lightscape in parks."

Park natural soundscape resources encompass all the natural sounds that occur in parks, including the physical capacity for transmitting those natural sounds and the interrelationships among park natural sounds of different frequencies and volumes (NPS 2006c). Section 4.9 of NPS *Management Policies 2006* states "The National Park Service will preserve, to the greatest extent possible, the natural soundscapes of parks…The Service will restore to the natural condition wherever possible those park soundscapes that have become degraded by unnatural sounds (noise), and will protect natural soundscapes from unacceptable impacts."

LIGHTSCAPE PERFORMANCE STANDARD

Minimize the visibility of operations from public use areas, including information stations, day and overnight use areas, public access roads, hiking trails, and administrative use areas.

SOUNDSCAPE PERFORMANCE STANDARD

Preserve the natural quiet and natural sounds associated with Big Thicket National Preserve.

HUMAN HEALTH AND SAFETY

According to section 8.2.5.1 of NPS *Management Policies 2006*, "The saving of human life will take precedence over all other management actions as the Park Service strives to protect human life and provide for injury-free visits…While recognizing that there are limitations on its capability to totally eliminate all hazards, the Service and its concessioners, contractors, and cooperators will seek to provide a safe and healthful environment for visitors and employees…The Service will strive to identify and prevent injuries from recognizable threats to the safety and health of persons and to the protection of property by applying nationally accepted codes, standards, engineering principles, and the guidance contained in Director's Orders 50, 58, and 83 and their associated reference manuals. When practicable, and consistent with congressionally designated purposes and mandates, the Service will reduce or remove known hazards and apply other appropriate measures, including closures, guarding, signing, or other forms of education. In doing so, the Service's preferred actions will be those that have the least impact on park resources and values."

General Health and Safety Performance Standard

The operator shall take all necessary precautions to prevent human exposure to hazards (physical, chemical, and fire).

Performance Standard for High Pressure Precautions and Open Flow/Control of Wild Wells

The operator must ensure that all equipment, methods, and materials will ensure proper control of the well, including pressure control.

CONTROL OF CONTAMINATING AND HAZARDOUS SUBSTANCES

Per section 9.1.6.2 of NPS *Management Policies 2006*, "The Service will make every reasonable effort to prevent or minimize the release of contaminants on, or that will affect, NPS lands or resources, and the Service will take all necessary actions to control or minimize such releases when they occur… The Service will take affirmative and aggressive action to ensure that all NPS costs and damages associated with the release of contaminants are borne by those responsible for the contamination of NPS property."

Contaminating substances is defined at 36 CFR § 9.31(n) as "those substances, including but not limited to, salt water, or any other injurious or toxic chemical, waste oil or waste emulsified oil, basic sediment, mud [drilling fluid] with injurious or toxic additives, or injurious or toxic substances produced or used in the drilling, development, production, transportation, or on-site storage, refining, and processing of oil and gas."

Contaminating Substances Performance Standards

- Operator shall take all necessary precautions to prevent the release of contaminating and hazardous substances into the environment.
- Operator shall respond quickly and effectively to contain and clean up spills and restore damaged resources.

Operators conducting oil and gas drilling and production operations will often use or generate substances that meet the regulatory definition of contaminating substances under 36 CFR 9.31(n), and are therefore required to fully comply with the provisions of 36 CFR 9.45 during the conduct of operations. Operators must include a "Contaminating or Toxic Substance Spill Control Plan" in their Plan of Operations (36 CFR 9.36(a)(10)(vi)). The Spill Control Plan will:

- List the types and amounts of contaminating substances proposed for use in operations;
- Describe potential hazards to humans and the environment and respective mitigation measures;
- Describe actions to be taken to handle, store, clean up, and dispose of such substances;
- Describe the equipment and methods for containment and clean up of contaminating substances, including a description of the equipment available on-site versus those available from local contractors; and
- Include an emergency spill response plan prepared by a qualified spill specialist in the event of accidents, fires, or spills.

If determined to be adequate by the superintendent, a Spill Prevention Control and Countermeasure Plan, required under 40 CFR 112, may be used to satisfy the oil spill contingency plan requirements under 36 CFR 9.36(a)(10)(vi).

- Confine brine water and all other waste and contaminating substances to the smallest practicable area, and prevent escape of such substances due to percolation, rain, high water, or other causes. Properly store and promptly remove all wastes and contaminating substances to prevent contamination, pollution, damage, and injury to unit resources and values (36 CFR 9.45).
- The operator will immediately stop work if contamination is found in the operating area and notify the park superintendent or his/her designated representative.
- The operator will be liable for pollution or other damages, as a result of their operations, to government-owned lands and property.
- Operators shall make efforts to use the least hazardous and/or contaminating substances necessary in the conduct of operations if those choices are available; and to store the minimum quantity on site needed to maintain operations.
- Hazardous and contaminating substances shall be properly stored in secondary containment systems.
- The operator shall indemnify the United States against any liability for damage to life or property arising from the occupancy or use of public lands under an approved Plan of Operations. This shall include liability arising from the occupancy or use of public lands under an approved Plan of Operations. This shall include liability arising from the release of any hazardous substance or hazardous waste (as these terms are defined in the Comprehensive Environmental Response, Compensation and Liability Act of 1980, 42 USC 9601, et seq., or the Resource Conservation and Recovery Act, 42 USC 6901, et seq.) on this approved surface use (unless the release or threatened release is wholly unrelated to operator's activity in this approved surface use), or resulting from the activity of operator on this approved surface use. This applies without regard to whether a release is caused by the operator, their agent, or unrelated third parties.

Any collection and laboratory analyses of soil sediment, surface or groundwater samples conducted before or after well drilling, production, or a change of ownership or lease rights, shall follow the NPS “Guideline for the Detection and Quantification of Contamination at Oil and Gas Operations,” contained in appendix K.

INTEGRATED PEST MANAGEMENT

In accordance with section 4.4.5 of NPS *Management Policies 2006*, all park employees, concessioners, contractors, permittees, licensees, and visitors on all lands managed or regulated by the NPS will comply with NPS pest management policies. Integrated pest management (IPM) is a decision-making process that coordinates knowledge of pest biology, the environment, and available technology to prevent unacceptable levels of pest damage, by cost-effective means, while posing the least possible risk to people, resources, and the environment. The NPS and each park unit will use an IPM approach to address pest issues. Proposed pest management activities must be conducted according to the IPM process prescribed in Director’s Order 77-7: Integrated Pest Management. Pest issues will be reviewed on a case-by-case basis. Controversial issues, or those that have potential to negatively impact the environment, must be addressed through established planning procedures and be included in an approved park management or IPM plan. IPM procedures will be used to determine when to implement pest management actions and which combination of strategies will be most effective for each pest situation.

Under the NPS IPM program, all pesticide use on lands managed or regulated by the NPS, whether that use was authorized or unauthorized, must be reported annually (NPS 2006c).

INTEGRATED PEST MANAGEMENT PERFORMANCE STANDARD

Avoid or minimize adverse impacts of pesticide use to nontarget species or resources.

PROTECTION OF PARK DEVELOPMENT AND SURVEY MONUMENTS

Although there is no applicable NPS management policy for this topic, supporting laws include the NPS Organic Act of 1916, as amended (16 USC 1 et seq.) and the Park System Resource Protection Act (16 USC 19jj), 36 CFR 9.41(a, b).

PARK DEVELOPMENT PERFORMANCE STANDARDS

- Avoid impacts on existing or future park structures, development, and survey markers.
- If impacts occur, restore, replace, or compensate for damages.
- Reduce fire hazards to acceptable levels.

APPENDIX G: ROAD AND TRAIL CLASSIFICATIONS AND STANDARDS

Road and trail standards are used to guide the attainment and maintenance of desired resource conditions and visitor experiences. The specific standard selected for a certain route is based on the designated uses, the management objectives for the surrounding area, and cost.

Use designations and standards may not always appear to be consistent. For example, a trail designated and signed for horse use may also occasionally be needed for vehicle access to an oil and gas well. In such a case, the “public use designation” would be as a horse trail, but the physical standard applied must be sufficient for vehicles. Therefore, the standard would reflect a “road” use, while the general public use would be as a “trail.” The discussion of each road and trail in this plan indicates both designation and standard.

ROADS

Roads are also classified by function. Classes and their definitions are from *Park Road Standards*, National Park Service, 1984. Road standards are guided by *Park Road Standards* but are developed specifically for application in the National Area.

CLASS 1 – Principal park roads or through roads: *Roads that provide the main access routes or that are through roads, for example, TN 297, TN 52, and KY 92*

Standard A – Relatively high traffic volume

- Two paved 12-feet travel lanes 2-feet paved shoulders
- 45-feet cleared right-of-way; 20-feet cleared height
- 1:4 fore slope and 1:2 back slope, except where rock prohibits grading
- 1-foot deep ditches, except flat bottom ditches, which will be 2-feet deep

Standard B – Moderate traffic volume

- 18- to 22-feet road width; paved or gravel (adequate for two vehicles to pass)
- 2-feet paved or gravel shoulders
- 30-feet cleared right-of-way; 20-feet cleared height
- Slopes and ditches same as A

CLASS 2 – Connector roads: *Roads that provide access within a park to areas of scenic, scientific, recreational, or cultural interest, such as overlooks, campgrounds, etc.*

Standard A – Moderate-to-high traffic volume, including campers, horse trailers

- 22-feet road width; paved or gravel (adequate for oncoming vehicles to pass)
- 2-feet paved or gravel shoulders
- 35-feet cleared right-of-way; 20-feet cleared height
- Slopes and ditches same as Class 1

Standard B – Moderate traffic volume, and may be used by trucks

- 16- to 18-feet road width; paved or gravel (oncoming vehicles would have to slow and may have to use shoulder to ensure safety)
- 1-foot paved or gravel shoulders
- 30-feet cleared right-of-way; 20-feet cleared height
- Slopes and ditches same as Class 1

Standard C – Low traffic volume, and may be used by trucks, e.g., oil/gas trucks

- 8- to 12-feet wide "one lane" gravel road (no constructed pull-outs)
- No shoulders
- 12- to 16-feet cleared right-of-way; 12-feet cleared height
- Normally no slopes and ditches

CLASS 3 – Special purpose roads: *Roads that provide circulation within public use areas (Development Zones), such as campgrounds*

- Standard A – Two-way, low speed, high volume traffic; including trailers, campers
- 20-feet paved or gravel road
- No shoulders
- 22-feet cleared right-of-way; 20-feet cleared height
- Normally no slopes and ditches

Standard B – One-way, low speed, high volume traffic; including trailers, campers

- 12-feet paved or gravel road
- No shoulders
- 14-feet cleared right-of-way; 20-feet cleared height
- Normally no slopes and ditches

CLASS 4 – Primitive roads: *Low traffic volume roads that provide access to remote or undeveloped areas*

- Standard
- No specific design standard; mostly old roads
- Maximum 8-feet cleared right-of-way; 10-feet cleared height
- Monitoring for maintenance needs and resource/safety issues

CLASS 5 – Administrative roads: *Roads intended mainly for administrative purposes but are normally open to public use also*

- Standard A
- Two 11-feet lanes; paved or gravel
- 2-feet shoulders
- 35-feet cleared right-of-way; 20-feet cleared height
- Slopes and ditches same as Class 1

Standard B

- 10- to 12-feet gravel or dirt road
- No shoulder
- 12- to 14-feet cleared right-of-way; 10-feet cleared height
- Normally no slopes and ditches
- May be gated

CLASS 6 – Administrative roads: *Roads intended for administrative purposes that are normally closed to public use*

- Standard
- Same as 2C

TRAILS

The following standards shall apply to new construction and to major rehabilitation of existing trails. These are target standards and every attempt will be made to meet them; however, site conditions may not allow for strict compliance in every case. Existing trails may not currently meet these standards, but will be rehabilitated, upgraded, or re-routed to meet these standards as funding and staffing permit. Existing trails causing immediate environmental damage will receive the top priority for rehabilitation.

The standards for specific trail types are typically expressed in terms of maximum widths. Trails can and should be narrower in more remote areas and in areas within the Sensitive Resource Protection Zone. Where the decision is made to maintain a trail on a former roadbed, it need not necessarily be maintained to road width.

GENERAL STANDARDS:

- Outslope on trails should be between 5 and 10%.
- Grade or slope of the trail will vary according to type of use. The target grade will be between 3% and 10% for all trails. For hiking trails, grades up to 18% will be allowed for distances up to 25 feet. For horse trails, grades up to 25% will be allowed for distances up to 50 feet. In cases where the grade exceeds 10%, efforts will be made to control drainage and erosion using drainage dips, water bars, steps and other structures.
- Although Full Bench construction is preferred, Partial Bench construction may be utilized wherever deemed necessary during the design process.
- Backslope will be determined as a part of the design and will depend upon the existing soil conditions. The backslope will vary from near vertical for rocky areas to 1:2 for areas where the soil has little cohesion.

HORSE TRAILS

LEVEL 1 (H-1): Major trails with heavy use, typically around development areas (e.g., connector trails for Bandy Creek Stables and Station Camp and Bear Creek Horse Camps

- Maximum 8-feet trail tread; hardened surface
- Maximum 4-feet clearance each side; 10-feet cleared height
- Liberal use of structures, e.g., bridges, earth/gravel water bars
- For slope information, see General Standards

LEVEL 2 (H-2): Major trails with frequent high levels of use (e.g., Pilot – Wines Loop and Cumberland Valley Loop

- Maximum 8-feet trail tread; hardened surface
- Maximum 4-feet clearance each side; 10-feet cleared height
- Some structures
- For slope information, see General Standards

LEVEL 3 (H-3): Trails with medium to heavy use, often with seasonal peaks; usually on flatter areas with fewer stream crossings (e.g., Jack’s Ridge Loop)

- Maximum 6-feet trail tread; hardened surface or dirt
- Maximum 3-feet clearance each side; 10-feet cleared height
- Structures as needed
- For slope information, see General Standards

LEVEL 4 (H-4): Extra-wide trails capable of use by horse drawn wagons (e.g., Gobbler's Knob Trail)

- Maximum 10-feet trail tread; hardened surface
- Maximum 4-feet clearance each side; up to 12-feet cleared height
- For slope information, see General Standards

LEVEL 5 (H-5): Trails supporting moderate to heavy use, mostly in the backcountry. Considered the standard for most new trails

- Maximum 6-feet trail tread; hardened surface
- Maximum 3-feet clearance each side; 10-feet cleared height
- Structures on all stream crossings
- For slope information, see General Standards

LEVEL 6 (H-6): Trails in the backcountry that are mostly lightly used and follow old roadbeds

- Old roadbed serves as trail tread; maximum 8-feet wide, dirt surface
- No specific standard width or cleared area in order to retain character
- Monitored for safety deficiencies and resource impacts; maintenance as needed
- For slope information, see General Standards

FOOT TRAILS

LEVEL 1 (F-1): Heavily used major trails (e.g., Yahoo Falls Trail)

- Maximum 30-inch trail tread; hardened surface where needed
- Maximum 3-feet clearance each side; 8-feet cleared height
- Liberal use of structures
- For slope information, see General Standards

LEVEL 1A (F-1A): Heavily used shorter trails (e.g., Blue Heron overlook trail, Mine 18 trails). These trails experience heavy use due to their proximity to developed areas or because they are short trails that are useable by most visitors.

- Maximum 6-feet trail tread; paved
- Maximum 3-feet clearance each side; 8-feet cleared height
- For slope information, see General Standards

LEVEL 1B (F-1B): Trails accessible to the physically challenged

- Trail width, surface, slope and other standards vary according to challenge level; ADA standards apply For slope information, see General Standards

LEVEL 2 (F-2): Trails moderately to heavily used (e.g., Oscar Blevins Farm Loop)

- Maximum 30-inch trail tread on constructed sections; other portions on old roads; hardened surface where needed
- Where trail utilizes old roadbeds, Maximum 8-feet trail tread width
- Maximum 3-feet clearance each side; 8-feet cleared height
- Some structures
- For slope information, see General Standards

LEVEL 3 (F-3): Trails moderately used in more backcountry settings (e.g., Laurel Fork Creek Trail)

- Maximum 2-feet trail tread
- Maximum 2-feet clearance each side; 8-feet cleared height

- Some structures
- For slope information, see General Standards

LEVEL 4 (F-4): Mainly long-distance trails with varying use levels depending on location and season (e.g., John Muir Trail, Sheltowee Trace)

- Maximum 30-inch trail tread where constructed; some portions on old roads
- Where trail utilizes old roadbeds, Maximum 8-feet trail tread width
- Maximum 2-feet clearance each side; maximum 8-feet cleared height Liberal use of permanent structures
- For slope information, see General Standards

BICYCLE TRAILS

As used here, the bicycle trail standard (B) refers to those trails, or trail segments, that are constructed for and used exclusively by mountain bikes. Where bikes are allowed on hiking trails, the standard applied would be within the maximum hiking standard. Bicycles are also allowed on public roads and horse trails, unless specifically disallowed.

- “Single track” trails only
- Maximum 3-feet trail tread; dirt (avoid gravel and sand)
- Maximum 1-foot clearance each side; 8-feet cleared height
- For slope information, see General Standards

MULTIPLE-USE TRAILS

Multiple-use trails (MU) provide for use by horses and motor vehicles on the same route. The trail is designed for slow vehicle traffic.

- 10-feet maximum tread width; can be a hardened surface
- Maximum 2-feet clearance each side; 12-feet cleared height
- Shoulders and drainage as needed
- For slope information, see General Standards
- Speed reduction devices and warning signs as necessary to slow vehicle traffic

ALL-TERRAIN VEHICLE (ATV) TRAILS

ATV usage would be allowed on multiple-use trails (during big game season only, by licensed hunters) and on specifically designated trail(s) in the ATV Planning Area. For purposes of this plan, an ATV is defined as a licensed or unlicensed three- or four-wheeled motorized vehicle that has a seat/saddle a rider straddles and

- Maximum 5-feet tread width; dirt
- No extra side clearance; 6-feet cleared height
- Drainage as needed
- For slope information, see General Standards

Appendix H: Types of Oil and Gas Operations

Prepared by
Pat O'Dell, Petroleum Engineer
Geologic Resources Division
National Park Service
Denver, Colorado

Introduction

The petroleum industry is a continuous cycle of searching for new oil and gas reservoirs, developing and producing them, and finally abandoning the property once the hydrocarbons are depleted.

There are four general phases of petroleum development. The phases are (1) exploration, (2) drilling, (3) production, and (4) abandonment/reclamation. Surface uses vary for each phase in terms of intensity and duration. Also, operations related to one or all of the phases may be occurring in the same area at any given time. In Big South Fork National River and Recreation Area and Obed Wild and Scenic River, most oil and gas activities will likely be part of the production and abandonment/reclamation phases. Drilling is expected to occur on a less frequent basis. Although described below, exploration work such as geophysical surveys is not expected because zones of interest in the area are shallow (economics of seismic survey versus just drilling an explorations well) and there is a good number of wells that provide information for interpreting the subsurface.

To be of interest to the petroleum industry, petroleum deposits must be commercially valuable. There must be a reasonable chance of making a profit on the eventual sale of the oil and gas. Factors such as the market price of oil and gas, the amount of recoverable petroleum, the expected production rates, and the cost of drilling wells, producing, and transporting the product to market all determine the economic viability of developing a deposit once it is discovered.

The following sections are meant to provide the reader with a general understanding of common activities associated with each phase of oil and gas development.

Exploration Operations

OCCURRENCE OF PETROLEUM

Petroleum deposits are not large underground caverns filled with oil and gas as the term reservoir might suggest. Rather, petroleum accumulates in tiny spaces within the buried rock layers. Most scientists today agree that petroleum was formed from large amounts of very small plant and animal life. These organic materials accumulated in ancient seas, which, over great periods of time, have covered much of the present land area. As time passed, sediments rich in organic matter were buried deeper and deeper. The increased pressure and temperature caused these organic remains to change into oil and natural gas. Once formed, the oil and gas migrated upward until certain forms and shapes of underground rocks halted the upward movement, trapping the hydrocarbons in large quantities. The search for these traps is the focus of the first phase of oil and gas development and exploration.

GEOLOGICAL EXPLORATION

The search for oil and gas often begins with geological exploration. The exploration geologist is looking for clues on the surface that would suggest the possibility of petroleum deposits below. Surface studies comprise the first stage of exploratory fieldwork. Geological surveys of the land surface are made using aerial photographs, satellite photographs, maps of surface outcrops of specific formations or rock types, and geochemical analyses. Field crews map surface attributes and collect surface samples of rock for analysis.

Creating maps of surface outcrops and geochemical analyses requires fieldwork. Little equipment is needed other than surveying gear and rock and soil sampling supplies. These activities require a small field party of two to four persons who can work out of a single vehicle or on foot. Access to remote areas can be gained by a four-wheel-drive vehicle, small all-terrain vehicles, helicopter, pack animals, or by walking. A small boat may be used where navigable water occurs near the area being studied. Constructing roads or channels in shallow water areas is not required at this early stage.

Geochemical analysis often requires subsurface samples to be taken from a ditch or a shallow corehole. The coreholes are usually shallow, but may generate some cuttings.

GEOPHYSICAL EXPLORATION

Geological exploration can narrow the area being searched, but subsurface geology may or may not be accurately indicated by surface outcrops. Geophysical prospecting extends the search beneath the earth's surface. The surveys identify and map characteristics favorable to oil and gas accumulation deep underground. Geophysical operations include gravitational, magnetic, and seismic surveys. Of these, the seismic survey is most common.

Gravitational and Magnetic Surveys—Gravitational and magnetic field studies yield regional or reconnaissance-type data. These surveys detect variation in gravitational attractions and magnetic fields of the various types of rock below the surface.

Gravity surveys are generally done with small, portable instruments called gravity meters or gravimeters. The number and placement of measurement points in a gravity survey depend on the site's characteristics. These include feasibility of access and the spacing pattern necessary to detail the features selected for mapping. The field party required is not large, usually 3 to 6 people. Travel on foot is possible with the smaller portable gravimeters. Progress, however, is slow, so most surveys use four-wheel-drive vehicles. In marshy areas, the use of special swamp or marsh buggies is quite common with gravity survey crews. Airborne survey operations are not yet practical due to present instrument limitations and the relatively large and rapid changes in altitude and acceleration characteristic to aircraft.

The objective of most surveys can be achieved when gravity stations are confined to existing roads or waterways. Where roads or waterways do not exist, a large level of latitude in positioning stations is possible to account for logistical or environmental constraints. Disturbance of the land surface is minimal when established access is already available. Methods of access to roadless areas are similar to those required for geological explorations described above. The surveying technique itself does not require any physical disturbance of the surface.

Magnetic surveys are often used in place of or to supplement gravity surveys. These surveys are done with relatively small airborne or portable ground instruments called magnetometers. Flight patterns usually consist of a series of parallel lines at 1- to 2-mile intervals.

Airborne surveys require geodetic and ground control points. These must be installed on the ground before the survey can take place, if not already present. A majority of the lower 48 states have been surveyed, so these points are already in place. If not, however, the area must be accessed by overland vehicles or helicopters. The size of the field party required is not large. The access to roadless areas is similar to that required for geological exploration described above. The surveying technique itself does not require any physical disturbance of the surface.

Seismic Surveys—Whereas gravity and magnetic surveys provide regional information, seismic survey can provide enough subsurface detail to locate potential oil and gas traps.

A seismic survey gathers subsurface geological information by recording impulses from an artificially generated shock wave. The energy waves travel downward toward underground formations. A series of sensitive instruments, called geophones, set out at surveyed points on the ground, record the energy waves as they are reflected off the subsurface formations and back to the surface. Cables or radio transmitters transfer information from the geophones to a recorder truck that receives and records the reflected seismic energy. Sophisticated computers analyze the data and generate a "picture" of the rocks underground. Each survey line provides a cross-section of the rock formations beneath it, and many lines may be run to create a complete picture.

In remote areas where there is little known subsurface data, a series of short seismic lines may be required to determine the attitude of the subsurface formations. After this, the pattern of seismic lines or grids is designed to make the final data more accurate and valuable. Although alignment is fairly critical, some source and recording stations may be moved or skipped for environmental or logistical reasons without seriously affecting the results of the investigation.

A more recent technique called 3-D Seismic works on the same principle as conventional seismic, but energy and recording stations are placed at a much denser spaced grid. There may be up to 150 energy source locations and 200 recording stations per square mile on a 3-D seismic project. Surveys commonly exceed a 25-square-mile-area. The 3D-Seismic surveys can provide enough detail to locate traps that have been "missed" by conventional geophysical methods and exploratory drilling. Even in areas that have been heavily explored and developed, 3D-Seismic is helping to optimize new field development and find new targets within producing fields. New life is being brought to areas thought to have been played out.

Seismic methods are usually referred to by the various methods of generating the shock wave. These include weight drop, vibrators, dinoseis (combustible gas expansion), and explosives. No matter what method of generating energy is used, the procedures for preparing the line and recording the data are relatively similar. The procedure typically consists of first surveying and flagging the locations for the geophones and the positions of the energy sources. Second, the geophones and the connecting cable are laid down. The cable is either connected with more cable to the recording truck or to a radio transmitter to send the data to the recording truck. Normally the recording truck will be within a short distance of the transmitter or within line of sight. Once the geophones and ground cable are in place, the energy source is put in place. The initiation of the energy source, whether by a "vibroseis" truck or by explosive, is controlled by the recording truck. The shock wave is set off, and the seismic signal recorded by multiple geophones. Once the signal is recorded, the 'shooting crew travels to the next source point, and the process is repeated.

The most common energy source in seismic work is explosives placed in holes drilled to depths of several feet up to 200 feet. Explosives may range from ½- to 50-pound charges and typically increase in size with increased setting depths. Drills can be mounted on trucks, boats, or specially designed airboats or ATVs, depending on the type of access required. In rugged topography, or to reduce surface disturbance associated with access, portable drills are sometimes carried by helicopter or by hand. Other field equipment can include vehicles to carry water for drilling operations, personnel, surveying equipment, recording equipment, and computers.

Existing roads are used if possible, but reaching some lines may require clearing vegetation and loose rock to improve access for the crews and the trucks. Each mile of seismic line cleared to a width of 8 to 15 feet represents disturbance of about an acre of land. A network of low-standard temporary roads and trails can result from these operations. The alignment of these trails usually consists of straight lines dictated by the grid, often with little regard for steep slopes or rough terrain. Level topography with few trees and shrubs would require little or no trail construction. An area with rugged topography or larger vegetative types such as trees and large shrubs would require more trail preparations. Temporary roads and trails are usually constructed with bulldozers.

Seismic crews consist of several surveying people, people for laying and retrieving the cable and geophones, the truck drivers and drillers for the energy source, personnel in the recording truck and miscellaneous water truck drivers, cleanup people, and field crew managers. The size of the seismic crews varies from 15 to 80 people. On most seismic jobs, the people and equipment are transported in trucks or four-wheel-drive vehicles. However, the surveying, cable laying, and sometimes the drilling can be done on foot in some situations.

Under normal conditions, 3 to 5 miles of line can be surveyed each day using the explosive methods. Crews may be in the field for 1 to 4 weeks for an average conventional survey. An average 3-D survey may take several months to complete.

DRILLING AND PRODUCTION OPERATIONS

OIL AND GAS WELL DRILLING

Classification of Wells—Wells drilled for oil and gas are classified as either exploratory or development wells. An exploratory well is drilled either in search of an as-yet-undiscovered pool of oil or gas (a wildcat well) or to extend greatly the limits of a known pool. Exploratory wells may be classified as (1) wildcat, drilled in an unproven area; (2) field extension or step-out, drilled in an unproven area to extend the proved limits of a field; or (3) deep test, drilled within a field area but to unproven deeper zones. Development wells are wells drilled in proven territory in a field to complete a pattern of production.

Similar to geophysical surveys, drilling operations are relatively short-term. However the intensity of impacts is much higher due to the equipment and materials needed to drill a well and the potential duration of the operation. At a common height of 180 feet, the rig stands as tall as a 12-story building. An average drilling rig needs a level location of about 3 acres. The drilling pad and access road must be capable of supporting thousands of tons of equipment. Existing access roads may need to be widened and upgraded to accommodate heavy loads. Rigs commonly used in Tennessee and Kentucky are somewhat smaller and locations perhaps 1 to 2 acres in size.

Choosing the Site—Once exploration activities have narrowed the search to specific drilling targets, the operator must select an exact spot on the surface to drill the well. The industry prefers to drill vertically, and usually chooses a drill site directly above the desired bottomhole location. When topographical, geological, or environmental constraints prevent a drill site from being located directly above the bottomhole location, the use of direction drilling can achieve the objective. Reaches of over a mile are common for 10,000-foot-deep wells, and extended reach wells have been drilled with over 2 miles of horizontal departure.

Directional drilling involves deviating a wellbore from its vertical along a predetermined course to a target located at some depth and some horizontal distance away. It is a common practice in the industry today, with a number of uses. Directional drilling techniques can be applied if the target zone lies underneath an inaccessible location such as a heavily urbanized area, mountain, or water body, and the drill rig must be located elsewhere. The technique is most often used in offshore applications to allow many wells to be drilled from one location. It can be used to drill around or through fault planes, salt domes, or obstructions in the hole, and to provide relief to a nearby well that has blown out. More recently, the technique has been used to move surface locations as an environmental protection measure.

While directional drilling allows flexibility in the selection of the drill site, there are technical, physical, and economic constraints on its use. Geological factors such as target depths, formation properties (stability, type, dip angle, etc.), and contemplated horizontal departures physically complicate and restrict the opportunities for using directional drilling. Sophisticated equipment and specialized personnel are needed to monitor and guide the direction of the well as it is being drilled. The cost of using this technique typically ranges from 10 percent to 50 percent higher than the cost of a vertical well. While directional drilling can be applied in a wide variety of situations, project specific conditions must always be taken into account.

Accessing the Site—Wildcat drilling often takes place in remote areas. Preliminary exploration work will not have contributed any new roads to an area, although there may be some cross-country trails. Temporary access roads will have to be constructed. Existing roads may need upgrading to accommodate the heavier loads associated with truck traffic. One lane is usually adequate, but turnouts and/or traffic control are necessary to accommodate two-way traffic on longer routes. Installation of culverts or other engineering structures will be needed in steep terrain or when crossing stream channels. Soil texture, topography, and moisture conditions might dictate that roads be surfaced with material such as gravel, oyster shells, caliche, or ground limestone. Heavy equipment such as graders, bulldozers, front-end loaders, and dump trucks are commonly used in constructing roads. In marshy areas, a roadbed may be laid with heavy boards.

Preparing the Drill Site—To accommodate the rig and equipment, the drill site must be prepared. Site preparation may include extensive clearing, grading, cutting, filling, and leveling of the drill pad using heavy construction equipment. Soil material suitable for plant growth is often removed first and stockpiled for later use in reclamation. The operator may also dig reserve pits to hold large volumes of drilling mud and drill cuttings. In environmentally sensitive areas, a large effort is made not to alter the surface area comprising the drill site more than is necessary. For example, reserve pits may not be dug. Instead, large steel bins are placed on the site to receive the cuttings and other materials that are normally dumped into the reserve pits. These bins can then be trucked away from the site and the material inside them disposed of properly. Also, even in areas where reserve pits are excavated, they are often lined with thick plastic sheeting to prevent any contaminated water or other materials from seeping into the ground. The drill pad typically occupies about 2 to 3 acres.

Directional drilling may require a larger-sized rig and additional support facilities that may lead to larger pad sizes. For inland water sites, drilling barges that sit on the bottom may be used as a foundation for the drill rig. Some dredging may be done on these sites to create a slip, and protective skirts or pilings may be installed around the barge to prevent erosion by currents and tidal flow. In deeper water, jack-up, submersible and semi-submersible, rigs and drill ships may be used to drill wildcat wells. An offshore platform is typically used to drill development wells in deep water.

Since a source of freshwater is required for the drilling mud and for other purposes, a water well is sometimes drilled prior to moving the rig onto the location. If other sources are available, the water may be piped or trucked to the site.

At the exact spot on the surface where the hole is to be drilled, a rectangular pit called a cellar is dug, or culvert-like pipe is driven into the ground. If the cellar is dug, it may be lined with boards, or forms may be built and concrete poured to make walls for the cellar. The cellar is needed to accommodate drilling accessories that will be installed under the rig later.

In the middle of the cellar, the top of the well is started, sometimes with a small truck-mounted rig. The conductor hole is large in diameter, perhaps as large as 36 inches or more; is about 20 to 100 feet deep; and is lined with conductor casing, which is also called conductor pipe. If the topsoil is soft, the conductor pipe may be driven into the ground with a pile driver. In either case, the conductor casing keeps the ground near the surface from caving in. Also, it conducts drilling mud back to the surface from the bottom when drilling begins, thus the name conductor pipe.

Usually, another hole considerably smaller in diameter than the conductor hole is dug beside the cellar and also lined with pipe. Called the rathole, it is used as a place to store the kelly when it is temporarily out of the borehole during certain operations. Sometimes on small rigs, a third hole, called the mousehole, is dug. On large rigs, it is not necessary to dig a mousehole because of the rig floor's height above the ground. In either case, the mousehole is lined with pipe and extends upward through the rig floor and is used to hold a joint of pipe ready for makeup.

Rigging Up—With the site prepared, the contractor moves in the rig and related equipment. The process, known as rigging up, begins by centering the base of the rig, called the substructure, over the conductor pipe in the cellar. The substructure supports the derrick or mast, pipe, drawworks, and sometimes the engines. If a mast is used, it is placed into the substructure in a horizontal position and hoisted upright. A standard derrick is assembled piece by piece on the substructure. Meanwhile, other drilling equipment such as the mud pumps are moved into place and readied for drilling.

Other rigging-up operations include erecting stairways, handrails, and guardrails; installing auxiliary equipment to supply electricity, compressed air, and water; and setting up storage facilities and living quarters for the toolpusher and company man. Further, drill pipe, drill collars bits, mud supplies, and many other pieces of equipment and supplies must be brought to the site before the rig can make hole.

Mobilizing the drill rig to the location requires moving 10 to 25 large truckloads of equipment over public highways and smaller roads. In very remote locations, entire drilling crews and service personnel may be temporarily housed onsite. A typical drilling crew consists of five people. Drilling operations are continuous, 24 hours a day and 7 days a week. The crews usually work two 12-hour shifts. With the drilling crew, geologists, engineers, supervisors, and specialized service providers, there may be anywhere from 5 to over 20 people on a drilling location at any given time. An irregular stream of traffic to and from the rig occurs day and night.

Drilling the Surface Hole—Rotary drilling is used almost universally in modern-day drilling. Drilling is accomplished by rotating special bits under pressure. Starting to drill is called “spudding in” the well. To spud in, a large bit, say 17 ½ inches in diameter as an example, is attached to the first drill collar and is lowered into the conductor pipe by adding drill collars and drill pipe one joint at a time until the bit reaches the bottom. While drilling, the rig derrick and associated hoisting equipment support the drill string’s weight. The combination of rotary motion and weight on the bit causes rock to be chipped away at the bottom of the hole.

The rotary motion is created by a square or hexagonal rod, called a kelly, which fits through a square or hexagonal hole in a large turntable, called a rotary table. The rotary table sits on the drilling rig floor and as the hole advances, the kelly slides down through it. With the kelly attached to the top joint of pipe, the pump is started to circulate mud, the rotary table is engaged to rotate the drill stem and bit, and weight is set down on the bit to begin making hole. When the kelly has gone as deep as it can, it is raised, and a joint of drill pipe about 30 feet long is attached in its place. The drill pipe is then lowered, the kelly is attached to the top of it, and drilling recommences. By adding more and more drill pipe, the hole can steadily penetrate deeper.

Large volumes of fluid, generically called drilling mud, circulate down the drill pipe to the drill bit and back to the surface. The mud lubricates and cools the bit and carries drill cuttings to the surface. The composition of the mud system depends on the types of formations being drilled, economics, water availability, pressure, temperature, and many other significant factors. Mud can be as simple as freshwater, or a complex emulsion of water, oil, chemicals, clays, and weighting material. Chemicals added to the mud help drill and protect the hole’s integrity. Weighting material is often added to prevent formation fluids from flowing into the well as it is being drilled. Mud systems can be highly toxic or relatively benign. The drilling mud along with cuttings from the well account for the largest volume of waste generated at the wellsite. In areas around Big South Fork NRRA and Obed WSR, wells are often drilled using compressed air instead of drilling mud. Drill cuttings and fluids produced from formations while drilling are blown into a lined pit next to the drilling rig through what is known as a blooey line.

The first part of the hole is known as the surface hole. Even though the formation that contains the hydrocarbons may lie many thousands of feet below this point, drilling ceases temporarily because steps must now be taken to protect and seal off the formations that occur close to the surface. For example, freshwater zones must be protected from contamination by drilling mud. To protect them, special pipe called casing is run into the hole and cemented.

Tripping Out—The first step in running casing is to pull the drill stem and bit out of the hole. Pulling the drill stem and bit out of the hole in order to run casing, change bits, or perform some other operation in the borehole is called tripping out. To trip out, the drilling crew uses the rig’s hoisting system, or drawworks, to raise the drill stem out of the hole.

Attached to the traveling block is a set of drill pipe lifting devices called elevators. Elevators are gripping devices that can be latched and unlatched around the tool joints of the drill pipe. The crew latches the elevators around the drill pipe, and the driller raises the traveling block to pull the pipe upward. When the third joint of pipe clears the rotary table, the rotary helpers set the slips and use the tongs to break out the pipe. The pipe is usually removed in stands of three joints. Removing pipe in three-joint stands, rather than in single joints, speeds the tripping out process. With the stand of pipe broken out, the crew guides it into position on the rig floor to the side of the mast or derrick.

The derrickman unlatches the elevators from the top of the pipe and stands the pipe back in the derrick. Working as a close-knit team, the driller, rotary helpers, and derrickman continue tripping out until all the drill pipe, the drill collars, and the bit are out of the hole. At this point, the only thing in the hole is drilling mud, because mud was pumped into the hole while pipe was tripped out.

Running Surface Casing—Once the drill stem is out, often a special casing crew moves in to run the surface casing. Casing is large-diameter steel pipe, and is run into the hole with the use of special heavy-duty casing slips, tongs, and elevators. Casing accessories include centralizers, scratchers, a guide shoe, a float collar, and plugs.

Centralizers keep the casing in the center of the hole so that when the casing is cemented, the cement can be evenly distributed around the outside of the casing. Scratchers help remove mud cake from the side of the hole so that the cement can form a better bond. The guide shoe guides the casing past debris in the hole, and has an opening in its center out of which cement can exit the casing. The float collar serves as a receptacle for special cementing plugs, and allows drilling mud to enter the casing at a controlled rate.

The plugs begin and end the cementing job, and serve to keep cement separated from the mud so that the mud cannot contaminate the cement. The casing crew, with the drilling crew available to help as needed, runs the surface casing into the hole one joint at a time. Casing is available in joints of about 40 feet. Once the hole is lined from bottom to top with casing, the casing is cemented in place.

Cementing—The cementing of oil well casing annuli is a universal practice done for a number of reasons, depending on casing type. Conductor casings can be cemented to prevent the drilling fluid from circulating outside the casing, causing the very surface erosion the casing was intended to prevent. Surface casings must be cemented to seal off and protect freshwater formations, provide an anchor for blowout preventer equipment, and give support at the surface for deeper strings of casing. Intermediate strings of casing are cemented in order to seal off abnormal pressure formations, effectively isolate incompetent formations that might cause drilling problems unless supported by casing and cement, and shut off zones of lost circulation. Production casing is cemented to prevent the migration of fluids to thief zones, to prevent sloughing of formations that could result in reduced production, and to isolate productive zones for future development.

An oilwell cementing service company usually performs the job of cementing the casing in place. The cement used to cement oilwells is not too different from the cement used as a component in ordinary concrete. Basically, oilwell cement is Portland cement with special additives to make it suitable for various conditions of pumping, pressure, and temperature.

Cementing service companies stock various types of cement and use special trucks to transport the cement in bulk to the well site. Bulk cement storage and handling at the rig location make it possible to mix the large quantities needed in a short time. The cementing crew mixes the dry cement with water, often using a recirculating mixer (RCM). This device thoroughly mixes the water and cement by recirculating part of the already-mixed components through a mixing compartment. Powerful cementing pumps move the liquid cement (slurry) through a pipe to a special valve made up on the topmost joint of casing. This valve is called a cementing head, or plug container. As the cement slurry arrives, the bottom plug is released from the cementing head and precedes the slurry down the inside of the casing. The bottom plug keeps any mud that is inside the casing from contaminating the cement slurry where the two liquids interface. Also, the plug wipes off mud that adheres to the inside wall of the casing and prevents it from contaminating the cement.

The plug travels ahead of the cement until it reaches the float collar. At the collar the plug stops, but continued pump pressure breaks a seal in the top of the plug and allows the slurry to pass through a passageway in it. The slurry flows out through the guide shoe, and starts up the annulus between the outside of the casing and the wall of the hole until the annulus is filled.

A top plug is released from the cementing head and follows the slurry down the casing. The top plug keeps the displacement fluid, usually drilling mud, from contaminating the cement slurry. When the top plug comes to rest on the bottom plug in the float collar, the pumps are shut down and the slurry is allowed to harden. Allowing time for the cement to set is known as waiting on cement (WOC) and varies in length. In some cases, it may be only a matter of a few hours; in other cases, it may be 24 hours or even more, depending on well conditions. Adequate WOC time must be given to allow the cement to set properly and bond the casing firmly to the wall of the hole. After the cement hardens and tests indicate that the job is good -- that is, that the cement has made a good bond and no voids exist between the casing and the hole -- drilling can be resumed.

Tripping In—To resume drilling, the drill stem and a new, smaller bit that fits inside the surface casing must be tripped back into the hole. The bit is made up on the bottommost drill collar. Then, working together, the driller, floormen, and derrickman make up the stands of drill collars and drill pipe and trip them back into the hole.

When the drill bit reaches bottom, circulation and rotation are begun and the bit drills through the small amount of cement left in the casing, the plugs, the guide shoe, and into the new formation below the cemented casing. As drilling progresses and hole depth increases, formations tend to get harder; as a result, several round trips (trips in and out of the hole) are necessary to replace worn bits.

Controlling Formation Pressure—During all phases of drilling, an important consideration is well control. Well control is preventing the well from blowing out by using proper procedures and equipment. A blowout is the uncontrolled flow of fluids -- oil, gas, water, or all three -- from a formation that the hole has penetrated.

Blowouts threaten lives, property, and pollution of the environment. Rig crews receive extensive training in how to recognize and react to impending blowouts, making them relatively rare events.

The key to well control is understanding pressure and its effects. Pressure exists in the borehole because it contains drilling mud and in some formations because they contain fluids. All fluids --drilling mud, water, oil, gas, and so forth -- exert pressure. The denser the fluid (the more the fluid weighs), the more pressure the fluid exerts. A heavy mud exerts more pressure than a light mud. For effective control of the well, the pressure exerted by the mud in the hole should be higher than the pressure exerted by the fluids in the formation.

Pressure exerted by mud in the hole is called hydrostatic pressure. Pressure exerted by fluids in a formation is called formation pressure. The amount of hydrostatic pressure and formation pressure depends on the depth at which these pressures are measured and the density, or weight, of each fluid. Regardless of the depth, hydrostatic pressure must be equal to or slightly greater than formation pressure, or the well kicks. The well kicks, formation fluids enter the hole, if hydrostatic pressure falls below formation pressure. Thus, one of the crew's main concerns during all phases of the drilling operation is to keep the hole full of mud whose weight is sufficiently high to overcome formation pressure.

However, unexpectedly high formation pressures can be encountered. Formation fluids can be swabbed, or pulled, into the hole by the piston-like action of the bit as pipe is tripped out of the hole. Also, the mud level in the hole can fall so that the hole is no longer full of mud. Whatever the reason, when hydrostatic pressure falls below formation pressure, crew members have a kick on their hands, and they must take quick and proper action to prevent the kick from becoming a blowout.

Helping the crew keep an eye on the rig's operation are various control instruments located on the driller's console. Some rigs have data processing systems that utilize slave computer display terminals, or CRTs (short for cathode ray tubes), on the rig floor, in the mud logging trailer, in the toolpusher's trailer, and in the company man's trailer. When limits that have been programmed into the system are exceeded, the system goes into an alarm condition.

Whether the kick warning signs come from electronic monitors, a computer printout, or the behavior of the mud returning from the hole, an alert drilling crew detects the signs and takes proper action to shut the well in. To shut a well in, large valves called blowout preventers, which are installed on top of the cemented casing, are closed to prevent further entry of formation fluids into the hole. Once the well is shut in, procedures are begun to circulate the intruded kick fluids out of the hole. Also, weighting material is added to the mud to increase its density to the proper amount to prevent further kicks, and the weighted up mud is circulated into the hole. If the mud has been weighted the proper amount, then normal operations can be resumed.

When drilling with air, there is very little hydrostatic pressure exerted downhole, and formations are drilled through in an “underbalanced” mode. This means the formations can flow into the wellbore as drilling progresses. With air drilling, well control is more dependent on the blowout preventers. It is prudent and often a regulatory requirement to have 1) extra storage capacity to hold formation fluids and 2) materials and equipment on location to “mud up” if necessary to maintain well control and wellbore integrity.

Running and Cementing Intermediate Casing—At a predetermined depth, drilling stops again in order to run another string of casing. Depending on the depth of the hydrocarbon reservoir, this string of casing may be the final one, or it may be an intermediate one. Intermediate casing is smaller than surface casing because it must be run inside the surface string and to the bottom of the intermediate hole. In general, it is run and cemented in much the same way as surface casing.

Final Depth and Well Evaluation—Using a still smaller bit that fits inside the intermediate casing, the next part of the hole is drilled. Often, the next part of the hole is the final part of the hole unless more than one intermediate string is required. After cementing the intermediate casing, drilling resumes by tripping the new bit and drill stem back in the hole. The intermediate casing shoe is drilled out, and drilling the new hole resumes.

While drilling and once reaching the total depth (TD) of the well, the operator collects information to determine if hydrocarbons have been encountered. To help the operator decide whether to abandon the well or to set a final, or production, string of casing, several techniques can be used. A thorough examination of the cuttings made indicates whether the formation contains sufficient hydrocarbons. A geologist catches cuttings at the shale shaker and analyzes them in a portable laboratory at the well site. He often works closely with a mud logger logger – a technician who monitors and records information brought to the surface by the drilling mud as the hole penetrates formations of interest.

Well logging is another valuable method of analyzing downhole formations. Using a mobile laboratory, well loggers lower sensitive tools to the bottom of the well on wireline and then pull them back up the hole. As they pass back up the hole, the tools measure and record certain properties of the formations and the fluids (oil, gas, and water) that may reside in the formations. Logging tools can also be run as part of the drill string to measure hole conditions and formation properties as the well is being drilled. This is called “measurement while drilling” or MWD.

If logging results indicate commercial quantities, a drill stem test (DST) may be run. Tools are positioned on the drill pipe to isolate the zone to be flow tested. Downhole formation pressure and fluids enter the tool and activate a recorder. Test may be designed to allow formation fluids to flow to the surface during the test or just to allow a certain volume to enter into the wellbore. In either case, provisions must be made at the surface to separate formation fluids from the mud, and to store and dispose of formation liquids. Natural gas produced during drill stem test is vented or flared. A properly designed and run DST can give excellent indication of the types and volumes of fluid the zone is capable of producing.

In addition to well logging and drill stem testing, formation core samples can be taken from the hole and examined in a laboratory.

Setting Production Casing—After the drilling contractor has drilled the hole to final depth and the operating company has evaluated the formations, the company decides whether to set production casing or plug and abandon the well. If the well is judged to be a dry hole --that is, not capable of producing oil or gas in commercial quantities -- the well will be plugged and abandoned.

Several cement plugs will be put in the well to seal it permanently. Cement plugs will be designed and placed to protect the zones of usable water from pollution and to prevent escape of oil, gas, or other fluids to the surface or other zones. Plugging and abandoning a well is considerably less expensive than completing it.

On the other hand, if evaluation reveals that commercial amounts of hydrocarbons exist, the company may decide to set casing and complete the well. The services of a casing crew and cementing company will once more be arranged for; and the production casing will be run and cemented in the well.

The drilling contractor nears the end of his job when the hole has been drilled to total depth and production casing has been set and cemented. In some cases, the rig and crew remain on the location to “complete” the well, or make it ready for production. In other cases, the drilling contractor moves his rig, and the operator brings in a smaller, less expensive completion rig and crew to finish up the job.

Well Completion—Completion equipment and methods employed are quite varied. The perforated completion is by far the most popular method of completing a well. Perforating is the process of piercing the casing wall, cement, and rock to provide openings through which formation fluids may enter the wellbore. Perforating is accomplished by placing guns holding special explosive charges opposite the zone to be produced. The charges are shaped so that an intense, directional explosion is formed. The well must have a good cement job and well-designed and well-executed perforation methods to get effective formation flow.

Explosives used in perforating guns are very stable. Accidents are rare as long as the people involved use proper procedures. Perforating guns may be run in the well on tubing or by wireline. Firing is accomplished by applying electric current, pressure, or mechanical force to a firing head located on the perforating gun.

In some areas, formations are competent enough that production casing is not used. The drilled hole is left uncased. Many wells in Tennessee and Kentucky are constructed with only surface casing and open hole below.

The final string of pipe usually run in a producing well is the tubing. Tubing is a string of relatively small diameter pipe through which the hydrocarbons are produced. Tubing sizes vary from less than 2 inches in diameter up to 4½ inches for large volume producers. In a flowing well, its smaller diameter produces more efficient flow than casing. Also, since it is not cemented in the hole, tubing may be removed when it becomes plugged or damaged. Tubing, when used with a packer, keeps well fluids and formation pressures away from the casing. Well fluids and high pressures can damage casing, necessitating costly repairs.

The packer consists of a pipe like device through which well fluids can flow. Rubber sealing elements form a fluid tight seal around the inside of the casing. Gripping elements, called slips, hold the packer in place. Because the packer seals off the space between the tubing and the casing, produced fluids are forced into and up the tubing.

Another device often installed in the tubing string near the surface is a “subsurface safety valve.” The valve remains opened, as long a flow is normal. When the valve senses a loss in pressure or significantly increased flow (such as would occur with a flowline break), the valve closes automatically. Subsurface safety valves can prevent uncontrolled well flow in the event of massive surface equipment failure.

Finally, a tubing head is installed at the top of the well to support the tubing. Valves, gauges, and flow control devices are installed on top of the tubing head. Together, they make up what is commonly called a Christmas tree.

When reservoir pressures are not sufficient for the well to flow on its own, operators employ artificial lift methods. The most common by far is rod pumping. A plunger pump is installed deep in the well and connected by rods to a pumping unit on the surface. The pump jack moves the rods up and down to work the downhole pump. Pump jacks are often driven with electric motors or natural gas engines. The gas lift method works by injecting high-pressure gas into the fluid column of a swell to lighten and raise the fluid by expansion of the gas. Instead of pump jacks, there will be a source of high-pressure gas in the field, usually from a gas compressor. The hydraulic pumping method uses a fluid to drive a downhole motor, which in turns drives a pump that pumps the oil to the surface. Surface equipment for hydraulic pumping includes a high-pressure pump and vessels to separate the hydraulic fluid from produced fluid. Yet another type of artificial lift is electric submersible pumping, usually only used on very high-volume wells. An electric motor attached to a pump is installed downhole. Electric current is supplied to the motor through special heavy-duty armored cable. Surface facilities may just be a small transformer/control box.

The well may be stimulated to enhance flow. Stimulation may be performed before or after the completion equipment is installed. Two common types of stimulation are formation acidization and hydraulic fracturing. Stimulation treatments can improve flow to the point where commercial production is achieved in an otherwise uneconomical well.

Formation acidizing is treating the hydrocarbon-bearing rock with large volumes of acid. The most common types of acid used are hydrochloric (HCl) and hydrofluoric (HF). Oilfield acids contain additives to prevent of delay corrosion of the well's tubulars, inhibit sludging and emulsion reactions with oil in the formation, and make the acid easier to pump. The aim in acidizing is to enlarge the pore spaces and passages by dissolving rock, thus enlarging existing flow channels and opening new ones to the wellbore.

Acid is brought to the well location in tanker trucks and pumped using one or more truck-mounted pumps. Spent acid that is flowed back from the well is often kept separate from field production. The spent acid may be put into temporary tanks until it is trucked off to disposal.

In hydraulic fracturing, fluid is pumped into the formation at high enough pressures and rates to split the rock. Proppants are pumped with the fluid to hold the crack open once pumping stops. Sand and sintered bauxite beads are two common propping agents. Fracturing fluid must not only break down the formation, but also extend and transport the proppant into the fracture. The industry has developed a multitude of complex fluid and proppant systems to achieve the best results in the many varied types of reservoirs.

Many truck-mounted pumps and temporary storage tanks are needed on location to fracture-treat wells. Larger well locations may be needed if hydraulic fracturing is part of a completion procedure.

Field Development—If the wildcat well produces oil or gas in commercial quantities, one or more additional wells are normally drilled to confirm the initial finding and further test and define the extent of the oil or gas reserves. Location of the confirmation wells is dependent upon analysis of discovery well data and any existing seismic surveys. Confirmation progresses by drilling one well after another, each dependent on the results of the previous wells.

With more information in hand, facilities can be designed to handle production from the field. Next, development wells are drilled as needed to efficiently drain the reservoir. The procedures for drilling development wells are about the same as for wildcats, except that there may be a variation in the amount and type of subsurface sampling, testing, and evaluation. More detailed seismic work may be performed to aid in the location of development wells.

A state Oil & Gas Commission usually establishes the field well spacing pattern. Typical well spacing may be one well every 640, 320, 160, 80, or 40 acres. Completely filled spacing patterns would translate to 1, 2, 4, 8, or 16 wells per square mile, respectively. In general, oil well spacing is denser for oil wells than for gas wells, and shallow well spacing is denser than for deeper wells.

Access roads to development wells are usually better planned and constructed than those for wildcat wells because these wells are expected to have longer lives. Typically a lease area will have one main route, with side roads to each well or multi-well pad location. Change from temporary to permanent roads does not take place until a well has been established as being capable of production. The amount of roadway required per square mile of field is 4 miles, based upon a spacing pattern of 40 acres and a separate pad for each well.

Directional drilling is sometimes used to concentrate the surface locations of two or more wells in one area. This technique minimizes the amount of surface area (roads and well pads) needed to develop a field. Multiple well pads may be used when developing a field inside the limits of a city or in environmentally sensitive areas.

Other surface equipment and support facilities are brought in or constructed during field development. For example, a battery of storage tanks or a pipeline may be required to handle produced oil or gas. Separation and treatment facilities are required to separate gas and water from oil. Storage tanks are required to hold brines produced during oil extraction, and a proper disposal capability, most typically reinjection, must be developed. Natural gas must be properly disposed of (usually flared) or treated to remove impurities if it is to used or sold.

Well Servicing and Workover Operations—Sometimes it is necessary to repair downhole mechanical problems. Workover rigs are often used to repair downhole equipment or assist in large stimulation jobs. The most common well servicing operation is related to artificial lift installation, tubing string repairs, and work on other downhole completion equipment that may be malfunctioning. More involved workover operations might include cleanout of sand, scale, or paraffin deposits that accumulate in the well, casing repair, cementing, perforating new or existing zones of production, or even some limited drilling operations.

Workover rigs are scaled-down drilling rigs. They are usually equipped to stand the pipe in the derrick, rotate pipe while it is in the hole, and circulate workover fluids down and back up the well. Workover rigs are usually self-contained on a truck. They are highly mobile and can be rigged up and rigged down quickly. A well servicing jog to replace a rod pump may last only 1 or 2 days. A major workover operation to change or “recomplete” to another productive zone may last more than a month.

PLUGGING/ABANDONMENT/RECLAMATION

Workover rigs are also used to plug and abandon wells once they are depleted. Plugging operations consist of removing the tubing, packer, and other completion equipment; pumping cement across producing zones; and placing cement plugs at various depths to protect freshwater zones. Finally, a cement plug is set at the surface to cap the well, and wellhead equipment is cut off. A permanent abandonment marker is often placed to identify the well’s location.

The surface owner and regulatory agencies often dictate surface reclamation. Reclamation can range from just removing equipment to reclaiming the area to conditions that existed before drilling the well.

Full-scale reclamation can include the following:

- Removal of structures, equipment, and debris used or generated during operations;
- Removal or remediation of contaminated soils;
- Recontouring of disturbed areas to near original grade;
- Spreading and preparation of topsoil;
- Planting of native vegetation, usually grasses, but sometimes also tree saplings;
- Erosion protection measures such as mulching; and
- Monitoring of revegetation and erosion control efforts.

Reclamation may last a few days or a few years, depending on the degree of contamination on the site and the ability of native species to grow.

APPENDIX I: USGS OPEN-FILE REPORT 2006-1048

An Allocation of Undiscovered Oil and Gas Resources to Big South Fork National Recreation Area and Obed Wild and Scenic River, Kentucky and Tennessee

By Christopher J. Schenk, Timothy R. Klett, Ronald R. Charpentier, Troy A. Cook, and Richard M. Pollastro

Open-File Report 2006-1048

U.S. Department of the Interior
U.S. Geological Survey

U.S. Department of the Interior
P. Lynn Scarlett, Acting Secretary

U.S. Geological Survey
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By Christopher J. Schenk, Timothy R. Klett, Ronald R. Charpentier, Troy A. Cook, and Richard M. Pollastro

Abstract

The U.S. Geological Survey (USGS) estimated volumes of undiscovered oil and gas resources that may underlie Big South Fork National Recreation Area and Obed Wild and Scenic River in Kentucky and Tennessee. Applying the results of existing assessments of undiscovered resources from three assessment units in the Appalachian Basin Province and three plays in the Cincinnati Arch Province that include these land parcels, the USGS allocated approximately (1) 16 billion cubic feet of gas, 15 thousand barrels of oil, and 232 thousand barrels of natural gas liquids to Big South Fork National Recreation Area; and (2) 0.5 billion cubic feet of gas, 0.6 thousand barrels of oil, and 10 thousand barrels of natural gas liquids to Obed Wild and Scenic River. These estimated volumes of undiscovered resources represent potential volumes in new undiscovered fields, but do not include potential additions to reserves within existing fields.

Introduction

The Central Energy Team of the U.S. Geological Survey (USGS) was requested by the National Park Service to estimate volumes of undiscovered oil and gas resources that may underlie Big South Fork National Recreation Area (NRA) in Kentucky and Tennessee and Obed Wild and Scenic River (WSR) in Tennessee (fig. 1). Big South Fork NRA is almost entirely within the USGS Appalachian Basin Province, but a small parcel lies within the USGS Cincinnati Arch Province. Obed WSR is entirely within the USGS Appalachian Basin Province. The undiscovered oil and gas resources of the Appalachian Basin Province were assessed most recently by the USGS in 2002 (Milici and others, 2003), and the undiscovered oil and gas resources of the Cincinnati Arch Province were assessed most recently in 1995 (Gautier and others, 1996). These quantitative assessments form the basis for the allocation of resources that may underlie Big South Fork NRA and Obed WSR in the present study.

The USGS defined twenty-six geologic assessment units (AU) within the Appalachian Basin Province. Twenty-two of these were assessed for undiscovered oil and gas resources (Milici and others, 2003), including three AUs that are in the areas of Big South Fork NRA and Obed WSR (table 1). Three plays from the Cincinnati Arch Province assessment (Gautier and others, 1996) included a part of Big South Fork NRA (table 1). For the purpose of our study, we did not reassess the areas of Big South Fork and Obed, but we applied the results of the earlier assessments to allocate undiscovered oil and gas resources for these six AUs or plays. This report summarizes the methodology and results of the allocation process.

Methodology Used for Resource Allocation

For the six AUs or plays that encompass parts of Big South Fork NRA and Obed WSR, we made the general assumption that the undiscovered resources that had been estimated previously for each of these were evenly distributed across the entire AU or play. This was considered to be the only feasible approach to the resource allocation process. Therefore, we allocated the undiscovered resources to either Big South Fork NRA or Obed WSR according to the percentage of the total land area of each

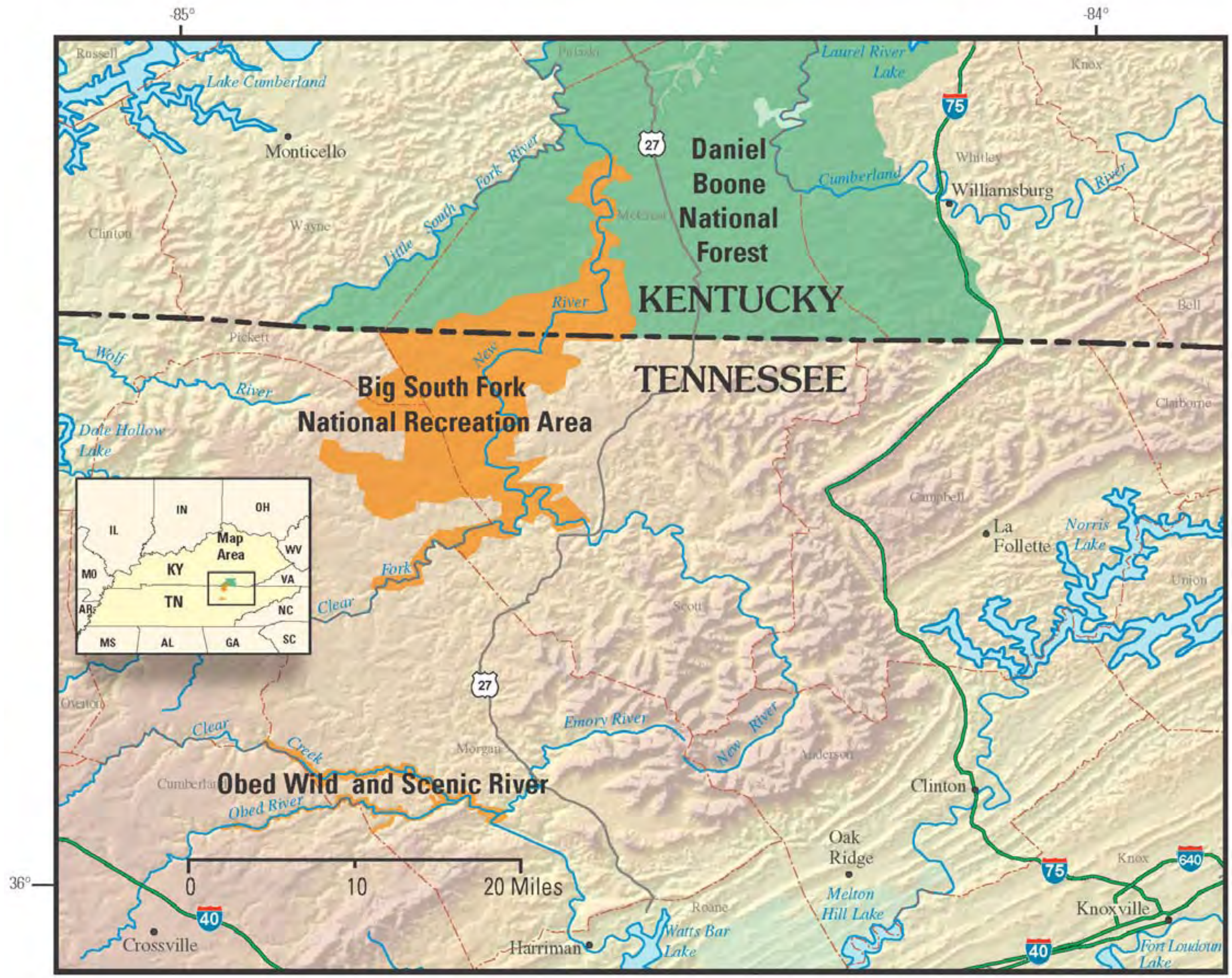


Figure 1. Map showing locations of Big South Fork National Recreation Area and Obed Wild and Scenic River in Kentucky and Tennessee.

Table 1. Acreages for those parts of assessment units (AU) and plays that lie within the Big South Fork National Recreation Area (NRA) and the Obed Wild and Scenic River (WSR), Kentucky and Tennessee.

[AU names and code numbers from Milici and others (2003); those for plays from Gautier and others (1996)]

Name of AU or play (Code no.)	Total AU or play acreage	NRA		WSR	
		Acreage within AU or play	Percent of AU or play	Acreage within AU or play	Percent of AU or play
Appalachian Basin Province Assessment Units					
Rome Trough (50670101)	39,594,309	124,264	0.314	—	—
Cambrian Limestone (50670403)	22,702,637	124,264	0.547	5,324	0.023
Northwest Ohio Shale (50670462)	29,337,139	124,264	0.423	5,324	0.018
Cincinnati Arch Province Plays					
Cambrian and Lower Ordovician Carbonate (6601)	41,585,845	3,720	0.0089	—	—
Middle and Upper Ordovician Carbonate (6602)	39,457,623	3,720	0.0094	—	—
Devonian Black Gas Shale (6604)	8,515,786	3,720	0.044	—	—

AU or play that lay within one or another of these tracts (table 1). For example, if Big South Fork NRA represented one percent of the land area of a given AU, we allocated one percent of the mean undiscovered resource to Big South Fork NRA from the USGS assessment of that AU; this procedure was followed for each AU or play. We then aggregated the allocations into a total volume of undiscovered resources for Big South Fork NRA and Obed WSR. The allocated potential resources, however, are only in terms of undiscovered fields. We did not estimate either the number of undiscovered fields or the number of wells that may be necessary to recover these potential, undiscovered resources.

Results

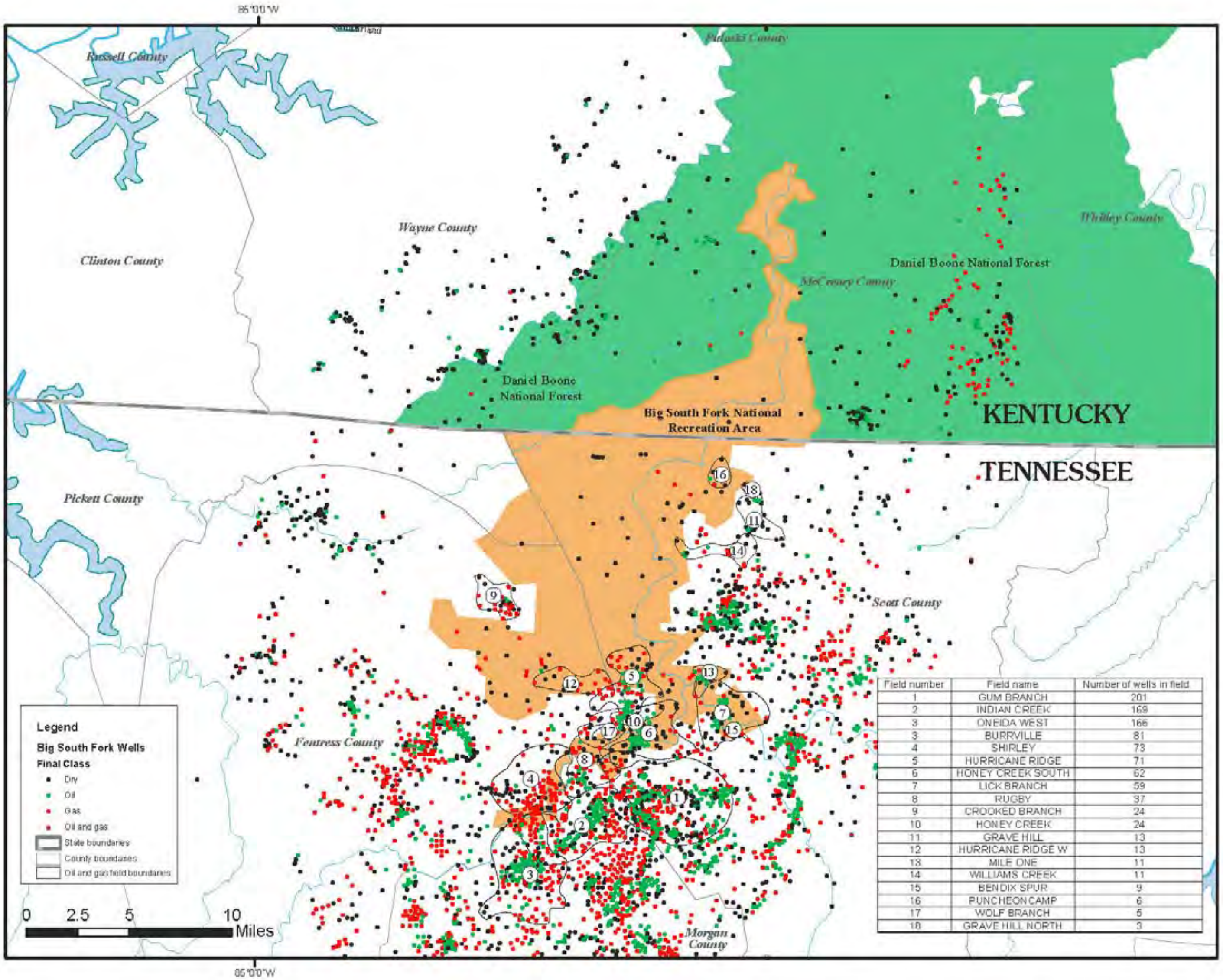
As discussed above, the allocation procedure provided estimates of the total volumes of undiscovered oil and gas resource that may underlie Big South Fork NRA and Obed WSR (table 2). The resulting estimates are: (1) 16 billion cubic feet of gas (BCFG), 15 thousand barrels of oil (MBO), and 232 thousand barrels of natural gas liquids (MBNGL) for the Big South Fork NRA; and (2) 0.5 BCFG, 0.6 MBO, and about 10 MBNGL for the Obed WSR.

Several oil and gas fields exist partly or wholly within the boundary of Big South Fork NRA (fig. 2) and within the boundary of Obed WSR (fig. 3). Field boundaries as shown in figures 1 and 2 are not state-defined boundaries, but are areas we outlined within which oil and gas wells were assigned to a specific field. Undiscovered resources allocated to Big South Fork and Obed would, by definition, be located outside existing fields.

Table 2. Allocations of undiscovered oil and gas resources for Big South Fork National Recreation Area (NRA) and Obed Wild and Scenic River (WSR), Kentucky and Tennessee.

[Assessment Unit (AU) names and code numbers from Milici and others (2003); those for plays from Gautier and others (1996). Resource volumes are stated as mean values. Abbreviations: MBO, thousand barrels of oil; BCF, billion cubic feet of gas; MBNGL, thousand barrels of natural gas liquids]

Name of AU or play (Code no.)	NRA			WSR		
	Oil (MMBO)	Gas (BCF)	Liquids (MBNGL)	Oil (MMBO)	Gas (BCF)	Liquids (MBNGL)
Appalachian Basin Province Assessment Units						
Rome Trough (50670101)	—	1.9	—	—	—	—
Cambrian Limestone (50670403)	13.4	0.7	7.6	0.6	—	0.3
Northwest Ohio Shale (50670462)	—	11.2	224.5	—	0.5	9.6
Cincinnati Arch Province Plays						
Cambrian and Lower Ordovician Carbonate (6601)	0.7	0.7	—	—	—	—
Middle and Upper Ordovician Carbonate (6602)	0.8	0.8	—	—	—	—
Devonian Black Gas Shale (6604)	—	0.6	—	—	—	—



Field number	Field name	Number of wells in field
1	GUM BRANCH	201
2	INDIAN CREEK	169
3	ONEIDA WEST	166
3	BURRVILLE	81
4	SHIRLEY	73
5	HURRICANE RIDGE	71
6	HONEY CREEK SOUTH	62
7	LICK BRANCH	59
8	RUGBY	37
9	CROOKED BRANCH	24
10	HONEY CREEK	24
11	GRAVE HILL	13
12	HURRICANE RIDGE W	13
13	MILE ONE	11
14	WILLIAMS CREEK	11
15	BENDIX SPUR	9
16	PUNCHEON CAMP	6
17	WOLF BRANCH	5
18	GRAVE HILL NORTH	3

Figure 2. Map showing oil and gas wells and selected oil and gas fields in and around Big South Fork National Recreation Area, Kentucky and Tennessee.

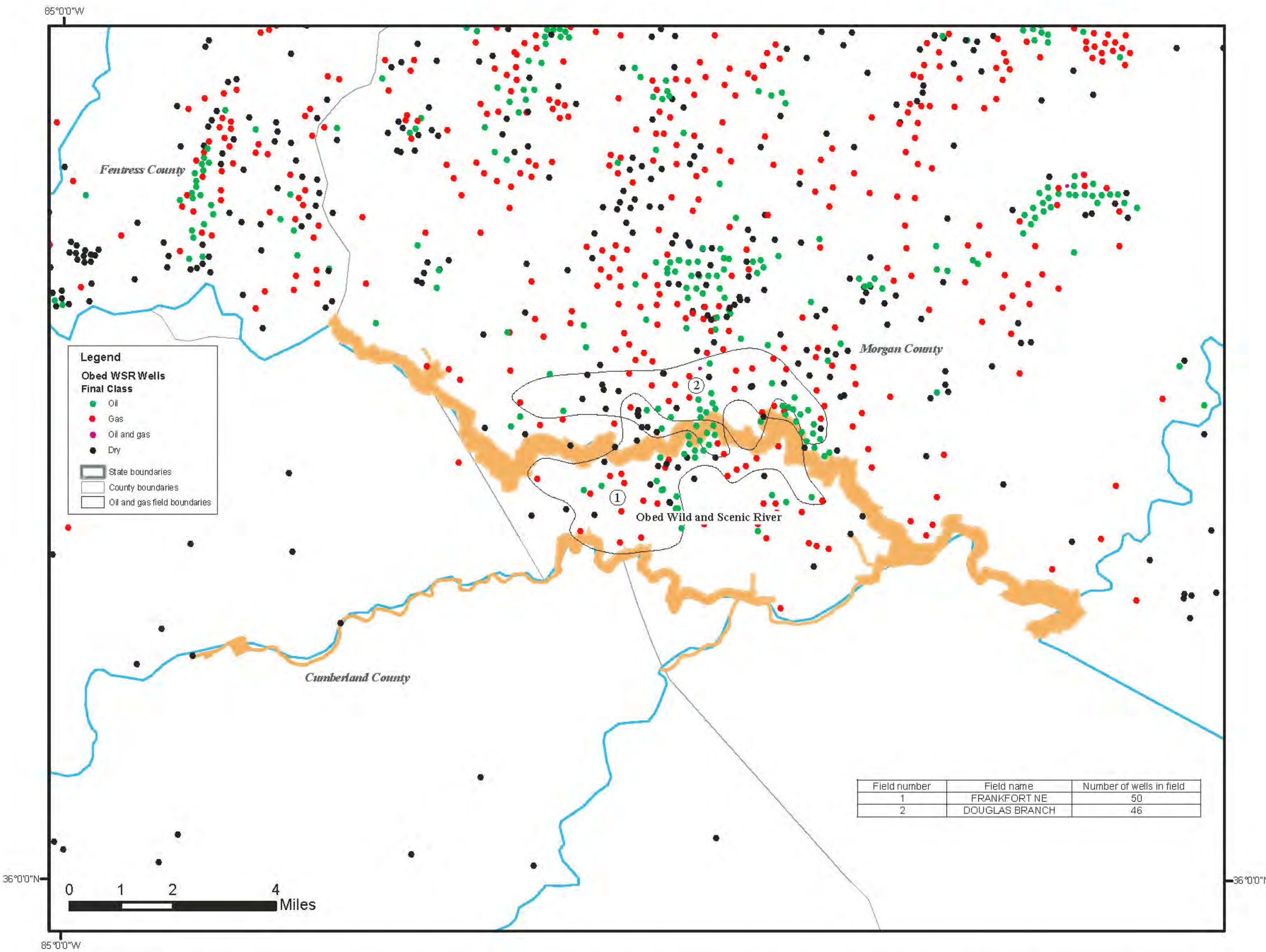


Figure 3. Map showing oil and gas wells and selected oil and gas fields in and around Obed Wild and Scenic River, Tennessee

References

Gautier, D.L., Dolton. G.L., Takahashi, K.I., and Varnes, K.L., eds., 1996, 1995 National assessment of United States oil and gas resources—results, methodology, and supporting data: U.S. Geological Survey Digital Data Series DDS-30, Release 2, one CD-ROM.

Milici, R.C., Ryder, R.T., Swezey, C.S., Charpentier, R.R., Cook, T.A., Crovelli, R.A., Klett, T.R., Pollastro, R.M., and Schenk, C.J., 2003, Assessment of undiscovered oil and gas resources of the Appalachian Basin Province, 2002: U.S. Geological Survey Fact Sheet FS-009-03.

APPENDIX J: NATIONAL PARK SERVICE RESPONSIBILITIES - OIL AND HAZARDOUS MATERIALS EMERGENCY RESPONSE

A. INITIAL PARK STAFF ACTIONS FOLLOWING DISCOVERY OF A RELEASE

1. First On-Scene – Always Operate From a Position of Safety. Approach spill site upwind and upgradient (at least 90 degrees crosswind side). Do not walk or drive through any spilled material, especially vapor clouds. (Preserve area for evidence collection and preservation).
2. Secure the area to protect human health and safety. Evacuate the area of all non-essential personnel and deny entry to others.
3. Eliminate ignition sources if suspected spilled material may be flammable or combustible (secure power, ban smoking, do not use road flares, do not mike radios, do not operate motor vehicles or internal combustion engines, use only non-sparking tools/equipment).
4. At a safe upwind distance utilizing binoculars determine:
    a. spill location,
    b. spill source/cause (fixed facility, pipeline, rail, motor vehicle, vessel, aircraft, natural disaster, operator error),
    c. material spilled, amount spilled,
    d. responsible party/shipper/carrier (company address, UN placard numbers, DOT hazard class, container shape, shipping papers, MSDS),
    e. spill site information (fire, injuries/casualties, adjacent navigable waterways, weather, environmentally sensitive areas), and
    f. situation evaluation (disaster, imminent danger, low risk). Explain the evaluation.
5. Perform rescue of injured personnel only if the spill has been stabilized and there is minimal health and safety risk to response personnel.
6. Initiate downwind evacuation (Utilize DOT Emergency Response Guidebook (ERG)) at a minimum distance of 1000 feet.
7. Establish spill response zones and command post (upwind and upgradient, install barriers and/or flagging tape to delineate red, yellow, green zones).
8. Conduct an initial site assessment to identify park resources potentially as risk from the release (surface water, wetlands, cultural resources, etc.), and quantity of released substance.
9. Obtain 5 liter sample of released substance (note: collection of samples must meet preservation and storage requirements) and initiate chain of custody documentation.
10. Oversee operator containment actions and maintain security.
11. Park staff prepares a detailed Case Incident Report on the spill event.

B. PARK NOTIFICATION DUTIES

1. Report the incident as a possible hazmat incident to dispatch, 911, or patrol ranger. Report if any persons are involved or injured. Request assistance (Is hazwopper trained staff available? Do they have proper PPE? Is a rescue necessary?)

   NOTE: All hazardous materials incidents MUST be reported to Shenandoah Dispatch Center @ 540-999-3422. (Report exact location in latitude/longitude, mile marker or by description of surroundings).

2. Notify the operator of the release and immediate need to control the source and contain the release, and obtain information of the released substance. Park Superintendent advises operator that the operation is immediately “suspended” pursuant to NPS regulations at 36 CFR §9.51(c)(2)
3. Contact National Response Center to get clean-up and other assistance, and to advise them of release. Note: it is the operator’s responsibility to notify the National Response Center to obtain a case number for the incident.
4. Spill Coordinator would notify the following NPS offices:
   a. Regional Hazardous Materials Coordinator,
   b. Environmental Quality Division,
   c. Geologic Resources Division,
   d. Regional Minerals Coordinator, and
   e. Water Resources Division if release threatens water resources.
5. Coordinate a conference call with NPS offices noted above and park staff to define appropriate course of action relative to spill containment, public health and safety, site assessment, damage assessment, and operator responsiveness and capability.
6. Coordinate with pertinent state regulatory agencies and state and federal trustees.

C. COORDINATION OF RESPONSE, CLEAN-UP AND DAMAGE ASSESSMENT

1. All involved NPS staff must track time and all other expenditures associated with the spill event.
2. Park Superintendent prepares formal suspension notice for Regional Director’s signature in accordance with NPS regulations at 36 CFR §9.51(c)(2).
3. Park staff coordinates with designated On Scene Coordinator (EPA, Coast Guard, or NPS staff expert if EPA or Coast Guard does not dispatch a coordinator) and state regulatory agencies to oversee operator spill response and initial clean-up actions.
4. Park staff coordinates with On Scene Coordinator (OSC) and state and federal trustee agencies in the conduct of resource damage assessment (Note: operator may contract with approved consulting firm/laboratory to conduct assessment work).
5. All involved NPS offices evaluate site assessment results and reach consensus on additional remediation actions and reclamation goals, and communicate recommendations to park Superintendent. (Note: NPS regulations at 36 CFR §9.39(a)(1)(i) and §9.39(a)(2)(iii) require operators to remove or neutralize any contaminating substance).
6. Park staff coordinates with OSC and state and federal trustees in monitoring remediation and reclamation actions.

7. Park Superintendent and NPS technical working group evaluates final remediation/reclamation success and determines if further legal action against the operator is required. (Note: operators are liable for any damages to federally-owned or controlled lands, waters or resources pursuant to 36 CFR §9.51(a) and 16 U.S. C. § 19jj.

APPENDIX K: WELL SITE PLUGGING AND RECLAMATION ACTIVITIES

SPECIFICATIONS

FOR

PLUGGING WELLS IN THE BIG SOUTH FORK NATIONAL RIVER AND RECREATION AREA

Section 1.0 – Introduction

The following specifications are for oil and gas well plugging and surface reclamation services at 45 well sites in the Big South Fork National River and Recreation Area.

Summary of Work

The majority of the work to be performed under this contract consists of the following:

- The mobilization of the contractor's employees, equipment and materials
- Site and access road preparation, including clearing and grubbing, minor grading and erosion and sediment control
- Plugging abandoned oil and gas wells
- The revegetation of all disturbed areas and blocking access on roads that will be restored to natural conditions.

Attachment A is a summary table of road access conditions including length, presence of steep slope, and overgrowth.

Attachment B includes copies of available well records from the State of Tennessee.

Attachment C provides sample wellbore schematics for plugging.

Section 2.0 – General Specifications

2.1 – Mobilization. The work in this section consists of furnishing all plant, equipment, labor, materials and supervision, and performing all operations in connection with mobilization of the contractor's forces and equipment necessary for performing the work required under this contract.

Mobilization shall include the purchase of contract bonds; transportation of personnel, equipment, and operating supplies to the site; establishment of temporary offices and sanitation facilities, and other necessary facilities at the site; and other preparatory work at the site. The specification covers mobilization for work required by the contract at the time of award. No adjustment of the contract price shall be made for additional mobilization cost incurred by the contractor unless they are incurred as the result of a written change order issued by the Program Manager of the Land Reclamation Section.

Demobilization is also included under this pay item.

Measurement and payment will be one (1) lump sum of which will include mobilization.

Payment will be made lump sum for completion of the work in this section.

2.2 – Delivery Time. All work specified in this contract must be completed within 365 days after your receipt of order.

Once work begins, the contractor shall use the necessary labor, equipment and materials to actively pursue the work.

Repeatedly moving on and off the job and arriving at noon is not considered actively pursuing the work. Therefore, an unsatisfactory report will be filed with the contracting office for delaying the work.

2.3 – Operator Qualifications. All equipment operators shall be competent and experienced with the type of equipment for which they are assigned.

2.4 – Increase or Decrease in Quantities. All quantities set forth in these specifications and on the bid sheet are estimates. The NPS reserves the right to increase or decrease the actual quantities as site conditions warrant. The unit price bid shall remain unchanged. Any increase in contract quantities will be made in writing prior to performing any work.

2.5 – Partial Payments. Partial payments will be made based on the amount of work accomplished at the time of the payment request. Payment request shall be accompanied by supporting measurement and calculation documents. Payment request shall be mutually developed by the contractor and project officer. Any payment request without the concurrence of these two will not be processed. Final payment shall be calculated using the total number of units utilized and measured in the project at the unit price bid for each item.

2.6 – Care of Public and Private Property. The contractor shall take all necessary precautions to prevent damage to all overhead, underground, and above ground structures and to protect and preserve property within or adjacent to the project and shall be responsible for all damage thereto. The contractor shall exercise special care in the execution of the work to avoid interference or damage to all operating facilities or structures. The contractor shall be responsible for any damage or injury to public or private property and shall otherwise restore or replace such damage or injury to property as may be deemed necessary by the engineer.

The contractor shall cooperate with utilities during any relocation work adjustment removal and reconstruction of any such utility or facility within the work areas.

2.7 – Preparation of Erosion Control Measures. Temporary Project Water Pollution Control of the Tennessee Department of Transportation Bureau of Highways Standard Specifications for Road and

Bridge Construction, March 1, 1981 Edition, shall apply except as modified herein. Special care shall be taken during all phases of construction to prevent pollution of streams with harmful or polluting materials such as but not limited to fuels, oils, bitumen, and calcium chloride. Payment will be a subsidiary of Section 201, Clearing and Grubbing.

2.8 – Working Hours. All work on this project will be restricted to daylight hours. Monday through Friday unless specifically approved in writing by the project officer.

2.9 – Maintenance During Construction. The contractor shall maintain the work during construction and until the project is accepted. This maintenance shall constitute continuous and effective work prosecuted day by day, with adequate equipment and forces to that end, and that the area is kept in a satisfactory condition at all times. No separate payment will be made for this item.

All cost of maintenance work during construction and before the project is accepted shall be a subsidiary to the lump sum bid price for mobilization.

2.10 – Unacceptable Material and Workmanship. All material not conforming to the requirements of the specifications will be considered as unacceptable. All unacceptable materials and workmanship, whether in place or not, will be rejected and shall be removed immediately from the site of the work unless otherwise directed by the engineer. In case of failure by the contractor to comply promptly with any order by the engineer to remove rejected material and workmanship, the engineer shall have authority to have such rejected work and materials removed by other means and to deduct the expense of such removal from any monies due, or to become due, to the contractor.

2.11 – Final Inspection and Acceptance.

(a) All work (which term includes but is not limited to materials, workmanship, and manufacture and fabrication of components) shall be subject to inspection and test by the NPS at all reasonable times and at all places prior to acceptance. Any such inspection and test is for the sole benefit of the NPS and shall not relieve the Contractor of the responsibility of providing quality control measures to assure that the work strictly complies with the contract requirements. No inspection or test by the NPS shall be construed as constituting or implying acceptance. Inspection or test shall not relieve the Contractor of responsibility for damage to or loss of the material prior to acceptance, nor in any way affect the continuing rights of the NPS after acceptance of the completed work under the terms of paragraph (f) of this clause, except as hereinabove provided.

(b) The Contractor shall, without charge, replace any material or correct any workmanship found by the NPS not to conform to the contract requirements, unless in the public interest the NPS consents to accept such material or workmanship with an appropriate adjustment in contract price. The Contractor shall promptly segregate and remove rejected material from the premises.

(c) If the Contractor does not promptly replace rejected material or correct rejected workmanship, the NPS (1) may, by contract or otherwise, replace such material or correct such workmanship and charge the cost thereof to the Contractor, or (2) may terminate the Contractor's right to proceed in accordance with the clause of this contract entitled "Cancellation."

(d) The Contractor shall furnish promptly, without additional charge, all facilities, labor, and material reasonably needed for performing such inspection and test as may be required by the engineer. All inspection and test by the NPS shall be performed in such manner as not unnecessarily to delay the work.

(e) Should it be considered necessary or advisable by the State at any time before acceptance of the entire work to make an examination of work already completed, by removing or tearing out same, the Contractor shall, on request, promptly furnish all necessary facilities, labor, and material. If such work is found to be defective or nonconforming in any material respect, due to the fault of the Contractor or his subcontractors, he shall defray all the expenses of such examination and of satisfactory reconstruction. If, however, such work is found to meet the requirements of the contract, an equitable adjustment shall be made in the contract price to compensate the Contractor for the additional services involved in such examination and reconstruction and, if completion of the work has been delayed thereby, he shall, in addition, be granted a suitable extension of time.

(f) Unless otherwise provided in this contract, acceptance by the NPS shall be made as promptly as practicable after completion and inspection of all work required by this contract, or that portion of the work that the engineer determines can be accepted separately. Acceptance shall be final and conclusive except as regards latent defects, fraud, or such gross mistakes as may amount to fraud, or as regards the NPS's rights under any warranty or guarantee.

(g) Upon due notice from the Contractor of presumptive completion of the entire project work, the engineer will make an inspection. If all construction provided for and contemplated by the contract is found completed to his satisfaction, a final inspection will be scheduled within five (5) days. The final inspection shall be conducted by the Program Manager of the Land Reclamation Section or his designee, the Division Engineer and the Project Officer. The Contractor shall be present along with his superintendent and all subcontractors, if any, that have worked on the project.

The Contractor shall not remove any equipment from the site until after he receives written notice of final acceptance of the work. Written notice of the final inspection and acceptance will be issued to the Contractor stating final acceptance and the date of release.

If, however, the inspection discloses any work in whole or in part, as being unsatisfactory, the engineer will give the Contractor the necessary instructions for the correction of the deficiencies and the Contractor shall immediately comply with and execute such instructions. Upon completion of the corrective work, another inspection shall be made which shall constitute the final inspection provided all work has been satisfactorily completed.

2.12 – Accidents

The contractor shall provide, at the site and at his own expense, such equipment and medical facilities as are necessary to supply first-aid service to anyone who may be injured in connection with the work.

The contractor must promptly report in writing to the project officer all accidents whatsoever arising out of, or in connection with, the performance of the work, whether on, or adjacent to the site which caused death, personal injury, or property damages, giving full details and statements of witnesses. In addition, if death, serious injuries, or serious damages are caused, the accident shall be reported immediately by telephone or messenger to both the project officer and the contracting officer.

If any claim is made against the contractor or any subcontractor on account of any accident, the contractor shall promptly report the facts in writing to the project officer, giving full details of the claim.

2.13 – Completion Time

The completion time is approximately 365 days which includes no days for bad weather, holidays and weekends. The contractor shall take this time frame for completion into consideration when bidding on this project. An extension shall not be granted unless there are unusual circumstances, such as an act of God. Poor planning, inefficiency, equipment breakdown, or any other factor of which the contractor has control over shall not be justification for time extensions.

2.14 – Safety

The contractor shall conduct his operations in such a manner that all applicable laws and regulations are adhered to during performance of this contract. Personal protective equipment (PPE) including hardhats, safety glasses, gloves, and steel-toed boots shall be use in work areas. Additional PPE shall be used as warranted by working conditions.

2.15 – Barricades, Warning Signs and Other Devices. The contractor shall provide, erect and maintain all necessary barricades, suitable and sufficient lights, danger signals, signs and other traffic control devices, and shall take all necessary precautions for the protection of the work and safety of the public.

No direct payment will be made for work required in this section, but the cost thereof will be considered to be included in bid price for mobilization.

2.16 – Dust Control

The contractor shall take all available precautions to control dust. Dust shall be controlled by sprinkling, by applying fresh water or by other methods as approved. If sprinkling is the selected method for controlling dust the contractor shall water as often as necessary to control dust that is produced as a result of the movement of construction equipment and vehicles. The use of other methods shall be effective in preventing dust formation. Oil will not be used.

2.17 – Superintendence By Contractor

The contractor at all times during performance and until all the work is completed and accepted, shall give his personal superintendence to the work or have on the project a competent superintendent, satisfactory to the NPS and with authority to act for the contractor.

Section 3.0 – Access Roads and Well Sites: Repair and Maintenance

The contractor shall be responsible for maintaining the access roads in a passable condition during the life of the contract. No other access points will be used unless approved by the engineer.

Passable condition means roadway shall be graded as often as necessary to remove ruts that will trap water or erode. Access roads will be ditched, waterbarred, graded, culverts installed or whatever other measures are necessary to protect the road from erosion and to maintain a relatively smooth surface.

3.1 – Opening Access Roads and Production Pads

This work shall consist of removing vegetation (by trimming, mowing, bush hogging, or like methods) to the minimum amount necessary to gain access for personnel and equipment to perform the work specified during the project. Site preparation shall include the repair, maintenance of access roads, remedial drainage measures, and the production areas. Roadways shall be left in a passable condition for a two-wheel drive vehicle at all times during the project work. Site preparation shall include use of flag persons, traffic lights and barricades to safely control vehicle, foot or horse traffic throughout the construction period and protection and maintenance of utilities.

Access roads shall be cleared not to exceed 12 feet in width. All downed or dead trees can be cut into manageable lengths and placed to the side of the access roads. All live trees that are removed may be scattered in the woods or chipped in place. All stumps that are removed from the ground must be hauled out of the BSFNRRA and disposed of in accordance with local laws.

Production pads must be cleared by a means that minimizes soil disturbance. Standing trees shall be cut off at ground level and either removed from the BSFNRRA or chipped and spread in the adjacent woods. Clearing limits shall not exceed the original footprint established during the drilling. No clearing on any site may exceed one-half acre without written approval.

3.1.1 – Construction Requirements

Vegetative Clearing. All debris, trees, stumps, roots, and other protruding obstructions within the clearing limits, not designated to remain, shall be cleared, grubbed, removed, and disposed of.

Road Repair and Maintenance. No access road shall exceed 12 feet in width. Overhanging limbs will be removed only high enough to allow passage of equipment. Onsite material will be used for fill when possible. If additional fill is required, appropriate material will be determined and approved by the project officer. Existing road drainage ditches will be pulled and utilized. The material pulled from these ditches may be used to fill gullies or to build a crown on the road. Water bars will be constructed on slopes that exceed 10%. Locations of water bars will be flagged by the project officer.

Removal of Abandoned Oil and Gas Field Equipment and Debris. The Contractor shall be responsible for removal of abandoned oil and gas field equipment, piping, fittings, meters, etc. and other debris associated with the wells. The materials become the property of the contractor and must be removed from the park.

3.1.2 – Measurement and Payment

Measurement will be made to the nearest 1/10 acre for all complete and accepted work. Payment shall be made at the contract unit price per acre for complete and accepted work.

3.2 – Ditches, Terraces and Channels

This work shall consist of the layout and construction of diversion ditches, terraces and channels necessary to prevent or minimize erosion, and control water flow and direction on the project sites and access roads.

3.2.1 – Equipment

Equipment size and quantity suited for the size drainage shall be available to perform the work. Large equipment shall not be permitted when cutting small diversion ditches if an excessive area of disturbance is the result of the use of large equipment. Equipment shall be in good serviceable condition with all required safety features operational. An inoperative emergency shutdown switch is an example of an unacceptable safety feature. Frayed or worn sling cable is an example of unacceptable equipment.

3.2.2 – Construction Requirements

The excavation proposed under all areas of this project shall be unclassified. It is anticipated that the majority of material to be removed will consist of a mixture of loose unconsolidated soil and rock, along with organic material and other debris. Some excavation of rock may be required to properly install the items included in these plans and specifications. Blasting will not be permitted on this project.

Before performing the work described in this section, the proposed diversion ditch location shall be cleared and grubbed in accordance with Section 3.1 and/or as approved by the project officer.

No payment will be made under this section; the work is considered a subsidiary of Section 701.0, Road Restoration.

Section 4.0 – Well Plugging

4.1 – Quality Control-Well Plugging Technicians

The contractor shall provide a Well Plugging Technician for each active plugging rig who is able to satisfactorily perform the duties listed below.

The Technician shall be qualified in all aspects of well plugging and must have a minimum of five (5) years experience. The contractor must submit a summary of the Technician's qualifications and experience along with his bid. Qualifications and experience may include: Type of plugging experience, any training or certifications received, previous jobs summary. A minimum of two references must be provided.

The contract shall not be awarded until the NPS has approved the Well Plugging Technician.

It shall be the responsibility of the Technician to review and become thoroughly familiar with the contract requirements. He/she shall continuously inspect the work in progress to assure that the work is in compliance with contract plans and specifications. The Technician shall be on the project site during working hours.

The Technician shall conduct and observe all plugging phases of work in progress and advise the "on site superintendent" of any work which is not in compliance with specifications. It shall be the responsibility of the contractor to immediately correct any work that is out of compliance.

The Technician shall have a working knowledge of equipment performance and safety regulations.

The Technician shall immediately notify the NPS project officer of any contract work which is not in compliance with contract requirements. A notation of any non-compliance work and the correction of same shall be made in the Daily Project Inspection Report.

The Technician shall maintain a project daily diary, the units of work accomplished and document with measurements or personal witness in the case of lump sum work. Measurements and calculations for unit items of work, that can be measured, will be submitted along with each payment request.

Special Conditions.

a. If at any time during the term of the contract the Technician cannot satisfactorily (at the discretion of the NPS) his duties, the contractor shall immediately replace the Technician with a qualified individual. No plugging work shall be performed during the absence of the Technician.

b. The Technician shall be capable of communicating with the contractor's personnel and the NPS personnel. He must be capable of anticipating problems and suggesting corrective or alternative action that is consistent with contract requirements. The Technician selected shall be on the project for the duration of the project and shall not be replaced without written approval of the NPS.

c. In the event a firm submits an individual for consideration, that same person must meet all the qualifications stated herein. A group of people with experience in certain phases will not be considered a Technician.

4.2 – General Well Plugging Specifications

This work shall consist of plugging vertical wells in accordance with the following specifications, drawings and the rules and regulations of the Tennessee State Oil and Gas Board, additional Federal regulations that may apply, or a combination thereof.

The plugging contractor is required to submit a Plugging and Abandonment Report for each well that is plugged. The Report must be signed by the operator and the State Inspector and must be notarized.

4.3 – Spill Prevention and Control Practices.

4.3. 1 – Prevention. During site preparation, the contractor will note the runoff point or points on the location and construct a small berm or berms capable of containing no less that 5 barrels. For most locations, it is anticipated this can be accomplished using materials available onsite and hand shovels.

All operations shall be carried out through an approved (by the project officer) control head, in good working order, which is attached to the surface casing at all times. The plugging rig shall include personnel trained in well control.

Saltwater, oils and sludge generated during the plugging operations may be temporarily stored only in properly constructed, liquid tight tanks. No pits, lined or otherwise shall be permitted. Such material must be removed and disposed of (in accordance with local laws) when requested by the project officer or at the time of plugging completion.

The contractor shall take precautions to prevent oil, brine, chemicals and other materials from contacting the ground during well plugging operations. Precautions will include the use of plastic liners beneath the plugging rig, pipe racks, and other equipment as necessary. When necessary to bleed pressure from wellheads, blowdown lines attached to collection tanks shall be used. The well location site will be prepared such that the liners will direct spilled liquids to a collection point for pickup.

Workers will be properly trained to reduce the number of human errors that often cause spills.

Visual inspection during rig-up to assure the satisfactory condition of storage tanks, piping, fittings, and other rig equipment that normally hold contaminating substances such as drilling mud, oil, fuel, lubricating oil, hydraulic fluid, etc.

During operations, workers will be observant for signs of spills or leakage and the need for equipment maintenance.

The contractor will visually inspect rainwater for sheen. If necessary, steps will be taken to prevent contaminated stormwater discharges. Such steps might include placement of absorbent materials at runoff points or vacuuming up of contaminated stormwater.

The following cleanup equipment will be available on the location for immediate use by on-site personnel in response to small spills, and for initial spill containment and cleanup efforts in response to larger spills: absorbent pads and material, a hand-held fire extinguisher, shovels, rake, and an assortment of hand tools.

4.3.2 – Spill Response. Any spills would be promptly contained and picked up.

In the event a spill is encountered, initial response actions will be aimed at controlling the spill, then containing spilled materials. Person(s) onsite will immediately assess the situation and take steps to control the source of the spill (if it can be done safely) by shutting valves, shutting down equipment, or closing in wells as needed.

For small spills, onsite personnel will use equipment on hand to contain the spread of the spill. This would typically involve placing absorbent pads or booms, or by constructing a retaining dike from dirt, boards, synthetic absorbents, hay, straw, etc. Small spills will be picked up immediately with absorbent materials.

For larger spills, will direct actions to immediately isolate and shut off source of the material being spilled (if it can be done safely). The supervisor will assess containment needs and call out contract equipment and services as determined necessary. Onsite personnel will use equipment and materials on hand to slow the spread of oil or contaminants until additional equipment/services can reach the site.

In the rare event that spilled materials escape from the location, the contractor will consult with the park superintendent, or designated representative, and obtain consent prior to mobilizing equipment that may have lingering impacts to natural resources outside the area of operations.

If a tank truck is involved in a spill incident outside the well plugging area or access road, but inside the park, the contractor will respond in the same manner as spills within the approved contract work area.

4.3.3 – Cleanup. Cleanup and removal of spills will be performed using accepted industry practices. Such practices include the pickup of free liquids with vacuum equipment, application of absorbent booms, materials, and pads; removal of contaminated wellpad material, and replacement with clean wellpad material.

All contaminated cleanup materials will be stored in impermeable, weatherproof containers and removed from the site as early as practical. All contaminated materials will be disposed of according to state and federal guidelines.

Should a spill occur or reach beyond the approved work area, the contractor will take actions to restore the disturbed area to the natural conditions and processes that existed before the spill. Restoration of the affected area will be performed in consultation with the superintendent and meet the same standards as Section 5.

4.4 – Downhole Plugging Operations

The following objectives will be applied to each well-plugging operation:

1. Set cement plugs to isolate all formations bearing oil, gas, geothermal resources and other minerals from zones of usable quality water (freshwater).

2. Set cement plugs to isolate all formations bearing usable quality water.

3. Set a cement plug to isolate the surface of intermediate casing from the open hole below the casing shoe.

4. Set a cement plug to seal the well at the surface. The top of surface plug shall be no deeper than 3 feet from ground level.

5. Remove the surface casing below grade and cap the well. The contractor will cut off all casing 18 inches below grade or to solid rock. The wellhead excavation shall not be backfilled until the cement has cured and shows no sign of leaking fluids or gas and the project officer has approved it.

4.4.1 – Plugging Requirements

Well Plugging Design. In order to achieve the above objectives in light of unknown depths of casings, freshwater zones, and hydrocarbon/brine bearing zones, the approach to plugging design is to the fill the entire wellbore with cement from the top of fluid found in the well or 1000 feet, whichever is deeper. If fluid level is below 1000 feet in a well, individual cement plugs may be set to meet state requirements for mineral zone isolation. Attachment C provides sample wellbore schematics for plugging scenarios.

Cement Quality. All cement for plugging shall be approved API oil well cement without volume extenders and shall be mixed in accordance with API standards. Slurry weights shall be reported on the Plugging and Abandonment Report.

Cement Placement. Cement plugs must be placed through tubing or drill pipe at depths greater than 500 feet or all depths below the fluid level in the well. The dump bailer method may be used only to place cement caps above a bridge plug or retainer. For depths above 500 feet, cement may be placed from surface provided that 1) the unplugged wellbore is free of liquids, and 2) there is a solid base such as the top of a previously set cement plug or a bridge plug present.

Plugging Fluid Where Pressure is Encountered. Each of the intervals between plugs must be filled with mud having sufficient density to exert hydrostatic pressure exceeding the greatest formation pressure encountered while drilling. In the absence of known data, a minimum mud weight of 9 pounds per gallon will be required.

Measurement and payment will be each well that is plugged and accepted.

Payment will be at the price per unit bid for each well. Attachment B includes available well records from the State of Tennessee with the exception of any well logs. The NPS cannot guarantee that all information is accurate.

4.4.2 – Equipment/Rigging Removal & Pumping Fluids

In the event that wells contain rigging or if abandoned equipment is present, the contractor shall log all hours spent upon removal and may charge at the unit price bid per hour. All hours must be approved by the Project Officer.

In the event fluid is present in the hole and must be removed (at the discretion of the project officer) the contractor shall log all hours spent pumping, containing and disposing of fluids at the unit price bid per hour. All pumped fluids shall be temporarily stored only in properly constructed, liquid tight tanks. All fluids must be disposed of in accordance with local, state and federal laws and regulations and disposal method must be approved by the Project Officer.

Measurement shall be to the nearest hour. Payment will be made at the unit price bid per hour.

Section 5.0 – Access Roads and Well Site Reclamation

Site Clean Up. All work areas and/or areas disturbed during the course of the work shall be thoroughly cleaned of all rubbish, debris, construction waste, or other unsightly materials. Sanitary facilities shall be removed and/or backfilled in a manner acceptable to the project officer.

All roads not designated as permanent or designated as trails shall be closed and erosion controls such as broad-based dips implemented to effectively and permanently abandon access roads. Vegetation cut and removed from road to gain access may be pulled back onto the road as a means of preventing unauthorized use.

The removal or remediation of any contamination from past operations is not within the scope of this contract. Should contamination be discovered in quantities or concentrations that would require action, the NPS may elect to keep the access road and/or a portion of the well pad open until such time the contamination is removed or remediated. If the road was scheduled to be restored to natural conditions as part of this contract, and the NPS cannot address the contamination within the timeframe of this contract, the NPS reserves the right to reduce the contract amount by the per acre bid amount for reclamation time the number of acres left unreclaimed. The contractor would be relieved of any further responsibility for maintenance or reclamation of that section of road and well pad.

5.1 – Vegetation Establishment

Work Description. Seeding shall consist of furnishing and placing seed and mulch all in accordance with these specifications, on all newly graded earthen areas.

All disturbed areas must be scarified mechanically to a depth of 3 inches. Seeding and mulching must occur within 48 hours of scarification. If precipitation occurs within those 48 hours, all areas must be re-scarified prior to seeding.

Seeding on this project will be done with a seeder, either hand driven or mechanical, which is capable of disseminating the following seed mixture evenly over the disturbed areas.

The project officer shall be on site during the revegetation process.

5.1.1 – Seed requirements and rates are as follows:

Seed Material	lbs/acre
little bluestem (Andropogon scoparius)	3 lbs/acre
indian grass (Sorghastrum nutans)	3 lbs/acre
big bluestem (Andropogon geradi)	3 lbs/acre
switchgrass (Panicum virgatum)	1 lb/acre
winter/common oats (Avena sativa)	30 lbs/acre
Virginia wild rye (Elymus virginicus)	10 lbs
crimson clover (Trifolium incarnatum)	15 lbs/acre
partridge pea (Chamaecrista fasciculata)	5 lbs/acre

Plus 10 lbs/acre total of any or all of the following:

roundhead lespedeza (Lespedeza capitata)

hairy lespedeza (Lespedeza hirta)

intermediate lespedeza (Lespedeza intermedia)

trailing lespedeza (Lespedeza procumbens)

creeping lespedeza (Lespedeza repens)

violet lespedeza (Lespedeza violacea)

Three tons of straw mulch per acre is required and mulch shall be held in place by using a crimper or other compatible method to anchor the mulch into the soil to a depth of two inches.

5.1.2 – Seed and Mulch Materials

Materials used in this construction shall meet the requirements of the following specifications:

5.1.2.1 – Grass Seed.

The seed shall meet the requirements of the Tennessee Department of Agriculture and no "Below Standard" seed will be accepted.

Grass seed furnished under these specifications shall be packed in new bags or bags that are sound and not mended.

The vendor shall notify the Department before shipments are made so that arrangements can be made for inspection and testing of stock.

The vendor shall furnish the Department a certified laboratory report from an accredited commercial seed laboratory or from a State seed laboratory showing the analysis of the seed to be furnished. The report from an accredited commercial seed laboratory shall be signed by a Registered Member of the Society of Commercial Seed Technologists. At the discretion of the Department, samples of the seed may be taken for check against the certified laboratory report. Sampling and testing will be in accordance with the requirements of the Tennessee Department of Agriculture.

The seed mixture shall be uniformly mixed using a mechanical mixer and bagged in 50-pound bags. Group seed shall not be mixed until after each type seed that is used to form the "Group" has been tested and inspected separately and approved for purity and germination by the Department. Seed mixed before tests and inspection are made will not be accepted.

Inoculants for Legumes. Inoculants for treating legume seed shall be standard cultures of nitrogen-fixing bacteria that are adapted to the particular kind of seed to be treated. The inoculants shall be supplied in convenient containers of a size sufficient to treat the amount of seed to be planted. The label on the container shall indicate the specified legume seed to be inoculated and the date period to be used. Twice the amount recommended by the manufacturer shall be used.

5.1.2.2 – Mulch Material.

All straw mulch material shall be air dried and reasonably free from noxious weeds and weed seeds or other materials detrimental to plant growth on the project or on adjacent agricultural lands.

Straw shall be stalks of rye, oats, wheat or other approved grain crops.

The mulch shall be reasonably free from weeds, seeds, and foreign materials and shall contain no Johnson grass or wild onions. Weight tickets shall be furnished to verify the quantity of mulch furnished.

Straw shall be suitable for spreading with standard mulch blower equipment.

All equipment necessary for the satisfactory performance of this work shall be on the project and approved before work will be permitted to begin.

5.1.3 – Care During Construction and Acceptable Stand. All seeded areas shall be properly cared for until acceptance of the work.

Areas which have been previously seeded and mulched in accordance with this section but which have been damaged or failed to successfully establish an acceptable stand of grasses or legumes shall be repaired as directed by the project officer.

The contractor shall notify the project officer at least 48 hours in advance of the time he intends to begin seeding operations and shall not do so until permission has been granted by the project officer. Before starting seeding operations, sloping, shaping and dressing shall have been completed in accordance with these specifications. If the contractor fails to notify the project officer within the specified time, then the seeding operation will not be accepted.

It shall be imperative that the contractor have on site all equipment, materials, labor and any other incidentals necessary for performing the work to satisfactory completion.

The contractor shall proceed, with vigor, the vegetation process once the process is begun.

Seeding. Seed of the specified groups shall be sown as soon as preparation of the seedbed has been completed. It shall be sown uniformly by an approved means. Seeds of legumes shall be inoculated before sowing in accordance with the manufacturer's recommendations and as approved by the project officer.

Mulching. Mulch material shall be spread evenly over the seedbed area using a mulching machine at an approximate rate of three (3) tons per acre immediately following seeding operations.

On extremely rocky finished grades where crimping will not be practical, crimping will not be permitted and a mulch binder shall be required. Also, crimping will not be permitted except on flat slopes (3:1 or flatter).

When crimpers are used to anchor the mulch into the soil, crimpers shall be capable of pushing the mulch into the soil to a depth of two inches.

Measurement and Payment

Measurement shall be one (1) job for all work completed and accepted.

Payment shall be made lump sum for complete and accepted work and shall constitute full and complete payment for all work in this section.

APPENDIX L: DEPARTMENT OF INTERIOR'S ONSHORE OIL AND GAS ORDER NUMBER 2, SECTION III.G., DRILLING ABANDONMENT

BUREAU OF LAND MANAGEMENT
43 CFR 3160

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Friday, November 18, 1988
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Onshore Oil and Gas Operations; Federal and Indian Oil and Gas Leases;
Onshore oil and Gas Order No. 2, Drilling Operations

Onshore Oil and Gas Order No. 2
Drilling Operations on Federal and Indian Oil and Gas Leases

I. Introduction

A. Authority

This order is established pursuant to the authority granted to the Secretary of the Interior pursuant to various Federal and Indian mineral leasing statutes and the Federal Oil and Gas Royalty Management Act of 1982. This authority has been delegated to the Bureau of Land Management and is implemented by the onshore oil and gas operating regulations contained in 43 CFR Part 3160. Section 3164.1 thereof specially authorizes the Director, Bureau of Land Management, to issue Onshore Oil and Gas Orders when necessary to implement and supplement the operating regulations and provides that all such Orders shall be binding on the lessees and operators of Federal and restricted Indian (except Osage tribe) oil and gas leases that have been, or may hereafter be issued.

Specific authority for the provisions contained in this Order is found at: 3162.3-1 Drilling Applications and Plans; 3162.3-4 Well Abandonment; 3162.4-1 Well Records and Reports; 3162.4-3 Samples, Tests, and Surveys; 3162.5-1 Environmental Obligations; 3162.5-2 Control of Wells; 3162.5-2(a) Drilling Wells; 3162.5-3 Safety Precautions; and Subpart 3163 Noncompliance, Assessments, and Penalties.

B. Purpose

This Order details the Bureau's uniform national standards for the minimum levels of performance expected from lessees and operators when conducting drilling operations on Federal and Indian lands (except Osage Tribe) and for abandonment immediately following drilling. The purpose also is to identify the enforcement actions that will result when violations of the minimum standards are found, and when those violations are not abated in a timely manner.

C. Scope

This Order is applicable to all onshore Federal and Indian (except Osage Tribe) oil and gas leases.

D. General

1. If an operator chooses to use higher rated equipment than that authorized in the Application for Permit to Drill (APD), testing procedures shall apply to the approved working pressures, not the upgraded higher working pressures.

2. Some situations may exist either on a well-by-well or field-wide basis whereby it is commonly accepted practice to vary a particular minimum standard(s) established in this Order. This situation may be resolved by requesting a variance (See section IV of this Order), by the inclusion of a stipulation to the APD, or by the issuance of Notice to Lessees and Operators (NTL) by the appropriate BLM office.

3. When a violation is discovered and if it does not cause or threaten immediate substantial and adverse impact on public health and safety, the environment, production accountability or royalty, it will be reissued as a major violation if not corrected during the abatement period and continued drilling has changed the adverse impact of the violation so that it meets the specific definition of a major violation.

4. This Onshore Order is not intended to circumvent the reporting requirements or compliance aspects that may be stated elsewhere in Existing NTL's, Onshore Orders, etc. A lessee's compliance with the requirements of the regulations in this Part shall not relieve the lessee of the obligation to comply with other applicable laws and regulations in accordance with 43 CFR 3162.5-1(c). Lessee's should give special attention to the automatic assessment provisions in 43 CFR 3163.1(b).

5. This Order is based upon the assumption that operations have been approved in accordance with 43 CFR Part 3160 and Onshore Oil and Gas Order No.1. Failure to obtain approval prior to commencement of drilling or related operations shall subject the operator to immediate assessment under 43 CFR 3163.1(b)(2).

II. Definitions.

A. Abnormal Pressure Zone means a zone that has either pressure above or below the normal gradient for an area and/or depth.

B. Bleed Line means the vent line that bypasses the chokes in the choke manifold system; also referred to as Panic Line.

C. Blooie Line means a discharge line used in conjunction with a rotating head. D. Drilling Spool means a connection component with both ends either flanged or hubbed with an internal diameter at least equal to the bore of the casing, and with smaller side outlets for connecting auxiliary lines.

E. Exploratory Well means any well drilled beyond the known producing limits of a pool.

F. Filled-up Line means the line used to fill the hole when the drill pipe is being removed from the well. It is usually connected to a 2-inch collar that is welded into a drilling nipple.

G. Flare Line means a line used to carry gas from the rig to be burned at a safer location. The gas comes from the degasser, gas buster, separator, or when drill stem testing, directly from the drill pipe.

H. Functionally Operated means activating equipment without subjecting it to well-bore pressure.

I. Isolating means using cement to protect, separate, or segregate usable water and mineral resources.

J. Lease means any contact, profit-share agreement, joint venture, or other agreement issued or approved by the United States under a mineral leasing law that authorizes exploration for, extraction of, or removal of oil or gas (See 43 CFR 3160.0-5).

K. Lessee means a person holding record title in a lease issued by the United States (See 43 CFR 3160.0-5).

L. Make-up Water means water that is used in mixing slurry for cement jobs and plugging operations, and is compatible with cement constituents being used.

M. Manual Locking Device means any manually activated device, such as a hand wheel, etc., that is used for the purpose of locking the preventer in the closed position.

N. Mud for Plugging Purposes means a slurry of bentonite ol similar flocculent/viscosfer, water, and additive needed to achieve the desired weight and consistency to stabilize the hole.

O. Mudding Up means adding materials and chemicals to water to control the viscosity, weight, and filtrate loss of the circulating system.

P. Operating Rights Owner (or Owner) means a person or entity holding operating rights in a lease issued by the United States. A lessee also may be an operating rights owner if the operating rights in a lease or portion thereof have not been severed from record title.

Q. Operational means capable of functioning as designed and installed without undue force or further modification.

R. Operator means any person or entity , including but not limited to the lessee or operating rights owner, who has stated in writing to the authorized officer his/her responsibility for the operations conducted in the leased lands or a portion thereof.

S. Precharge Pressure means the nitrogen pressure remaining in the accumulator after all the hydraulic fluid has been expelled from beneath the movable barrier.

T. Prompt Correction means immediate correction of violations, with drilling suspended if required in the discretion of the authorized officer.

U. Prospectively Valuable Deposit of Minerals means any deposit of minerals that the authorized officer determines to have characteristics of quantity and quality that warrant its protection.

V. Tagging the Plug means running in the hole with a string of tubing or drill pipe and placing sufficient weight on the plug to insure its integrity. Other methods of tagging the plug may be approved by the authorized officer.

W. Targeted Tee or Turn means a fitting used in pressure piping in which a bull plug or blind flange of the same pressure rating as the rest of the approved system is installed at the end of a tee or cross, opposite the fluid entry arm, to change the direction of flow and to reduce erosion.

X. 2M, 3M, 5M, 10M, and 15M mean the pressure ratings used for equipment with a working pressure rating of the equivalent thousand pounds per square inch (psi) (2M=2,000 psi, 3M=3,000 psi, etc.)

Y. Usable Water means generally those waters containing up to 10,000 ppm of total dissolved solids.

Z. Weep Hole means a small hole that allows pressure to bleed off through the metal plate, used in covering well bores after abandonment operations.

[57 FR 3025, Jan. 27, 1992]

Requirements

A. Well Control Requirements

1. Blowout preventer (BOP) and related equipment (BOPE) shall be installed, used, maintained, and tested in manner necessary to assure well control and shall be in place and operational prior to drilling the surface casing shoe unless otherwise approved by the APD. Commencement of drilling without the approved BOPE installed, unless otherwise approved, shall subject the operator to immediate assessment under 43 CFR 3163.1(b)(1). The BOP and related control equipment shall be suitable for operations in those areas which are subject to sub-freezing conditions. The BOPE shall be based on known or anticipated sub-surface pressures, geologic conditions, accepted engineering practice, and surface environment. The working pressure of all BOPE shall exceed the anticipated surface pressure to which it may be subjected, assuming a partially evacuated hole with a pressure gradient of 0.22 psi/ft.

2. The gravity of the violations for many of the well control minimum standards listed below are shown as minor. However, very short abatement periods in this Order are often specified in recognition that by continuing to drill, the violation which was originally determined to be of a minor nature may cause or threaten immediate, substantial and adverse impact on public health and safety, the environment, production accountability, or royalty income, which would require it reclassification as a major violation.

a. Minimum standards and enforcement provisions for well control equipment. i. A well control device shall be installed at the surface that is capable of complete closure of the well bore. This device shall be closed whenever the well is unattended.

Violation: Major.
Corrective Action: Install the equipment as specified.
Normal Abatement Period: Prompt correction required.

ii. 2M system:

- Annular preventer, or double ram, or two rams with one being blind and onebeing a pipe ram *
- kill line (2 inch minimum)
- 1 kill line valve (2 inch minimum)
- 1 choke line valve
- 2 chokes (refer to diagram in Attachment 1)
- Upper kelly cock valve with handle available
- Safety valve and subs to fit all drill strings in use
- Pressure gauge on choke manifold
- 2 inch minimum choke line
- Fill-up line above the uppermost preventer.

Violation: Minor (all items unless marked by asterisk).
Corrective Action: Install the equipment as specified.
Normal Abatement Period: 24 hours.

*Violation: Major.
Corrective Action: Install the equipment as specified.
Normal Abatement Period: Prompt correction required.

iii. 3M system:

- Annular preventers*
- Double ram with blind rams and pipe rams*
- Drilling spool, or blowout preventer with 2 side outlets (choke side shall be a 3-inch minimum diameter, kill side shall be at least 2-inch diameter)*
- Kill line (2 inch minimum)
- A minimum of 2 choke line valves (3 inch minimum)*
- 3 inch diameter choke line
- 2 kill line valves, one of which shall be a check valve (2 inch minimum)*
- 2 chokes (refer to diagram in Attachment 1)
- Pressure gauge on choke manifold
- Upper kelly cock valve with handle available
- Safety valve and subs to fit all drill string connections in use
- All BOPE connections subjected to well pressure shall be flanged, welded, or clamped*
- Fill-up line above the uppermost preventer.

Violation: Minor (all items unless marked by asterisk).
Corrective Action: Install the equipment as specified.
Normal Abatement Period: 24 hours.

*Violation: Major.
Corrective Action: Install the equipment as specified.
Normal Abatement Period: Prompt correction required.

iv. 5M system:

- Annular preventer*
- Pipe ram, blind ram, and, if conditions warrant, as specified by the authorized officer, another pipe ram shall also be required*
- A second pipe ram preventer shall be used with a tapered drill string
- Drilling spool, or blowout preventer with 2 side outlets (choke side shall be a 3-inch minimum diameter, kill side shall be at least 2-inch diameter)*
- 3 inch diameter choke line
- 2 choke line valves (3 inch minimum)*
- Kill line (2 inch minimum)
- 2 chokes with 1 remotely controlled from rig floor (refer to diagram in Attachment 1)
- 2 kill line valves and a check valve (2 inch minimum)*
- Upper kelly cock valve with handle available
- When the expected pressures approach working pressure of the system, 1 remote kill line tested to stack pressure (which shall run to the outer edge of the substructure and be unobstructed)
- Lower kelly cock valve with handle available
- Safety valve(s) and subs to fit all drill string connections in use
- Inside BOP or float sub available
- Pressure gauge on choke manifold
- All BOPE connections subjected to well pressure shall be flanged, welded, orclamped*
- Fill-up line above the uppermost preventer.

Violation: Minor (all items unless marked by asterisk).
Corrective Action: Install the equipment as specified.
Normal Abatement Period: 24 hours.

*Violation: Major.
Corrective Action: Install the equipment as specified.
Normal Abatement Period: Prompt correction required.

v. 10M & 15M system:

- Annular preventer*
- 2 pipe rams*
- Blind rams*
- Drilling spool, or blowout preventer with 2 side outlets (choke side shall be a 3-inch minimum diameter, kill side shall be at least 2-inch diameter)*
- 3 inch choke line*
- 2 kill line valves (2 inch minimum) and check valve*
- Remote kill line (2 inch minimum) shall run to the outer edge of the substructure and be unobstructed
- Manual and hydraulic choke line valve (3 inch minimum)*
- 3 chokes, 1 being remotely controlled (refer to diagram in Attachment 1)
- Pressure gauge on choke manifold
- Upper kelly cock valve with handle available
- Lower kelly cock valve with handle available
- Safety valves and subs to fit all drill string connections in use
- Inside BOP or float sub available
- Wearing ring in casing head
- All BOPE connections subjected to well pressure shall be flanged, welded, orclamped*
- Fill-up line installed above the uppermost preventer.

Violation: Minor (all items unless marked by asterisk).
Corrective Action: Install the equipment as specified.
Normal Abatement Period: 24 hours.

*Violation: Major. Corrective Action:
Install the equipment as specified.
Normal Abatement Period: Prompt correction required.

vi. If repair or replacement of the BOPE is required after testing, this work shall be performed prior to drilling out the casing shoe.

Violation: Major.
Corrective Action: Install the equipment as specified.
Normal Abatement Period: Prompt correction required.

vii. When the BOPE cannot function to secure the hole, the hole shall be secured using cement, retrievable packer or a bridge plug packer, bridgeplug, or other acceptable approved method to assure safe well conditions.

Violation: Major.
Corrective Action: Install the equipment as specified.
Normal Abatement Period: Prompt correction required.

[54 FR 39528, Sept. 27, 1989]

b. Minimum standards and enforcement provisions for choke manifold equipment.

i. All choke lines shall be straight lines unless turns use tee blocks or are targeted with running tees, and shall be anchored to prevent whip and reduce vibration.

Violation: Minor.
Corrective Action: Install the equipment as specified.
Normal Abatement Period: 24 hours.

ii. Choke manifold equipment configuration shall be functionally equivalent to the appropriate example diagram shown in Attachment 1 of this Order. The configuration of the chokes may vary.

Violation: Minor.
Corrective Action: Install the equipment as specified.
Normal Abatement Period: Prompt correction required.

iii. All valves (except chokes) in the kill line choke manifold, and choke line shall be a type that does not restrict the flow (full opening) and that allows a straight through flow (same enforcement as item ii).

iv. Pressure gauges in the well control system shall be a type designed for drilling fluid service (same enforcement as above).

[57 FR 3025, Jan. 27, 1992]

c. Minimum standards and enforcement provisions for pressure accumulator system.

i. 2M system accumulator shall have sufficient capacity to close all BOP's and retain 200 psi above precharge. Nitrogen bottles that meet manufacturer's specifications.

Violation: Minor.
Corrective Action: Install the equipment as specified.
Normal Abatement Period: 24 hours.

ii. 3M system accumulator shall have sufficient capacity to open the hydraulically-controlled choke line valve(if so equipped), close all rams plus the annual preventer, and retain a minimum of 200 psi above precharge on the closing manifold without the use of the closing pumps. this is a minimum requirement. The fluid reservoir capacity shall be double the usable fluid volume of the accumulator system capacity and the fluid level shall be maintained at the manufacturer's recommendations. The 3M system shall have 2 independent power sources to close the preventers. Nitrogen bottles (3 minimum) may be 1 of the independent power sources and, if so, shall maintain a charge equal to the manufacturer's specifications.

Violation: Minor
Corrective Action: Install the equipment as specified.
Normal Abatement Period: 24 hours.

iii. 5M and higher system accumulator shall have sufficient capacity to open the hydraulically-controlled gate valve (if so equipped) and close all rams plus the annular preventer (for 3 ram systems add a 50 percent safety factor to compensate for any fluid loss in the control system or preventers) and retain a minimum pressure of 200 psi above precharge on the closing manifold without use of the closing unit pumps. The fluid reservoir capacity shall be double the usable fluid volume of the accumulator system capacity and the fluid level of the reservoir shall be maintained at the manufacturer's recommendations. Two independent sources of power shall be available for powering the closing unit pumps. Sufficient nitrogen bottles are suitable as a backup power source only, and shall be recharged when the pressure falls below manufacturer's specifications.

Violation: Minor.
Corrective Action: Install the equipment as specified.
Normal Abatement Period: 24 hours.

[57 FR 3025, Jan. 27, 1992]

d. Minimum standards and enforcement provisions for accumulator precharge pressuretest. This test shall be conducted prior to connecting the closing unit to the BOP stack and at least once every 6 months. The accumulator pressure shall be corrected if the measured precharge pressure is found to be above or below the maximum or minimum limit specified below (only nitrogen gas may be used to precharge):

Accumulator working pressure rating	Minimum acceptable operating pressure	Desired precharge pressure	Maximum acceptable precharge pressure	Minimum acceptable precharge pressure
1,500 psi	1,500 psi	750 psi	800 psi	700 psi
2,000 psi	2,000 psi	1,000 psi	1,100 psi	900 psi
3,000 psi	3,000 psi	1,000 psi	1,100 psi	900 psi

Violation: Minor.
Correction Action: Perform test.
Normal Abatement Period: 24 hours.

e. Minimum standards and enforcement provisions for power availability. Power for the closing unit pumps shall be available to the unit at all times so that the pumps shall automatically start when the closing valve manifold pressure has decreased to the pre-set level.

Violation: Major.
Corrective Action: Install the equipment as specified.
Normal Abatement Period: Prompt correction required.

f. Minimum standards and enforcement provisions for accumulator pump capacity. Each BOP closing unit shall be equipped with sufficient number and sizes of pumps so that, with the accumulator system isolated from service, the pumps shall be capable of opening the hydraulically-operated gate valve (if so equipped), plus closing the annular preventer on the smallest size drill pipe to be used within 2 minutes, and obtain a minimum of 200 psi above specified accumulator precharge pressure.

g. Minimum standards and enforcement provisions for locking devices. A manual locking device (i.e., hand wheels) or automatic locking devices shall be installed on all systems of 2M or greater. A valve shall be installed in the closing line as close as possible to the annular preventer to act as a locking device. This valve shall be maintained in the open position and shall be closed only when the power source for the accumulator system is inoperative.

Violation: Minor.
Corrective Action: Install the equipment as specified.
Normal Abatement Period: 24 hours.

h. Minimum standards and enforcement provisions for remote controls. Remote controls shall be readily accessible to the driller. Remote controls for all 3M or greater systems shall be capable of closing all preventers. Remote controls for 5M or greater systems shall be capable of both opening and closing all preventers. Master controls shall be at the accumulator and shall be capable of opening and closing all preventers and the choke line valve (if so equipped). No remote control for a 2M system is required.

Violation: Minor.
Correction Action: Install the equipment as specified.
Normal Abatement Period: 24 hours.

i. Minimum standards and enforcement provisions for well control equipment testing.

i. Perform all tests described below using clear water or an appropriate clear liquid for subfreezing temperatures with a viscosity similar to water.

ii. Ram type preventers and associated equipment shall be tested to approved (see item I.D.1. of this order) stack working pressure if isolated by test plug or to 70 percent of internal yield pressure of casing if BOP stack is not isolated from casing. Pressure shall be maintained for at least 10 minutes or until requirements of test are met, whichever is longer. If a test plug is utilized, no bleed-off of pressure is acceptable. For a test not utilizing a test plug, if a decline in pressure of more than 10 percent in 30 minutes occurs, the test shall be considered to have failed. Valve on casing head below test plug shall be open during test of BOP stack.

iii. Annular type preventers shall be tested to 50 percent of rated working pressure. Pressure shall be maintained at least 10 minutes or until provisions of test are met, whichever is longer.

iv. As a minimum, the above test shall be performed:

A. when initially installed;
B. whenever any seal subject to test pressure is broken;
C. following related repairs; and
D. at 30-day intervals.

v. Valves shall be tested from working pressure side during BOPE tests with all down stream valves open.

vi. When testing the kill line valve(s), the check valve shall be held open or the ball removed.

vii. Annular preventers shall be functionally operated at least weekly.

viii. Pipe and blind rams shall be activated each trip, however, this function need not be performed more than once a day.

ix. A BOPE pit level drill shall be conducted weekly for each drilling crew.

x. Pressure tests shall apply to all related well control equipment.

xi. All of the above described tests and/or drills shall be recorded in the drilling log.

Violation: Minor.
Corrective action: Perform the necessary test or provide documentation.
Normal Abatement Period: 24 hours or next trip, as most appropriate.

[54 FR 39528, Sept. 27, 1989]

B. Casing and Cementing Requirements

The proposed casing and cementing programs shall be conducted as approved to protect and/or isolate all usable water zones, lost circulation zones, abnormally pressured zones, and any prospectively valuable deposits of minerals. Any isolating medium other than cement shall receive approval prior to use. The casing setting depth shall be calculated to position the casing seat opposite a competent formation which will contain the maximum pressure to which it will be exposed during normal drilling operations. Determination of casing setting depth shall be based on all relevant factors, including: presence/absence of hydrocarbons; fracture gradients; usable water zones; formation pressures; lost circulation zones; other minerals; or other unusual characteristics. All indications of usable water shall be reported.

- Minimum design factors for tensions, collapse, and burst that are incorporated into the casing design by an operator/lessee shall be submitted to the authorized operator for his review and approval along with the APD for all exploratory wells or as otherwise specified by the authorized officer.

- Casing design shall assume formation pressure gradients of 0.44 to 0.50 psi per foot for exploratory wells (lacking better data).

- Casing design shall assume fracture gradients from 0.70 to 1.00 psi per foot for exploratory wells (lacking better data).

- Casing collars shall have a minimum clearance of 0.422 inches on all sides in the hole/casing annulus, with recognition that variances can be granted for justified exceptions.

- All waiting on cement times shall be adequate to achieve a minimum of 500 psi compressive strength at the casing shoe prior to drilling out.

1. Minimum Standards and Enforcement Provisions for Casing and Cementing.

a. All casing, except the conductor casing, shall be new or reconditioned and tested casing. All casing shall meet or exceed API standards for new casing. The use of reconditioned and tested used casing shall be subject to approval by the authorized officer; approval will be contingent upon the wall thickness of any such casing being verified to be at least 87 1/2 percent of the nominal wall thickness of new casing.

Violation: Major.

Corrective Action: Perform remedial action as specified by the authorized officer.
Normal Abatement Period: Prompt correction required.

[57 FR 3025, Jan. 27, 1992]

b. For liners, a minimum of 100 feet of overlap between a string of casing and the next larger casing is required. The interval of overlap shall be sealed and tested. The liner shall be tested by a fluid entry or pressure test to determine whether a seal between the liner top and next larger string has been achieved. The test pressure shall be the maximum anticipated pressure to which the seal will be exposed. No test shall be required for liners that do not incorporate or need a seal mechanism.

Violation: Minor.
Corrective Action: Perform remedial action as specified by the authorized officer.
Normal Abatement Period: Upon determination of corrective action.

c. The surface casing shall be cemented back to surface either during the primary cement job or by remedial cementing.
Corrective Action: Perform remedial cementing.
Normal Abatement Period: Prompt correction required.

d. All of the above described tests shall be recorded in the drilling log.

Violation: Minor.
Corrective Action: Perform the necessary test or provide documentation.
Normal Abatement Period: 24 hours.

e. All indications of usable water shall be reported to the authorized officer prior to running the next string of casing or before plugging orders are requested, whichever occurs first. Violation: Major.
Corrective Action: Report information as required.
Normal Abatement Period: Prompt correction required.

f. Surface casing shall have centralizers on the bottom 3 joints of the casing (a minimum of 1 centralizer per joint, starting with the shoe joint).

Violations: Major.
Corrective Action: Logging/testing may be required to determine the quality of the job. Recementing may then be specified.
Normal Abatement Period: Prompt correction upon determination of corrective action.

[57 FR 3025, Jan. 27, 1992]

g. Top plugs shall be used to reduce contamination of cement by displacement fluid. A bottom plug or other acceptable technique, such as a preflush fluid, inner string cement method, etc., shall be utilized to help isolate the cement from contamination by the mud fluid being displaced ahead of the cement slurry. Violation: Major.
Correction Action: Logging may be required to determine the quality of the cement job. Recementing or further recementing may then be specified.
Normal Abatement Period: Based upon determination of corrective action.

h. All casing strings below the conductor shall be pressure tested to 0.22 psi per foot of casing string length or 1500 psi, whichever is greater, but not to exceed 70 percent of the minimum internal yield. If pressure declines more than 10 percent in 30 minutes, corrective action shall be taken.

Violation: Minor.
Corrective Action: Perform the test and/or remedial action as specified by the authorized officer.
Normal Abatement Period: 24 hours.

i. On all exploratory wells, and on that portion of any well approved for a 5M BOPE system or greater, a pressure integrity test of each casing shoe shall be performed. Formation at the shoe shall be tested to a minimum of the mud weight equivalent anticipated to control the formation pressure to the next casing depth or at total depth of the well. This test shall be performed before drilling more than 20 feet of new hole.

Violation: Minor.
Corrective Action: Perform the specified test.
Normal Abatement Period: 24 hours.

C. Mud Program Requirements

The characteristics, use, and testing of drilling mud and the implementation of related drilling procedures shall be designed to prevent the loss of well control. Sufficient quantities of mud materials shall be maintained or readily accessible for the purpose of assuring wellcontrol.

Minimum Standards and Enforcement Provisions for Mud Program and Equipment

1. Record slow pump speed on daily drilling report after mudding up.

Violation: Minor.
Corrective Action: Record required information.
Normal Abatement Period: 24 hours.

2. Visual mud monitoring equipment shall be in place to detect volume changes indicating loss or gain of circulating fluid volume.

Violation: Minor.
Corrective Action: Install necessary equipment.

Normal Abatement Period: 24 hours.

3. When abnormal pressures are anticipated, electronic/mechanical mud monitoring equipment shall be required, which shall include as a minimum; pit volume totalizer (PVT); stroke counter; and flow sensor.

Violation: Minor.
Corrective Action: Install necessary instrumentation.
Normal Abatement Period: 24 hours.

4. A mud test shall be performed every 24 hours after mudding up to determine, as applicable: density, viscosity, gel strength, filtration, and pH.

Violation: Minor.
Correction Action: Perform necessary tests.
Normal Abatement Period: 24 hours.

5. A trip tank shall be used on 10M and 15M systems and on upgraded 5M systems as determined by the authorized officer.

Violation: Minor.
Corrective Action: Install necessary equipment.
Normal Abatement Period: 24 hours.

6. a. Gas detecting equipment shall be installed in the mud return system for exploratory wells or wells where abnormal pressure is anticipated, and hydrocarbon gas shall be monitored for pore pressure changes.

b. Hydrogen sulfide safety and monitoring equipment requirements may be found in Onshore Oil and Gas Order No. 6 - Hydrogen Sulfide Operations.

Violation: Minor.
Corrective Action: Install necessary equipment.
Normal Abatement Period: 24 hours.

7. All flare systems shall be designed to gather and burn all gas. The flare line(s) discharge shall be located not less than 100 feet from the well head, having straight lines unless turns are targeted with running tees, and shall be positioned downwind of the prevailing wind direction and shall be anchored. The flare system shall have an effective method for ignition. Where noncombustible gas is likely or expected to be vented, the system shall be provided supplemental fuel for ignition and to maintain a continuous flare.

Violation: Major.
Corrective Action: Install equipment as specified.
Normal Abatement Period: 24 Hours.

8. A mud-gas separator (gas buster) shall be installed and operable for all systems of 10M or greater and for any system where abnormal pressure is anticipated beginning at a point at least 500 feet above any anticipated hydrocarbon zone of interest.

Violation: Minor.
Corrective Action: Install required equipment.
Normal Abatement Period: Prompt correction required.

[54 FR 39528, Sept. 27, 1989, further amended at 57 FR 3026, Jan.27, 1992]

D. Drill Stem Testing Requirements

Initial opening of drill stem test tools shall be restricted to daylight hours unless specific approval to start during other hours is obtained from the authorized officer. However, DSTs may be allowed to continue at night if the test was initiated during daylight hours and the rate of flow is stabilized and if adequate lighting is available (i.e., lighting which is adequate for visibility and vapor-proof for safe operations). Packers can be released, but tripping shall not begin before daylight, unless prior approval is obtained from the authorized officer. Closed chamber DSTs may be accomplished day or night.

Minimum Standards for Drill Stem Testing.

1. A DST that flows to the surface with evidence of hydrocarbons shall be eitherreversed out of the testing string under controlled surface conditions or displaced into the formation prior to pulling the test tool. This would involve providing some means forreserve circulation.

Violation: Major.
Corrective Action: Contingent on circumstances and as specified by the authorizedofficer.
Normal Abatement Period: Prompt correction required.

2. Separation equipment required for the anticipated recovery shall be properly installed before a test starts.

Violation: Major.
Corrective Action: Install required equipment.
Normal Abatement Period: Prompt correction required.

3. All engines within 100 feet of the wellbore that are required to "run" during the test shall have spark arresters or water cooled exhausts.

Violation: Major.
Corrective Action: Contingent on circumstances and as specified by the authorized officer.
Normal Abatement Period: Prompt correction required.

E. Special Drilling Operations

1. In addition to the equipment already specified elsewhere in this onshore order, the following equipment shall be in place and operational during air/gas drilling:

- Properly lubricated and maintained rotating head*
- Spark arresters on engines or water cooled exhaust*
- Blooie line discharge 100 feet from well bore and securely anchored
- Straight run on blooie line unless otherwise approved
- Deduster equipment*
- All cuttings and circulating medium shall be directed into a reserve or blooie pit*
- Float valve above bit*
- Automatic igniter or continuous pilot light on the blooie line*
- Compressors located in the opposite direction from the blooie line a minimum of 100 feet from the well bore
- Mud circulating equipment, water, and mud materials (does not have to be premixed) sufficient to maintain the capacity of the hole and circulating tanks or pits

Violation: Minor (unless marked by an asterisk).
Corrective Action: Install the equipment as specified.
Normal Abatement Period: 24 hours.

*Violation: Major.
Corrective Action: Install the equipment as specified.
Normal Abatement Period: Prompt correction required.

2. Hydrogen sulphide operation is specifically addressed under Onshore Oil and Gas Order No. 6.

F. Surface Use

Onshore Oil and Gas Order No. 1 specifically addresses surface use. That Order provides for safe operations, adequate protection of surface resources and uses, and other environmental components. The operator/lessee is responsible for, and liable for, all building, construction, and operating activities and subcontracting activies conducted in association with the APD. Requirements and special stipulations for surface use are contained in or attached to the approved APD.

Minimum Standards and Enforcement Provisions for Surface Use.

The requirements and stipulations of approval shall be strictly adhered to by the operator/lessee and any contractors. Violation: If a violation is identified by the authorized officer he shall dtermine wherther it is major or minor, considering the definitions in 43 CFR 3160.0-5, and shall specify the appropriate corrective action and abatement period.

G. Drilling Abandonment Requirements

The following standards apply to the abandonment of newly drilled dry or non- productive wells in accordance with 43 CFR 3162.3-4 and section V of Onshore Oil and Gas Order No. 1. Approval shall be obtained prior to the commencement of abandonment. All formations bearing usable-quality water, oil, gas, or geothermal resources, and/or a prospectively valuable deposit of minerals shall be protected. Approval may be given orally by the authorized officer before abandonment operations are initiated. This oral request and approval shall be followed by a written notice of intent to abandon filed not later than the fifth business day following oral approval. Failure to obtain approval prior to commencement of abandonment operations shall result in immediate assessment of under 43 CFR 3163.1(b)(3). The hole shall be in static condition at the time any plugs are placed (this does not pertain to plugging lost circulation zones). Within 30 days of completion of abandonment, a subsequent report of a abandonment shall be filed. Plugging design for an abandonment hole shall include the following:

1. Open Hole.

i. A cement plug shall be placed to extend at least 50 feet below the bottom (except as limited by total depth (TD) or plugged back total depth (PBTD)), to 50 feet above the top of:
a. Any zone encountered during which contains fluid or gas with a potential to migrate;
b. Any prospectively valuable deposit of minerals.

ii. All cement plugs, except the surface plug, shall have sufficient slurry volume to fill 100 feet of the hole, plus an additional 10 percent of slurry for each 1,000 feet of depth.

iii. No plug, except the surface plug, shall be less than 25 sacks without receiving specific approval from the authorized officer.

iv. Extremely thick sections of single formation may be secured by placing 100-foot plugs across the top and bottom of the formation, and in accordance with item ii hereof. v. In the absence of productive zones or prospectively valuable deposits of minerals which otherwise require placemnt of cement plugs, long sections of open hole shall be plugged at least every 3,000 feet. Such plugs shall be placed across in gauge sections of the hole, unless otherwise approved by the authoriuzed officer.

2. Cased Hole. A cement plug shall be placed opposite all open perforation and extend to a minimum of 50 feet below (except as limited by TD or PBTD) to 50 feet above the perforated interval. All cement plugs, except the surface plug, shall have sufficient slurry volume to fill 100 feet of hole, plus an additional 10 percent of slurry for each 1,000 feet of depth. In lieu of the cement plug, a bridge plug is acceptable, provided:

i. The bridge plug is set within 50 feet to 100 feet above the open perforations;
ii. The perforations are isolated from any open hole below; and
iii. The bridge plug is capped with 50 feet of cement. If a bailer is used to cap this plug, 35 feet of cement shall be sufficient.

3. Casing Removed from Hole. If any casing is cut and recovered, a cement plug shall be placed to extend at least 50 feet above and below the stub. The exposed hole resulting from the casing removal shall be secured as required in items 1i and 1ii hereof.

4. An additional cement plug placed to extend a minimum of 50 feet above and below the shoe of the surface casing for intermediate string, as appropriate).

5. Annular Space. No annular space that extends to the surface shall be left open to the drilled hole below. If this condition exists, a minimum of the top 50 feet of annulus shall be plugged with cement.

6. Isolating Medium. Any cement plug which is the only isolating medium for a usable water interval or a zone containg a prspectively valuable deposit of minerals shall be testedby tagging with the drill string. Any plugs placed where the fluid level will not remain static also shall be tested by either tagging the plug with the working pipe string, or pressuring to a minimum pump (surface) pressure of 1,000 psi, with no more than a 10 percent drop during a 15-minute period (cased hole only). If the integrity of any other plug is questionable, or if the authorized officer has specific concerns for which he/she orders a plug to be tested, it shall be tested in the same manner.

7. Silica Sand or Silica Flour. Silica sand or silica flour shall be added to cement exposed to bottom hole static temperatures above 230 øF to prevent heat degradation of the cement.

8. Surface Plug. A cement plug of at least 50 feet shall be placed across all annuluses. The top of this plug shall be placed as near the eventual casing cutoff point as possible.

9. Mud. Each of the intervals between plugs shall be filled with mud of sufficient density to exert hydrostatic pressure exceeding the greatest formation pressure encountered while drilling such interval. In the absense of other information at the time plugging is approved, a minimum mud weight of 9 pounds per gallon shall be specified.

10. Surface Cap. All casing shall be cut-off at the base of the cellar or 3 feet below final restored ground level (whichever is deeper). The well bore shall then be covered with a metal plate at least 1/4 inch thick and welded in place, or a 4-inch pipe, 10-feet in length, 4 feet above ground and embedded in cement as specified by the authorizedofficer. The well location and identity shall be permanently inscribed. A weep hole shall be left if a metal plate is welded in place.

11. The cellar shall be filled with suitable material as specified by the authorized officer and the surface restored in accordancxe with the instructions of the authorized officer.

Minimum Standard

All plugging orders shall be strictly adhered to.

Violation: Major.
Corrective Action: Contingent upon circumstances.
Normal Abatement Period: Prompt correction required.

[54 FR 39528, Sept. 27, 1989]

IV. Variances From Minimum Standard

An operator may request the authorized officer to approve a variance from any ofthe minimum standards prescribed in section III hereof. All such request shall be submitted in writing to the appropriate authorized officer and provide information as to the circumstances which warrant approval of the variance(s) requested and the proposed alternative methods by which the related minimum standard(s) are to be satisfied. The authorized officer, afterconsidering all relevant factors, if appropriate, may approve the requested variance(s) if it is determined that the proposed alternative(s) meet or exceed the objectives of the applicable minimum standard(s).

Emergency or other situations of an immediate nature that could not be reasonably forseen at the time of APD approval may recieve oral approval. However, such requests shall be followed up by a written notice filed not later than the fifth business day following oral approval.

ATTACHMENTS

I. Diagrams of Choke Manifold Equipment
II. Sections From 43 CFR Subparts 3163 and 3165 (Not Included With Federal Register Publication)

APPENDIX M: GUIDELINE FOR THE DETECTION AND QUANTIFICATION OF CONTAMINATION AT OIL AND GAS OPERATIONS

Prepared by
Mark VanMouwerik
CSU Research Associate/Contaminants Specialist
November 1999

Updated by
Pete Penoyer
Hydrologist
Water Resources Division
National Park Service
Fort Collins, Colorado
May 2004

I. WHAT IS THE PURPOSE OF THIS DOCUMENT?

This document is to be used as a guideline for collecting samples at sites within National Park Service (NPS) units where there are oil or gas operations. Samples will indicate whether or not contamination exists at the site as a result of an operation.

It is important that specific contaminants are tested for and that specific methodology is used so that contamination is accurately defined and so that results taken at different times by different people at the same site can be reliably compared. This guideline presents methodology for analyzing soil, sediment, groundwater, and surface water.

Specifically, guidelines are presented for: 1) when owner/operators must collect samples, 2) what contaminants to test for, 3) how to collect samples, 4) quality assurance/quality control, 5) how to analyze samples in the laboratory, 6) required detection limits and choosing environmental benchmarks, and 7) sample plan and reporting requirements.

Note that in this guideline “Superintendent” refers to the Superintendent and/or members of his/her staff who will represent him/her on these issues. In many cases, the Superintendent's actual involvement may be only that of approving the recommendations of the staff member(s).

II. WHEN AND WHERE TO COLLECT SAMPLES

The Superintendent can require sampling by an operator at a site if it has recently experienced a release, has a history of releases, or the facility is operated in a manner that poses a risk of releasing crude oil, natural gas condensates, produced water, or any other “contaminating substance” associated with an oil or gas operation.

Sampling can occur at any time during or after an operation. (“After” refers to when an owner/operator sells the operation, transfers its leasing rights, or closes the operation and abandons the site.) In most instances, sampling by the operator should be conducted under the direction of a Sampling and Analysis Plan that has been approved by the Superintendent to ensure all work will be performed in a professional manner, meets the resource protection needs of the park, and with the knowledge of the appropriate Park staff.

Sampling will be biased, not random, focusing on areas where contamination is obvious (visible) or suspected (such as near production or storage facilities). The exact sample locations and number of samples collected are site-specific and will be determined by the Superintendent, or proposed by the site operator in a Sampling and Analysis Plan or Work Plan submitted to the Superintendent for review and approval. Owner/operators are responsible for sample collection, sample analyses, and reporting of results, not NPS.

Sample data from a nearby (but off-site) “clean” location will be needed to determine “background” concentrations at the site for the contaminants of concern. A comparison of the contaminated site data with “background” data will allow resource managers to determine how contaminated the site is. If the site has been remediated, comparisons of sample data with “background” data can indicate if the clean-up met the Superintendent’s remediation goals for the site.

Note that incoming owner/operators at new or existing oil or gas operations may wish to test the site for contamination before they begin operations. If they choose to do so, it is strongly suggested they test for the contaminants and use the methodology given in this guideline so that if samples are required during or after the operation for any reason, all data can be reliably compared.

III. WHAT CONTAMINANTS TO TEST FOR

Contaminating substances that can be found at oil and gas sites are primarily crude oil, natural gas condensate, produced water, drilling mud, lube (motor) oil, and solvents. The individual contaminants found in these substances are listed in Table 1. Though other contaminants also are found in these substances, those in Table 1 were chosen because of their greater environmental toxicity and because they are good indicators of the presence of the contaminating substance(s) of interest.

When contamination of a site by one of these six contaminating substances is being investigated, sampling and analyses for some or all of the individual contaminants found in that contaminating substance should occur. Two lists of contaminants were compiled and are designated as “Tier I” (the smaller group, indicated by “xx” in Table 1) and “Tier II” (the more comprehensive group, indicated by both “xx” and “x”). Having two tiers to choose from allows the Superintendent flexibility in what contaminants he/she requires that the operator test for. The Tier I contaminants are included in the Tier II contaminants and therefore will always be tested for.

Tier I sampling should be conducted when basic information is needed. For instance, if contamination at a site is suspected but not known, testing for Tier I contaminants will confirm this; it will also give an idea of the severity of contamination. Tier I sampling might also be conducted where Park natural resources (like groundwater, vegetation, or surface water) are at low/no risk.

TABLE 1: CONTAMINANTS TO TEST FOR WHEN INVESTIGATING VARIOUS TYPES OF CONTAMINATION AT OIL AND GAS SITES.

Contaminants that should be tested for during Tier I sampling are indicated by "xx", while those with either an "x" or "xx" should be tested for during Tier II sampling.

containmant	where found: soil/sediment = S groundwater/surface water = W	crude oil	condensate [j]	produced water	drilling mud	lube (motor) oil	solvents [k]
		Contaminating substances individual contaminants are associated with:					
PAHs [a]	S, W	x	x	x	x	x	x
TPH [b]	S, W	xx	xx	x	x	xx	xx
BTEX [c]	S, W	x	xx	x	x	x	xx
metals							
arsenic	S, W	x		x	x		
barium	S, W	x		xx	xx	x	
cadmium	S, W	x		x	x	x	
chromium	S, W	x		x	xx		
copper	S, W	x		x	x	x	
iron	S, W		x			x	
lead	S, W	x		x	x	xx	
magnesium	S, W	x		x	x	x	
mercury [e]	S, W	x		x	x		
nickel	S, W	xx		x		x	
selenium	S, W	x			x		
strontium	S, W	x		xx			
vanadium	S, W	xx		x	x		
zinc	S, W	x		xx	x	xx	
ammonia	W	x		x			
calcium	W			x	x	x	
chloride	S, W			xx			
potassium	W	x		x	x		
sodium	S, W				xx	xx	xx
sulfates	W			x			
gross alpha emissions [g]	W			x			
radium-226 [g]	S			xx			
pentachlorophenol	S, W				x		
surfactants	S, W				x		
pH	S, W	x	x	x	x		
conductivity/salinity [h]	S, W		x	xx	xx		
TDS	W			x	x		
grain size	S	x	x	x	xx	x	
total organic carbon	S	x	x	x	x	x	x
percent moisture [i]	S	xx	xx	xx	xx	xx	xx
static water level [j]	W	xx	xx	xx	xx	xx	xx
temperature	W	xx	xx	xx	xx	xx	xx

a = Polycyclic Aromatic Hydrocarbons. The lab analysis required in this guideline detects approximately 38 individual compounds including the priority pollutant “parent” compounds and their alkylated homologs. See Table 2 for a full list of these. Note that these 38 compounds are measured with a single analytical test (i.e. there is not a separate test for each compound). When testing water for PAHs, do for groundwater only unless ongoing surface water contamination from adjacent contaminated soil, sediment, or aquifer is suspected.

b = Total Petroleum Hydrocarbons. Certain "ranges" of hydrocarbons should be analyzed for, depending on the contaminating substance. For crude oil, a “full range” or “wide range” TPH scan should be conducted; for natural gas condensate a “lighter end” TPH scan, like for “gasoline range organics” (GRO) or total volatile petroleum hydrocarbons (TVPH) C_6-C_{10} should be conducted; and for diesel fuel a TPH scan for “diesel range organics” (DRO) or total extractable petroleum hydrocarbons (TEPH) C_{11}-C_{34} should be conducted. See section VI.A for details.

c = Benzene, Toluene, Ethylbenzene, Xylene. Only test for these in soil, sediment, or surface water if contamination is very recent and sampling is for initial (preliminary) assessment purposes.

d = analyze all metals for the “total recoverable” fraction

e = analyze soil (or sediment) for mercury only if mercury manometers are suspected to have been used on-site in the past (natural gas operations only)

f = report both the “total” and “unionized” fractions

g = note that if gross alpha in water exceeds a certain level, further testing for radioactive elements may be required. Radium-226 analyses must use gamma spectroscopy; this test takes approx. 30 days. At sites where produced water contamination may be more recent (in the last 10 yrs), gamma ray emissions in the soil can be preliminarily measured in the field (e.g. with a MicroRmeter) to determine if the radium-226 soil analyses are necessary.

h = salinity can be calculated from conductivity measurements

i = percent moisture is necessary to calculate the required dry weight and wet weight units

j = for groundwater only

k = can be from a gas production facility or a gas pipeline

l = various solvents can be used on-site (e.g. benzene, toluene, ethylbenzene, xylene, various petroleum products, etc.). Analyte tested for depends on the particular solvent used on-site.

Table 2: Polycyclic aromatic hydrocarbons (PAHs) detected by the recommended “expanded scan” analysis for PAHs (see section VI.A). These compounds include the so-called priority pollutant “parent” compounds plus their alkylated homologs. Note that the 38 compounds below are measured with a single analytical test (that is, there is not a separate analytical test for each compound).

Acenaphthene
Acenaphthylene

Anthracene
Benzo(a)anthracene
Benzo(b)fluoranthene
Benzo(k)fluoranthene
Benzo(g,h,i)perylene
Benzo(e)pyrene
Benzo(a)pyrene
Biphenyl
Chrysene
Chrysene, C1-
Chrysene, C2-
Chrysene, C3-
Chrysene, C4-
Dibenzo(a,h)anthracene
Dibenzothiophene
Dibenzothiophene, C1-
Dibenzothiophene, C2-
Dibenzothiophene, C3-
Fluoranthene
Fluoranthenes/Pyrenes, C1-
Fluorene
Fluorene, C1-
Fluorene, C2-
Fluorene, C3-
Ideno(1,2,3,c,d)pyrene
Naphthalene
Naphthalene, C1-
Naphthalene, C2-
Naphthalene, C3-
Naphthalene, C4-
Perylene
Phenanthrene
Phenanthrenes/Anthracenes, C1-
Phenanthrenes/Anthracenes, C2-
Phenanthrenes/Anthracenes, C3-
Phenanthrenes/Anthracenes, C4-

Tier II sampling should be conducted when more detailed information is needed. For instance, if clean-up activities at a site have been completed, testing for Tier II contaminants will confirm if all (or nearly all) the contaminants have, in fact, been removed. Tier II sampling might also be conducted at sites where important Park natural resources are at a higher risk of being exposed to contaminants and where more stringent cleanup standards than those promulgated by a State regulatory body may be appropriate.

The Superintendent will determine whether Tier I or II is needed. Some combination of the two may also be used. He/she may also choose to omit or add contaminants to the Tier I or II lists should the situation warrant it.

Note that Table 1 does not include all possible contaminants associated with oil or gas operations. Other contaminating substances involved are: caustic solutions used in natural gas sweetening (these can contain sodium, pH, amines, and EDTA contaminants); glycols used in natural gas dehydration; and surfactants, acidizing agents, corrosion inhibitors, solvents, biocides, etc. used in oil or gas well workover and completion. The Superintendent may require that contaminants associated with these substances be tested for if they are suspected of having been released on-site.

IV. HOW TO COLLECT SAMPLES

A. Sample Locations

1. Soil

Background samples should be collected from an area as close to the site as possible where it is certain no contaminating substances from the site could have reached (from surface runoff, off-site dumping, migration from wind, etc.).

For soils that are known to be contaminated, samples should be collected from the spot and depth where contamination appears to be highest. For sites where soils are suspected of being contaminated, seek out areas near production facilities, storage tanks, valves, etc., and adjacent low points in the topography where contaminated runoff may have passed over or “puddled up” and concentrated. Collect sample at a depth where contamination would be highest: in most cases probably the top one to two inches. Note that releases in very porous (e.g. sandy) soil may percolate down and pool immediately above deeper, less porous soil layers (e.g. clay or silt strata, particularly if saturated), pool at the water table, or concentrate in highly organic layers.

For sites where removal of contaminated soils has already occurred, a sample should be collected in the top inch or so of the newly exposed soil to insure that all the contaminants that percolated down into the soil were, in fact, removed. (Note: At hydrocarbon release sites, screening of soils at the base of the excavation for volatile organic compounds/VOCs with a photo-ionization detector could improve the confidence that Tier II sample selection is sufficient to confirm a site is clean.)

All samples will be grab samples. (As a rule, composite samples should not be collected.) Where contamination is suspected but not known, the sampling device probably should be some type of tube or auger in order to capture equal amounts of soil over the depth of the profile; depending on the properties of the soil (like how hard or rocky it is), however, other devices (like a trowel) may work better. Sample collectors may have to communicate with the laboratory to ensure that enough soil is collected for the various analyses.

For BTEX samples, see section B.1. below.

The total number of samples to be collected will be site-specific and determined by the Superintendent. Enough samples should be collected and analyzed to meet the Tier I or Tier II sampling objective (see section III).

2. Sediment

Background samples should be collected from sediment adjacent to the sediments in question, but where it is reasonably certain no contaminating substances from the site (or other sites in the area) could have reached (from surface runoff, off-site dumping, etc.).

As with soils, sediments known to be contaminated should be sampled from the spot and depth where contamination appears to be highest. For sediments suspected of being contaminated, seek out areas near production facilities, storage tanks, valves, etc., and adjacent areas where potentially contaminated sediment in runoff could have settled out. Sample the sediment that has accumulated since the spill/release began. In some cases this may be the top ¼ inch, in others it may be the top several inches.

For sites where removal of contaminated sediments has already occurred, samples should be collected in the newly exposed sediment to insure that all contaminants were, in fact, removed.

All samples will be grab samples. (As a rule, composite samples should not be collected.) Where contamination is suspected but not known, or the layer of contaminated sediment is more than a couple inches thick, the sampling device probably should be some type of tube or auger in order to capture equal amounts of sediment over the depth of the profile; depending on the properties of the sediment (like how rocky it is) and the depth of the water, however, other devices may work better. Sample collectors may have to communicate with the laboratory to ensure that enough sediment is collected for the various analyses.

The total number of samples to be collected will be site-specific and determined by the Superintendent. Enough samples should be collected and analyzed to meet the Tier I or Tier II sampling objective (see section III).

3. Groundwater

Groundwater samples should be collected if the Superintendent determines that hydrogeological conditions at the site are such that groundwater resources under or near the site are reasonably at risk. Samples can be collected either via established monitoring wells or with “push” technology (such as Geoprobe®).

It is critical that: a) sampling occurs in the right areas (for example, one location must be upgradient of the potential point of impact and at least two must be downgradient); and b) wells are screened at the appropriate depths to intercept any contaminant plume(s). (This will require knowledge of the local hydrogeology and the contaminants involved and their environmental fate characteristics). If “push” technology is used to collect soil samples for lab analysis or for on-site screening of various media (soil, ground water) for contaminants and samples are collected on more than one occasion, care must be taken to sample the exact same locations and at the same depths in the aquifer. Typically, once contamination is found in ground water using screening methodologies, monitoring wells are required by State regulatory agencies to ensure sample quality and integrity is sufficient to base regulatory decisions.

“Low-flow” sample collection methods should be used as per the EPA guidance document in IV.B.3 below.

Groundwater samples should not be filtered.

For BTEX samples, see section B.3. below.

All samples will be grab samples. (As a rule, composite samples should not be collected.) Sample collectors may have to communicate with the laboratory to ensure that enough sample is collected for the various analyses.

The total number of samples to be collected will be site-specific and determined by the Superintendent or through his/her approval of the owner/operator's Sampling and Analysis Plan after consultation with Park resource staff. Enough samples should be collected and analyzed to meet the Tier I or Tier II sampling objective (see section III).

4. Surface Water

Background samples should be collected upstream of any possible inputs of contaminated water (e.g. surface runoff or shallow groundwater) from the site.

Where contamination is obvious, such as in a surface sheen, collect samples right at the surface, avoiding any scum, algae, or other detritus on the water surface if possible (and note in fieldbook if present). Where a contaminating substance such as chlorinated solvents (dense nonaqueous phase liquids, or DNAPLs) was released or is suspected at the bottom of an aquifer (e.g. above a clay layer or aquitard), then collect samples at a depth immediately above the base of the aquifer, the depth of the first fine-grained layer below the water table, or both. For surface water suspected of being contaminated but it is unknown whether the contaminants are "floaters" or "sinkers," collect samples at a depth of 3-12 inches.

For BTEX samples, see section B.4. below.

Again, all samples will be grab samples. (As a rule, composite samples should not be collected.) Sample collectors may have to communicate with the laboratory to ensure that enough sample is collected for the various analyses.

The total number of samples to be collected will be site-specific and determined by the Superintendent. Factors such as flow, depth, and the size of the water body are important here. Enough samples should be collected and analyzed to meet the Tier I or Tier II sampling objective (see section III).

B. Sample Collection Methodologies

Acceptable sampling methodology must be used so that results are as representative as possible. Sample collection can be complex and should be conducted by experienced professionals (typically a contractor). This could also help if the values or methods are challenged by one of the interested parties involved (State regulatory agency, Park, owner/operator etc.). Furthermore, experienced professionals are also trained in the appropriate precautions to protect the health and safety of the sample collector(s) from exposure to potentially harmful contaminants or hazardous situations that could develop.

Methodologies that should be used are typically those accepted/sanctioned by the appropriate State regulatory agency or are found in publications of widely recognized organizations (e.g. EPA, NOAA) that conduct environmental research. Acceptable methodologies are listed below for each environmental media (soil, sediment, etc.). In general, the State is authorized as the lead regulatory agency and should be the initial contact for appropriate sampling methodologies to employ when various environmental media are believed contaminated. In site-specific situations where a sensitive Park resource is threatened and more stringent cleanup than that required by a State agency may be appropriate, Park staff should consult WASO support offices as needed for appropriate criteria prior to discussion of more stringent cleanup levels with the owner/operator. If sample collection methodologies other than the above are used, they must contain the following to be acceptable: 1) Applicability of the procedure, 2) Equipment required,

3) Detailed description of procedures to be followed in collecting the samples, 4) Common problems encountered and corrective actions to be followed, and 5) Precautions to be taken. The methodology to be used must be cited in the sample plan. A basic description of collection methodology should be included in the report to the Superintendent (section VIII).

1. Soil

Methods from source documents published by the following organizations are acceptable:

-State Governing Regulatory Agency
-U.S. EPA
-American Society for Testing and Materials
-U.S. Department of the Interior
-American Petroleum Institute

Note that when collecting soil samples for BTEX analysis, specialized equipment and collection methods are necessary. Use a coring device such as the EnCore™ sampler or disposable plastic syringes. For detailed guidance, see section 4.1 and method 5035 in Chapter 4 of EPA's SW-846, Update III (full reference in section VI.A. below).

2. Sediment

Methods from source documents published by the following organizations are acceptable:

-State Governing Regulatory Agency
-U.S. EPA
-American Society for Testing and Materials
-U.S. Department of the Interior
-American Petroleum Institute

3. Groundwater

Use: Environmental Protection Agency. 1992. RCRA Ground-Water Monitoring: Draft Technical Guidance. EPA/530/R-93-001. Office of Solid Waste, EPA, Washington, D.C.; or Publications of State Governing Regulatory Agency (DEQ, DEM, State EPA etc.)

"Low-flow" sampling should be conducted; for guidance, see:

Puls, R.W. and M.J. Barcelona. 1996. Ground Water Issue: Low-Flow (Minimal Drawdown) Ground-Water Sampling Procedures. EPA/540/S-95/504. Office of Solid Waste and Emergency Response, EPA, Washington, D.C.

Note that when collecting water samples for BTEX analysis, specialized equipment and collection methods are necessary. For detailed guidance, see section 4.1 and method 5030B in Chapter 4 of EPA's SW-846, Update III (full reference in section VI.A. below).

4. Surface Water

Methods from source documents published by the following organizations are acceptable:

-State Governing Regulatory Agency
-U.S. EPA
-American Society for Testing and Materials
-U.S. Department of the Interior
-American Petroleum Institute

Also recommended is this NPS guidance: Stednick, J.D. and D.M. Gilbert. 1998. Water quality inventory protocol: Riverine environments. National Park Service, Water Resources Division, Technical Report no. NPS/NRWRD/NRTR-98/177. Fort Collins, CO, 103 pp.

Note that when collecting water samples for BTEX analysis, specialized equipment and collection methods are necessary. For detailed guidance, see section 4.1 and method 5030B in Chapter 4 of EPA's SW-846, Update III (full reference in section VI.A. below).

C. Sample Containers, Preservation, Storage

Refer to documents listed in sections VI.A. below and IV.B. above for specific guidance, including 40 CFR Part 136, if necessary. EPA's SW-846, Update III is especially helpful.

Note that sediment samples should not be acidified for metals and that neither groundwater nor surface water samples should be filtered. Remember special conditions when sampling for BTEX (see section 4.1 and methods 5030 and 5035 in Chapter Four of SW-846, Update III) and for any metals requiring unusually low detection limits.

D. Chain of Custody

Proper chain-of-custody procedures must be used in sample handling (collection, shipping, storage, analysis). For examples, see Standard Methods for the Examination of Water and Wastewater for general guidance, and SW-846, Update III, Chapter 9, section 9.2.2.7 for detailed guidance.

V. QUALITY ASSURANCE/QUALITY CONTROL

Quality assurance/quality control (QA/QC) plans or Quality Assurance Project Plans (QAPPs) ensure that the data generated are scientifically valid, defensible, and of known precision and accuracy. Some of the basic elements of QA/QC or QAPP plans are:

- data quality objectives (DQO)
- field operating procedures (such as sample management, decontamination, equipment calibration, etc.)
- field QA/QC requirements (such as data handling, collection of control samples like blanks, spikes and duplicates, etc.)
- lab operating procedures (such as sample management, equipment calibration, etc.)
- lab QA/QC procedures (such as data handling, control samples, etc.).

A QA/QC plan should be in place before any sampling begins. Basic QA/QC procedures to be followed should be described briefly in the sample plan (section VIII). If a certain QA/QC guidance document is used, it should be cited in the sample plan. Many guidance documents are available—several through EPA—including the following, recommended here:

> Environmental Protection Agency. 1997. Test methods for evaluating solid waste, physical/chemical methods (SW-846), 3rd edition, Update III, Chapter One. EPA Office of Solid Waste and Emergency Response, EPA, Washington, D.C.

Adherence to the QA/QC plan should be documented throughout the project and demonstrated in the final report to the Superintendent.

Aspects of quality assurance that may be helpful can be found in:

> Environmental Protection Agency. 1996. The volunteer monitor's guide to quality assurance project plans. EPA Office of Wetlands, Ocean and Watersheds 4503F. EPA publication number: EPA 841-B-96-003. Also available at: http://www.epa.gov/owow/monitoring/volunteer/qappcover.htm

VI. HOW TO ANALYZE SAMPLES IN THE LABORATORY

A. Analytical Methods

Metals analyses must use the methods in EPA's SW-846, Update III (or more recent). This applies to soil, sediment, groundwater, and surface water samples. Groundwater and surface water methods can also include EPA's 200 series for metals, or the 1600 series where extremely low (state-of-the-art) detection limits are desired. The full reference for the SW-846 document is:

> Environmental Protection Agency. 1997. Test methods for evaluating solid waste, physical/chemical methods (SW-846), 3rd edition, Update III. EPA Office of Solid Waste and Emergency Response, EPA, Washington, D.C.

Polycyclic aromatic hydrocarbon (PAH) analyses must use a modification of method 8270 in EPA's SW-846, Update III. Developed by the National Oceanic and Atmospheric Administration (NOAA), this method is referred to as "GC/MS method 8270 in selective ion mode (SIM)", and is informally referred to as the "expanded scan" for PAHs. Consult the following for a detailed explanation of methodology:

> Lauenstein, G.G., and A.Y. Cantillo (1998). Sampling and analytical methods of the National Status and Trends Program Mussel Watch Project: 1993-1996 update. NOAA Technical Memorandum NOS ORCA 130. 233 pp.

Total petroleum hydrocarbons (TPH) analyses will be for certain "ranges" of hydrocarbons, depending on the contaminating substance present. For crude oil, a **"wide range" or "full range" TPH scan** should be conducted to measure the heavier fractions. For natural gas condensate a "lighter end" TPH scan, such as for **"gasoline range organics" (GRO)**, should be conducted. For diesel fuel, a TPH scan for **"diesel range organics" (DRO)** should be conducted to measure the mid-range fractions. Although many analytical methods are available for TPH, samples should be analyzed using only GC/FID (gas chromatograph/flame ionization detection) methodology. Method 8015B in EPA's SW-846, Update III is highly recommended.

Benzene, toluene, ethylbenzene, and xylene (BTEX) analyses should use method 8260B in EPA's SW-846, Update III. Analysis for BTEX compounds is typically done in place of a TPH analysis when a refined product is released as opposed to crude oil.

Ammonia analyses should use EPA method 350.1 (or equivalent APHA method 4500-NH3 H, or USGS method 4523-85). Samples should not be filtered.

For all other contaminants in Table 1, use methods approved in 40 CFR Part 136 (EPA, Standard Methods for the Examination of Water and Wastewater (latest edition), ASTM, or USGS). Methods in the NPS, Water Resources Division "Water quality inventory protocol" (section IV.B.4 above) can also be used.

B. Laboratories

Samples must be sent to an experienced lab that can: 1) perform the above analytical methods; 2) achieve the required detection limits (section VII below); 3) perform the required QA/QC procedures (section V above); and 4) provide the information required in the sample plan and the final report to the Superintendent (section VIII below).

Note that in regards to the PAH analytical method (as specified in VI.A. above), only a few labs nationwide (perhaps a dozen) currently can perform this analysis. Many of these same labs can also "fingerprint" samples; that is, by analyzing hydrocarbon-contaminated samples, they can identify the type and source of the petroleum product at the site. A partial list of these labs follows (no government endorsement implied):

Arthur D. Little, Inc.
25 Acorn Park
Cambridge, MA. 02140
(617) 498-5000

Geochemical and Environmental Research Group
Texas A&M University
833 Graham Rd.
College Station, TX. 77845
(409) 862-2323 ext. 115

Battell Marine Science Lab
1529 West Sequim Bay Rd.
Sequim, WA 98382
(360) 683-4151

Woods Hole Group, Environmental Laboratories
375 Paramount Drive, Suite B
Raynham, MA 02767-5154
(508) 822-9300 or 563-5030

VII. DETECTION LIMITS

Note: The term "detection limit" used herein refers to what is commonly called the "reporting limit" and occasionally called the "quantitation limit. A detection limit is what a lab (using a particular instrument in some combination with analytical method and skill level of operator) can quantify low levels of a contaminant substance with acceptable confidence. It does not refer to the sometimes much lower "instrument detection limit" or "method detection limit" where how well the value obtained represents the true value may be of low confidence. Also note that detection limits should not be confused with cleanup standards or cleanup criteria. Required cleanup levels/criteria are usually set by State regulatory authorities as the acceptable contaminant residue (usually well above detection limits) that may remain in some environmental media after a remedial effort has occurred. NPS is authorized to require more stringent cleanup criteria on a case-by-case basis, particularly in site-specific situations where sensitive ecological resources could be threatened. Widely accepted, peer-reviewed research may then be used to support the NPS position that State criteria are not sufficiently protective and lower cleanup criteria are warranted.

Labs should achieve the detection limits (DLs) provided in Table 3 below. These DLs are below federal (and presumably state) standards and most other criteria currently in the literature. Therefore, analytical methods that achieve these DLs will be able to indicate if most standards and criteria are being met. Note, however, that the DLs for two contaminants—PAHs and mercury—are above some of the more strict standards or criteria that exist. This is because many labs cannot achieve DLs this low, and the DLs in the table were chosen so that most experienced and well-equipped labs could achieve them. Lower DLs are achievable for PAHs and mercury at some labs that have the expertise and special instrumentation (see section VI.B. above for examples).

If the natural resources at or near the site are particularly sensitive, pristine, or important to the Park, the Superintendent may wish to choose the strictest available standard or criteria as the remediation goal. He/she would then have to request some lower DLs (lower than those in Table 3) from the lab for PAHs and mercury.

For the contaminants in Table 1 that are not listed in Table 3, commonly reported DLs are acceptable.

Table 3: Maximum acceptable detection limits ("reporting limits") for surface water, groundwater, soil, and sediment samples. Lower detection limits are also acceptable.

Contaminant	Detection limit for surface water and groundwater samples	Detection limit for soil and sediment samples (dry weight)
PAHs	10 ppt [a]	1 ppb [c]
TPH	50 ppb	0.1 ppm
benzene	1 ppb	25 ppb
toluene	5 ppb	25 ppb
ethylbenzene	5 ppb	25 ppb
xylene	5 ppb	25 ppb
ammonia	0.05 ppm	--
arsenic	5 ppb	0.5 ppm
barium	1 ppb	1 ppm
cadmium	0.5 ppb	0.2 ppm
chromium	3 ppb	1 ppm
copper	5 ppb	1 ppm
iron	0.1 ppm	10 ppm
lead	1 ppb	5 ppm
mercury	0.2 ppb [b]	0.2 ppm [d]
nickel	5 ppb	5 ppm
selenium	1 ppb	1 ppm
strontium	10 ppb	5 ppm
vanadium	10 ppb	1 ppm
zinc	10 ppb	5 ppm

water units:

ppm = parts per million = milligrams per liter = mg/L

ppb = parts per billion = micrograms per liter = ug/L

ppt = parts per trillion = nanograms per liter = ng/L

soil/sediment units:

ppm = parts per million = milligrams per kilogram = mg/kg = micrograms per gram = ug/g

ppb = parts per billion = micrograms per kilogram = ug/kg = nanograms per gram = ng/g

a - DLs as low as 1 ppt may be achievable

b - DLs as low as 0.1 ppb, or even 10 ppt, may be achievable

c - DLs as low as 0.25 ppb may be achievable

d - DLs as low as 25 ppb, or even 1 ppb, may be achievable

For an extensive list of federal standards and other published environmental criteria for most of the contaminants in Table 1, consult NPS Water Resources Divisions' "Environmental Contaminants Encyclopedia" at the website http://www.aqd.nps.gov/toxic. Note that there may be state standards, other criteria, or in some cases, updated federal standards that are not listed in this Encyclopedia.

VIII. SAMPLE PLAN AND REPORTING REQUIREMENTS

A. Sample Plan

The owner/operator should submit a Sampling and Analysis Plan to the Superintendent for approval before samples are collected. The plan must include:

- sampling objectives (such as, “identify contaminants and concentrations involved,” “determine spatial extent of spill,” “determine if remediation is complete,” etc.)
- the contaminating substances being investigated (such as crude oil, natural gas condensate, produced water, etc.)
- list of individual contaminants that will be tested for (see Table 1)
- analytical methods to be used (see section VI. A.)
- type of samples to be collected (such as soil, sediment, groundwater, or surface water)
- citation and brief description of sample collection methodology to be used (see section IV. B.)
- specific sample locations and number of samples at each (Superintendent will walk the site and choose exact locations; this information may not be available until the time when samples are actually collected)
- total number of samples (this information may not be available until the time when samples are actually collected)
- acknowledgment that detection limits (that is, “reporting limits”) specified herein (section VII) will be achieved
- brief description of QA/QC procedures to be followed and citation of any guidance document used (see section V)
- acknowledgment that proper chain-of-custody procedures will be initiated and followed

B. Reporting Requirements

Upon completing sample collection and analyses, the owner/operator shall submit a report to the Superintendent. This report shall include:

- sample ID number/name
- description of sample locations (include maps, sketches, or photos)
- sample depth
- brief description of spill area (apparent extent of spill, topography, vegetation, surface water features, apparent soil conditions, etc.)
- date and time of sampling
- name of sample collector
- information pertinent to the sample collection methodology used (sampling devices used, how samples were collected, etc.)
- sample containers used, any preservation methods, and storage conditions of samples
- date and time of analyses
- name of chemist/technician performing analyses
- type of sample (soil, sediment, groundwater, or surface water)
- sample fraction measured (such as “total”, “total recoverable”, etc.)
- analytical results and units (mg/kg, µg/L, etc.)
- percent moisture (for soil/sediment samples)
- wet weight *and* dry weight units (for soil/sediment samples)
- analytical methods used

- detection limits (that is, “reporting limits”) achieved
- method detection limits (MDL) for the analytical methods used
- indication of analyses done in the field (such as pH, conductivity, etc.)
- field observations made while collecting samples
- lab and field QA/QC results and procedures followed
- name of analytic equipment used
- appropriate chain-of-custody forms

IX. SPILL RESPONSE AND NOTIFICATION PROCEDURE FOLLOWING RELEASE OF A CONTAMINATING SUBSTANCE FROM A NONFEDERAL OIL AND GAS OPERATION IN A PARK UNIT

A. Initial Park Staff Actions Following Discovery of a Release

1. Secure the area to protect human health and safety

2. Notify operator of the release and immediate need to control the source and contain the release, and obtain information of the released substance

3. Initial site assessment to identify park resources potentially as risk from the release (surface water, wetlands, cultural resources, etc.), and quantity of released substance

4. Direct operator during initial spill containment actions to protect natural and cultural resources at risk, and to protect human health and safety

5. Notify Regional Spill Response Coordinator and relay all pertinent information

6. Obtain 5 liter sample of released substance (Note: need preservation and storage guidance for park staff) and initiate chain of custody documentation

7. Continue to oversee operator containment actions and maintain security

8. Park Superintendent advises operator that the operation is immediately “suspended” pursuant to NPS regulations at 36 CFR §9.51(c)(2)

9. Park staff prepares a detailed Case Incident Report on the spill event

B. Regional Spill Response Coordinator Notification Duties

1. Contact National Response Center to advise of release and obtain case number

2. Notify Environmental Quality Division (Dan Hamson), Geologic Resources Division (Jim Woods), Regional Minerals Coordinator (Linda Dansby), and Water Resources Division (Matt Hagermann) if release threatens water resources

3. Coordinate a conference call with above technical offices and park staff to define appropriate course of action relative to spill containment, public health and safety, site assessment, damage assessment, and operator responsiveness and capability

4. Notify pertinent state regulatory agencies and state trustees

C. Coordination of Response, Clean-up and Damage Assessment

1. All involved NPS staff track time and all other expenditures associated with the spill event

2. Park Superintendent prepares formal suspension notice for Regional Director's signature in accordance with NPS regulations at 36 CFR §9.51(c)(2)

3. Park staff coordinates with designated On Scene Coordinator (EPA, Coast Guard, or NPS staff expert if EPA or Coast Guard does not dispatch a coordinator) and state regulatory agencies to oversee operator spill response and initial clean-up actions

4. Park staff coordinates with On Scene Coordinator (OSC) and state trustee agencies in the conduct of resource damage assessment (Note: operator may contract with approved consulting firm/laboratory to conduct assessment work)

5. All involved NPS offices evaluate site assessment results and reach consensus on additional remediation actions and reclamation goals, and communicate recommendations to park Superintendent. (Note: NPS regulations at 36 CFR §9.39(a)(1)(i) and §9.39(a)(2)(iii) require operators to remove or neutralize any contaminating substance)

6. Park staff coordinates with OSC and state trustee agencies in monitoring remediation and reclamation actions

7. Park Superintendent and NPS technical working group evaluates final remediation/reclamation success and determines if further legal action against the operator is required (Note: operators are liable for any damages to federally-owned or controlled lands, waters or resources pursuant to 36 CFR §9.51(a).

APPENDIX N: TRIBAL CONSULTATION LETTERS AND RESPONSES

IN REPLY REFER TO:

United States Department of the Interior

National Park Service
Big South Fork
National River and Recreation Area
4564 Leatherwood Road
Oneida, Tennessee 37841

L3023

December 29, 2006

Larry Nuckolls, Governor
Absentee-Shawnee Tribe of Oklahoma
2025 S. Gordon Cooper Drive
Shawnee, OK 74801

Dear Governor Nuckolls:

Federal regulations for the implementation of Section 106 of the National Historic Preservation Act of 1966, as amended, require consultation with federally recognized American Indian tribes (36 CFR 800.2) on a government-to-government basis, as specified in Executive Order 13175. The administration of the Big South Fork National River and Recreation Area and the Obed National Wild and Scenic River (collectively "the Parks") is committed to honoring in full good faith its obligations and responsibilities toward the sovereign, federally recognized Indian tribes under all United States laws, regulations, and policies. As part of my responsibility to "make a reasonable and good faith effort to identify Indian tribes…that shall be consulted in the 106 process," I am writing to inquire if the Absentee-Shawnee Tribe of Oklahoma desires to consult with the National Park Service regarding a proposed Oil and Gas Management Plan/Environmental Impact Statement (EIS) covering oil and gas operations at the Parks. We are also making a similar inquiry of six other tribal governments traditionally associated with Eastern Tennessee. The purpose and need for the proposed Oil and Gas Management Plan/EIS is described in the enclosed scoping brochure. You may also find additional information at our Planning, Environment, and Public Comment (PEPC) website:

http://parkplanning.nps.gov/projectHome.cfm?parkId=354&projectId=10911

If the Absentee-Shawnee Tribe of Oklahoma wishes to consult with the National Park Service regarding the proposed plan as provided for under the regulations for the National Historic Preservation Act, please contact me at the address above, by phone at 423-569-9778 or email at biso_superintendent@nps.gov in order that we may arrange mutually agreeable time(s) and location(s) for consultation. To ensure that our planning process continues on

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schedule, please respond to this letter within 30 days. We are looking forward to your reply and to maintaining a continuing relationship with the tribal government of the Absentee-Shawnee Tribe of Oklahoma.

Sincerely,

/s/Reed E. Detring

Reed E. Detring
Superintendent

cc: Ms. Karen Kaniatobe, THPO

tblount:eh:12/22/06:423-569-2404 X252

2

United States Department of the Interior

National Park Service
Big South Fork
National River and Recreation Area
4564 Leatherwood Road
Oneida, Tennessee 37841

IN REPLY REFER TO:

L3023

December 29, 2006

Chad "Corntassle" Smith, Principal Chief
Cherokee Nation
P.O. Box 948
Tahlequah, OK 74465

Dear Chief Smith:

Federal regulations for the implementation of Section 106 of the National Historic Preservation Act of 1966, as amended, require consultation with federally recognized American Indian tribes (36 CFR 800.2) on a government-to-government basis, as specified in Executive Order 13175. The administration of the Big South Fork National River and Recreation Area and the Obed National Wild and Scenic River (collectively "the Parks") is committed to honoring in full good faith its obligations and responsibilities toward the sovereign, federally recognized Indian tribes under all United States laws, regulations, and policies. As part of my responsibility to "make a reasonable and good faith effort to identify Indian tribes…that shall be consulted in the 106 process," I am writing to inquire if the Cherokee Nation desires to consult with the National Park Service regarding a proposed Oil and Gas Management Plan/Environmental Impact Statement (EIS) covering oil and gas operations at the Parks. We are also making a similar inquiry of six other tribal governments traditionally associated with Eastern Tennessee. The purpose and need for the proposed Oil and Gas Management Plan/EIS is described in the enclosed scoping brochure. You may also find additional information at our Planning, Environment, and Public Comment (PEPC) website:

http://parkplanning.nps.gov/projectHome.cfm?parkId=354&projectId=10911

If the Cherokee Nation wishes to consult with the National Park Service regarding the proposed plan as provided for under the regulations for the National Historic Preservation Act, please contact me at the address above, by phone at 423-569-9778 or email at biso_superintendent@nps.gov in order that we may arrange mutually agreeable time(s) and location(s) for consultation. Please forward this letter to your Tribal Historic Preservation

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Officer (THPO) or Acting THPO. To ensure that our planning process continues on schedule, please respond to this letter within 30 days. We are looking forward to your reply and to maintaining a continuing relationship with the tribal government of the Cherokee Nation.

Sincerely,

/s/Reed E. Detring

Reed E. Detring
Superintendent

tblount:eh:12/22/06:423-569-2404 X252

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United States Department of the Interior

National Park Service
Big South Fork
National River and Recreation Area
4564 Leatherwood Road
Oneida, Tennessee 37841

IN REPLY REFER TO:

L3023

December 29, 2006

Michell Hicks, Principal Chief
Eastern Band of Cherokee Indians
Qualla Boundary
P.O. Box 455
Cherokee, NC 28719

Dear Principal Chief Hicks:

Federal regulations for the implementation of Section 106 of the National Historic Preservation Act of 1966, as amended, require consultation with federally recognized American Indian tribes (36 CFR 800.2) on a government-to-government basis, as specified in Executive Order 13175. The administration of the Big South Fork National River and Recreation Area and the Obed National Wild and Scenic River (collectively "the Parks") is committed to honoring in full good faith its obligations and responsibilities toward the sovereign, federally recognized Indian tribes under all United States laws, regulations, and policies. As part of my responsibility to "make a reasonable and good faith effort to identify Indian tribes…that shall be consulted in the 106 process," I am writing to inquire if the Eastern Band of Cherokee Indians desires to consult with the National Park Service regarding a proposed Oil and Gas Management Plan/Environmental Impact Statement (EIS) covering oil and gas operations at the Parks. We are also making a similar inquiry of six other tribal governments traditionally associated with Eastern Tennessee. The purpose and need for the proposed Oil and Gas Management Plan/EIS is described in the enclosed scoping brochure. You may also find additional information at our Planning, Environment, and Public Comment (PEPC) website:

http://parkplanning.nps.gov/projectHome.cfm?parkId=354&projectId=10911

If the Eastern Band of Cherokee Indians wishes to consult with the National Park Service regarding the proposed plan as provided for under the regulations for the National Historic Preservation Act, please contact me at the address above, by phone at 423-569-9778 or email at biso_superintendent@nps.gov in order that we may arrange mutually agreeable time(s) and location(s) for consultation. To ensure that our planning process continues on

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schedule, please respond to this letter within 30 days. We are looking forward to your reply and to maintaining a continuing relationship with the tribal government of the Eastern Band of Cherokee Indians.

Sincerely,

/s/Reed E. Detring

Reed E. Detring
Superintendent

cc: Russell Townsend, THPO

tblount:eh:12/22/06:423-569-2404 X252

United States Department of the Interior

National Park Service
Big South Fork
National River and Recreation Area
4564 Leatherwood Road
Oneida, Tennessee 37841

IN REPLY REFER TO:

L3023

December 29, 2006

Robin Dushane, Chief
Eastern Shawnee Tribe of Oklahoma
P.O. Box 350
Seneca, MO 64865

Dear Chief Dushane:

Federal regulations for the implementation of Section 106 of the National Historic Preservation Act of 1966, as amended, require consultation with federally recognized American Indian tribes (36 CFR 800.2) on a government-to-government basis, as specified in Executive Order 13175. The administration of the Big South Fork National River and Recreation Area and the Obed National Wild and Scenic River (collectively "the Parks") is committed to honoring in full good faith its obligations and responsibilities toward the sovereign, federally recognized Indian tribes under all United States laws, regulations, and policies. As part of my responsibility to "make a reasonable and good faith effort to identify Indian tribes…that shall be consulted in the 106 process," I am writing to inquire if the Eastern Shawnee Tribe of Oklahoma desires to consult with the National Park Service regarding a proposed Oil and Gas Management Plan/Environmental Impact Statement (EIS) covering oil and gas operations at the Parks. We are also making a similar inquiry of six other tribal governments traditionally associated with Eastern Tennessee. The purpose and need for the proposed Oil and Gas Management Plan/EIS is described in the enclosed scoping brochure. You may also find additional information at our Planning, Environment, and Public Comment (PEPC) website:

http://parkplanning.nps.gov/projectHome.cfm?parkId=354&projectId=10911

If the Eastern Shawnee Tribe of Oklahoma wishes to consult with the National Park Service regarding the proposed plan as provided for under the regulations for the National Historic Preservation Act, please contact me at the address above, by phone at 423-569-9778 or email at biso_superintendent@nps.gov in order that we may arrange mutually agreeable time(s) and location(s) for consultation. Please forward this letter to your Tribal Historic Preservation Officer (THPO) or Acting THPO. To ensure that our planning process continues on schedule,

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please respond to this letter within 30 days. We are looking forward to your reply and to maintaining a continuing relationship with the tribal government of the Eastern Shawnee Tribe of Oklahoma.

Sincerely,

/s/Reed E. Detring

Reed E. Detring
Superintendent

tblount:ch:12/22/06:423-569-2404 X252

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IN REPLY REFER TO:

United States Department of the Interior

National Park Service
Big South Fork
National River and Recreation Area
4564 Leatherwood Road
Oneida, Tennessee 37841

L3023

December 29, 2006

Ron Sparkman, Chairman
Shawnee Tribe
P.O. Box 189
Miami, OK 74355

Dear Chairman Sparkman:

Federal regulations for the implementation of Section 106 of the National Historic Preservation Act of 1966, as amended, require consultation with federally recognized American Indian tribes (36 CFR 800.2) on a government-to-government basis, as specified in Executive Order 13175. The administration of the Big South Fork National River and Recreation Area and the Obed National Wild and Scenic River (collectively "the Parks") is committed to honoring in full good faith its obligations and responsibilities toward the sovereign, federally recognized Indian tribes under all United States laws, regulations, and policies. As part of my responsibility to "make a reasonable and good faith effort to identify Indian tribes…that shall be consulted in the 106 process," I am writing to inquire if the Shawnee Tribe desires to consult with the National Park Service regarding a proposed Oil and Gas Management Plan/Environmental Impact Statement (EIS) covering oil and gas operations at the Parks. We are also making a similar inquiry of six other tribal governments traditionally associated with Eastern Tennessee. The purpose and need for the proposed Oil and Gas Management Plan/EIS is described in the enclosed scoping brochure. You may also find additional information at our Planning, Environment, and Public Comment (PEPC) website:

http://parkplanning.nps.gov/projectHome.cfm?parkId=354&projectId=10911

If the Shawnee Tribe wishes to consult with the National Park Service regarding the proposed plan as provided for under the regulations for the National Historic Preservation Act, please contact me at the address above, by phone at 423-569-9778 or email at biso_superintendent@nps.gov in order that we may arrange mutually agreeable time(s) and

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location(s) for consultation. To ensure that our planning process continues on schedule, please respond to this letter within 30 days. We are looking forward to your reply and to maintaining a continuing relationship with the tribal government of the Shawnee Tribe.

Sincerely,

/s/Reed E. Detring

Reed E. Detring
Superintendent

cc: Ms. Rebecca Hawkins, Administrator/THPO

tblount:eh:12/22/06:423-569-2404 X252

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IN REPLY REFER TO:

United States Department of the Interior

National Park Service
Big South Fork
National River and Recreation Area
4564 Leatherwood Road
Oneida, Tennessee 37841

L3023

December 29, 2006

Bill Anoatubby, Governor
Chickasaw Nation
P.O. Box 1548
Ada, OK 74821

Dear Governor Anoatubby:

Federal regulations for the implementation of Section 106 of the National Historic Preservation Act of 1966, as amended, require consultation with federally recognized American Indian tribes (36 CFR 800.2) on a government-to-government basis, as specified in Executive Order 13175. The administration of the Big South Fork National River and Recreation Area and the Obed National Wild and Scenic River (collectively "the Parks") is committed to honoring in full good faith its obligations and responsibilities toward the sovereign, federally recognized Indian tribes under all United States laws, regulations, and policies. As part of my responsibility to "make a reasonable and good faith effort to identify Indian tribes…that shall be consulted in the 106 process," I am writing to inquire if the Chickasaw Nation desires to consult with the National Park Service regarding a proposed Oil and Gas Management Plan/Environmental Impact Statement (EIS) covering oil and gas operations at the Parks. We are also making a similar inquiry of six other tribal governments traditionally associated with Eastern Tennessee. The purpose and need for the proposed Oil and Gas Management Plan/EIS is described in the enclosed scoping brochure. You may also find additional information at our Planning, Environment, and Public Comment (PEPC) website:

http://parkplanning.nps.gov/projectHome.cfm?parkId=354&projectId=10911

If the Chickasaw Nation wishes to consult with the National Park Service regarding the proposed plan as provided for under the regulations for the National Historic Preservation Act, please contact me at the address above, by phone at 423-569-9778 or email at biso_superintendent@nps.gov in order that we may arrange mutually agreeable time(s) and location(s) for consultation. Please forward this letter to your Tribal Historic Preservation

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Officer (THPO) or Acting THPO. To ensure that our planning process continues on schedule, please respond to this letter within 30 days. We are looking forward to your reply and to maintaining a continuing relationship with the tribal government of the Chickasaw Nation.

Sincerely,

/s/Reed E. Detring

Reed E. Detring
Superintendent

tblount:eh:12/22/06:423-569-2404 X252

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United States Department of the Interior

National Park Service
Big South Fork
National River and Recreation Area
4564 Leatherwood Road
Oneida, Tennessee 37841

IN REPLY REFER TO:

L3023

December 29, 2006

George Wickliffe, Chief
United Keetoowah Band of Cherokee Indians in Oklahoma
P.O. Box 746
Tahlequah, OK 74465

Dear Chief Wickliffe:

Federal regulations for the implementation of Section 106 of the National Historic Preservation Act of 1966, as amended, require consultation with federally recognized American Indian tribes (36 CFR 800.2) on a government-to-government basis, as specified in Executive Order 13175. The administration of the Big South Fork National River and Recreation Area and the Obed National Wild and Scenic River (collectively "the Parks") is committed to honoring in full good faith its obligations and responsibilities toward the sovereign, federally recognized Indian tribes under all United States laws, regulations, and policies. As part of my responsibility to "make a reasonable and good faith effort to identify Indian tribes…that shall be consulted in the 106 process," I am writing to inquire if the United Keetoowah Band of Cherokee Indians in Oklahoma desires to consult with the National Park Service regarding a proposed Oil and Gas Management Plan/Environmental Impact Statement (EIS) covering oil and gas operations at the Parks. We are also making a similar inquiry of six other tribal governments traditionally associated with Eastern Tennessee. The purpose and need for the proposed Oil and Gas Management Plan/EIS is described in the enclosed scoping brochure. You may also find additional information at our Planning, Environment, and Public Comment (PEPC) website:

http://parkplanning.nps.gov/projectHome.cfm?parkId=354&projectId=10911

If the United Keetoowah Band of Cherokee Indians in Oklahoma wishes to consult with the National Park Service regarding the proposed plan as provided for under the regulations for the National Historic Preservation Act, please contact me at the address above, by phone at 423-569-9778 or email at biso_superintendent@nps.gov in order that we may arrange mutually agreeable time(s) and location(s) for consultation. To ensure that our planning process continues on

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schedule, please respond to this letter within 30 days. We are looking forward to your reply and to maintaining a continuing relationship with the tribal government of the United Keetoowah Band of Cherokee Indians in Oklahoma.

Sincerely,

/s/Reed E. Detring

Reed E. Detring
Superintendent

cc: Lisa C. Stopp, Acting THPO

tblount:eh:12/22/06:423-569-2404 X252

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United Keetoowah Band
Of Cherokee Indians in Oklahoma
P.O. Box 746 • Tahlequah, OK 74465
2450 S. Muskogee • Tahlequah, OK 74464
Phone: (918) 431-1818 • Fax: (918) 431-1873
www.ukb-nsn.gov

Historic Preservation Program

January 22, 2007

Reed E. Detring
National Park Service
Big South Fork
National River and Recreation Area
4564 Leatherwood Road
Oneida, TN 37841

Dear Mr. Detring:

We are in receipt of your letter dated December 29, 2007, and I apologize for the delay in responding. We suffered a severe ice storm, and our office was temporarily closed.

The United Keetoowah Band of Cherokee Indians in Oklahoma would like to be a consulting party to the proposed Oil and Gas Management Plan/EIS.

You may contact me at the above address, phone 918-456-9200 and e-mail lstopp@unitedkeetoowahband.org if you have any questions.

Best Regards,

Lisa C. Stopp
Acting Tribal Historic Preservation Officer

The Tribal Historic Preservation Office of the Eastern Band of Cherokee Indians is in receipt of the above-referenced project information and would like to thank you for the opportunity to comment on this proposed NHPA Section 106 activity.

The project's location is within the aboriginal territory of the Cherokee people. This area may have cultural, archaeological, or religious significance to the Eastern Band of Cherokee Indians. Potential cultural resources are subject to damage or destruction from land disturbing activities requiring new ground disturbance, or vegetation manipulation.

Adverse effects to ethnographic sites, such as traditional Native American campsites or burials, can reduce the interpretative or spiritual significance of a site to Tribal and United States culture and history. The EBCI THPO requests any cultural resource data, including phase I archeological reports, topographic maps, historical research, or archives research, forwarded to the Kentucky Heritage Council for comment also be sent to this office. The EBCI THPO looks forward to participating in the project review process as a consulting party as stipulated in Section 106 of the National Historic Preservation Act of 1966. If we can be of further service, or if you have any comments or questions, please feel free to contact me at (828) 554-6852.

Sincerely,

Tyler B. Howe
Tribal Historic Preservation Specialist
Eastern Band of Cherokee Indians
828-554-6852