

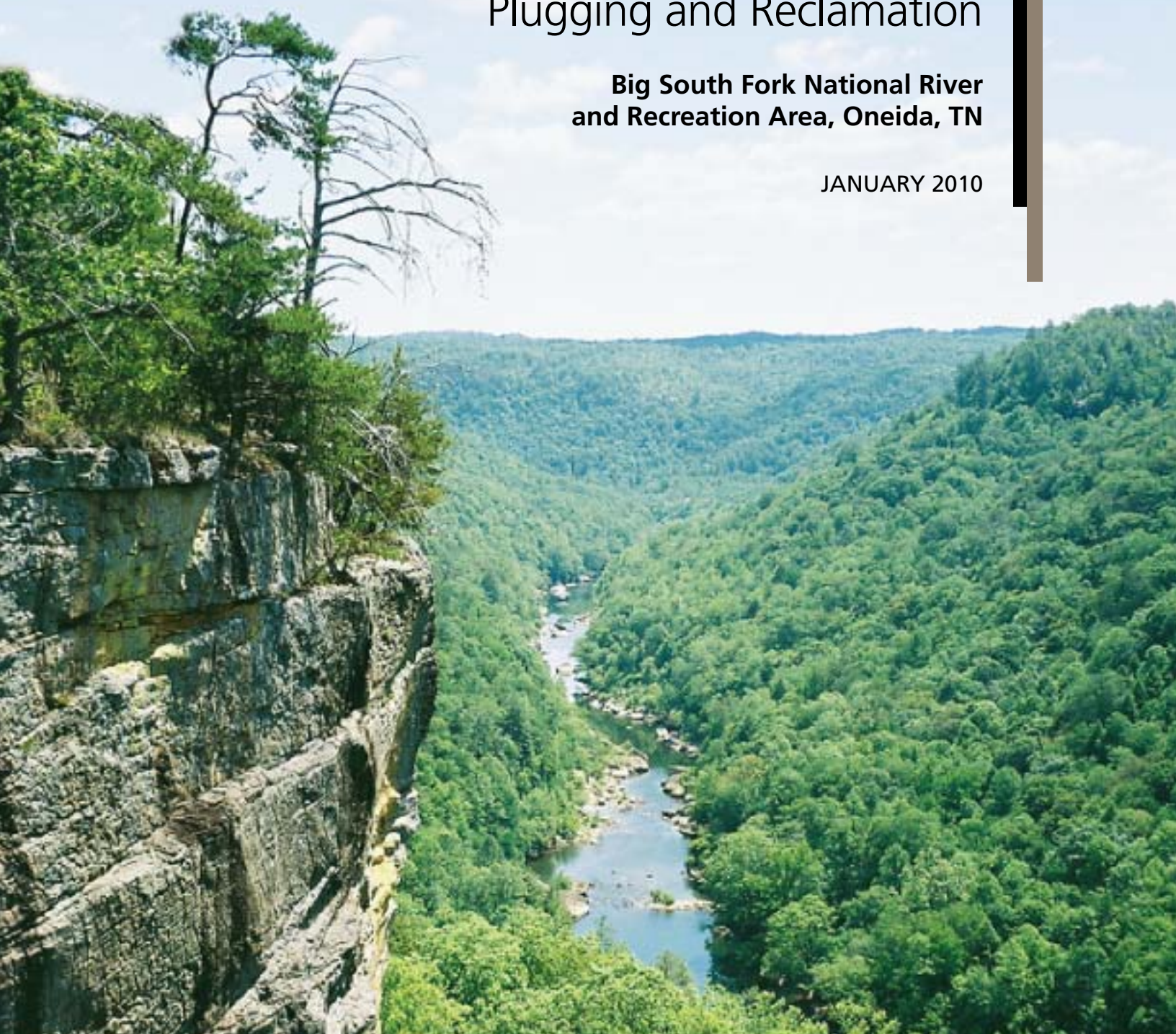


Environmental Assessment

for Oil and Gas Well Plugging and Reclamation

**Big South Fork National River
and Recreation Area, Oneida, TN**

JANUARY 2010





Big South Fork National River and Recreation Area
Kentucky and Tennessee

Environmental Assessment for Oil and Gas Well Plugging and Reclamation

Big South Fork National River and Recreation Area, Kentucky and Tennessee

January 2009

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EXECUTIVE SUMMARY

The National Park Service (NPS) plans to plug and reclaim orphaned oil and natural gas (gas) wells at Big South Fork National River and Recreation Area (Big South Fork NRRA or the park unit), including 45 known wells. Nearly all of these wells were recorded by GPS, and current site and access conditions were documented by park staff during spring and summer of 2009. Two of these wells are owned by the NPS and would be plugged when they are no longer producing gas.

These orphaned wells pose environmental risks and public safety threats that include:

- resource damage from the release of contaminants as deteriorating pressure-control equipment fails
- subsurface groundwater contamination absent proper well plugging
- personal injury and property damage from spontaneous release of pressurized and highly flammable well fluids
- site and access erosion from unreclaimed oil and gas development
- health and safety hazards in locations easily accessible by visitors

All of the wells would be plugged to federal and applicable state standards. Upon completion of well plugging, the well sites would be reclaimed, including the removal of aboveground structures and non-significant non-historic or historic human-made debris that resulted from operations. Access roads no longer needed for future private mineral access or existing or proposed NPS access would be stabilized and allowed to reestablish into native vegetative communities or reclaimed with native vegetation.

This project is needed to ensure protection of natural and cultural resources from the effects of these past oil and gas operations in Big South Fork NRRA, to minimize human health and safety risks, and because there is no responsible non-federal party to plug and reclaim these wells. The action is possible at this time because funding has been made available through the 2009 enactment of the American Recovery and Reinvestment Act (ARRA) to plug and reclaim the majority of these wells.

This Environmental Assessment (EA) analyzes two alternatives: the no action alternative and one action alternative. The EA has been prepared in accordance with the National Environmental Policy Act (NEPA) of 1969 and implementing regulations, 40 CFR Parts 1500-1 508; National Park Service Director's Order #12 and Handbook, *Conservation Planning, Environmental Impact Analysis, and Decision-making*.

PUBLIC COMMENT

If you wish to comment on this EA, you may mail your comments to:

Stennis R. Young, Superintendent
Big South Fork NRRA
4564 Leatherwood Road
Oneida, TN 37841
Attn: Environmental Assessment for Well Plugging and Reclamation

The EA can be accessed and/or comments can be transmitted by going to the NPS Planning, Environment, and Public Comment (PEPC) website at <http://parkplanning.nps.gov/biso>, clicking on the project name, and then clicking on the ‘Open for Public Comment’ link on the left-hand side of the page.

This EA will be on public review for twenty (20) days. A notice of availability for the EA will be posted on the park’s website and will be furnished to area newspapers and media outlets. Reading copies of the EA are available for review at park headquarters at the address noted above, the park’s Bandy Creek Visitor Center, the NPS Kentucky Visitor Center in Stearns at the Stearns Depot, and at area public libraries.

Before including your address, phone number, e-mail address, or other personal identifying information in your comment, you should be aware that your entire comment—including your personal identifying information—may be made publicly available at any time. When commenting, you may request that your personal identifying information be withheld from public review; however, we cannot guarantee our ability to do so. All submissions from organizations, businesses, and individuals identifying themselves as representatives or officials of organizations or businesses will be available for public inspection in their entirety.

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ACRONYMS AND ABBREVIATIONS

ARRA	American Recovery and Reinvestment Act
ATV	All-terrain Vehicle
CEQ	Council on Environmental Quality
CWA	Clean Water Act
EA	Environmental Assessment
EIS	Environmental Impact Statement
ESA	Endangered Species Act
GIS	Geographic Information System
GMP	General Management Plan
GPS	Global Positioning System
GRD	Geologic Resources Division
IPCC	Intergovernmental Panel on Climate Change
KDNR	Kentucky Department of Natural Resources
NEPA	National Environmental Policy Act
NPS	National Park Service
NRCS	Natural Resources Conservation Service
NRRA	National River and Recreation Area
NVCS	National Vegetation Classification System
ONRW	Outstanding National Resource Water
ORV	Off-road Vehicle
PEPC	Planning, Environment and Public Comment
SHPO	State Historic Preservation Office
TDEC	Tennessee Department of Environment and Conservation
TMDL	Total Maximum Daily Load
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey

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CHAPTER 1: PURPOSE AND NEED

The National Park Service (NPS) proposes to plug and reclaim orphaned oil and natural gas (gas) wells at Big South Fork National River and Recreation Area (Big South Fork NRRA or the park unit). Oil and gas fields are located adjacent to and extend into the boundary of the park unit. The park unit encompasses approximately 125,000 acres and more than 300 oil and gas sites in Tennessee and Kentucky (Figure 1). Currently, of these 300 plus oil and gas sites, 45 known orphaned well sites were identified for plugging and reclamation by the NPS.

The U.S. Army Corps of Engineers (USACE) began to acquire property inside the legislatively mandated boundary of Big South Fork NRRA during the late 1970s and early 1980s. Many of the pre-existing wells located within the boundary were orphaned (i.e., there is no longer a responsible party), according to information from the Tennessee Department of Environment and Conservation (TDEC) and the Kentucky Department of Natural Resources (KDNR). The NPS proposes to plug and reclaim orphaned oil and gas wells, including 45 known wells shown on Figure 2. Nearly all of these wells were recorded by global positioning system (GPS), and current site and access conditions were documented by park staff during spring and summer of 2009. The NPS owns two wells that would be plugged when they are no longer producing gas. Nine wells are located in the “gorge” at the park unit, where the minerals are owned by NPS. The gorge, as defined by the enabling legislation for Big South Fork NRRA, represents roughly one-half of the total acreage in the park unit (Figure 2) and encompasses sheer bluffs at the rim which tower over wooded talus slopes and a naturally fluctuating river (and its tributaries) below. Wells not in the gorge are considered to be in the “adjacent area.”

These orphaned wells pose environmental risks and public safety threats that include:

- resource damage from the release of contaminants as deteriorating pressure-control equipment fails,
- subsurface groundwater contamination absent proper well plugging
- personal injury and property damage from spontaneous release of pressurized and highly flammable well fluids,
- site and access erosion from unreclaimed oil and gas development, and
- health and safety hazards in locations easily accessible by visitors

All of the wells would be plugged to federal and applicable state standards. Upon completion of well plugging, the well sites would be reclaimed, including the removal of above-ground structures and non-significant non-historic or historic human-made debris, such as any remaining piping or equipment that may have resulted from operations. Access roads no longer needed for future private mineral access or for existing or proposed NPS access would be stabilized and allowed to reestablish into native vegetative communities or reclaimed with native vegetation.

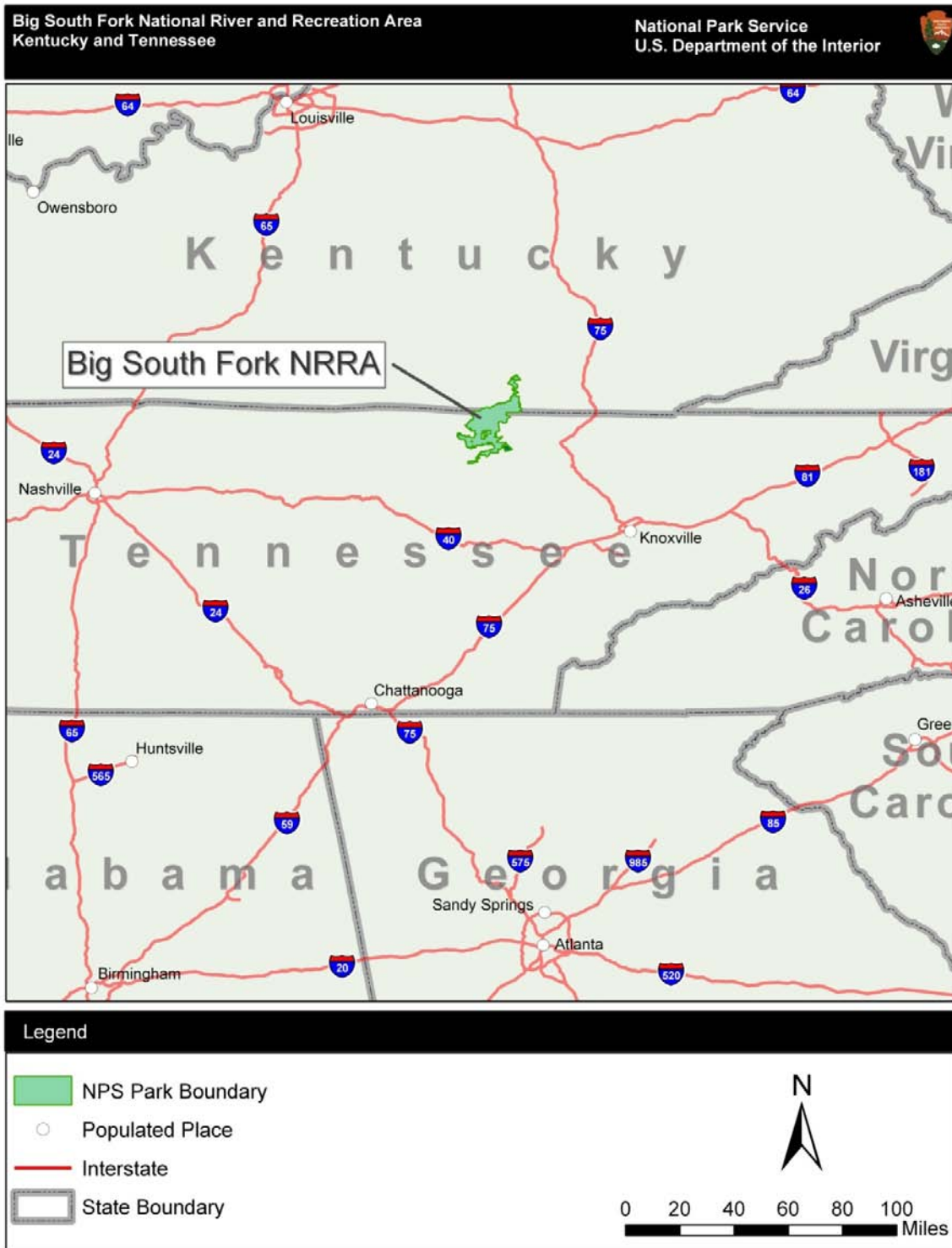


Figure 1. Big South Fork National River and Recreation Area Vicinity Map

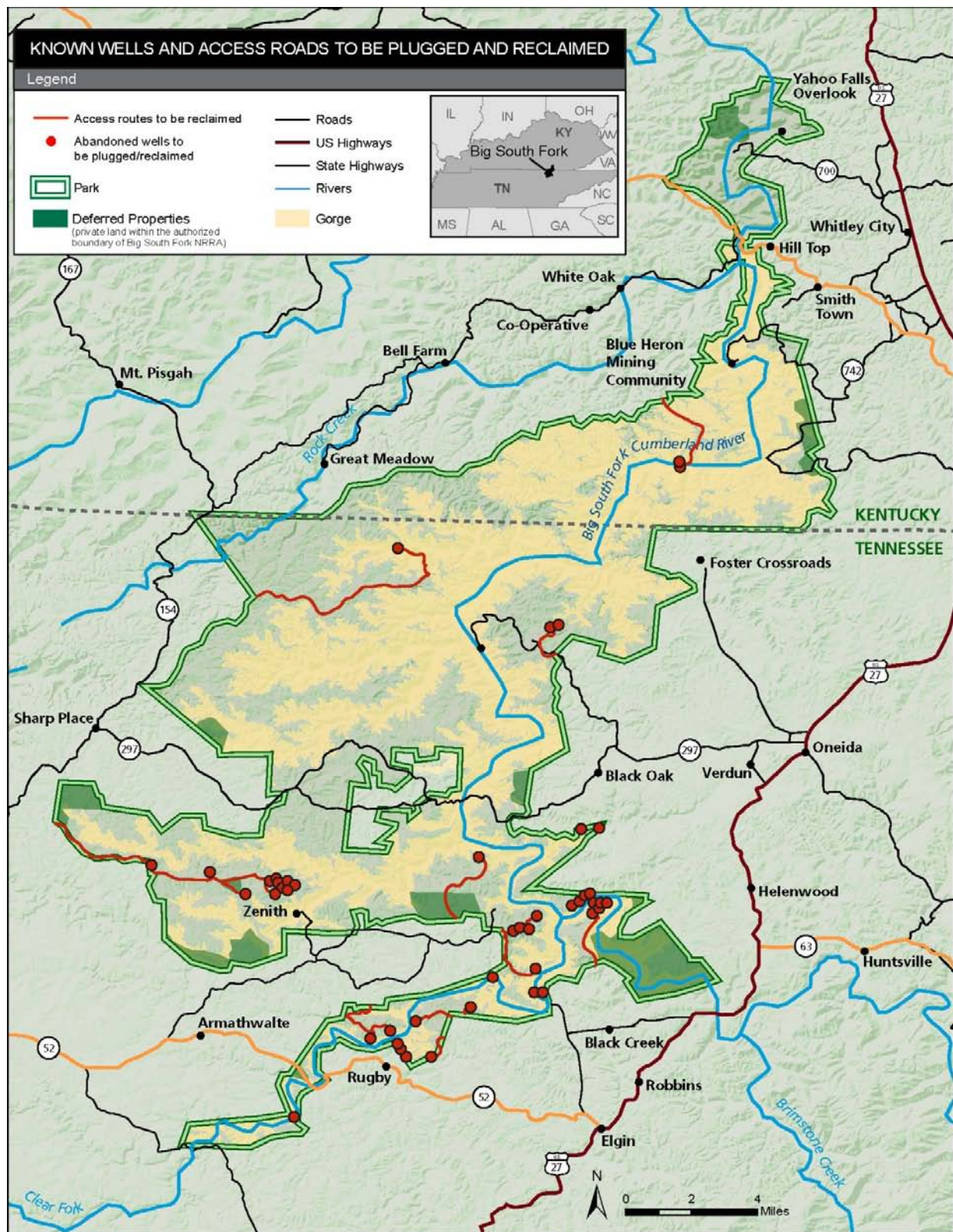


Figure 2. Known Wells and Access Roads to be Plugged and Reclaimed

This Environmental Assessment (EA) analyzes the no action alternative and one action alternative. The EA has been prepared in accordance with the National Environmental Policy Act (NEPA) of 1969 and implementing regulations, 40 CFR Parts 1500-1 508; NPS Director's Order #12 and Handbook, *Conservation Planning, Environmental Impact Analysis, and Decision-making*.

PURPOSE AND NEED FOR ACTION

The purpose for taking action is to plug and reclaim at least 45 known orphaned wells. These wells were identified through communication with the states of Tennessee and Kentucky as wells where the plugging and reclamation bond is not longer valid and there is no responsible non-federal party to plug and reclaim these wells. Therefore, a determination of “orphaned” was made at these well site locations. The project is also needed to:

- ensure protection of natural and cultural resources from the effects of these past oil and gas operations in Big South Fork NRRA, and
- minimize human health and safety risks.

The action is possible at this time because funding has been made available through the 2009 enactment of the American Recovery and Reinvestment Act (ARRA) to plug and reclaim the majority of these wells.

PURPOSE AND SIGNIFICANCE OF THE PARK

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 River 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 General Management Plan (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 NRRA.

- The Big South Fork is a free-flowing river system, flowing unhindered by water development projects except as it enters Lake Cumberland.
- The Big South Fork NRRRA 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 Big South Fork NRRRA including farmsteads eligible for the National Register of Historic Places.
- Big South Fork NRRRA 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 Big South Fork NRRRA 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 (ONRW) 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.

ISSUES AND IMPACT TOPICS

Issues

Issues describe problems or concerns associated with current impacts from environmental conditions or current operations as well as problems or benefits that may arise from the implementation of any of the alternatives. Potential issues associated with orphaned wells or their plugging and reclamation were identified during internal and public scoping (Table 1).

Table 1. Issue Statements

Issue Statement	Affected Resources/Values
<ul style="list-style-type: none"> • Unplugged wells may continue to release hydrocarbons into the environment, including small volumes of greenhouse gases (e.g., methane) as well as liquid hydrocarbons. 	Air quality, geology and soils, water resources, vegetation, wetlands, wildlife and wildlife habitat, special status species, cultural landscapes, visitor use and experience, park management and operations
<ul style="list-style-type: none"> • Unplugged wells may provide a conduit for contamination or loss of fresh groundwater. • Unplugged wells located in floodplains may affect floodplain functions and values. 	Water resources, floodplains
<ul style="list-style-type: none"> • Unplugged wells pose threats to human health and safety, including 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. 	Visitor use and experience (including health and safety), park management and operations

Issue Statement	Affected Resources/Values
<ul style="list-style-type: none"> Unauthorized use of unmaintained oil and gas well access roads causes increased loss of topsoil (erosion) from these roads and increased sedimentation downslope from the roads. 	Geology and soils, water resources, special status species, wetlands
<ul style="list-style-type: none"> Clearing vegetation from well pads and oil and gas well access roads would temporarily modify the existing plant community structure and composition in the project area, could temporarily promote soil erosion and stormwater runoff, could temporarily affect the function and values of wetlands, and could cause the loss or modification of certain types of wildlife habitat. Temporary loss or modification of certain types of wildlife habitat could occur by re-opening roads and well pads. These activities may increase human access and edge effects, and may alter wildlife species composition and migration. For edge species or species needing open areas, the results could be beneficial until forest cover is restored. 	Geology and soils, water resources, vegetation, wetlands, wildlife and wildlife habitat, special status species
<ul style="list-style-type: none"> Using vehicles during well plugging and surface reclamation and disturbing/removing native vegetation may temporarily promote the accidental spread and establishment of exotic species in the project area. Vehicle use and vegetation clearing could temporarily affect wildlife by increasing human access, poaching in open areas, and could disrupt feeding, denning, spawning/reproduction, and other wildlife behaviors. 	Vegetation, wetlands, wildlife and wildlife habitat, special status species
<ul style="list-style-type: none"> An accidental release of liquid hydrocarbons, contaminating/hazardous substances from wellhead equipment, flowlines, or vehicles during well plugging may alter chemical and physical soil properties, could degrade surface and subsurface water quality, could adversely affect plant growth and survival, could adversely affect wetlands function and values, could cause a local decline in wildlife populations, could threaten human health and safety, and could impede recreational use. 	Soils/geology, water resources, vegetation, wetlands, wildlife and wildlife habitat, special status species, visitor use and experience (including health and safety)
<ul style="list-style-type: none"> Plugging and reclamation activities would create man-made noise that may temporarily disrupt wildlife and affect visitor use and experience. 	Wildlife and wildlife habitat, special status species, soundscapes, visitor use and experience
<ul style="list-style-type: none"> Well plugging would require NPS oversight and supervision, which could temporarily cause shifts in priorities for park resource management responsibilities. 	Park management and operations
<ul style="list-style-type: none"> Closing and reclaiming access routes may reduce alteration and erosion of soils and geology. Reclamation activities that stabilize natural contours and native plant communities could reduce erosion and sedimentation and improve surface and subsurface water quality. 	Soils/geology, water resources, vegetation, wetlands, wildlife and wildlife habitat, special status species
<ul style="list-style-type: none"> Reclamation activities that control exotic plant species, reestablish native plant communities, and restore wetland functions and values could benefit vegetation, wetlands, wildlife and wildlife habitat, and special status species. 	Vegetation, wetlands, wildlife and wildlife habitat, special status species

Issue Statement	Affected Resources/Values
<ul style="list-style-type: none"> Stabilizing disturbed areas and reestablishing native vegetation, wetlands, and wildlife habitat would benefit visitor experiences in the project area. 	Visitor use and experience
<ul style="list-style-type: none"> Well construction, maintenance activities, and siting of equipment have disturbed and possibly destroyed archeological artifacts and harmed the integrity of archeological sites. However, plugging and reclamation activities could disturb known and unknown archeological resources. Plugging and reclamation activities could temporarily disrupt cultural landscapes. Ultimately, reclamation activities may benefit cultural landscapes by restoring natural conditions that could contribute to the historic scene. 	Cultural resources

Impact Topics

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. Per this guidance, the impact topics to be evaluated in detail in the EA were derived from the issues summarized in Table 1 and are discussed in “Chapter 3: Affected Environment / Environmental Consequences” of this EA. Chapter 3 also examines the extent to which the resources associated with the impact topic would be affected by the actions of a particular alternative. These impact topics include:

- Soils/Geology
- Water Resources
- Vegetation
- Wetlands
- Wildlife and Wildlife Habitat
- Special Status Species
- Visitor Use and Experience (including health and safety)
- Park Management and Operations

Because some issues identified in Table 1 would have minimal impact, they were dismissed from detailed evaluation as described in the following section on “Issues and Impact Topics Eliminated from Detailed Analysis.”

ISSUES AND IMPACT TOPICS ELIMINATED FROM DETAILED ANALYSIS

The following topics were eliminated from further analysis in this EA because the particular resource is not in the analysis area, the resource would not be affected by the proposal, or by applying mitigation there would be no measurable impact from the implementation of the proposal.

Air Quality/Climate Change

Emissions of particulates that could affect air quality, including visibility in the general vicinity of the park, would temporarily increase during plugging and reclamation activities from the use of vehicles on and off paved roads, and from exhaust from gasoline- or diesel-powered vehicles and equipment. This equipment would also temporarily emit various air pollutants including nitrogen oxides, volatile organic compounds, carbon monoxide, sulfur dioxide, particulates, and odors during the use of such equipment. However, 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 the 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. Because of the short-term, localized nature of these operations, plugging and reclamation activities would not affect the attainment status of the airshed that encompasses Big South Fork NRR and would not affect the airshed designation (e.g. the Class II designation under the prevention of significant deterioration program) at the park.

In addition to the air quality issues described above, the use of gasoline- or diesel-powered equipment during plugging and reclamation could cause increases in “greenhouse gases” that contribute to climate change. However, these emissions would be negligible in comparison to other local and regional sources of greenhouse gas emissions.

Unplugged wells are also responsible for emission of greenhouse gases. Plugging and reclamation of the wells would not only remove a source of greenhouse gas emissions, it would also promote the restoration of native plant communities that act as a sink for such gases, resulting in an overall long-term beneficial effect on greenhouse gas emissions. Because the adverse impacts described above would not exceed a minor threshold and the plugging and reclamation of the wells would have a beneficial effect on air quality and greenhouse gas emissions, the topics of air quality and climate change have been dismissed from further analysis in this EA.

Floodplains

Some unplugged wells, including four of the known wells, are located in a floodplain and could be subject to flooding. If these wells are leaking hydrocarbons, they could affect some floodplain values, which contribute to ecosystem quality, including soils, vegetation, wildlife habitat, and groundwater quality. The potential effects to these values are described in the impact analysis for these topics, which have been carried forward for detailed evaluation. In addition, plugging and reclamation of these wells under the proposed action would result in short-term effects during plugging operations. The proposed action would remove the abovementioned risks, which would result in long-term beneficial effects to the floodplains. The proposed actions would also not increase the flood risk to human life, place infrastructure in a flood-prone location, compromise natural floodplain values, nor potentially increase flood elevations. As described under the air quality discussion, plugging and reclamation activities are temporary, lasting two to five days each, and given the mitigation measures described in chapter 2, any short-term impacts associated with these operations would not appreciably affect floodplain functions and values or exceed a minor threshold. As a result, this topic has been dismissed from further evaluation in this EA.

Soundscapes

According to the NPS, a soundscape is defined to be the “total acoustic environment of an area,” which includes both natural and human sounds (NPS 2009b). Section 4.9 of NPS Management Policies 2006, refers to the natural soundscape of a park as 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 birdcalls and insect chirps, 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.

Unplugged wells do not affect soundscapes because they do not contain any operating production equipment. Well plugging and surface reclamation would result in intermittent, temporary (two to five days at a time), and localized adverse impacts on soundscapes from man-made noises caused by mechanized equipment used to access the well sites, clear vegetation from access roads and well pads, plug the wells, and reclaim the surface resources. Once these activities are complete and sites are restored to natural conditions, the revegetation would ultimately help attenuate the noise from other nearby oil and gas operations. In addition, noise impacts from plugging and reclamation have been addressed under visitor use and experience, wildlife and wildlife habitat, and special status species. As a result, this impact topic was dismissed from further analysis in this EA.

Prime and Unique Farmlands

The Farmland Protection Policy Act was passed 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) Natural Resources Conservation Service (NRCS), 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 NRRRA contains seven soil associations identified as prime farmland soils: Allegheny Grigsby, Lily Loam, Lonewood Clarkrange, Sequoia Silt Loam, Sequoia Wernock, Sewanee Loam, and Wernock Silt Loam (USDA 2009b); however, these soils are not in agricultural production. The alternatives considered in this EA would not involve the conversion of areas of prime farmland soils to a new use. Therefore, this topic was dismissed from further analysis in this EA.

Cultural Resources

The cultural resources at Big South Fork NRRRA are diverse, numerous, and extensive. However, any cultural resources or archeological sites that may have occurred at oil and gas operations were likely destroyed by road construction for logging or for oil and gas well access roads and well construction before the federal government purchased the property. Because of this past disturbance, impacts to cultural resources associated with the proposed plugging and reclamation actions at most of the oil and gas well sites and access roads would be negligible (NPS 2009f). All of the known wells that would be plugged and reclaimed have been visited, and the well pads and roadbeds have been examined for the presence of cultural resources. Only five of the selected locations are close to historic cultural resources and would require an archeologist to be present during the plugging actions to ensure that no impacts occur to the cultural resources here (NPS 2009f).

The following sections provide more detail regarding the various cultural resources occurring in the park and the reasons each topic was dismissed from further evaluation in this EA. In addition, chapter 4 and appendix A provide information on consultation with Tennessee and Kentucky State Historic Preservation Offices (SHPOs) under Section 106 of the National Historic Preservation Act. The Tennessee SHPO has concluded “there are no National Register of Historic Places listed or eligible properties affected by this undertaking.” The Kentucky SHPO indicated they “consider the oil wells potentially eligible but the plugging of the oil wells to have No Adverse Effect if the location of each is thoroughly documented, including GPS coordinates and photo documentation.”

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).

Archeological resources at the Big South NRRA consist of early hunter-gatherer limited use and seasonal hunting camps, rock shelters, semi-sedentary open campsites, 19th century farms and communities, moonshine/still operation sites, niter and coal mines, timber production sites, and contemporary farms (NPS 2009e).

Some archeologists consider the Big South Fork NRRA 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 20% of the estimated total for the park unit. Between 1996 and 2001, 249 new culturally associated rock shelters were recorded by the Middle Tennessee State University (Smith and Des Jean 2008). These rock shelters date between the Early Archaic period (8,000 – 10,000 B.C.) and the Modern Historic period (A.D.1900 – 1960).

Past road and well pad construction and drilling activities had an adverse impact on any existing archeological sites that were located in those construction zones. Additionally, the maintenance, mineral extraction, and logging activities along the access roads and well sites continued this destruction. Fortunately, any prehistoric archeological sites once located along the ridgetop roadbeds are typically low-density flint scatters that are not stratified and that are devoid of features or diagnostic materials. The roads also follow the line of previous ridgetop roads and trails that passed by, not through, historic archeological sites (NPS 2009g). For the five sites that occur in proximity to any well sites, an archeologist would be onsite to monitor plugging and reclamation activities. As a result, any impacts to archeological resources would be negligible, and this topic has been dismissed from further consideration.

Historic/Prehistoric Structures. A historic structure, for purposes of listing on the National Register of Historic Places, can be any structure constructed by or utilized by humans that meets specified criteria. In the National Register context of Big South Fork NRRA there are a total of 12 domestic structures representing preserved examples of vernacular architecture and two engineering structures that have been determined eligible for the National Register. Many other historic constructions (mill races, bridge piers, stone culverts, retaining walls, etc.) have been identified as contributing elements to the National Register-eligible Rural Historic District. There are also three structures that do not meet eligibility criteria as National Register historic structures and numerous other scattered constructions (stone walls, pier stones, foundations, ruins, etc.) that do not meet criteria as contributing elements. These structures and elements are being managed as non-significant discovery sites for visitors. Properties that are listed or that

are eligible for listing in the National Register receive special consideration when federal agencies propose projects that may affect them.

Some known well sites require access along the historic John Muir Trail. As a result, there could be some temporary impacts to the John Muir Trail from vehicles and other equipment that must be brought in for plugging and reclamation. The NPS would repair any damage to the trail resulting from this access once these operations are complete, and there would be negligible impacts.

The Beatty well, drilled in 1818, is currently cased with steel pipe and closed with a screw cap. This well was documented in an historic structure survey in 1982 (Hutchinson et al.) and determined as not eligible for listing in the National Register as an engineering structure, but, even so, the park archeologist will be onsite to monitor plugging operations. The well pads at all of the oil and gas well locations at Big South Fork have been located using GPS, and photographs have been taken. Any impacts to historic/prehistoric structures or to the Rural Historic District would be negligible, so this topic has been dismissed from further discussion.

Cultural Landscapes. A cultural landscape is 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).

One known well is located in the Ranse Boyatt Cultural Landscape, a designated cultural landscape at the park identified as being important for its intact landscape elements. The well was drilled in 1958 after the area had been abandoned, and while it may be in a historic setting, it is along the previously disturbed access road that runs through what was once the middle of the Ranse Boyatt farm field. As a result, the oil well casing and unplugged well are not contributing elements or historic features associated with the cultural landscape (NPS 2009g). Although plugging and reclamation activities would temporarily introduce noise and ground disturbance that could affect the cultural landscape, the reclamation of this well would help restore natural conditions that might contribute to the landscape. As a result, any short-term impacts would negligibly affect cultural landscapes while contributing to potential long-term benefits. As a result, this impact topic has been dismissed from further consideration in this EA.

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 NRA. 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 were 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 2009). The NPS sent letters to three Cherokee bands, three Shawnee groups, and the Chickasaw Nation in October 2009 to notify them of the EA and to initiate compliance with Section 106 of the National Historic Preservation Act (see appendix A for copies of these letters and any responses received). Should ethnographic resources be identified, the NPS would

work with the tribes to ensure that access to or use of Indian sacred sites is not limited, and that management actions do not affect the physical integrity of such sites. In addition, the reclamation of these wells would help restore natural conditions that might contribute to the importance of a site.

Although there were Scottish, Irish, and German immigrants to the area in historic times, there are no distinct ethnographic groups of European descent associated with Big South Fork NRRA (Des Jean 2009). However, one known well that would be plugged and reclaimed is located in the Ranse Boyatt Cultural Landscape, which has been identified as being important for ethnographic reasons. The well was drilled in 1958 after the site had been abandoned. As a result, any impacts on ethnographic resources would be negligible, so this impact topic has been eliminated from further consideration.

Museum Collections. The Big South Fork NRRA preserves the fifth largest museum collection in the Southeast Region including a model of the Blue Heron mining community, a model of a coal tippie and bridge, and the No Business community. Plugging and reclamation activities would not impact existing collections or the building in which they are housed, nor would they add additional objects to the collections. Therefore, this impact topic has been eliminated from further consideration.

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.

Socioeconomics

The area of influence for socioeconomics for purposes of plugging and reclamation activities at Big South Fork NRRA is comprised of five counties: McCreary County in 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 park unit. Most of the surface lands and federal oil and gas estate are located in Scott and Morgan Counties. The entire area is predominantly rural in character, with settlement patterns, land use, and economic activity influenced heavily by terrain, natural resources, and transportation networks. The presence of unplugged wells would have no effect on the socioeconomics of this area (e.g., population numbers, demographics, income, employment, economic output, tourism, NPS contribution to the local economy). Under the proposed action, the NPS would hire well-plugging contractors, which would support employment and income and increase the NPS contribution to the local economy. However, relative to other contributions, including that of other oil and gas operations, these temporary well plugging projects would contribute negligibly to

the regional and local economies. These wells have no responsible party or are owned by the NPS (the NPS wells would be plugged in the future once the natural gas resources are exhausted). There would be no socioeconomic effects from plugging the wells. As a result, the socioeconomics topic has been dismissed from further consideration.

Environmental Justice

Executive Order 12898 (General Actions to Address Environmental Justice in Minority Populations and Low-Income Populations 1994) requires all agencies to incorporate environmental justice into their missions by identifying and addressing disproportionately high and adverse human health or environmental effects of their programs and policies on minorities and low-income populations or communities. No alternative under consideration would have disproportionate impacts on the health or environment of minority or low-income populations or communities as defined in the 1996 EPA Draft Environmental Justice Implementation Plan. The alternative would affect all populations equally; therefore, environmental justice was dismissed from detailed analysis.

Energy Requirements and Conservation Potential

The no action and the preferred alternative would require expenditures of energy, including natural and depletable resources during the construction period from construction equipment. Neither of the alternatives analyzed in this EA would require an increase in energy consumption, nor would the alternatives have appreciable effects on energy availability or costs. Adverse impacts would be no greater than short-term and negligible. Therefore, this impact topic was dismissed from further analysis.

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CHAPTER 2: ALTERNATIVES

NEPA requires that federal agencies explore a range of reasonable alternatives. The alternatives under consideration must include the “no action” alternative as prescribed by 40 CFR 1502.14. Project alternatives may originate from the proponent agency, local government officials, or members of the public, at public meetings, or during the early stages of project development. The alternatives analyzed in this document, in accordance with NEPA, were developed and analyzed by an interdisciplinary team made up of NPS staff from Big South Fork NRRRA, the Denver Service Center, and the NPS Geologic Resources Division (GRD).

NO ACTION – ALTERNATIVE A

Under alternative A, the NPS would plug at least 45 abandoned oil and gas wells (see Figure 1 in chapter 2) and reclaim associated sites and access roads in Big South Fork NRRRA only when NPS or state funding becomes available. Project activities would be done on a well by well basis or by small groupings of wells as funding becomes available over a period of years. Work would occur over an extended period of time.

All plugging and reclamation would comply with or exceed NPS plugging standards, which are based on the Department of the Interior’s *On-Shore Oil and Gas Order Number 2, Section III. G., Drilling Abandonment*, and all other applicable state requirements (either Tennessee or Kentucky).

During preparation of a programmatic plan and Environmental Impact Statement (EIS) for non-federal oil and gas operations at Big South Fork NRRRA, the GRD adjusted plugging specifications for accessing, plugging, and reclaiming wells at the park unit. This guidance is described in the next sections, and a summary of access, plugging, and reclamation requirements for 45 known orphaned wells is included in appendix C.

Access Roads

Typical oil and gas access roads were built with a bulldozer to access the sites based on oversight by the states (if permitted) and mostly before NPS ownership. The roads were built to accommodate drilling equipment and meet minimum size and width standards. Roads were cleared of vegetation and bladed smooth. Drainage ditches were established to capture runoff. Culverts or gravel were added at low spots. Gravel was used mostly in cases where the soil was too soft for equipment, on steep areas, or in drainage areas. Roads have since revegetated with grasses, shrubs, and trees, and erosion has occurred in steep areas where there has been no maintenance.

There are four goals for temporarily improving access roads during plugging and reclamation activities.

1. Provide access to well sites 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 redisturbance (vegetative removal and road repair) than is necessary to achieve goals 1 and 2.
4. Secure access for authorized use by project personnel.

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

Vegetation Trimming/Removal. Much of the oil and gas access roads network 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 roadsides. A small vehicle with a chipper/shredder attachment or a tractor with a brush hog may be used to clear low-growing plants or small woody shrubs and small trees. Small bulldozers or the front bucket of a backhoe may be used to clear vegetation within the roadway or remove large, fallen woody debris. Some access has been blocked by mature trees that have fallen across established routes. These tree trunks would be cut into sections removed or dispersed into the woods in a manner that avoids wildfire fuel loading and promotes natural decay.

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. Mud holes and road washouts would need to be repaired for rig access and larger cementing equipment. The material for road repair (including improving the crown and filling in holes) would generally be obtained from clearing/improving ditches. In some cases, temporary drainage would be established to empty mud holes. 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 meeting temporary access needs and minimizing impacts.

Erosion Control. Staked weed-free straw bales and sediment traps would be used at mud hole drainages and steep slopes in excess of 3% as well as silt fence 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. Any road base materials used in areas to be reclaimed would be left in place to minimize erosion after egress unless gravel is not part of cultural landscape, such as the Ranse Boyatt house site. In such cases, the gravel would be removed, and the disturbed area would be reclaimed as appropriate to the cultural landscape. 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 temporary access routes. Gravel would be screened to minimize the amount of limestone sand, which could contribute to impacts on water-quality parameters such as pH. Larger (3-inch diameter or greater) material would often be necessary to fill mud holes or to use at the base of exposed, uneven bedrock. Smaller gravel would be used for traction on steeper slopes.

Equipment. Typical equipment used in opening up and repairing temporary access roads includes a small bulldozer, small backhoe, and 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 in plugging a well are:

- To protect the zones of usable quality water
- To prevent escape of oil, gas, or other fluids to the surface or to zones of usable-quality water
- To leave the surface in a clean and safe condition that sets the stage for surface reclamation

The following well plugging objectives have been developed to meet the NPS well plugging goals and are further refined to be more specific to Big South Fork NRRRA:

- Set cement plug(s) to isolate all formations bearing oil, gas, geothermal resources, and other prospectively valuable minerals from zones of usable-quality water.
- Set cement plug(s) to isolate all formations bearing usable-quality water.
- Set a cement plug to isolate the surface or intermediate casing from the open hole below the casing shoe.
- Set a cement plug to seal the well at the surface.
- If more economical or unknown conditions exist for the casing, a well may be plugged from bottom to top with cement.
- Remove surface casing below grade and cap the well.

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

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 fill the entire wellbore with cement from the top of fluid found in the well or 1,000 feet, whichever is deeper. If fluid level is below 1,000 feet in a well, individual cement plugs may be set to meet state requirements for mineral zone isolation.

Primarily, plugging activities would include redistributing only those areas along the access road and at the well site, which are necessary to temporarily gain access for equipment and materials to complete the plugging. A maximum of 150 feet by 150 feet wide (0.5 acre per well site) would be cleared of vegetation and covered with gravel (if necessary) to allow access and maneuverability by plugging equipment. The NPS has adopted the minimum standards of the Department of Interior's *On-shore Oil and Gas Order Number 2, Section III. G., Drilling Abandonment* for plugging wells in parks. The plugging requirements of On-shore 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 producer or service wells.

General Cementing Requirements. Unless downhole problems exist, all wells would be plugged to exceed state and federal standards by cementing from bottom up to prevent bridging plugging media in the well bore/casing. An exact plugging strategy will be determined upon field conditions at the

time of the plugging effort. All plugging operations would need to include the general NPS requirements that are explained in appendix B 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.

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

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 the 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 metal tanks and disposed of at an approved disposal site outside the park. No water would be obtained from sources within the NPS property. Water needed during plugging would be transported to the site by 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
- Personal vehicles
- Tanks for handling fluids/solids returned from the well

Reclamation

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. While this is not a 9B operation, the 36 CFR 9B regulations 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. For surface reclamation, the 9B regulations direct the NPS to 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. The 9B regulations identify specific actions that need to be completed to satisfy the standard. These are:

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

While all well sites would be reclaimed per these standards, some access roads would be maintained or stabilized for future use. These include oil and gas access roads identified in the GMP for Big South Fork NRRA for future visitor uses and roads that provide access to private mineral in-holdings that may be used in the future. Roads that provide access to private mineral interests would be closed to public use, but would be stabilized for future use until the NPS acquires the mineral interests.

Contamination. Obvious surface contamination would be mitigated during this effort by the contractor (e.g., free-phase surface product and pit contents would be removed). If a site is identified as contaminated beyond surficial observation, a separate project would be established to fully characterize site conditions and a remediation plan developed to mitigate contamination issues.

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. Consideration regarding current conditions of plant communities and soils/slope stability would be given when deciding how to reclaim a site. 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, site impacts would be minimized. Soil, hydrology, and native vegetation communities would be restored as soon as practicable after completion of the plugging operation.

The reestablishment of native vegetative communities would generally be accomplished by seeding with native grasses and using weed-free 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. To further the succession stage, in some cases where small areas are disturbed, leaf litter from the adjoining forested area would be blown into the disturbed area to encourage the reintroduction of native plant seeds and the addition of forest litter as some of the needed mulch.

Projects 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). 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; in some cases, follow-up treatment or control may be required.

Equipment. Typically, small earth-moving equipment (small bulldozer 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. Weed-free 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 may be required if reclamation involves removal of contaminated soils. Access for monitoring would be by truck or off-road vehicle (ORV) only to that point where vehicles would negatively affect reclamation efforts (i.e., along roads and trails not being reclaimed), and then by foot.

PREFERRED ALTERNATIVE – ALTERNATIVE B

Alternative B is the NPS preferred alternative. This alternative would take advantage of the substantial funding received under ARRA to help the park fulfill its mandates and mission by plugging and reclaiming orphaned oil and gas wells, giving due consideration to environmental, health and safety, economic, technical, and other factors.

Under this alternative, the NPS would plug at least 45 known orphaned oil and gas wells (see Figure 2 in chapter 1), and associated sites and access roads, in Big South Fork NRRA as described for alternative A. The majority of these wells would be plugged and reclaimed using funding received under ARRA, completing the project within a year of receiving funding and eliminating threats to the environment and health and safety.

MITIGATION

Table 2 identifies mitigation measures for both alternatives according to affected resource area.

Table 2. Mitigation Measures

Resource Protected	Mitigation Measures
General	- Projects would follow all requirements of the Specifications for Well Plugging in the Big South Fork National River and Recreation Area (Appendix B).
Geology and Soils	- Silt fences and straw bales would be placed around drainage paths and the perimeter of the well site, in areas prone to erosion, and along temporary access routes during well plugging and surface reclamation. - Tanks would be placed at each well to capture any well fluids produced during plugging.
Water Resources	- A liner would be placed around the wellhead and under all service vehicles to prevent soil, surface, and groundwater contamination from wellhead fluids, such as brine, and other fluids that may leak from equipment during plugging.

Resource Protected	Mitigation Measures
	<ul style="list-style-type: none"> - All stream crossings (wet or dry) on routes identified in the GMP as part of the trail system would have a sub-base of rock and a filter fabric layer installed or the crossings would be hardened with concrete planks. - If plugs are used, after each plug is poured the NPS would require on a case-by-case basis the contractor to “touch” each plug before additional concrete is poured. NPS would monitor each wellhead annually for two (2) years after plugging. - Geology and Soils mitigation measures would also protect water quality.
Wetlands	<ul style="list-style-type: none"> - If wetland areas have been directly or indirectly affected by project activities, the soil, hydrology, and native vegetation communities would be restored as soon as practicable after completion of the plugging operation. - Projects would implement wetland Best Management Practices of NPS Procedures Manual 77-1, Appendix 2 (NPS, 2008).
Vegetation	<ul style="list-style-type: none"> - Clearing of vegetation, performed with chainsaws and tractors with brush hogs to open well pads and oil and gas well access roads, would be kept to a minimum. - Weed-free native seed mixtures and straw bales would be used to revegetate well sites and access roads. - Where possible, forest duff would be blown into areas to augment revegetation of disturbed areas.
Wildlife	<ul style="list-style-type: none"> - Proper spill response and mitigation would occur following any spill in accordance with the spill response and clean-up provisions in the contract. Monitoring would continue as warranted. - Additional erosion control measures under Geology and Soils and Water Quality would protect aquatic populations, streams, and habitat.
Special Status Species	<ul style="list-style-type: none"> - Oil field brine, and all other waste and contaminating substances would be kept in the smallest practicable area to prevent escape as a result of percolation, rain, high water or other causes. Wastes would be stored and disposed of or removed from the area as quickly as practicable to prevent contamination, pollution, damage or injury to the lands, water (surface and subsurface), facilities, cultural resources, wildlife, and vegetation or visitors of the unit. - Tanks would be placed at each well to capture any well fluids produced during plugging. - A plastic liner would be placed around the wellhead and under all service vehicles to prevent soil, surface, and groundwater contamination from wellhead fluids, such as brine, and other fluids that may leak from equipment during plugging. - All oil and gas well plugging contractors would be required to develop a Spill Prevention and Emergency Preparedness Plan and emergency and spill equipment would be readily available on site. - Silt fences and straw bales would be placed around drainage paths and the perimeter of the well site, in areas prone to erosion, and along temporary access routes during well plugging and surface reclamation. - No streams with a known occurrence of federally listed species would be crossed. All stream crossings (wet or dry) on routes identified in the GMP as part of the trail system would have a subbase of rock. As necessary, filter fabric would be installed or the crossings would be hardened with concrete planks to protect the integrity of the stream banks. The type of ford used would be based on the best protection for the aquatic organisms present. - At Oil Branch and at sites adjacent to bluffs and/or with limited space to contain spills above Clear Fork and North White Oak, well plugging would be limited to

Resource Protected	Mitigation Measures
	<p>periods outside the breeding season (mussel breeding season in November through March) and work would be done during periods of low flow. Low flow conditions are described as less than 400 cubic feet per second at the Leatherwood Ford gauge. Oil Well Branch is the site closest to the river</p> <ul style="list-style-type: none"> - The Big South Fork NRRA's wildlife biologist would be present to oversee activities near the river.
Cultural Resources	<ul style="list-style-type: none"> - An archaeological monitor would be present during site clearing, well plugging, and revegetation activities at well permit 7192, 151-02, the Beatty Well (1818) and the two additional wells near the Beatty Well. - If archaeological materials are found, the contractor would stop work and the park would determine the course of action (data recovery or avoidance). - For the five sites that occur in proximity to any well sites, the Rance Boyatt home site, Rock Shelters, the Rugby National Register Historic District, the 1818 Beatty Well, and the historic John Muir Trail, an archeologist would be onsite to monitor plugging and reclamation activities. - Any damage to the John Muir trail resulting from temporary access would be repaired once operations are complete.
Visitor Use and Experience	<ul style="list-style-type: none"> - Areas closed to visitor use during plugging and reclamation would be posted at the entrance to the access road and the public would be notified by signs which would promote visitor safety.
Floodplains	<ul style="list-style-type: none"> - Environmentally friendly stream crossings, i.e., geotextile fabric with gravel or crossings hardened with concrete planks, would be installed at all fords used for this project. The type of ford used would be based on the best protection for the aquatic organisms present. This measure would also protect Soils, Water Quality, and Special Status Species.

ALTERNATIVES CONSIDERED BUT DISMISSED FROM FURTHER ANALYSIS

The NPS conducted a thorough analysis of the resource threats associated with unplugged oil and gas wells within the park. Based on this analysis, the NPS prepared funding proposals to plug orphaned wells and reclaim well sites with no responsible party to plug the well. ARRA funding was approved to plug the more than 45 wells covered in this EA. Because these wells pose risks to the environment and human health and safety, which the NPS is mandated to protect, the NPS did not consider any other alternatives for this EA. However, during scoping, the NPS received comments suggesting additional alternative elements. After considering these ideas, the NPS dismissed them from further analysis, as described in the following sections.

Reclaim Access Roads for Visitor Uses

One commenter suggested reclaiming oil and gas access roads as hiking trails and areas for bird watching. As described for alternative B, some access roads would be maintained for visitor access, in accordance with the Big South Fork NRRA GMP (NPS 2005a). All other oil and gas access roads that are not identified in the GMP would be reclaimed, unless they provide access to private mineral in-holdings. These roads would be closed to horses, vehicles, and biking. The GMP does allow the public to walk anywhere including abandoned roads; however, these abandoned roads will not

become part of the designated trail system unless specified in the GMP. Therefore, this alternative was not considered further in this EA.

Compressed Air Energy Storage

One commenter suggested converting the orphaned oil and gas wells for use in underground compressed air energy storage. The development of such technology and the necessary infrastructure are outside the scope of this plan, as they would not meet the purpose and need for taking action, as described in chapter 1 (i.e., the wells would not be plugged, the sites would not be reclaimed, natural and cultural resources would not be protected from the effects of these past oil and gas operations in Big South Fork NRRRA, and human health and safety risks would not be minimized). In addition, development of such technology to generate electricity is not consistent with the purpose and significance of the park (as described in chapter 1) or the special mandates described in the Big South Fork NRRRA GMP (NPS 2005). Finally, underground storage coupled with the expense, technical, and logistical issues, and the use of compressed air energy storage is not a reasonable alternative per NPS guidance (e.g., Director's Order #12).

ENVIRONMENTALLY PREFERABLE ALTERNATIVE

The environmentally preferable alternative is determined by applying the criteria stated in NEPA, which is guided by the Council on Environmental Quality (CEQ). Guidance from the CEQ states that the environmentally preferable alternative 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). The CEQ also states that, “...the environmentally preferable alternative is the alternative that would promote the national environmental policy as expressed in NEPA’s Section 101 to:

1. fulfill the responsibilities of each generation as trustee of the environment for succeeding generations;
2. assure for all Americans safe, healthful, productive, and aesthetically and culturally pleasing surroundings;
3. attain the widest range of beneficial uses of the environment without degradations, risk to 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 which supports diversity, and variety, of individual choice;
5. achieve a balance between population and resource use which 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.” (42 U.S.C. § 4321 et seq. § 101[b]).

Identification of the "Environmentally Preferable Alternative" was based on an analysis that balances factors such as physical impacts on various aspects of the environment, mitigation measures to deal with impacts, and other factors including the statutory mission of the NPS and the purposes of the project. The no action alternative is not the environmentally preferable alternative because, while it

would address long-term threats of resource damage from release of liquid contaminants as deteriorating pressure-control equipment fails, contamination of groundwater resources, personal injury and property damage from the spontaneous release of pressurized and highly flammable well fluids, and continued disturbance from unreclaimed oil and gas development the benefits of addressing these threats would be realized sooner under alternative B, whereas funding under alternative A is less certain.

The environmentally preferable alternative in this EA is the preferred alternative. This alternative was selected based on the following criteria: it protects natural resources by addressing concerns associated with deteriorating pressure-control equipment failures and by subsequent reclamation activities (NEPA criteria 2, 3, and 5); reclamation of sites would enhance natural resources and open up previously closed areas of the park to visitors (NEPA criteria 1, 2, 3, and 4); and while both alternatives meet NEPA criteria 1, 2, 3, 4, and 5, the benefits of plugging and reclamation are more likely to be realized, and sooner, under alternative B because funding is available now from ARRA to plug and reclaim the majority of these wells, whereas funding under alternative A is less certain.

ALTERNATIVES SUMMARY

With the no action alternative, Alternative A, plugging would be done on a well by well basis or by small groupings of wells as funding becomes available over a period of years. Work would occur over an extended period of time and have less short-term impacts to park operations. However, threats to the environment and to public health and safety would increase as wellhead conditions continued to degrade.

With the preferred alternative, Alternative B, plugging would be done within one year of receiving funding having greater short-term impacts to park operations. However, threats to the environment and to public health and safety would be eliminated quickly.

IMPACT SUMMARY

Based on project scoping concerns and on the level and extent of potential impacts likely to occur, the NPS determined that the impact topics listed in Table 3, below, would likely have more than negligible impacts and, therefore, would be carried forward for detailed analysis in chapter 3 of this EA. Other topics were addressed by closely examining potential impacts; however, these were dismissed from further analysis because their impacts would not be expected to exceed negligible levels. Table 3 compares the impacts of the alternatives, A – *No Action*, and B – *Preferred Alternative*.

Table 3. Comparison of Environmental Consequences

Activity	No Action - Alternative A	Preferred Alternative - Alternative B
Geology and Soils	<p>Localized short- and long-term moderate adverse impacts</p> <p>Localized long-term beneficial effects</p> <p>Cumulative effects would be short-term moderate adverse, long-term negligible to moderate adverse, and long-term beneficial.</p> <p>Alternative would contribute slightly to overall adverse cumulative impacts. It would also add a beneficial increment to cumulative impacts.</p> <p>There would be no impairment of geology and soils</p>	<p>Localized short-term moderate adverse impacts</p> <p>Localized long-term beneficial effects</p> <p>Cumulative effects would be short-term moderate adverse, long-term negligible to moderate adverse, and long-term beneficial.</p> <p>Alternative would contribute minimally to overall adverse cumulative impacts. It would also add a beneficial increment to cumulative impacts.</p> <p>There would be no impairment of geology and soils</p>
Water Resources	<p>Localized short-term minor to moderate adverse impacts</p> <p>Localized long-term beneficial effects</p> <p>Cumulative effects would be short-term minor to moderate adverse, long-term negligible to moderate adverse, and long-term beneficial.</p> <p>Alternative would contribute slightly to overall adverse cumulative impacts. It would also add a beneficial increment to cumulative impacts.</p> <p>There would be no impairment of water resources</p>	<p>Localized short-term minor adverse impacts</p> <p>Localized long-term beneficial effects</p> <p>Cumulative impacts would be short-term minor to moderate adverse, long-term negligible to moderate adverse, and long-term beneficial.</p> <p>Alternative would contribute minimally to overall adverse cumulative impacts. It would also add a beneficial increment to cumulative impacts.</p> <p>There would be no impairment of water resources</p>
Vegetation	<p>Localized short-term negligible to moderate adverse impacts</p> <p>Localized long-term beneficial effects</p> <p>Cumulative effects would be short- and long-term negligible to moderate adverse and long-term beneficial.</p> <p>Alternative would contribute slightly to overall adverse cumulative impacts. It would also add a beneficial increment to cumulative impacts.</p> <p>There would be no impairment of vegetation</p>	<p>Localized short-term negligible to minor adverse impacts</p> <p>Localized long-term beneficial effects</p> <p>Cumulative effects would be short- and long-term negligible to moderate adverse and long-term beneficial.</p> <p>Alternative would contribute minimally to overall adverse cumulative impacts. It would also add a beneficial increment to cumulative impacts.</p> <p>There would be no impairment of vegetation</p>

Activity	No Action - Alternative A	Preferred Alternative - Alternative B
Wetlands	<p>Localized short-term negligible to moderate and long-term moderate adverse impacts</p> <p>Localized long-term beneficial effects</p> <p>Cumulative effects would be short-term minor to moderate adverse, long-term negligible to moderate adverse and long-term beneficial.</p> <p>Alternative would contribute slightly to overall adverse cumulative impacts. It would also add a beneficial increment to cumulative impacts.</p> <p>There would be no impairment of wetlands</p>	<p>Localized short-term negligible to minor adverse impacts</p> <p>Localized long-term beneficial effects</p> <p>Cumulative effects would be short- and long-term negligible to moderate adverse and long-term beneficial.</p> <p>Alternative would contribute minimally to overall adverse cumulative impacts. It would also add a beneficial increment to cumulative impacts.</p> <p>There would be no impairment of wetlands</p>
Wildlife and Wildlife Habitat	<p>Short-term negligible to minor adverse impacts</p> <p>Localized long-term beneficial effects</p> <p>Cumulative effects would be short- and long-term negligible to moderate adverse and long-term beneficial.</p> <p>Alternative would contribute minimally to overall adverse cumulative impacts. It would also add a beneficial increment to cumulative impacts.</p> <p>There would be no impairment of wildlife or wildlife habitat</p>	<p>Short-term negligible to minor adverse impacts</p> <p>Localized long-term beneficial effects</p> <p>Cumulative effects would be short- and long-term negligible to moderate adverse and long-term beneficial.</p> <p>Alternative would contribute minimally to overall adverse cumulative impacts. It would also add a beneficial increment to cumulative impacts.</p> <p>There would be no impairment of wildlife or wildlife habitat</p>
Special Status Species	<p>Short-term negligible to minor adverse and long-term moderate impacts</p> <p>Localized long-term beneficial effects</p> <p>Cumulative effects would be short- and long-term negligible to moderate adverse and long-term beneficial.</p> <p>Alternative would contribute slightly to overall adverse cumulative impacts. It would also add a beneficial increment to cumulative impacts.</p> <p>There would be no impairment special status species</p>	<p>Short-term negligible to minor adverse impacts</p> <p>Localized long-term beneficial effects</p> <p>Cumulative effects would be short- and long-term negligible to moderate adverse and long-term beneficial.</p> <p>Alternative would contribute minimally to overall adverse cumulative impacts. It would also add a beneficial increment to cumulative impacts.</p> <p>There would be no impairment of special status species</p>

Activity	No Action - Alternative A	Preferred Alternative - Alternative B
Visitor Use and Experience (including health and safety)	<p>Localized short-term minor to moderate adverse impacts</p> <p>Long-term beneficial effects</p> <p>Cumulative effects would be short-term negligible to moderate adverse, long-term minor to moderate adverse and long-term beneficial.</p> <p>Alternative would contribute slightly to overall adverse cumulative impacts. It would also add a beneficial increment to cumulative impacts.</p>	<p>Localized short-term minor adverse impacts</p> <p>Long-term beneficial effects</p> <p>Cumulative effects would be short-term negligible to moderate adverse, long-term minor to moderate adverse and long-term beneficial.</p> <p>Alternative would contribute negligibly to overall adverse cumulative impacts. It would also add a beneficial increment to cumulative impacts.</p>
Park Management and Operations	<p>Short- and long-term term minor adverse impacts</p> <p>Long-term beneficial effects</p> <p>Cumulative effects would be short- and long-term minor to moderate adverse and long-term beneficial.</p> <p>Alternative would contribute negligibly to overall adverse cumulative impacts. It would also add a beneficial increment to cumulative impacts.</p>	<p>Short-term minor to moderate adverse impacts</p> <p>Long-term beneficial effects</p> <p>Cumulative effects would be short- and long-term minor to moderate adverse and long-term beneficial.</p> <p>Alternative would contribute slightly to overall adverse cumulative impacts. It would also add a beneficial increment to cumulative impacts.</p>

GENERAL CONSTRUCTION SCHEDULE

Construction to plug and reclaim approximately 45 known orphaned oil and gas wells at Big South Fork NRRA would take place over one year after the construction contract award date, which is estimated to be April 2010.

CHAPTER 3: AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

This chapter describes the present condition (the affected environment) within the project area and the changes (the environmental consequences) that can be expected from implementing the no action or action alternatives.

The natural environment components that are addressed in this chapter include geology and soils, water resources (surface and groundwater), vegetation, wetlands, wildlife and wildlife habitat, and special status species. Visitor use and experience and park management and operations are also addressed. Other components of the natural environment, as well as components of the cultural and socioeconomic environments, were dismissed from detailed analysis for reasons described in “Chapter 1: Purpose and Need for Action.”

GENERAL METHODOLOGY FOR ASSESSING IMPACTS

The Environmental Consequences discussion for each impact topic addresses the potential effects for the no action and action alternative. The action alternative is compared to the no action alternative, or baseline condition of the project area, to determine resource impacts. Potential impacts are described in terms of type (beneficial or adverse); context; duration (short or long-term); and (for adverse impacts) intensity (negligible, minor, moderate, major). Definitions of these descriptors include:

Beneficial: A positive change in the condition or appearance of the resource or a change that moves the resource toward a desired condition.

Adverse: A change that declines, degrades, and/or moves the resource away from a desired condition or detracts from its appearance or condition.

Context: Context is the affected environment within which an impact would occur, such as local, park-wide, regional, global, affected interests, society as whole, or any combination of these. Context is variable and depends on the circumstances involved with each impact topic. As such, the impact analysis determines the context, not vice versa.

Duration: The duration of the impact is described as short-term or long-term.

Short-term: Impacts are temporary without lasting effects. Examples include disturbances to wildlife or visitors while accessing, plugging, and reclaiming a site.

Long-term: Impacts are continuous with potentially permanent effects. Examples include impacts on soils from leaking, unplugged wells, or the beneficial effects on vegetation that result when wells are plugged and reclaimed.

Intensity: Because definitions of impact intensity (negligible, minor, moderate, and major) vary by impact topic, intensity definitions are provided separately for each impact topic analyzed. Major impacts are considered “significant” impacts in the context of NEPA. These definitions are applied for adverse impacts only, and are not used to qualify beneficial effects.

CUMULATIVE IMPACTS

The CEQ regulations to implement 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 Part 1508.7). Cumulative impacts are considered for the no action and action alternatives and were determined by combining the impacts of the alternative being considered with impacts of other past, present, or reasonably foreseeable future projects or plans in the study area. Table 4 summarizes the projects included in the cumulative impacts analysis and describes the various resource areas that could be affected by these projects. The analysis of cumulative effects was accomplished using four steps:

1. Fully identify resources affected by any of the alternatives (the impact topics discussed in this chapter).
2. Identify an appropriate spatial boundary for each resource (generally limited to Big South Fork NRRRA and some activities outside the boundaries of the park unit).
3. Determine which actions may affect the resources identified (described in the following table).
4. Summarize the cumulative impact, which are the effects of the proposed action plus other actions affecting the resource (described at the end of each impact topic).

Table 4. Cumulative Impacts Projects or Actions

Action Item	Individual Action within Action Item	Description	Status
Exotic species management	N/A	<p>The spread of non-native plant species has historically been occurring and is a serious problem within Big South Fork NRRRA. Initially, many cultivated non-native species were planted for livestock forage. 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 and reduce wildlife habitat (NPS 2005a).</p> <p>At Big South Fork NRRRA, efforts to control exotic vegetation have involved the use of herbicides as the primary tool used to control 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 2006).</p> <p>Affected Resource Areas: The spread of exotic species has adverse effects on vegetation, wetlands, wildlife and wildlife habitat, species of</p>	Past, Present, and Future

Action Item	Individual Action within Action Item	Description	Status
		special concern, and visitor use. Management of these species has primarily beneficial effects to these resources, although some adverse impacts may be associated with visitor use and experience due to temporary closures of recreational areas while management actions are taking place.	
Implementation of the GMP at Big South Fork NRR	N/A	<p>The GMP for Big South Fork NRR was completed in 2005, and park staff has begun implementation. 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 planning and reclamation standards discussed in chapter 2. Currently, many oil and gas access routes are being used as routes by ORVs 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 NRR.</p> <p>Affected Resource Areas: The implementation of GMP management prescriptions would have beneficial effects for all impact topics, including visitor use and experience. There may be some adverse effects on staff associated with implementation of these prescriptions such as staff rescheduling and more time commitment. This could result in impacts to park management and operation.</p>	Present and Future
Visitor Activities Within/Adjacent to the Big South Fork NRR	N/A	<p>Visitor activities such as horse riding, biking, hunting, recreational rock climbing, swimming, kayaking, and ORV use all occur within Big South Fork NRR. These activities, as well as the use of motor boats, also occur outside of 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 of the park unit, stocking is used to support fisheries.</p> <p>Affected Resource Areas: May affect resources such as soil, water resources, vegetation, wetlands, wildlife, and species of special concern. Impacts arise from trampling/compaction, refuse disposal, and disturbances to native wildlife.</p>	Past, Present, and Future

Action Item	Individual Action within Action Item	Description	Status
Facility Development and Maintenance	Development and Facility Maintenance Inside Big South Fork NRRRA	<p>The NPS has developed numerous features related to park-wide administrative, managerial, and support functions, as well as visitor use. This includes campgrounds, a lodge, day use areas, a horse stable, visitor centers/contact stations, river access areas, and administration buildings. There are also over 300 miles of trails, approximately 180 miles of unimproved dirt roads, 95 miles of gravel roads, and 20 miles of paved roads.</p> <p>Affected Resource Areas: Development and maintenance inside the park unit generally has effects on resources such as soil, water resources, vegetation, wildlife, and species of special concern. Impacts arise from trampling/compaction, vegetation clearing, and disturbances to native wildlife. These developments do have beneficial effects on visitor use and experience, although temporary adverse effects could occur during maintenance activities.</p>	Past, Present, and Future
	Development Outside Big South Fork NRRRA	<p>Relatively low-density residential development occurs in the immediate vicinity of the park unit, including Big South Fork Airpark, Spruce Creek, Beacon Hill and White Oak Estates.. The developments include 1- to 3-acre home sites, some of which have been sold. and have horse trails that connect with Big South Fork NRRRA . Industrial activities that could contribute to cumulative impacts include power plants, hardwood flooring, sawmills, railroads, and other manufacturing facilities.</p> <p>Affected Resource Areas: Development outside the park has similar impacts as described for development inside the park, and can also affect wetlands, as well as visitor use and experience (by creating disturbances to natural soundscapes). Among other things, industrial sites can result in discharges to surface waters, as well as non-point source pollution from runoff.</p>	Past, Present, and Future
Oil and Gas Operations	Oil and Gas Development Inside the Park Unit	<p>Currently, there are more than 300 oil and gas wells within the Big South Fork NRRRA. No new wells have been drilled in the Big South Fork NRRRA since about 1990. Active oil and gas production at Big South Fork NRRRA 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 in the New River drainage, within</p>	Past, Present, and Future

Action Item	Individual Action within Action Item	Description	Status
		<p>one of the largest oil and gas fields in Tennessee.</p> <p>Affected Resource Areas: Oil and gas development has adverse effects on resources such as soil, water resources, vegetation, wetlands, wildlife, and special status species. Impacts arise from trampling/compaction, vegetation clearing, and disturbances to native wildlife. Such developments can also affect visitor use and experience at the park by creating disturbances to natural soundscapes. Among other things, these sites can result in discharges to surface waters, as well as non-point source pollution from runoff. Deteriorating casing that leads to leaking can contaminate groundwater and surface water.</p>	
	Mineral Development Outside the Park Unit	<p>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 (E. Spradlin, NPS, pers. comm., 2007), and approximately 50% of Tennessee's total oil production and 99% of its gas production came from the watershed counties that encompass the park unit (NPS 2005a). In addition to traditional oil and gas development, coal bed methane/shale gas drilling is an ongoing feature in the vicinity of the park unit. There are also 4 pending permits in the watershed, including strip and deep mines, located between 20 and 30 river miles upstream from the legislative boundary for BISO.</p> <p>Affected Resource Areas: Same as listed above for oil and gas development inside Big South Fork NRRA.</p>	Past, Present, and Future
	Oil and Gas Management Plan	<p>The NPS is preparing an oil and gas management plan for Big South Fork NRRA 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.</p> <p>Affected Resource Areas: This plan would have beneficial effects on all resource areas, including park management and operations, by ensuring new and existing operations are conducted in a manner that protects resources; facilitates future plugging and reclamation activities; and provides a</p>	Future

Action Item	Individual Action within Action Item	Description	Status
		comprehensive plan that provides for more efficient park management and operations.	
	NPS Plugging and Reclamation Activities	<p>The NPS recently completed an EA to plug and reclaim 11 orphaned wells at Big South Fork NRRA through a cooperative agreement with the TDEC, Division of Water Pollution Control.</p> <p>Affected Resource Areas: These activities would have beneficial effects on most resource areas, including visitor use and experience, by plugging and reclaiming orphaned wells that have the potential for resource and health and safety impacts.</p>	Present, Future
Mining	Acid Mine Drainage	<p>The majority of historic and current coal mining in Tennessee has occurred and still occurs within the Big South Fork watershed, especially in the New River drainage. Big South Fork NRRA waters are generally considered good quality; however, acid mine drainage impacts are notable in Bear Creek, Roaring Paunch Creek, New River, and several others. Acid mine drainage occurs from sulfuric acid and ferric hydroxide runoff at active and abandoned coal mining sites. Acid mine drainage results in increased acidity, increased heavy metals, and a sterile coating of ferric hydroxide on stream substrate (NPS 1997).</p> <p>Affected Resource Areas: Mining has adverse effects on resources such as soil, water resources, vegetation, wetlands, wildlife, and species of special concern. Impacts arise from trampling/compaction, vegetation clearing, and disturbances to native wildlife; discharges to surface waters; and non-point source pollution from runoff.</p>	Past, Present, and Future
	Abandoned Mines/ Reclamation	<p>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 ten abandoned surface coal mine sites in McCreary County, Kentucky (NPS, 2005a). There are an estimated 100 abandoned deep coal mine openings and associated spoil piles within Big South Fork.</p> <p>Mine reclamation efforts, funded by the Office of Surface Mining, have concentrated on areas having visitor access. A special reclamation effort is being made for the Bear Creek watershed in Tennessee by numerous agencies, communities, organizations, and landowners, under the leadership of the Natural Resource Conservation</p>	Past, Present, and Future

Action Item	Individual Action within Action Item	Description	Status
		Service. The Big South Fork NRRRA has also undertaken remediation studies of selected sites where contaminated mine drainage is of concern. Affected Resource Areas: Same as above for acid mine drainage, however, reclamation activities would have beneficial effects as well.	
Development and Implementation of Water Quality Standards under Section 303(d) of the CWA	N/A	In the 303(d) lists for Kentucky and for Tennessee for the year 2008, there are a total of 4 impaired streams that fall within the Big South Fork NRRRA. A total maximum daily load limit (TMDL) 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, (3) and recommends regulatory or other actions that may need to be taken in order for the stream to no longer be polluted. Currently, there are approved TMDLs for two of the four impaired waters in Big South Fork NRRRA (Pine Creek and Rock Creek) (TDEC 2008); a TMDL is still needed for the other two impaired waters, but their schedule is unknown. Affected Resource Areas: Beneficial effects for water resources, including the aquatic species that occur in these habitats, and visitor experience, from cleaner waters.	Past, Present, and Future

IMPAIRMENT

The NPS 2006 Management Policies (NPS 2006c) requires an analysis of potential effects to determine whether actions would impact or impair park resources. The fundamental purpose of the national park system, as established by the Organic Act and reaffirmed by the General Authorities Act, as amended, begins with a mandate to conserve park resources and values. These laws give the NPS the management discretion to allow impacts on park resources and values (when necessary and appropriate) to fulfill the purposes of a park, as long as the impact does not constitute impairment of the affected resources and values. NPS managers must always seek ways to avoid or minimize, to the greatest degree practicable, adversely impacting park resources and values.

The impairment prohibited by the Organic Act and the General Authorities Act is an impact, in the professional judgment of the responsible NPS manager, that harms the integrity of park resources or values, including the opportunities that otherwise would be present for the enjoyment of those resources or values. Whether an impact meets this definition depends on 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.

An impact on any park resource or value may constitute impairment, but an impact would be more likely to constitute impairment to the extent that it has a major or severe adverse effect upon 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 a goal in the park's GMP or other relevant NPS planning documents.

Impairment may result from NPS activities in managing the park, visitor activities, or activities undertaken by contractors and others operating in the park. An impairment determination is included for all impact topics related to park resources. Impairment determinations are not made for visitor use and experience because, according to the Organic Act, enjoyment cannot be impaired in the same way that park resources and values can be impaired.

In analyzing impairment in conjunction with the NEPA analysis for this project, the NPS takes into account the fact that if impairment were likely to occur, by operation of the CEQ's regulations at 40 CFR, such impacts would be considered to be major or significant. This is because the context and intensity of the impact would be sufficient to render what would normally be a minor or moderate impact to be major or significant. Taking this into consideration, NPS guidance notes that "Not all major or significant impacts under a NEPA analysis are impairments. However, all impairments to NPS resources and values would constitute a major or significant impact under NEPA. If an impact results in impairment, the action should be modified to lessen the impact level. If the impairment cannot be avoided by modifying the proposed action, that action cannot be selected for implementation" (NPS 2003b).

GEOLOGY AND SOILS

Affected Environment

Big South Fork NRRA is located on the Cumberland Plateau. The following description of general geologic features in the region is taken from Smith (2000) unless otherwise noted.

Geology. 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 from the rock face.

The geologic units found at Big South Fork NRRA are summarized in Table 5 and shown on Figure 3.

Table 5. Geologic Units of Big South Fork National River and Recreation Area

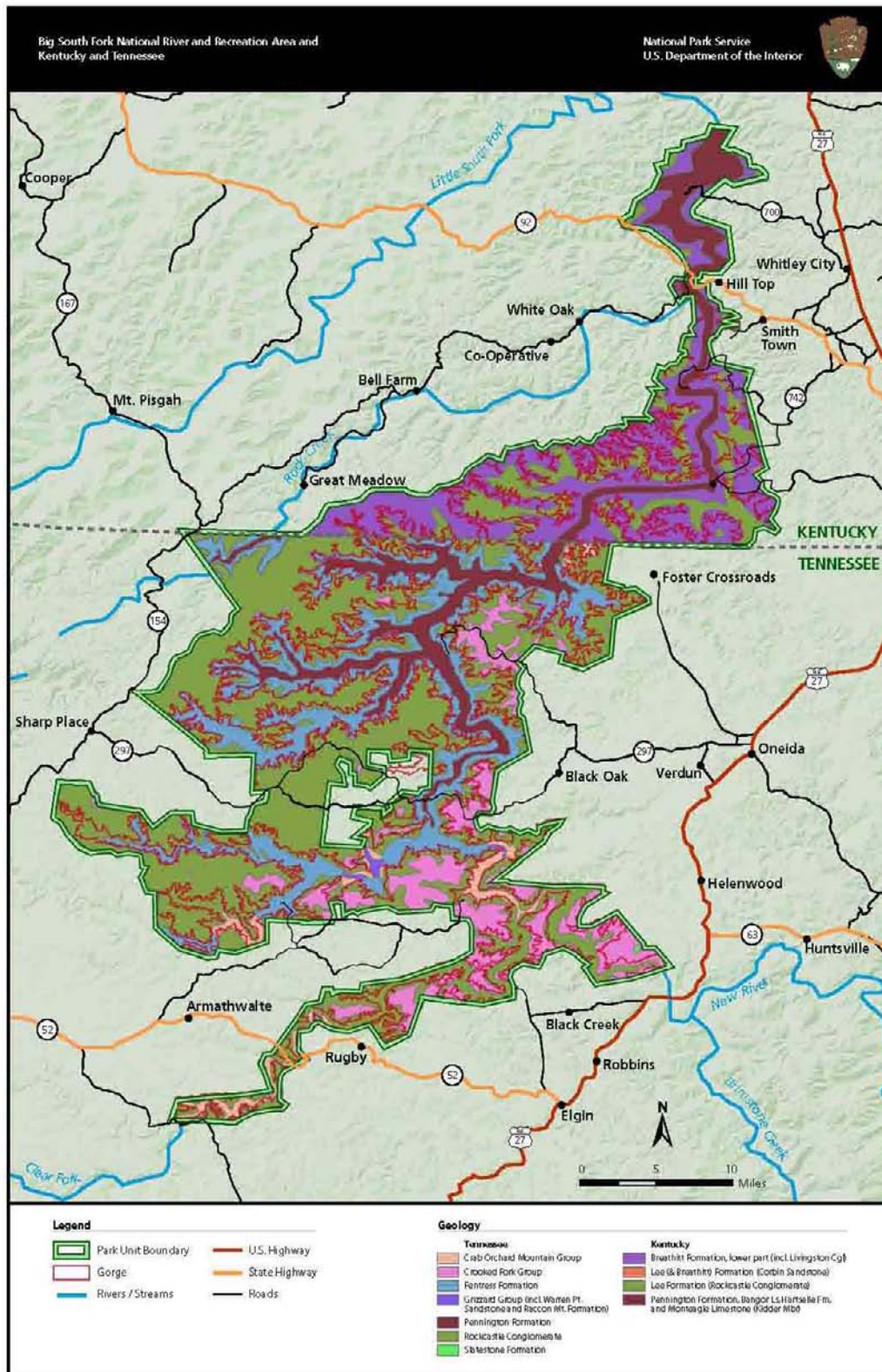
Name	Age	Rock Types
Tennessee		
Crab Orchard Mountain Group	Pennsylvanian	Conglomerate sandstone with thin zone of quartz and shale-pebble conglomerate at base; maximum preserved thickness 35 feet
Crooked Fork Group	Pennsylvanian	Shale, sandstone, siltstone, and thin coal beds; thickness 200 to 450 feet
Fentress Formation	Pennsylvanian	Shale with minor siltstone and sandstone; also coal; thickness as much as 340 feet
Gizzard Group	Pennsylvanian	Sandstone, conglomeratic sandstone, siltstone, shale, and minor coal; thickness 100 to 200 feet
Rockcastle Conglomerate	Pennsylvanian	Conglomeratic sandstone and sandstone, thin coal-bearing shale locally present; thickness 150 to 220 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 (& Brathitt) 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

Many prominent rock formations including arches, chimneys, promontories, caves, ledges, and overhangs are frequently encountered within Big South Fork NRRRA (NPS 2005a). Several of the known wells to be plugged and reclaimed are located anywhere between 75 and 500 feet from such features, including the Diocese Arch, Dead Deer Arch, as well as other arches, rocks shelters, and cliffs.

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 inter-stream divides. Soil characteristics for Big South Fork NRRRA are described in detail in the following paragraphs.

Big South Fork NRRRA 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 NRRRA categorized soils into 19 map units (see Figure 4). 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 6.



**Big South Fork National River and Recreation Area
Kentucky and Tennessee**

**National Park Service
U.S. Department of the Interior**

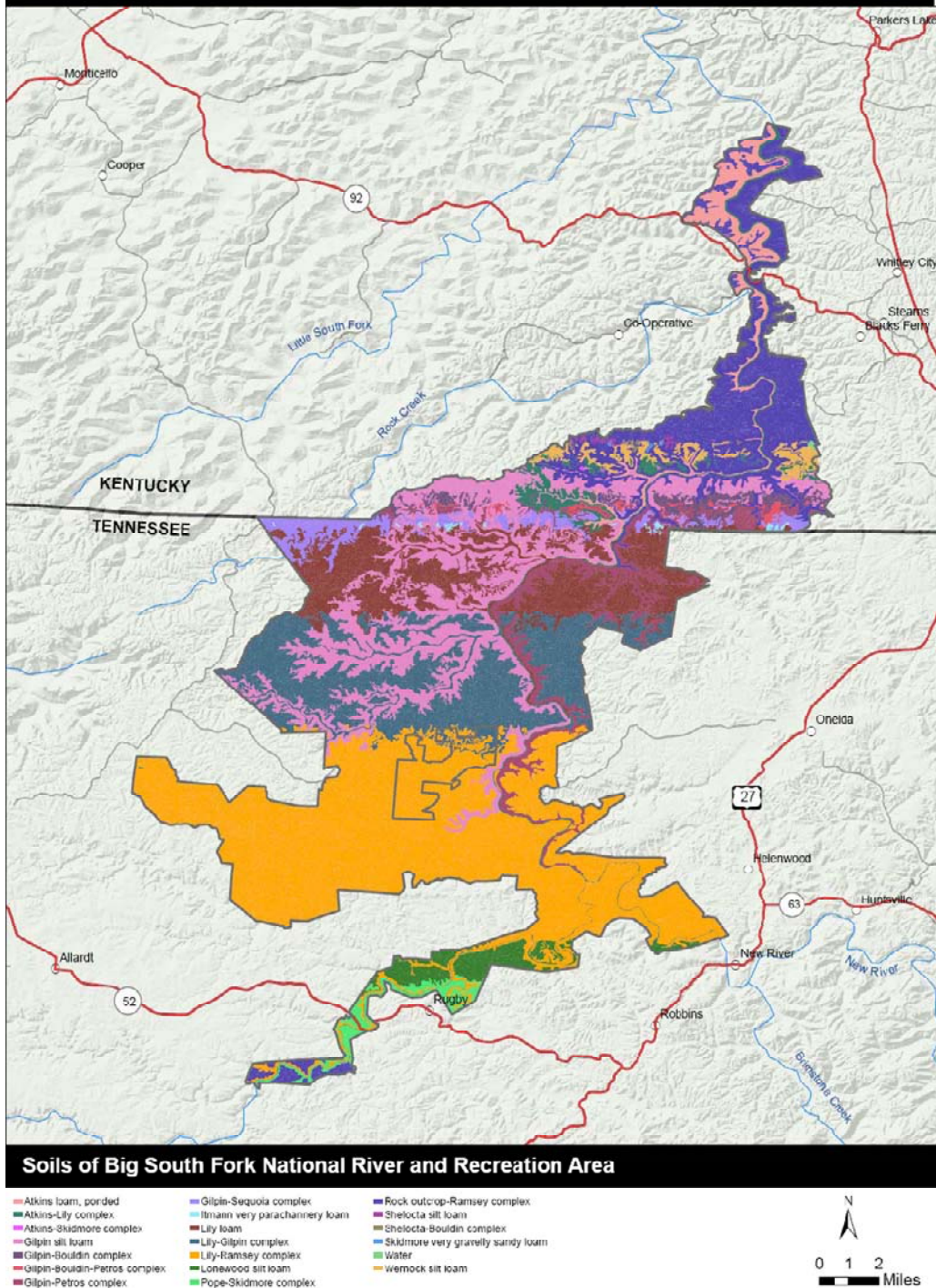


Figure 4. Soils of Big South Fork National River and Recreation Area

Table 6. 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 NRCS and are provided where available for specific soils contained in the map unit.

For purposes of describing the hydrologic characteristics of the soil and evaluating the potential impacts of plugging and reclamation operations, soil associations within the recreation area were 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 NRCS. The four hydrologic soil groups are A, B, C, and D, where soils in group A generally have the least runoff potential, while those in group D have the greatest runoff potential. Table 7 describes common characteristics of these hydrologic groups.

Table 7. Common Characteristics of Hydrologic Soil Groups

Hydrologic Soil Group	A Soils	B Soils	C Soils	D Soils
Composition	Thick, well-drained to excessively drained, moderately coarse textures (sands, loamy sands, and sandy loams)	Moderately thick, well-drained 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

Environmental Consequences

Area of Analysis. The area of analysis for direct and indirect impacts to geology and soils is limited to the immediate vicinity of the well sites and access roads. Because park-wide actions, as well as actions outside the park, have the potential to contribute cumulative effects, an expanded area of analysis was used for the cumulative impacts analysis to include the Big South Fork of Cumberland watershed.

Methodology and Assumptions. Impacts to geology and soils were assessed by considering the types of impacts associated with plugging and reclamation of oil and gas wells, both during the operations and once operations are completed. For known sites that would be plugged and reclaimed, locations of the well pads and access roads were mapped relative to soil types and geologic features (e.g., sandstone arches, chimneys, rock shelters, as well as cliff edges) maintained as part of the Big South Fork NRRA geographic information system (GIS) database. Assessment of impacts was subsequently based on best professional judgment and was developed through discussions with NPS staff and consultants.

In addition, the NPS developed the following definitions for intensity thresholds for impacts to geology and soils:

- **Negligible:** Impacts would result in a change to soils and geologic 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 naturally occurring conditions.
- **Minor:** Impacts would result in a change to soils and geologic resources, including changes to erosion rates, soil productivity, and soil stability, which would be detectable. The volume of 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 soils and geologic resources, including changes to erosion rates, soil productivity, and soil stability, which would be readily detectable. The volume of disturbance would be expected to be small and localized. Local geomorphologic features would not 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 soils and geologic resources that would result in the loss of local geomorphologic features, or would have substantial consequences on a regional scale. The volume of 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 their success would not be guaranteed.

No Action – Alternative A. Under alternative A, the NPS would plug at least 45 known orphaned oil and gas wells (see Figure 2 in chapter 1) and reclaim associated sites and access roads in Big South Fork NRRRA when NPS or state funding becomes available.

Under this alternative, clearing vegetation from oil and gas access roads and well pads would temporarily increase localized erosion potential. Soils in hydrologic soil groups C and D are highly erodible, and when combined with runoff potential and slope, could have high rates of erosion if proper management practices are not applied. The use of heavy equipment to access, plug, and reclaim the sites would also result in temporary, localized soil compaction of approximately 1.0 acre of soil in the hydrologic soil group C or D, which are highly prone to compaction. In addition, there is the temporary potential for release of liquid hydrocarbons and/or contaminating or hazardous substances from vehicles, wellhead equipment, or flowlines during well plugging and reclamation activities. These activities could locally alter the chemical and physical properties of soils, as well as soil productivity and stability, and would be even more pronounced if they occurred in areas of poorly drained soils that support riparian or wetland vegetation. Prominent rock formations including arches, chimneys, promontories, caves, ledges, and overhangs located near known wells to be plugged and reclaimed would be avoided as the disturbance would be localized and inconsequential. The adverse impacts to geologic layers and surficial and shallow geology would be localized and indiscernible.

Mitigation would be applied during plugging and reclamation operations to minimize any potential long-term impacts to soils and geology, including 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 soil contamination. The NPS would avoid any unique geologic features during ground disturbing activities to ensure that they are not destabilized. Therefore, plugging and reclamation activities would have localized short-term moderate adverse impacts on geology and soils.

As described above, plugging would be done on a well by well basis or by small groupings of wells as funding becomes available over a period of years. Work would occur over an extended period of time. Downhole conditions of the wells would continue to deteriorate creating the risk of an underground rupture causing long-term moderate adverse impacts to geology and soils in the area surrounding the rupture.

During plugging operations the park staff intends to 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 well pads and access roads, including replacing natural soils and planting of native vegetation, would help stabilize soils and reduce erosion. Closing access routes to unauthorized users would also minimize soil erosion and compaction, as well as access to sensitive geologic features. As a result, there would be long-term beneficial effects on geology and soils once reclamation is complete.

Cumulative Impacts. Several cumulative actions described in the “Cumulative Impacts” section of this chapter would contribute both adverse and beneficial cumulative impacts on geology and soils. Oil and gas development, within and outside Big South Fork NRRA, including new operations, would have adverse short- and long-term moderate impacts on soils and geology from vegetation clearing, trampling, compaction, and erosion of soils. Potential contamination of soils from leaking wells would also contribute 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. Acid mine drainage and abandoned mine impacts include contamination of soils from sulfuric acid and ferric hydroxide runoff at active and abandoned coal mining sites, and trampling and compaction of soils at active mine sites. Residential development and industrial activity outside the park unit would also contribute to soil disturbance and potential for contamination.

Other cumulative actions contributing to impacts on soils and geology include visitor activities, such as hiking, biking, recreational rock climbing, and ORV use. Development and routine maintenance of facilities within the park would also disturb soils locally. These activities would have long-term localized negligible adverse cumulative impacts on geology and soils through compaction and soil erosion.

Some plans and projects within the park would also have long-term beneficial effects on soils, including implementation of the GMP at Big South Fork NRRA. This plan outlines desired resource conditions and several measures to protect geology and soils in the park, including the implementation of official roads and trails system and road and trail standards, which would help reduce erosion and compaction of soils. This plan also called for development of an oil and gas management plan, which is currently being developed and which outlines specific operating standards

to protect park resources, including geology and soils. Reclamation of abandoned mines would also have beneficial long-term effects on soils and geology as would the plugging and reclamation of other wells, including 11 orphaned wells that are known to occur in the park.

Overall, when impacts of these actions are combined with the short- and long-term moderate adverse and long-term beneficial effects of alternative A, there would be short-term moderate adverse, long-term negligible to moderate adverse and long-term beneficial cumulative impacts on geology and soils.

Conclusion. Plugging and reclamation activities under alternative A would result in localized short- and long-term moderate adverse impacts on soils and geology resources during implementation. However, there would also be long-term beneficial effects on soils and geology resources under alternative A. Overall, the short- and long-term moderate adverse impacts and long-term beneficial effects of alternative A, when combined with other past, present, and reasonably foreseeable future actions, would have short-term moderate adverse and long-term negligible to moderate adverse and long-term beneficial cumulative impacts on geology and soils. When compared to the broader area of analysis, alternative A would directly impact and ultimately reclaim a relatively small amount of acreage. As a result, the long-term beneficial effects of alternative A would move the resource toward the desired condition, and the adverse impacts of the alternative A would contribute slightly to the overall adverse cumulative impacts of these past, present, and reasonably foreseeable actions.

Preferred Alternative - Alternative B. Under this alternative, the NPS would plug at least 45 known orphaned oil and gas wells (see Figure 2 in chapter 1) and reclaim associated sites and access roads in Big South Fork NRR as described for alternative A. The majority of these wells would be plugged and reclaimed using funding received under ARRA.

The same actions identified as contributing effects to geology and soils under alternative A would apply to alternative B. However, the risk of equipment and well failure is much less due to the shorter time period before implementation. Alternative B would contribute short-term moderate adverse effects during plugging and reclamation activities. Long-term beneficial impacts described for alternative A would also occur under alternative B. These benefits are more likely to be realized, and would be realized sooner under alternative B because at this time funding is available from ARRA to plug and reclaim the majority of these wells.

Cumulative Impacts. The same actions identified as contributing cumulative effects under alternative A would apply to alternative B. The short-term moderate adverse effects during plugging and reclamation activities and the long-term beneficial effects once reclamation is complete described for alternative A would also occur under alternative B. Overall, the short-term moderate adverse and long-term beneficial impacts of alternative B, when combined with the impacts of past, current, and reasonably foreseeable projects, would have short-term moderate adverse, long-term negligible to moderate adverse, and long-term beneficial cumulative impacts.

Conclusion. Plugging and reclamation activities under alternative B would result in localized short-term moderate adverse impacts on soils and geology resources during implementation. However, there would also be long-term beneficial effects on soils and geology resources under alternative B by removing the risks associated with unplugged wells. The long-term benefits are more likely to be

realized and would be realized sooner under alternative B because funding is available now from ARRA to plug and reclaim the majority of these wells. Overall, the short-term moderate adverse and long-term beneficial effects of alternative B, when combined with other past, present, and reasonably foreseeable future actions, would have short-term moderate adverse, long-term negligible to moderate adverse, and long-term beneficial cumulative impacts on geology and soils. When compared to the broader area of analysis, alternative B would directly impact and ultimately reclaim a relatively small amount of acreage. As a result, the long-term beneficial effects of alternative B would move the resource toward the desired condition, and the adverse impacts of alternative B would contribute minimally to the overall adverse cumulative impacts of other past, present, and reasonably foreseeable future actions.

WATER RESOURCES

Affected Environment

One of the primary reasons the Big South Fork NRRRA 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 NRRRA. 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 NRRRA Water Resources Management Plan (NPS 1997).

Surface Water. The Big South Fork River (also known as the South Fork Cumberland) originates at the confluence of the Clear Fork River and New River in the southern portion of the Big South Fork NRRRA. Other major tributaries include North White Oak Creek, Pine Creek, Bear Creek, Station Camp Creek, Williams Creek, Roaring Paunch Creek, and Rock Creek.

The Big South Fork River flows northward through the Big South Fork NRRRA for approximately 49 miles and joins the Cumberland River 28 miles north of the Big South Fork NRRRA's northern boundary at Burnside, Kentucky (NPS 1997) (Figures 5, 6, and 7). 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 NRRRA boundaries show evidence of substantial water level changes along the banks due to the influence of Lake Cumberland.

Seeps and springs, occurring where the groundwater table intersects the land surface, are common in the Big South Fork NRRRA, 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).

Some of the well sites and associated access routes are located near surface waters including Big South Fork River, No Business Creek, Longfield Branch, Anderson Cave Branch, and several unnamed streams. Several of the well sites are near the confluence of Oil Well Branch and Big South Fork River.

The states of Kentucky and Tennessee have each declared their portions of the Big South Fork River 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 NRRRA GMP (NPS 2005a) 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 NRRRA] for primary contact recreation and fish and aquatic life. Kentucky classifies all [Big South Fork NRRRA] streams for primary contact recreation and for either warmwater or coldwater aquatic habitat. A number of streams in the [Big South Fork NRRRA] 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 NRRRA:

[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 [Rikard et al. 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). 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 (p.158-159).

A unique feature of surface waters in the Big South Fork NRRRA is their low ionic strength. Insofar as conductivity may be taken as an indicator of ionic strength, clean streams in the Big South Fork NRRRA would have a conductivity of 60 umhos/cm or less in watersheds with limestone, or 30 umhos/cm or less in watersheds without limestone. When conductivity exceeds 60 umhos/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.

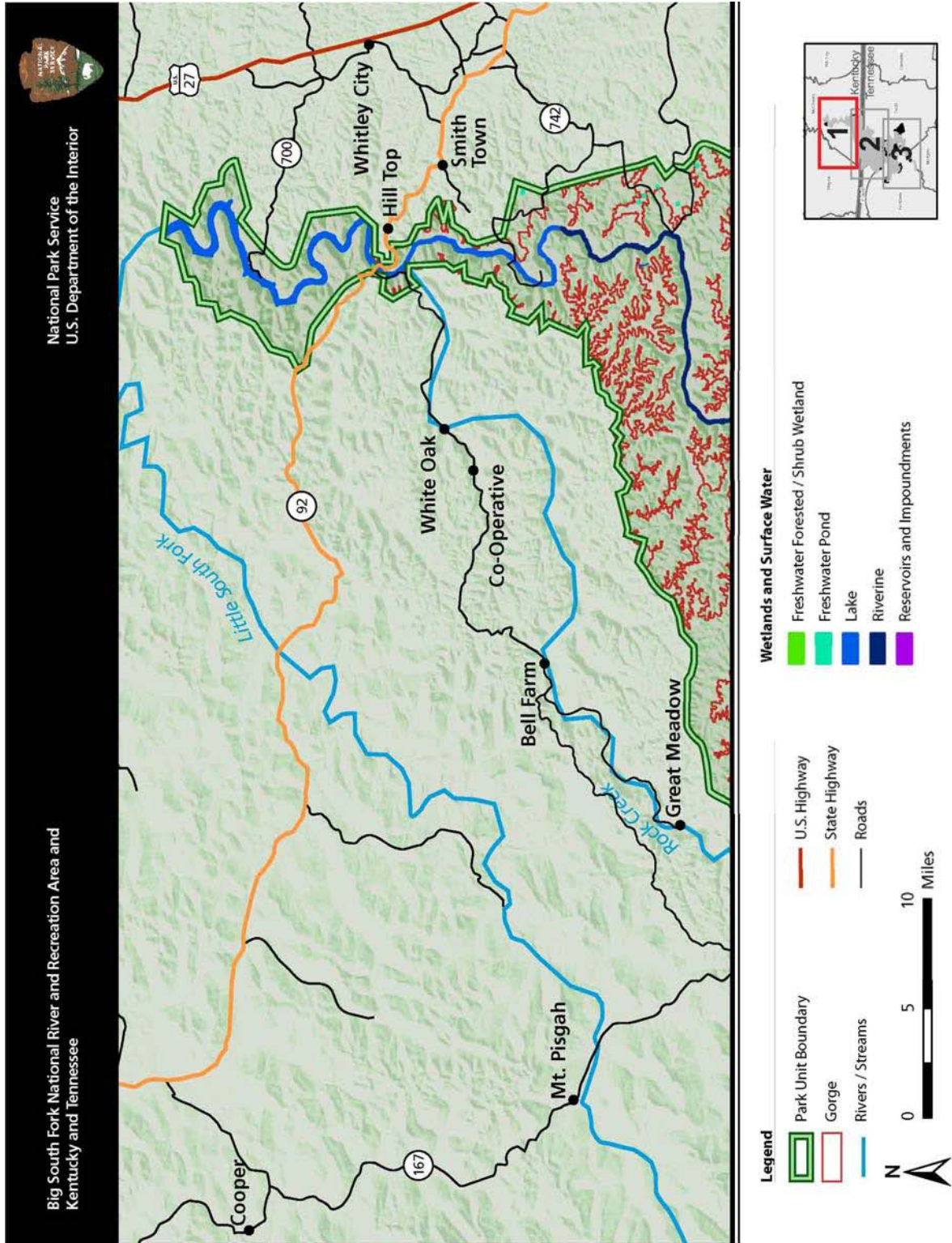


Figure 5. Wetlands and Surface Water of Big South Fork National River and Recreation Area (Map 1)

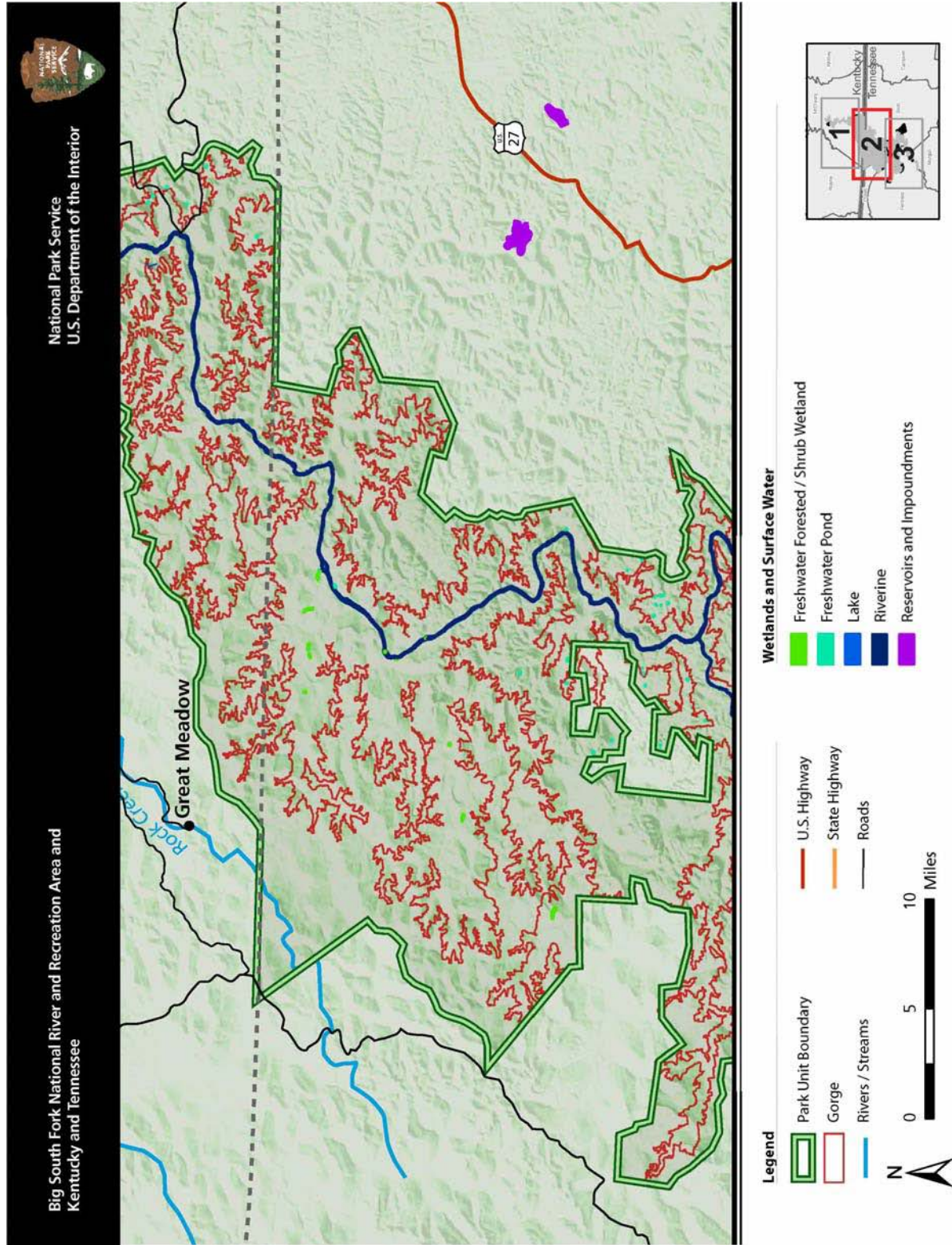


Figure 6. Wetlands and Surface Water of Big South Fork National River and Recreation Area (Map 2)

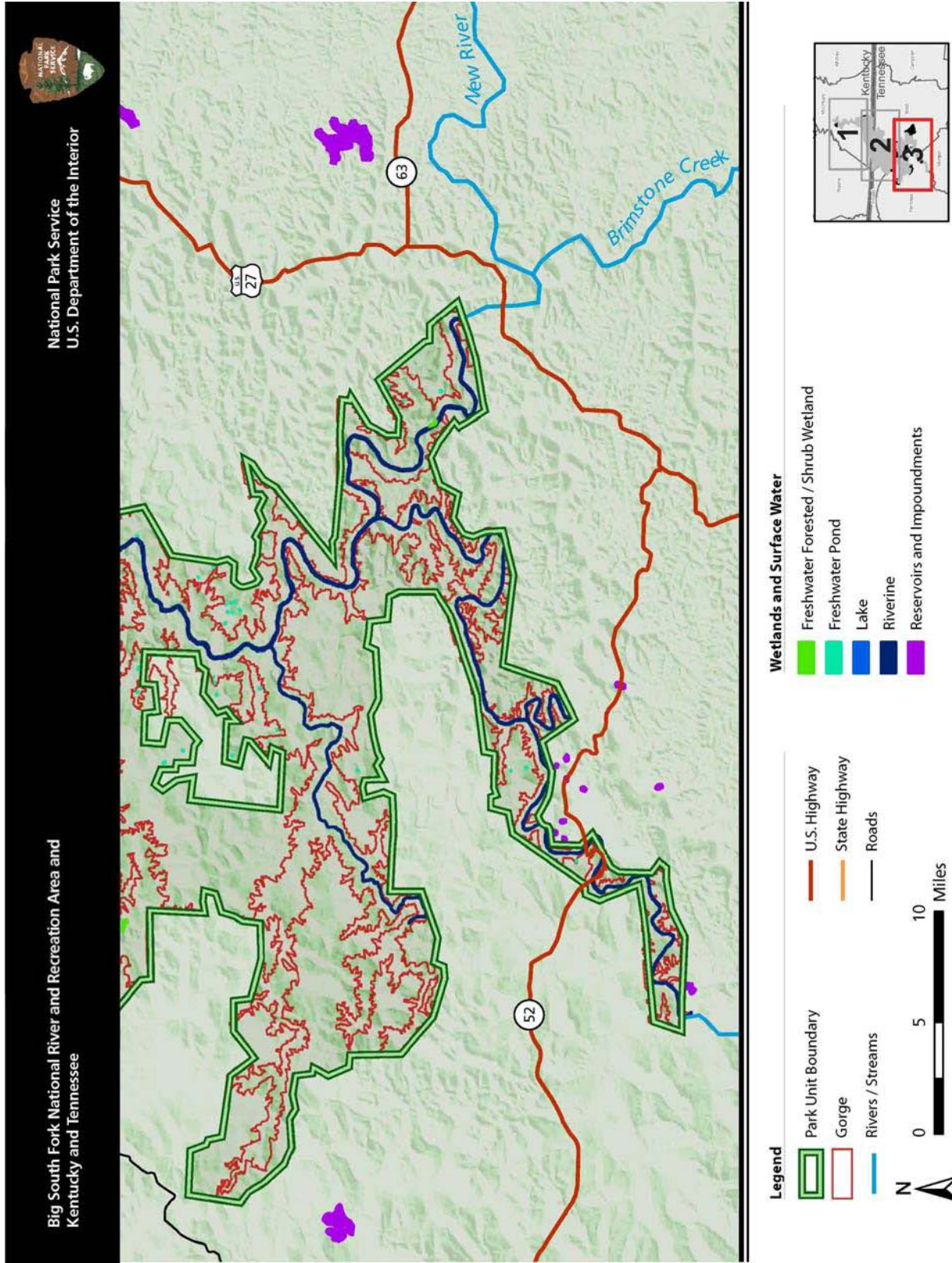


Figure 7. Wetlands and Surface Water of Big South Fork National River and Recreation Area (Map 3)

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. A total of four streams that fall within the Big South Fork NRRRA (Table 8) were on the 2008 303(d) lists for Kentucky and Tennessee. Some of the well sites are located close to Pine Creek, which is on the 303(d) list, and an unnamed tributary to Pine Creek

Table 8. 303(d) 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 TN DEC (2008a)

Surface coal mining does not currently occur inside the Big South Fork NRRRA; however, past coal mining has affected water quality within the area through acid mine drainage. Acid mine drainage impacts are notable in Bear Creek, Roaring Paunch Creek, New River, and several others. Acid mine drainage occurs from sulfuric acid and ferric hydroxide runoff at active and abandoned coal mining sites. Acid mine drainage results in increased acidity, increased heavy metals, and a sterile coating of ferric hydroxide on stream substrate (NPS 1997). Mining also has disrupted the flow of underground aquifers. Mining wastes also contribute various elements into the flow of Big South Fork NRRRA streams that negatively impact water quality (NPS 1997).

Groundwater

The Cumberland Plateau’s major regional aquifer is the Cumberland Plateau aquifer, formerly known as the Pennsylvanian sandstone aquifer. Groundwater in this system is discharged into streams and also into springs. Recharge occurs primarily via precipitation on the outcrops of sandstones and conglomerates. 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.

There is no published data describing the water quality of the groundwater in the Big South Fork NRRRA. NPS 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” (NPS 1997). Oil, gas, brine, or chemicals associated with the oil and/or gas extraction processes can influence groundwater quality. The NPS notes that groundwater quality has potentially already been affected by contaminated mine drainage and oil and/or gas operations (NPS 1997).

Environmental Consequences

Area of Analysis. The area of analysis for water resources includes the immediate location of the 45 known well sites and access roads. Because park-wide actions, as well as actions outside the park, have the potential to contribute cumulative effects, an expanded area of analysis was used for the cumulative impacts analysis to include the Big South Fork of Cumberland watershed.

Methodology and Assumptions. Impacts to water resources were assessed by considering the types of impacts associated with plugging and reclamation of oil and gas wells, both during the operations and once they are completed. For known sites that would be plugged and reclaimed, locations of well pads and access roads were mapped relative to water resources maintained as part of Big South Fork NRRRA GIS database. These include groundwater, surface waters, and waters listed by the states of Tennessee and Kentucky as 303(d) waters. The degree of potential impacts on water resources from oil and gas development would depend on the types and locations of operations, including proximity to the main stems of the Big South Fork of the Cumberland River, and on the mitigation measures used to reduce impacts. Assessment of impacts was based on best professional judgment and was developed through discussions with NPS staff and consultants.

In addition, the NPS developed the following definitions for intensity thresholds for impacts to water resources:

- **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 stream flows would be consistent with historical or baseline conditions.
- **Minor:** 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 stream flows would be consistent with historical or baseline conditions. 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 stream flow conditions could occur. 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. Frequent alterations in the historical or baseline water quality and stream flow conditions would occur over a large area and could result in modifications to the natural stream channel and in-stream flow characteristics. Extensive mitigation measures would be needed to offset any adverse effects, and their success would not be guaranteed.

No Action – Alternative A. Under alternative A, the NPS would plug at least 45 known orphaned oil and gas wells (see Figure 2 in chapter 1) and reclaim associated sites and access roads in Big South Fork NRRA when funding becomes available.

Clearing vegetation from oil and gas access roads and well pads and the use of heavy equipment and vehicles would temporarily increase localized erosion potential causing turbidity and sedimentation. 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 flow lines during well plugging and reclamation activities. These temporary activities could cause detectable, localized changes to water quality for wells located near surface waters.

However, mitigation would be applied during plugging and reclamation operations to minimize any potential long-term impacts to water resources including 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 sub-base 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 well pads and access roads would reduce erosion rates to pre-disturbance 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 the park staff intends to 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. Therefore, plugging and reclamation activities would have localized short-term minor adverse impacts on water resources.

The extended time period for the no action alternative would allow wellhead and downhole conditions to deteriorate. There are currently a number of known well sites that could potentially adversely affect surface water as a result of leaking fluids, past or present spills, and poor condition of existing structures at orphaned well sites. A rupture in the well casing downhole would present a risk of contaminating groundwater causing long-term moderate adverse impacts around the wellhead and, potentially, an entire aquifer.

However, reclaiming the well pads and access roads would be a beneficial impact on water resources once recontouring and planting and establishment of native vegetation in disturbed areas is complete by reducing soil erosion and reestablishing surface drainage flows. As a result, there would be long-term beneficial effects on water resources once reclamation is complete.

Cumulative Impacts. Several cumulative actions described in the “Cumulative Impacts” section of this chapter would contribute both adverse and beneficial cumulative impacts on water resources. Oil and gas development within and outside Big South Fork NRRA, including new operations, would have short- and long-term minor to moderate adverse impact on water resources from vegetation clearing, ORV use, and the construction and maintenance of access roads, well pads, and flow lines.

These activities increase erosion of soils, causing increased turbidity and sedimentation and degrading water quality in surface waters. In addition, potential contamination of surface and ground water 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 NRRRA, and 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. 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.

Other cumulative actions that would contribute to impacts on water resources include visitor activities, such as hiking, biking, recreational rock climbing, ORV use, and refuse disposal. Ground disturbances during development and routine maintenance of facilities would increase soil erosion potential. These activities would have long-term localized negligible adverse cumulative impacts on water resources through increased turbidity and sedimentation and potential contamination of surface waters from improper refuse disposal.

Some plans and projects within the park would also have long-term beneficial effects on water resources, including implementation of the GMP at Big South Fork NRRRA. This plan outlines desired resource conditions and visitor experience 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 runoff potential and increased turbidity and sedimentation by reducing the erosion and compaction of soils. An oil and gas management plan is also being developed and outlines specific objectives and operating standards to protect park resources, including water resources. Reclamation of abandoned mines would also have beneficial long-term effects on water resources as would the plugging and reclamation of other wells, including 11 orphaned wells that are known to occur in the park. In addition, Kentucky and Tennessee are developing TMDLs for impaired waters in the Big South Fork NRRRA. The implementation of these TMDLs would have beneficial effects on water resources by reducing pollutants entering streams.

Overall, when impacts of these actions are combined with the localized short-term minor adverse, long-term moderate adverse, and the long-term beneficial impacts of alternative A, there would be short-term minor to moderate adverse, long-term negligible to moderate adverse, and long-term beneficial cumulative impacts on water resources.

Conclusion. Plugging and reclamation activities under alternative A would result in localized short-term minor adverse and long-term moderate adverse impacts on water resources. However, there would be long-term beneficial effects under alternative A by eventually removing the risks associated with unplugged wells and moving the resource toward the desired condition. Overall, the short-term minor adverse impacts, long-term moderate adverse, and long-term beneficial effects of alternative A, when combined with other past, present, and reasonably foreseeable future actions, would have short-term minor to moderate adverse, long-term negligible to moderate, and long-term beneficial cumulative impacts on water resources. When compared to the broader area of analysis, the long-term beneficial effects of alternative A would move the resource toward the desired condition, and the

adverse impacts under alternative A would contribute slightly to the overall adverse cumulative impacts of all the other past, present, and reasonably foreseeable future actions.

Preferred Alternative - Alternative B. Under this alternative, the NPS would plug at least 45 known orphaned oil and gas wells (see Figure 2 in chapter 1) and reclaim associated sites and access roads in Big South Fork NRRRA as described for alternative A. The majority of these wells would be plugged and reclaimed using funding received under ARRA.

Most of the same actions identified as contributing effects under alternative A would apply to alternative B. However, the risk of a potential spill from the deterioration of the wellhead would be much less due to the shorter timeframe for the preferred alternative. Alternative B would contribute short-term minor adverse effects during plugging and reclamation. Long-term beneficial impacts described for alternative A would also occur under alternative B. These benefits are more likely to be realized, and would be realized sooner under alternative B because at this time funding is available from ARRA to plug and reclaim the majority of these wells.

Cumulative Impacts. The same actions identified as contributing cumulative effects under alternative A would apply to alternative B. The short-term minor adverse effects during plugging and reclamation activities and long-term beneficial effects once reclamation is complete described for alternative A would also occur under alternative B. Overall, the short-term minor adverse and long-term beneficial impacts under alternative B, when combined with the adverse and beneficial effects of the cumulative actions, would result in short-term minor to moderate adverse, long-term negligible to moderate adverse, and long-term beneficial impacts.

Conclusion. Plugging and reclamation activities under alternative B would result in localized short-term minor adverse impacts on water resources during implementation. However, there would be long-term beneficial effects under alternative B by removing the risks associated with unplugged wells and moving the resource toward the desired condition. The long-term benefits are more likely to be realized and would be realized sooner under alternative B because funding is available now from ARRA to plug and reclaim the majority of these wells. Overall, the short-term minor adverse and long-term beneficial impacts under alternative B, when combined with the adverse and beneficial effects of the cumulative actions, would result in short-term minor to moderate adverse, long-term negligible to moderate adverse, and long-term beneficial impacts. When compared to the broader area of analysis, the long-term beneficial effects of alternative B would move the resource toward the desired condition, and the adverse impacts under alternative B would contribute minimally to the overall adverse cumulative impacts of all the other past, present, and reasonably foreseeable future actions.

VEGETATION AND NON-NATIVE SPECIES

Affected Environment

Vegetation at Big South Fork NRRRA 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 EA, 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. All eight of the land use / land cover types described in this section can be found on at least one well site. The vegetation types that make up each of these map units are described in the following sections, and distribution is shown in Figures 8, 9, and 10. The land use / land cover types have also been grouped for this EA into three mapping units, including agriculture, developed/disturbed areas, and water. Although not described in detail or analyzed below, these types are graphically depicted in Figures 8, 9, and 10.

Timber harvesting, agriculture, coal mining, oil and gas extraction, fire, grazing, exotic forest diseases, recreational activities, and exotic nonnative plants have all shaped or continue to shape the plant communities within Big South Fork NRR (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 NRR where shortleaf pine (*Pinus echinata*) and Virginia pine (*Pinus virginianus*) stands existed prior to the infestation (NPS 2005a).

Pine Forest. This mapping unit is the most extensive vegetation category present within Big South Fork NRR 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).

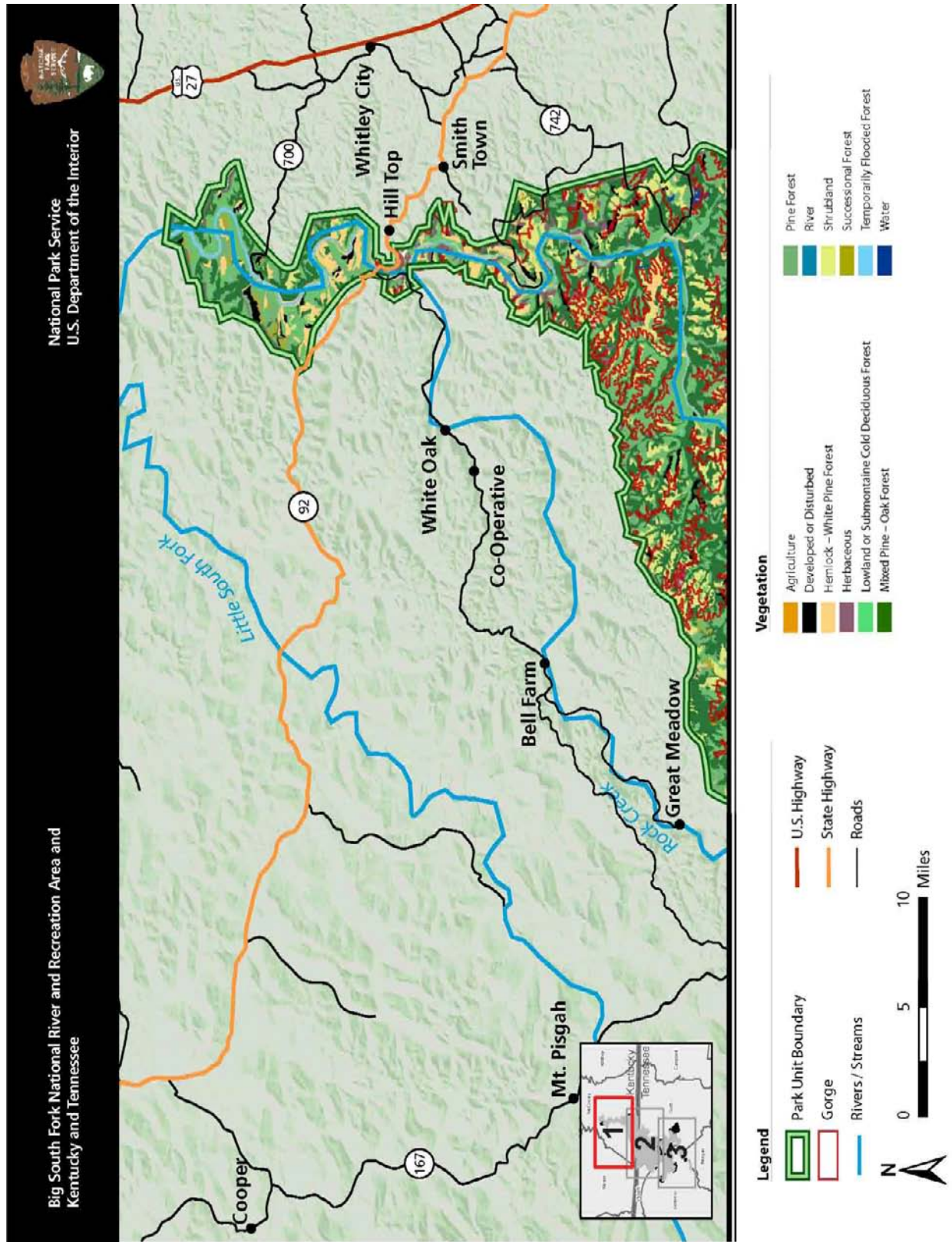


Figure 8. Vegetation of Big South Fork National River and Recreation Area (Map 1)

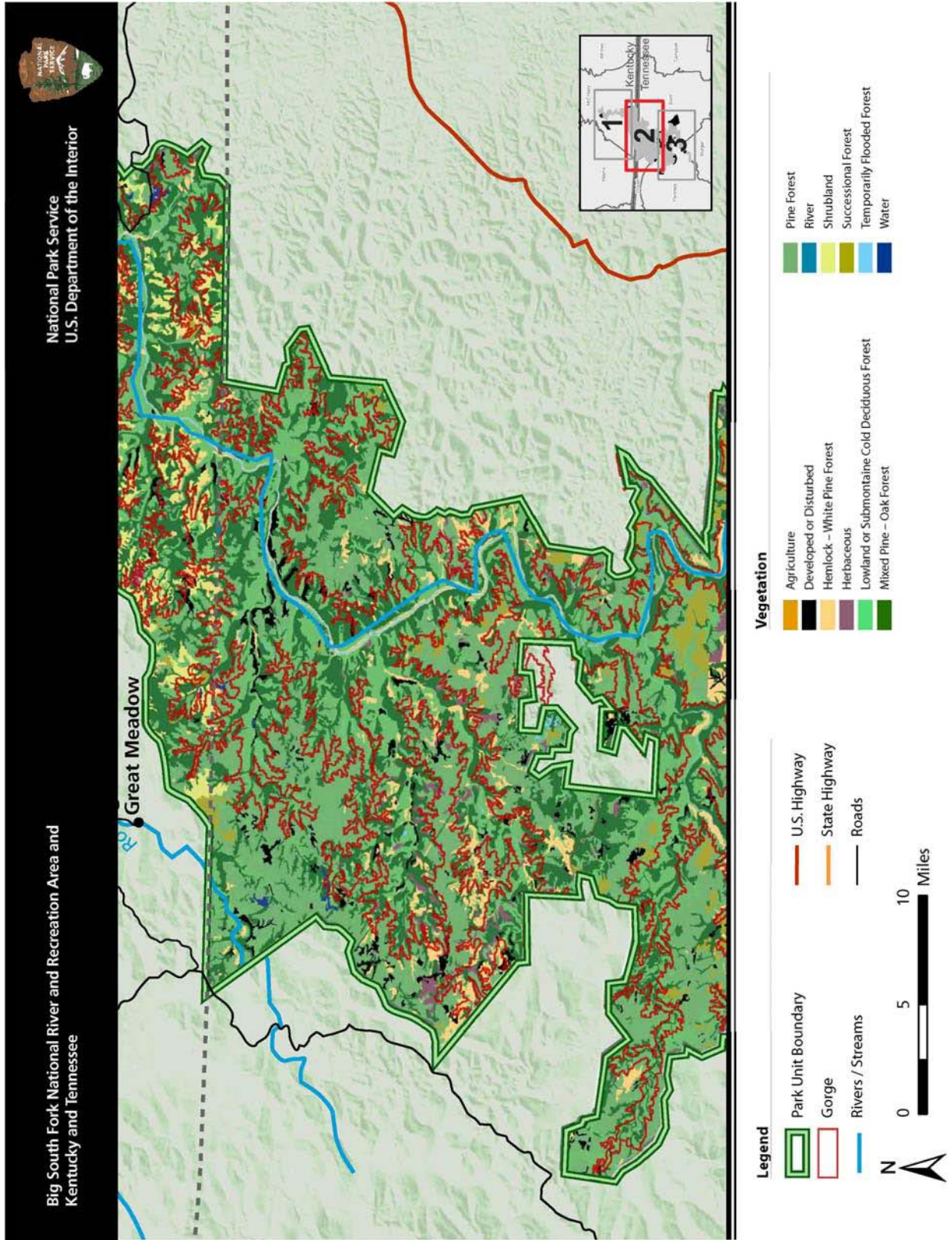


Figure 9. Vegetation of Big South Fork National River and Recreation Area (Map 2)

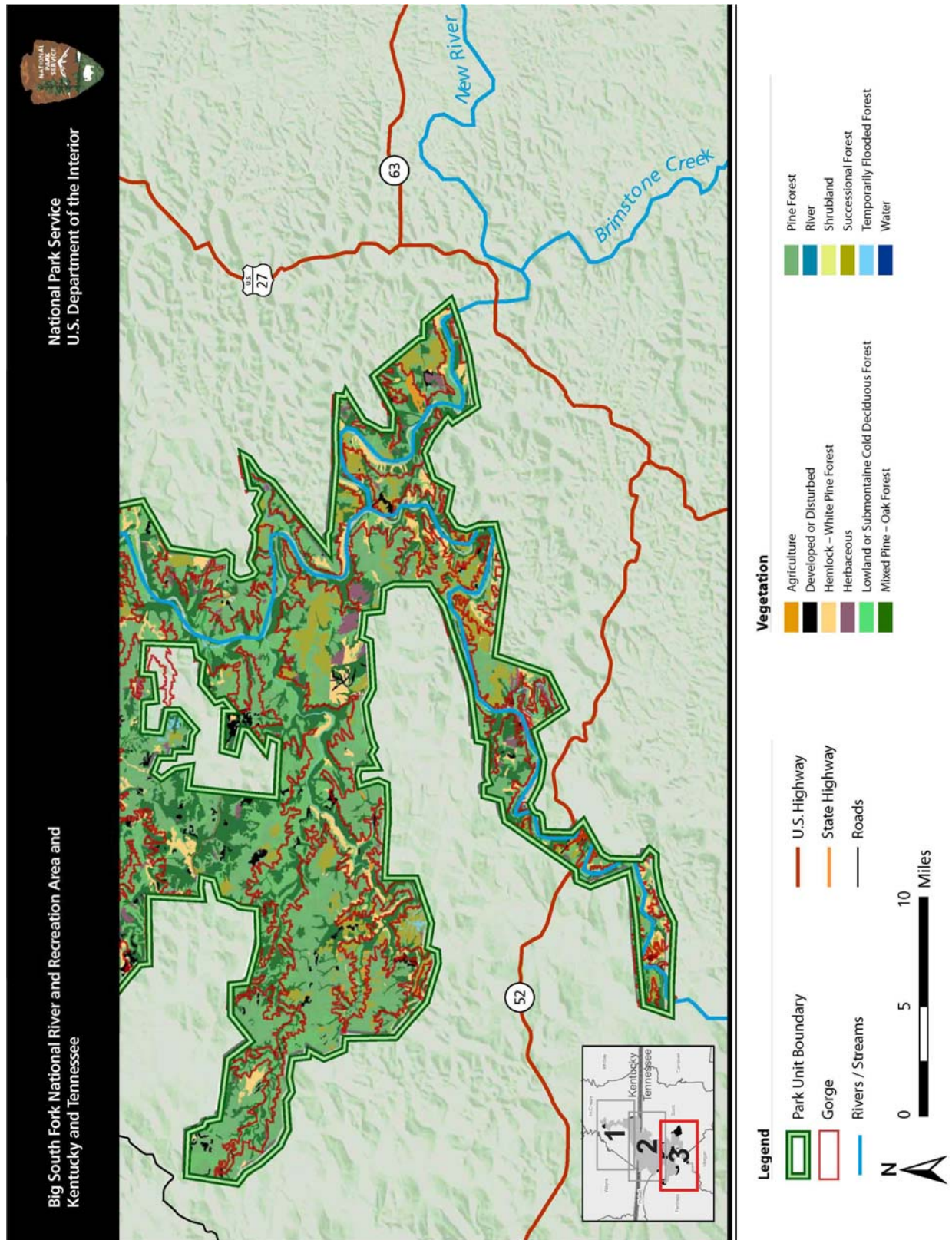


Figure 10. Vegetation of Big South Fork National River and Recreation Area (Map 3)

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 Unglaciaded Forest.** This dense hardwood forest is typically dominated by American beech and sugar maple. It generally occurs on unglaciaded 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 NRR 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 NRR, 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 NRR, 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 NRR

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 NRR, 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 2007).
- **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 NRR 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. 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 NRR, is dominated by big bluestem (*Andropogon gerardii*), yellow Indiangrass (*Sorghastrum nutans*), and little bluestem (NatureServe 2007).

Non-native Species. At Big South Fork NRR, forests along rivers and streams are the most susceptible to invasion by non-native plants, including Japanese spiraea (*Spiraea japonica*) and Nepalese browntop (*Microstegium vimineum*). Patches of tree-of-heaven (*Ailanthus altissima*), mimosa (*Albizia julibrissin*), multiflora rose (*Rosa multiflora*), garlic mustard (*Alliaria petiolata*), and Japanese knotweed (*Polygonum cuspidatum*) are also present, particularly where homesteads or small communities previously occurred along the river. Efforts are currently underway to remove these 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 NRR 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 these species and encourages native grasses, forbs, and shrubs for the benefit of wildlife (NPS 2006f).

Environmental Consequences

Area of Analysis. The impact analysis area for evaluating direct and indirect effects is the park boundary. The area of analysis for cumulative effects was expanded to capture actions that affect vegetation both park-wide and within the Big South Fork of Cumberland watershed.

Methodology and Assumptions. Actions under the EA scenario were analyzed against the types of vegetation in the park that could be impacted. Impacts to vegetation may result from the direct removal of vegetation, degradation of existing vegetation, and the potential for nonnative species to invade native vegetation communities. The assessment of impacts is based on best professional judgment and was developed through discussions with park staff and EA team members, and a review of relevant literature.

In addition, the NPS developed the following definitions for intensity thresholds for impacts to vegetation:

- **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, would recover. Mitigation measures, if needed to offset adverse effects, would be simple and successful.
- **Moderate:** Impacts would result in affects to native vegetation types, their habitats, or the natural processes sustaining them, and would cause a 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 their success would not be guaranteed.

No Action – Alternative A. Under alternative A, the NPS would plug at least 45 known orphaned oil and gas wells (see Figure 2 in chapter 1), and reclaim associated sites and access roads, in Big South Fork NRRRA when NPS or state funding becomes available.

This alternative would require clearing vegetation at the well and access roads. At known well sites, this would temporarily affect approximately 3.1 acres of Hemlock – White Pine Forest; 0.10 acre of Herbaceous vegetation; 4.4 acres of Lowland or Submontane Cold Deciduous Forest; 3.0 acres of Mixed Pine – Oak Forest; 10.2 acres of Pine Forest; 4.6 acres of Successional Forest; 0.4 acre of Temporarily Flooded Forest; and 0.3 acre of developed or disturbed land. Along the access roads, temporary disturbance would occur to approximately 1.8 acres of Hemlock – White Pine Forest; 1.3 acres of Herbaceous vegetation; 4.8 acres of Lowland or Submontane Cold Deciduous Forest; 6.6 acres of Mixed Pine – Oak Forest; 24.1 acres of Pine Forest; 0.7 acre of Shrubland; 7.4 acres of Successional Forest; 0.01 acre of Temporarily Flooded Forest; and 1.3 acres of developed or disturbed land.

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 well pads and access roads and revegetating the area with weed-free native seed mix. These effects, 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.

The extended time period for the no action alternative would allow wellhead conditions would continue to deteriorate. The risk of a surface blowout would increase, potentially causing short-term moderate adverse impacts. There are also currently a number of known well sites that could potentially adversely affect vegetation as a result of leaking fluids, past or present spills, and poor condition of existing structures at orphaned well sites.

During reclamation operations, sites are reclaimed by grading the site to promote drainage and site reclamation, replacing topsoil, seeding with a selected mix of native herbaceous vegetation, and possibly planting. During plugging operations the park staff intends to 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. 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 would be monitored and success would be determined by measuring species survival, native vegetation density and diversity, percent cover, etc. Site monitoring also would include monitoring by the Big South Fork NRR 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. Except for rare vegetation communities that are susceptible to the adverse impacts of oil and gas operations, most vegetation communities in the park 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 to vegetation could occur if visitors travel off of established routes. Despite this potential effect, restoration of native vegetation communities associated with plugging and reclamation would ultimately have long-term beneficial impacts.

Cumulative Impacts. Several cumulative actions described in the “Cumulative Impacts” section of this chapter would contribute both adverse and beneficial cumulative impacts on vegetation. Oil and gas development, within and outside Big South Fork NRR, including new operations, would have adverse short- and long-term moderate impact on vegetation from clearing and alteration of habitat. Potential contamination of soils from leaking wells would also contribute impacts and could kill vegetation. Coal bed methane/shale gas drilling is an ongoing activity in the vicinity of Big South Fork NRR, and has similar impacts to traditional oil and gas development. Acid mine drainage and abandoned mine impacts include contamination of resources from sulfuric acid and ferric hydroxide runoff at active and abandoned coal mining sites, and clearing of vegetation at active mine sites. Residential development and industrial activity outside the park unit would also contribute to clearing of vegetation.

Other cumulative actions that would contribute to impacts on vegetation include visitor activities including hiking, biking, recreational rock climbing, and ORV use. Development and routine

maintenance of facilities within the park would also disturb vegetation locally. These activities would have long-term localized negligible adverse cumulative impacts on vegetation.

Some plans and projects within the park would also have long-term beneficial effects on vegetation, including implementation of the GMP at Big South Fork NRRRA. This plan outlines desired resource conditions and visitor experience that would protect vegetation resources in the park. An oil and gas management plan is also being developed and outlines specific objectives and operating standards to protect park resources, including vegetation. Reclamation of abandoned mines would also have beneficial long-term effects on vegetation as would the plugging and reclamation of other wells, including 11 orphaned wells that are known to occur in the park.

NPS staff at Big South Fork NRRRA 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 an adverse effect on native vegetation, but the active management of exotic species has a long-term localized beneficial effect.

Overall, when impacts of these actions are combined with the localized short-term negligible to moderate adverse impacts and the beneficial effects of alternative A, there would be short- and long-term negligible to moderate adverse cumulative impacts on vegetation.

Conclusion. Plugging and reclamation activities under alternative A would result in localized short-term negligible to moderate adverse impacts on vegetation. However, there would be long-term beneficial effects under alternative A by removing the risks associated with unplugged wells and moving the resource toward the desired condition. However, implementation would take longer under alternative A because funding under alternative A is less certain. Overall, when impacts of these actions are combined with the localized short-term negligible to moderate adverse impacts and the beneficial effects of alternative A, there would be short- and long-term negligible to moderate adverse cumulative impacts on vegetation. When compared to the broader area of analysis, alternative A would directly impact and ultimately stabilize or reclaim a relatively small amount of acreage (approximately 26.05 acres at the well sites, and 47.96 acres at the access roads). As a result, the long-term beneficial effects of alternative A would move the resource toward the desired condition, and the adverse impacts under alternative A would contribute slightly to the overall adverse cumulative impacts of all the other past, present, and reasonably foreseeable future actions.

Preferred Alternative - Alternative B. Under this alternative, the NPS would plug at least 45 known orphaned oil and gas wells (see Figure 2 in chapter 1), and reclaim associated access roads, in Big South Fork NRRRA as described for alternative A. The majority of these wells would be plugged and reclaimed using funding received under ARRA.

The same actions identified as contributing effects under alternative A would apply to alternative B. However, the risk of a potential spill from the deterioration of the wellhead would be much less. Alternative B would contribute localized short-term negligible to minor adverse effects during plugging and reclamation activities. Long-term beneficial impacts described for alternative A would also occur under alternative B. These benefits are more likely to be realized and would be realized sooner under alternative B because at this time funding is available from ARRA to plug and reclaim the majority of these wells.

Cumulative Impacts. Several cumulative actions described in the “Cumulative Impacts” section of this chapter would contribute both adverse and beneficial cumulative impacts on vegetation. Oil and gas development, within and outside Big South Fork NRR, including new operations, would have adverse short- and long-term moderate impact on vegetation from clearing and alteration of habitat. Potential contamination of soils from leaking wells would also contribute impacts and could kill vegetation. Coal bed methane/shale gas drilling is an ongoing activity in the vicinity of Big South Fork NRR, and has similar impacts to traditional oil and gas development. Acid mine drainage and abandoned mine impacts include contamination of resources from sulfuric acid and ferric hydroxide runoff at active and abandoned coal mining sites, and clearing of vegetation at active mine sites. Residential development and industrial activity outside the park unit would also contribute to clearing of vegetation.

Other cumulative actions that would contribute to impacts on vegetation include visitor activities including hiking, biking, recreational rock climbing, and ORV use. Development and routine maintenance of facilities within the park would also disturb vegetation locally. These activities would have long-term localized negligible adverse cumulative impacts on vegetation.

Some plans and projects within the park would also have long-term beneficial effects on vegetation, including implementation of the GMP at Big South Fork NRR. This plan outlines desired resource conditions and visitor experience that would protect vegetation resources in the park. An oil and gas management plan is also being developed and outlines specific objectives and operating standards to protect park resources, including vegetation. Reclamation of abandoned mines would also have beneficial long-term effects on vegetation as would the plugging and reclamation of other wells, including 11 orphaned wells that are known to occur in the park.

NPS staff at Big South Fork NRR 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 an adverse effect on native vegetation, but the active management of exotic species has a long-term localized beneficial effect.

The same actions identified as contributing cumulative effects under alternative A would apply to alternative B. Overall, the negligible to minor adverse and long-term beneficial impacts from alternative B when combined with the adverse and beneficial effects of these cumulative actions, would result in short- and long-term negligible to moderate adverse cumulative impacts

Conclusion. Plugging and reclamation activities under alternative B would result in localized short-term negligible to minor adverse impacts on vegetation during implementation. However, there would be long-term beneficial effects under alternative B by removing the risks associated with unplugged wells and moving the resource toward the desired condition. The long-term benefits are more likely to be realized and would be realized sooner under alternative B because funding is available now from ARRA to plug and reclaim the majority of these wells. Overall, the negligible to minor adverse and long-term beneficial impacts from alternative B when combined with the adverse and beneficial effects of these cumulative actions, would result in short- and long-term negligible to moderate adverse cumulative impacts and when compared to the broader area of analysis, alternative B would directly impact and ultimately reclaim a relatively small amount of acreage (approximately 26.05 acres at the well sites, and 47.96 acres at the access roads). As a result, the long-term beneficial

effects of alternative B would move the resource toward the desired condition, and the adverse impacts under alternative B would contribute minimally to the overall adverse cumulative impacts of all the other past, present, and reasonably foreseeable future actions.

WETLANDS

Affected Environment

Important wetland functions and values are provided protection under NPS regulations, orders, and policies (in particular, Director's Order #77-1: Wetland Protection [NPS 2002]), as well as USACE regulations. In general, wetlands must first be avoided, and then, if no practicable alternatives exist, impacts must be mitigated.

An assessment of wetland functions and values was needed to facilitate evaluation of the 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 to document any wetlands occurring within the project area and to assess wetland functions and values.

Wetland Delineation. To be consistent with permitting requirements established under Section 404 of the CWA, the extent of wetlands occurring in the delineation site was determined based on criteria established in the *Draft Interim Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Eastern Mountains and Piedmont Region* (USACE 2009), but also included additional wetland habitats determined present based on the *Classification of Wetlands and Deepwater Habitats of the United States*, prepared by Cowardin for the U.S. Fish and Wildlife Service (USFWS) and referred to as the Cowardin classification system (Cowardin et al. 1979). The NPS classifies wetlands based on the Cowardin classification system, under which a wetland must have at least one of the following attributes:

- at least periodically, the habitat supports predominantly hydrophytic vegetation (wetland vegetation)
- the substrate is predominantly undrained hydric soil
- the substrate is non-soil and is saturated with water, or is covered by shallow water at some time during the growing season

After observing and reviewing the characteristics of each wetland, the functions and values of these areas were determined using *The Highway Methodology Handbook Supplement: Wetland Functions and Values—A Descriptive Approach* (USACE 1999). Typical functions and values of wetlands include high productivity, fish and wildlife support, erosion and sedimentation control, dampening storm effects and flood control, water purification, and nutrient cycling. Wetlands also play a major role in the biodiversity of the park and add to its cultural and scientific value. Wetland functions are processes which tend to improve the environmental quality of an ecosystem. Examples of this include groundwater recharge/discharge, stormwater and flood control, improvement of water quality, sediment stabilization and retention, and aquatic and wildlife diversity and habitat (USACE 1999). Values are functions which are highly valued by society. These include water quality maintenance,

flood control, shoreline erosion control, groundwater supply recharge, hunting and recreation, and commercial fishing. Assessing wetland functions and values is a vital step in characterizing the importance of these areas (USACE 1999).

The NPS identified several well sites and access roads that were near potential wetlands located in the Big South Fork NRR. A site investigation for the presence of wetlands and other waters of the United States was conducted at Beatty Well (1818), Beatty Well A, Beatty Well B, and well site 151-02 (NPS 2009f). Field survey efforts identified 14 jurisdictional wetlands and five areas that qualified as wetlands under NPS guidelines but not under USACE guidelines. The 19 wetlands were delineated, and account for 7.52 acres/3.04 hectares (ha) of wetland habitat. Only a small portion of these are within the well site areas or the access road right-of-way. The wetlands within well site areas and access road right-of-way are discussed below.

Well Site 151-02—One jurisdictional wetland and one feature that qualified as a wetland under NPS guidelines but not under USACE guidelines were identified at well site 151-02 and its access road during the field survey. The two wetlands were delineated and account for approximately 0.1 acre of wetland habitat shown on Figure 11. Table 9 shows characteristics of these wetlands such as wetland area, type, location, and function and values.

Table 9. Wetland Characteristics: Well Site 151-02

Wetland/Stream Identification (Guidelines delineated under)	Type	Location	Functions and Values	Area (acres)
Wetland NBNF (USACE/NPS)	Palustrine, forested, broad-leaved deciduous, saturated (PSS1B)	Northern floodplain of No Business Creek, approximately 550 feet east of the western site boundary	Groundwater discharge/recharge, floodflow alteration, sediment retention, production export, wildlife habitat, recreation, scientific value, uniqueness /heritage, and aesthetics.	0.004
No Business Creek (USACE/NPS)	Riverine, upper perennial, unconsolidated bed, permanently flooded (R3UBH)	Flows west to east through the center of the site	Groundwater discharge and recharge, floodflow alteration, recreational use, aesthetics, heritage, and fish, shellfish, and wildlife habitat.	0.086

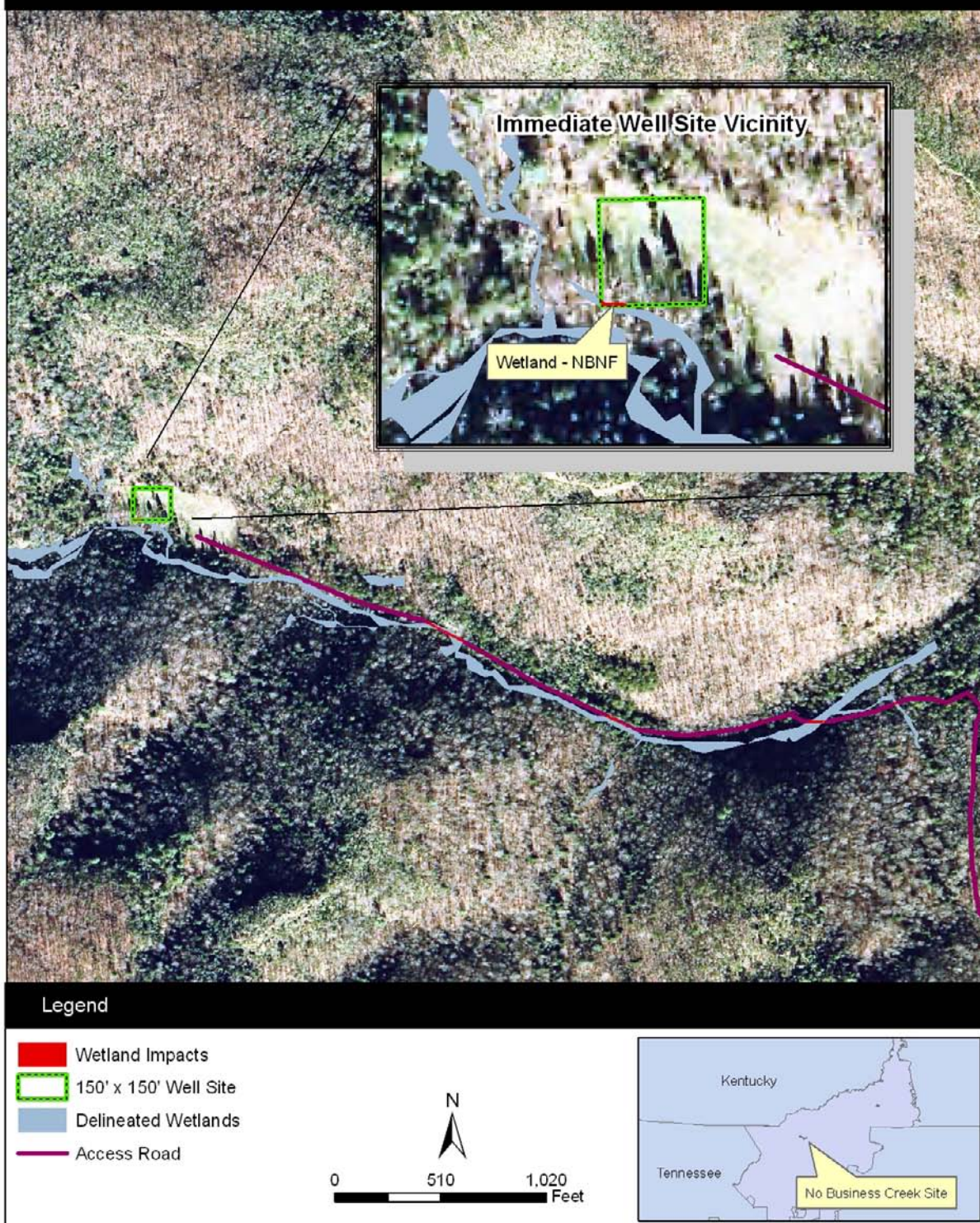


Figure 11. Wetlands at Well Site 151-02

Beatty Well Sites—No jurisdictional wetlands were identified at the three Beatty well sites, but three areas that qualified as wetlands under NPS guidelines but not under USACE guidelines were identified. The three wetlands were delineated and the area within the well site and access road account for 0.1 acre of wetland habitat, shown on Figure 12. Table 10 shows characteristics of these wetlands such as wetland area, type, location, and functions and values.

Table 10. Wetland Characteristics: Beatty Well (1818), Beatty Well A, Beatty Well B

Wetland/Stream Identification (Guidelines delineated under)	Type	Location	Functions and Values	Area (acres)
Wetland OWB (NPS)	Palustrine, emergent, non-persistent, seasonally flooded/well drained (PEM2D)	Floodplain of the Big South Fork of the Cumberland River, west of Oil Well Branch	Groundwater discharge/recharge, floodflow alteration, sediment retention, production export, wildlife habitat, recreation, scientific value, uniqueness/ heritage, and aesthetics.	0.010
Big South Fork of the Cumberland River (USACE/NPS)	Riverine, upper perennial, unconsolidated bottom, permanently flooded (R3UBH)	Southern boundary of the site	Functions and values in this river include groundwater discharge/recharge, floodflow alteration, shoreline stabilization, production export, recreation, heritage, aesthetics, scientific value, and fish, shellfish, and wildlife habitat.	0.277
Oil Well Branch (USACE/NPS)	Riverine, upper perennial, unconsolidated bottom, permanently flooded (R3UBH)	Flows south through the center of the site	Functions and values in this creek include groundwater discharge/recharge, floodflow alteration, production export, recreation, heritage, aesthetics, scientific value, and fish, shellfish, and wildlife habitat.	0.124

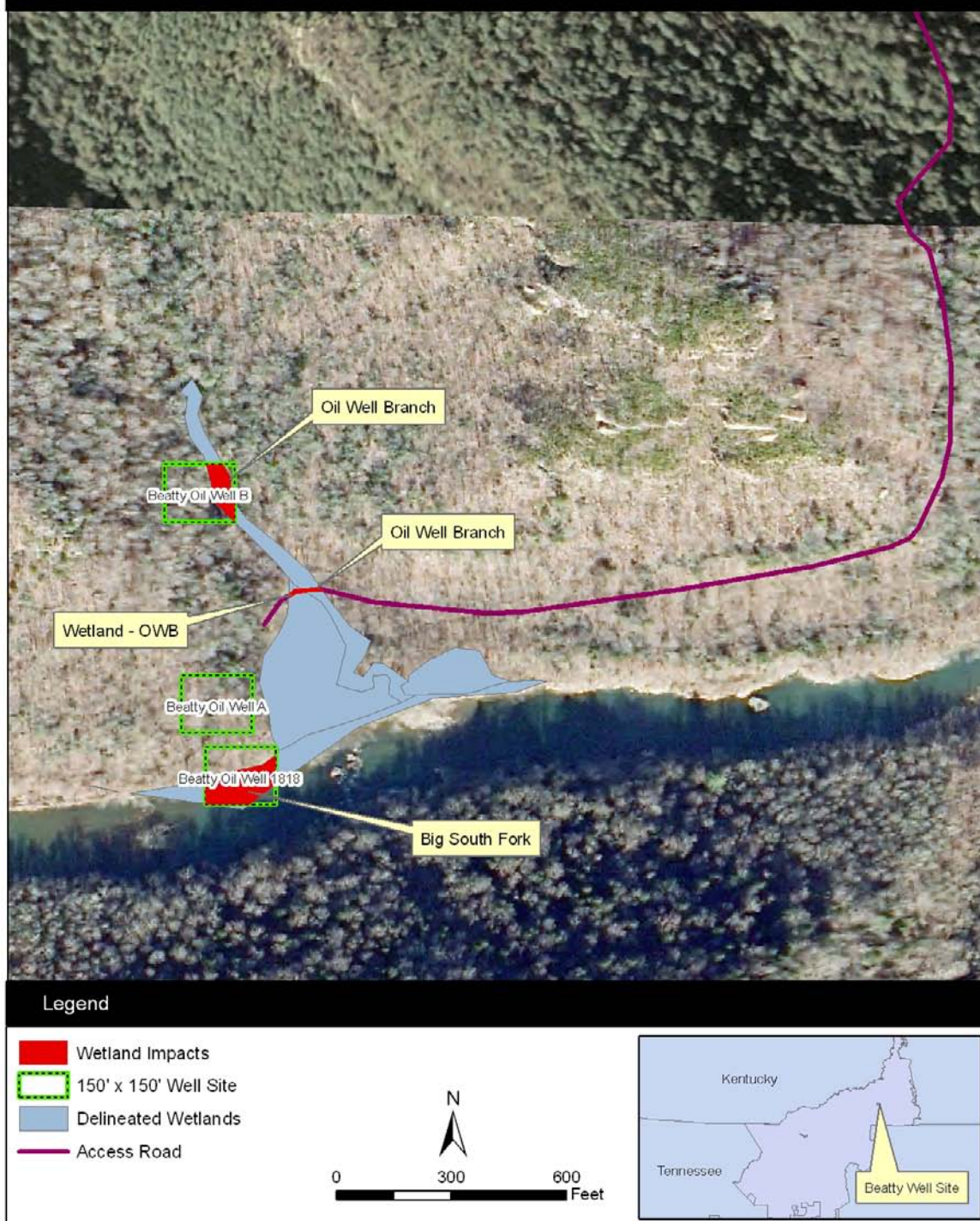


Figure 12. Wetlands at Beatty Well 1818, Beatty Well A, and Beatty Well B

Environmental Consequences

Area of Analysis. The area of analysis for wetlands includes the Big South Fork of Cumberland watershed and specifically the immediate location of the 45 known orphaned well sites and associated access roads.

Methodology and Assumptions. Impacts to wetlands were assessed by considering the types of impacts associated with plugging and reclamation of oil and gas wells, both during the operations and once they are completed. For known sites that would be plugged and reclaimed, locations of wetlands were mapped and overlaid relative to the well pads and access roads were mapped. The degree of potential impacts on wetlands, and their functions and values, from plugging and reclamation of orphaned wells would depend on the types and locations of activities, including proximity to the main stems of the Big South Fork of the Cumberland River and the mitigation measures used to reduce impacts. Assessment of impacts was based on best professional judgment and was developed through discussions with NPS staff and consultants.

The project would not require a Statement of Findings because the project qualifies as an exception under DO#77-1 (Wetland Protection). According to the NPS Procedural Manual #77-1: Wetland Protection, actions designed specifically for the purpose of restoring degraded (or completely lost) natural wetland, stream, riparian, or other aquatic habitats or ecological processes are excepted. For purposes of this exception, "restoration" refers to reestablishing environments in which natural ecological processes can, to the extent practicable, function at the site as they did prior to disturbance. Temporary wetland disturbances that are directly associated with and are necessary for implementing the restoration are allowed under this exception (see "conditions" in Section 4.2.2). Actions causing a cumulative total of up to 0.25 acre of new long-term adverse impacts on natural wetlands may be allowed under this exception if they are directly associated with and necessary for the restoration (e.g., small structures or berms). The project would meet these requirements, thus no Statement of Findings for wetlands is required.

In addition, the NPS developed the following definitions for intensity thresholds for impacts to wetlands:

- **Negligible:** No measurable or perceptible effects on size, function, or value of wetlands would occur.
- **Minor:** The effect on wetlands would be perceptible, but small in terms of area and the nature of the impact. Limited, localized effects on wetland functions and values would occur; however, the overall viability would not be affected. If left alone, an adversely affected wetland would recover, and the impact would be reversed.
- **Moderate:** The impact would be sufficient to cause a measurable effect on the size, function, or value of wetlands in a localized area. There would be a permanent loss or gain in wetland acreage, but not to large areas. Mitigation measures, if needed to offset adverse effects, would be extensive and likely successful.
- **Major:** The impact would result in substantial effects on size, function, or value of wetlands and would result in a permanent loss or gain of large wetland areas. The impact would be

highly noticeable, extensive mitigation measures would be needed to offset any adverse effects, and their success would not be guaranteed.

No Action - Alternative A. Under alternative A, the NPS would plug at least 45 known orphaned oil and gas wells (see Figure 2 in chapter 1) and reclaim associated sites and access roads in Big South Fork NRRRA when NPS or state funding becomes available.

Clearing vegetation from oil and gas access roads and well pads and the use of heavy equipment and vehicles would temporarily increase localized erosion potential, causing sedimentation in waterways and altering flow characteristics and hydrologic functions of surface waters that provide hydrology for wetlands. Impacts to wetlands could result, but only four well sites, as described in the “Affected Environment”, contain wetlands totaling approximately 0.2 acre of wetland. A total of 0.2 acre of wetland would be impacted by this alternative. In addition, there is the potential for release of liquid hydrocarbons and/or contaminating or hazardous substances from vehicles, wellhead equipment, or flow lines during well plugging and reclamation activities into wetlands either directly or indirectly through surface water and groundwater.

Mitigation would be applied during plugging and reclamation operations to minimize any potential long-term impacts to wetlands including 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. Projects would implement wetland best management practices of Director’s Order #77-1: Wetland Protection (NPS 2002), Appendix 2. Reclamation of well pads and access roads would reduce erosion rates to pre-disturbance levels within two to five years. Given the limited area that would be affected, and the expected reclamation, plugging and reclamation activities would have localized short-term negligible to minor adverse impacts on wetlands.

The extended time period for the no action alternative would allow wellhead and downhole conditions to deteriorate increasing the risk of a spill. There are currently a number of known well sites that could potentially adversely affect wetlands as a result of leaking fluids, past or present spills, and poor condition of existing structures at orphaned well sites causing localized short- and long-term moderate adverse impacts to wetlands.

Proper plugging of the wells would ensure that hydrocarbon contamination would not occur in the future. In addition, reclaiming the well pads and access roads would be a beneficial impact on wetlands once recontouring and planting and establishment of native vegetation in disturbed areas is complete by reducing soil erosion and reestablishing surface drainage flows. Over time, these practices could eliminate the adverse impacts caused by 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. As a result, there would be long-term beneficial effects on wetlands once reclamation is complete.

Cumulative Impacts. Several cumulative actions described in the “Cumulative Impacts” section of this chapter would contribute both adverse and beneficial cumulative impacts on wetlands. Wetlands can be affected directly by changes in water quality or indirectly by alteration of surface water or

groundwater supply during development. Oil and gas development, within and outside Big South Fork NRRA, including new operations, would have adverse short- and long-term minor to moderate adverse impact on wetlands from vegetation clearing, ORV use, and construction and maintenance of access roads, well pads, and flow lines. These activities increase erosion of soils causing increased sedimentation and degrading water quality in wetlands. In addition, potential contamination of soils, surface water, and groundwater from leaking wells would also contribute indirectly to wetland 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. Acid mine drainage and abandoned mine impacts include contamination of surface water and groundwater, which could kill wetland vegetation and wildlife, from sulfuric acid and ferric hydroxide runoff at active and abandoned coal mining sites. 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.

The spread of exotic species has adverse effects on wetland functions and values through their migration into previously stable communities and herbicides used to control exotic plant infestations. Management of these exotic species during reclamation activities and monitoring would have long-term beneficial effects on wetland function and values.

Other cumulative actions that would contribute to impacts on wetlands include visitor activities including horseback riding, hiking, biking, ORV use, and refuse disposal. Ground disturbances during development and routine maintenance of facilities within the park would increase soil erosion potential. These activities would have long-term localized negligible adverse cumulative impacts on wetland function and value through increased sedimentation and the potential contamination of surface waters from improper refuse disposal.

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 and visitor experience that would protect resources in the park. An oil and gas management plan is also being developed and outlines specific objectives and operating standards to protect park resources, including wetlands. Reclamation of abandoned mines would also have beneficial long-term effects on wetlands as would the plugging and reclamation of other wells, including 11 orphaned wells that are known to occur in the park.

Overall, when impacts of these actions are combined with the short-term negligible to moderate adverse, long-term moderate adverse impacts, and the long-term beneficial effects of alternative A, there would be short-term negligible to moderate adverse, long-term negligible to moderate adverse, and long-term beneficial cumulative impacts on wetlands.

Conclusion. Plugging and reclamation activities under alternative A would result in localized short-term negligible to moderate adverse and long-term moderate impacts on wetlands. However, there would also be long-term beneficial effects under alternative A by eventually removing the risks associated with unplugged wells and moving the resource toward the desired condition. Funding for alternative A would be less certain, therefore, the time period for implementation would be extended over several years allowing continued deterioration of wellheads and surface equipment.

Overall, when impacts of these actions are combined with the short-term negligible to moderate adverse, long-term moderate adverse impacts, and the long-term beneficial effects of alternative A, there would be short-term negligible to moderate adverse, long-term negligible to moderate adverse, and long-term beneficial cumulative impacts on wetlands. When compared to the broader area of analysis, alternative A would directly impact and ultimately reclaim a relatively small amount of acreage. As a result, the long-term beneficial effects of alternative A would move the resource toward the desired condition, and the adverse impacts under alternative A would contribute slightly to the overall adverse cumulative impacts of all the other past, present, and reasonably foreseeable future actions.

Preferred Alternative - Alternative B. Under this alternative, the NPS would plug at least 45 known orphaned oil and gas wells (see Figure 2 in chapter 1) and reclaim associated sites and access roads in Big South Fork NRRRA as described for alternative A. The majority of these wells would be plugged and reclaimed using funding received under ARRA, where the NPS would contract the necessary services directly.

Most of the same actions identified as contributing effects under alternative A would apply to alternative B. However, the risks of project implementation over an extended period of time would be eliminated. Alternative B would contribute short-term negligible to minor adverse effects during plugging and reclamation activities. Long-term beneficial impacts described for alternative A would also occur under alternative B. These benefits are more likely to be realized, and would be realized sooner under alternative B because at this time funding is available from ARRA to plug and reclaim the majority of these wells.

Cumulative Impacts. The same actions identified as contributing cumulative effects under alternative A would apply to alternative B. Overall, the short-term negligible to minor adverse and long-term beneficial impacts, when combined with the adverse and beneficial effects of these cumulative actions would result in short- and long-term negligible to moderate adverse and long-term beneficial cumulative impacts.

Conclusion. Plugging and reclamation activities under alternative B would result in localized short-term negligible to minor adverse impacts on wetlands during implementation. However, there would be long-term beneficial effects under alternative B by removing the risks associated with unplugged wells and moving the resource toward the desired condition. The long-term benefits are more likely to be realized and would be realized sooner under alternative B because funding is available now from ARRA to plug and reclaim the majority of these wells. Overall, the short-term negligible to minor adverse impacts, when combined with the adverse and beneficial effects of these cumulative actions would result in short- and long-term negligible to moderate adverse and long-term beneficial cumulative impacts. When compared to the broader area of analysis, alternative B would directly impact and ultimately reclaim a relatively small amount of acreage. As a result, the long-term beneficial effects of alternative B would move the resource toward the desired condition, and the adverse impacts under alternative B would contribute minimally to the overall adverse cumulative impacts of all the other past, present, and reasonably foreseeable future actions.

WILDLIFE AND WILDLIFE HABITAT

Affected Environment

The terrestrial vegetation types described in the “Vegetation” section of this chapter combine with the terrain and aquatic environments at Big South Fork NRR 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 species of mammals have been documented as being “present in the park,” including 10 species of bats, with nine other mammals possibly present at Big South Fork NRR (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 NRR. Outside the park, pigs are hunted year round, and they can be taken inside the park 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 release programs are considered a success, these species are less common than other large mammals. Although there is a stable bear population, no current population estimates are available for them in Big South Fork NRR. Elk are infrequently seen within the park unit due to low population levels in the area. This may be attributed to more suitable habitat found surrounding Big South Fork NRR, including farms.

Predators, including coyote (*Canis latrans*), red fox (*Vulpes vulpes*), river otter (*Lontra canadensis*), and bobcat (*Lynx rufus*), also occur at Big South Fork NRR. 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 NRR and include wood rat (*Neotoma magister*), chipmunk (*Tamias striatus*), deer mouse (*Peromyscus maniculatus*), voles (*Microtus* sp.), moles (*Parascalops breweri*), shrews (*Sorex* and *Blarina* sp.), various rodents, and bats (Britzke 2007).

Birds. Breeding bird surveys have been conducted annually at Big South Fork NRR from 1994 to 2006 (Stedman 1998, 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 and Stedman 2006).

Besides having general characteristics determined by habitat, the bird communities of Big South Fork NRR 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, many breeding species begin to migrate south, and the detectability and density of birds in the Big South Fork NRR 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 NRR 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 NRR. Other common species include American crow (*Corvus brachyrhynchos*), overbird (*Seiurus aurocapillus*), indigo bunting, (*Passerina cyanea*), and hooded warbler (*Wilsonia citrina*) (Stedman and Stedman nd).

Reptiles and Amphibians. A total of 28 reptile species (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 NRR (Stephens, Kiser, and MacGregor 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 undulatus*), 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, Kiser, and MacGregor 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 NRR 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 12 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).

Environmental Consequences

Area of Analysis. The impact analysis area for evaluating direct and indirect effects is the park boundary. The area of analysis for cumulative effects was expanded to capture actions that affect wildlife both park-wide and within the Big South Fork of Cumberland watershed.

Methodology and Assumptions. Impacts to wildlife were assessed by considering the types of impacts associated with plugging and reclamation of oil and gas wells, both during the operations and once operations are completed. Assessment of impacts was subsequently based on best professional judgment and was developed through discussions with NPS staff and consultants.

In addition, the NPS developed the following definitions for intensity thresholds for impacts to wildlife:

- **Negligible:** There would be no observable or measurable impacts to native species, their habitats, or the natural processes sustaining them.
- **Minor:** Impacts would be detectable, and might cause small changes to population numbers, population structure, genetic variability, and other demographic factors 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. Changes to population numbers, population structure, genetic variability, and other demographic factors would occur on a local level, but species would remain stable and viable. Responses to disturbance by some individuals could be expected and could have negative impacts to factors affecting local population levels. 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 might cause large declines in population numbers, population structure, genetic variability, and other demographic factors 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.

No Action - Alternative A. Under alternative A, the NPS would plug at least 45 known orphaned oil and gas wells (see Figure 2 in chapter 1) and reclaim associated sites and access roads in Big South Fork NRA when NPS or state funding becomes available.

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 cause them to temporarily avoid the area. Vehicle use on and vegetation clearing of access roads and well pads may adversely affect wildlife 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, edge effects, and temporarily alter wildlife species composition and migration. The use of heavy equipment and vehicles to plug and reclaim sites could have the potential for release of oil and other contaminating and hazardous substances, which could harm or kill fish and wildlife, but would be minimized with mitigation. These operations would cause occasional responses by wildlife, but would not cause observable or measurable impacts to native species populations. Sufficient habitat would be available to support these species. Therefore, there would be localized short-term negligible to minor adverse impacts at sites throughout the park during plugging and reclamation activities.

Due to the extended time period associated with the implementation of alternative A, there would be an increased risk of spill from the deterioration of surface equipment and wellhead conditions. This increased risk would have a minor adverse impact on wildlife and wildlife habitat.

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 to native species, their habitat, and the natural processes sustaining them.

Cumulative Impacts. Several cumulative actions described in the “Cumulative Impacts” section of this chapter would contribute both adverse and beneficial cumulative impacts on wildlife. Oil and gas development, within and outside Big South Fork NRR, including new operations, would have adverse short- and long-term moderate impact on wildlife from noise, vegetation clearing, and loss of habitat. Potential contamination of soils from leaking wells would also contribute impacts by degrading habitat. Coal bed methane/shale gas drilling is an ongoing activity in the vicinity of Big South Fork NRR, and has similar impacts to traditional oil and gas development. Acid mine drainage and abandoned mine impacts include degradation of wildlife habitat from sulfuric acid and ferric hydroxide runoff at active and abandoned coal mining sites, and loss of habitat at active mine sites. Residential development and industrial activity outside the park unit would also contribute to loss of wildlife habitat.

Other cumulative actions that would contribute to impacts on wildlife include visitor activities such as hiking, biking, recreational rock climbing, and ORV use. Development and routine maintenance of facilities within the park would also disturb wildlife locally. These activities would have long-term localized negligible adverse cumulative impacts on wildlife through disturbance of wildlife and loss or alteration of habitat.

Some plans and projects within the park would also have long-term beneficial effects on wildlife, including implementation of the GMP at Big South Fork NRR. This plan outlines desired resource conditions and visitor experience that would protect wildlife habitat in the park. Implementation of an official roads and trails system and standards associated with the GMP, would help limit the visitor use of important habitat by directing visitors away from these areas. An oil and gas management plan

is also being developed and outlines specific objectives and operating standards to protect park resources, including wildlife. Reclamation of abandoned mines would also have beneficial long-term effects on wildlife as would the plugging and reclamation of other wells, including 11 orphaned wells that are known to occur in the park.

NPS staff at Big South Fork NRRRA routinely manages exotic species. Efforts to control exotic species primarily include spot treatments of herbicide at infested areas. The spread of exotic species has an adverse effect on wildlife and their habitat, but the active management of exotic species has a long-term localized beneficial effect.

Overall, when impacts of these actions are combined with the short-term negligible to minor adverse and the long-term beneficial effects of alternative A, there would be short- and long-term negligible to moderate adverse and long-term beneficial cumulative impacts on wildlife and wildlife habitat.

Conclusion. Plugging and reclamation activities under alternative A would result in localized short-term negligible to minor adverse impacts on wildlife and wildlife habitat during implementation. However, there would also be long-term beneficial effects under alternative A by removing the risks associated with unplugged wells and moving the resource toward the desired condition. Funding for alternative A would be less certain, therefore, the time period for implementation would be extended over several years allowing continued deterioration of wellheads and surface equipment. Overall, when impacts of these actions are combined with the short-term negligible to minor adverse and the long-term beneficial effects of alternative A, there would be short- and long-term negligible to moderate adverse and long-term beneficial cumulative impacts on wildlife and wildlife habitat. When compared to the broader area of analysis, alternative A would directly impact and ultimately stabilize or reclaim a relatively small amount of wildlife habitat (approximately 74 acres). As a result, the long-term beneficial effects of alternative A would move the resource toward the desired condition, and the adverse impacts under alternative A would contribute minimally to the overall adverse cumulative impacts of all the other past, present, and reasonably foreseeable future actions.

Preferred Alternative - Alternative B. Under this alternative, the NPS would plug at least 45 known orphaned oil and gas wells (see Figure 2 in chapter 1) and reclaim associated sites and access roads in Big South Fork NRRRA as described for alternative A. The majority of these wells would be plugged and reclaimed using funding received under ARRA, where the NPS would contract the necessary services directly.

The same actions identified as contributing effects under alternative A would apply to alternative B. However, the risk of a spill occurring is much less because of plugging wells in a short time period. Alternative B would contribute localized short-term negligible to minor adverse effects during plugging and reclamation activities. Long-term beneficial impacts described for alternative A would also occur under alternative B. These benefits are more likely to be realized, and would be realized sooner under alternative B because at this time funding is available from ARRA to plug and reclaim the majority of these wells.

Cumulative Impacts. The same actions identified as contributing cumulative effects under alternative A would apply to alternative B. Overall, the short-term negligible to minor adverse and long-term beneficial impacts, when combined with the adverse and beneficial effects of these

cumulative actions, would result in short- and long-term negligible to moderate adverse cumulative impacts.

Conclusion. Plugging and reclamation activities under alternative B would result in localized short-term negligible to minor adverse impacts on wildlife during implementation. However, there would be long-term beneficial effects under alternative B by removing the risks associated with unplugged wells and moving the resource toward the desired condition. The long-term benefits are more likely to be realized and would be realized sooner under alternative B because funding is available now from ARRA to plug and reclaim the majority of these wells. Overall, the short-term negligible to minor adverse and long-term beneficial impacts, when combined with the adverse and beneficial effects of these cumulative actions, would result in short- and long-term negligible to moderate adverse cumulative impacts. When compared to the broader area of analysis, alternative B would directly impact and ultimately stabilize or reclaim a relatively small amount of wildlife habitat (approximately 74 acres). As a result, the long-term beneficial effects of alternative B would move the resource toward the desired condition, and the adverse impacts under alternative B would contribute minimally to the overall adverse cumulative impacts of all the other past, present, and reasonably foreseeable future actions.

SPECIAL STATUS SPECIES

Affected Environment

Under the Endangered Species Act (ESA) of 1973, the NPS has responsibility to address impacts to federally listed threatened, endangered, candidate 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. 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. 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 2009).

The NPS sent a letter to the USFWS on October 7, 2009, to request a list of species that could be affected by well plugging and reclamation. A response was received on November 16, 2009 (see appendix A for a copy of the letter and response), and Table 11 lists the species the USFWS identified. Separate from this EA, the NPS has also prepared a biological assessment for consultation with the USFWS under Section 7 of the ESA. Federally listed species will be addressed in this EA following federal law and NPS policy.

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 (Table 11). Three fish, two river-dependent plants, and two upland plants are also federally listed.

Table 11. Federally Listed Threatened and Endangered Species that May Occur in the Project Area

Common Name	Scientific Name	Status	Critical Habitat in Big South Fork NRR
Mussel			
Cumberland bean	<i>Villosa trabalis</i>	Endangered	Yes
Cumberland elktoe	<i>Alasmidonta atropurpurea</i>	Endangered	Yes
Cumberlandian combshell	<i>Epioblasma brevidens</i>	Endangered	Yes
Tan riffleshell	<i>Epioblasma florentina walker</i>	Endangered	Yes
Littlewing pearlymussel	<i>Pegias fabula</i>	Endangered	Yes
Dromedary pearlymussel	<i>Dromus dromas</i>	Endangered	Yes
Oyster mussel	<i>Epioblasma capsaeformis</i>	Endangered	Yes
Spectaclecase	<i>Cumberlandia monodonta</i>	Candidate	Yes
Fluted kidneyshell	<i>Ptychobranhus subtentum</i>	Candidate	Yes
Clubshell	<i>Pleurobema clava</i>	Endangered	Yes
Fish			
Duskytail darter	<i>Etheostoma percnurum</i>	Endangered	No
Blackside dace	<i>Phoxinus cumberlandensis</i>	Threatened	No
Palezone shiner	<i>Notropis albizonatus</i>	Endangered	No
Plants			
Cumberland sandwort	<i>Arenaria cumberlandensis</i>	Endangered	No
Virginia spiraea	<i>Spiraea virginiana</i>	Endangered	No
Cumberland rosemary	<i>Conradina verticillata</i>	Threatened	No
White fringeless orchid	<i>Platanthera integrilabia</i>	Candidate	No

In addition, special status species for Kentucky and Tennessee are discussed below. Some species that are not federally listed are listed in Kentucky or Tennessee as in need of management, of special concern, state-threatened, or state-endangered.

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 more than 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. 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, U.S. Geological Survey, 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).

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, barcheck 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 (*Alasmodonta 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).

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 pearlshell (*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 pearlshell 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 (*Etheostoma flabellare*), redline darter (*Etheostoma rufilineatum*), and snubnose darter (*Etheostoma simoterum*) (NatureServe 2009).

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 pearl mussel (*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 NRA, 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 barcheck 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).

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, 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. Subsequently, Brooks Burr (personal communication) collected duskytail darters 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 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 (Spew 1981). 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 stream flows with 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 rock houses 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).

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 spirea 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 spirea 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 gigantea*, *Conradina verticillata*, *Dirca palustris*, *Ilex verticillata*, *Juniperus virginiana*, *Liriodendron tulipifera*, *Orontium aquaticum*, *Osmunda regalis*, *O. cinnamomea*, *Phlox amoena*, *Salix*, *Senecio aureus*, *Silene virginica*, *Spiraea japonica*, *Toxicodendron radicans*, *Trautvetteria*, *Tsuga*, *Ulmus*, and *Viburnum dentatum*.

Virginia spirea 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 recreational use (fishing and boating). Roadside maintenance, beaver damage, deer browse, all-terrain vehicle users, and upslope timbering are noted as potential threats. Exotic species (*Rosa multiflora*, *Elaeagnus umbellata*, *Ailanthus altissima*, *Spiraea japonica*, *Alliaria 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 cinnamomea*, *Woodwardia areolata*, and *Thelypteris 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.

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, oyster mussel, and the Cumberland combshell. 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).

Kentucky and Tennessee Special Status Species. Most of the well sites have potential habitat for state wildlife species of concern. Mammal species of special concern that could use habitat around the well sites include: Rafinesque's big-eared bat (*Corynorhinus rafinesquii*), southern bog lemming (*Synaptomys cooperi*), eastern small-footed bat (*Myotis leibii*), woodland jumping mouse (*Napaeozapus insignis*), hairy-tailed mole (*Parascalops breweri*), and smoky shrew (*Sorex fumeus*). Bird species of special concern that could use habitat around the well sites include cerulean warbler (*Dendroica cerulean*), Swainson's warbler (*Limnothlypis swainsonii*), and sharp-shinned hawk (*Accipiter striatus*). Reptile and amphibian species of special concern that could use habitat around the well sites include slender glass lizard (*Ophisaurus attenuatus longicaudus*), Black Mountain salamander (*Desmognathus welteri*), and four-toed salamander (*Hemidactylium scutatum*). All of these species are listed in Kentucky or Tennessee as in need of management or of special concern. They are not federally listed or state listed as threatened or endangered, except for the eastern small-footed bat and the slender glass lizard, which are listed in Kentucky as threatened.

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 northeast 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; Wouldiams, Bivens, and Carter 2002).

Environmental Consequences

Area of Analysis. The impact analysis area for evaluating direct and indirect effects is the park boundary. The area of analysis for cumulative effects was expanded to capture actions that affect special status species both park-wide and within the Big South Fork of Cumberland watershed.

Methodology and Assumptions. Impacts to special status species were assessed by considering the types of impacts associated with plugging and reclamation of oil and gas wells, both during the operations and once operations are completed. Assessment of impacts was subsequently based on best professional judgment and was developed through discussions with NPS staff and consultants. Park staff evaluated all of the oil and gas wells to determine if impacts would affect federally listed species from the proposed closing of oil and gas wells (NPS 2009h). Staff specialists have determined that no listed species are known to occur on the access routes, on the well sites or in the stream areas where there are crossings (NPS 2009j).

In addition, the NPS developed the following definitions for intensity thresholds for impacts to special status species:

- **Negligible-** The action could result in a change to a population or individuals of a species or designated critical habitat, but the change would be so small that it would not be of any measurable or perceptible consequence and would be well within natural variability. This impact intensity equates to a U.S. Fish and Wildlife Service “*no effect*” determination.
- **Minor-** The action could result in a change to a population or individuals of a species or designated critical habitat. The change would be measurable, but small and localized and not outside the range of natural variability. Mitigation measures, if needed to offset the adverse effects, would be simple and successful. This impact intensity equates to a U.S. Fish and Wildlife Service “*may affect, not likely to adversely affect*” determination.
- **Moderate-** Impacts on special status species, their habitats or the natural processes sustaining them would be detectable and occur over a large area. Breeding animals of concern are present; animals are present during particularly vulnerable life-stages, such as migration or juvenile stages; mortality or interference with activities necessary for survival can be expected on an occasional basis, but is not expected to threaten the continued existence of the species in the park unit. Mitigation measures, if needed to offset adverse effects, would be extensive and likely successful. This impact intensity equates to a U.S. Fish and Wildlife Service “*may affect, not likely to adversely affect,*” or “*may affect, likely to adversely affect*” determination.

- **Major-** The action would result in a noticeable effect to viability of a population or individuals of a species or resource or designated critical habitat. Impacts on a special status species, critical habitat, or the natural processes sustaining them would be detectable, both in and out of the park. Loss of habitat might affect the viability of at least some special status species. Extensive mitigation measures would be needed to offset any adverse effects and their success would not be guaranteed. This impact intensity equates to a U.S. Fish and Wildlife Service “*may affect, likely to jeopardize the continued existence of a species or adversely modify critical habitat for a species*” determination.

No Action - Alternative A. Under alternative A, the NPS would plug at least 45 known orphaned oil and gas wells (see Figure 2 in chapter 1), and reclaim associated sites and access roads, in Big South Fork NRRA when NPS or state funding becomes available.

Although some habitat may exist for federally listed plant species surrounding the well pads and access roads, plant surveys did not find any federally listed species in the vicinity of oil and gas wells (NPS 2009g). Element occurrence databases and literature for all wildlife species, including protected species, were reviewed by park staff. Knowledge of federally listed occurrences based on previous surveys and assistance from other researchers was also used to evaluate impacts on federally listed species.

Special status species could be impacted from a potential spill of hazardous substances, such as oil, gas, or brine brought to the surface as a result of well plugging activities. Well plugging activities could also temporarily increase erosion and sedimentation from redisturbance of access roads, oil well pads, and reclamation afterward that would affect habitat of listed aquatic species such as mussels. The access routes would use the same travel corridor that was originally used when the wells were drilled, creating as little disturbance as possible. Access to the main river would be by existing roads and, therefore, would have little effect on aquatic resources. No streams with federally listed species or critical habitat would be crossed by plugging equipment. Therefore, there would be localized short-term negligible to minor adverse impacts at sites throughout the park during plugging and reclamation activities.

Properly plugging the wells would isolate the fluid bearing zones from each other, reducing the chance of contamination to the freshwater zones that feed into the park streams. All fluids would be contained and disposed of properly, causing no harm to protected species through the discharge of contaminants. Additionally, reclamation of the well sites and access roads would ultimately remove the threats posed by unplugged oil and gas wells and would improve native plant communities that could have long-term benefits for federally listed threatened and endangered species.

The proposed actions would also improve habitat over the long-term by eliminating the risk of unintended discharges to the Big South Fork River from orphaned oil and gas wells. No critical habitat should be harmed by well-plugging activities keeping all fluids contained which would prevent discharges to the river. Mitigation measures described in Table 2 would also minimize potential adverse impacts to water quality and habitat from accessing the sites and site reclamation. Therefore, the well-plugging activities related to alternative A are not likely to result in the *adverse modification of federally designated critical habitat*. Due to the elimination of the risk of unintended

discharges to the National River from orphaned oil and gas wells, there would also be a benefit to federally designated critical habitat.

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 to special status species, their habitat, and the natural processes sustaining them.

However, due to the extended time period before well plugging under the no action alternative wellhead conditions would continue to deteriorate, increasing the risk of a spill occurring, potentially having a long-term moderate adverse impact on special status species and the potential adverse modification of critical habitat. Wells located near or directly uphill from critical habitat could potentially impact surface water as a result of leaking fluids, past or present spills, and poor condition of existing structures at orphaned well sites. Only one site is located within 100 feet of federally designated critical habitat. The park monitors these sites to ensure quick response to potential spills.

Cumulative Impacts. Several cumulative actions described in the “Cumulative Impacts” section of this chapter would contribute both adverse and beneficial cumulative impacts on special status species. Oil and gas development, within and outside Big South Fork NRRRA, including new operations, would have adverse short- and long-term moderate impact on special status species from noise, vegetation clearing, and loss of habitat. Potential contamination of soils from leaking wells would also contribute impacts by degrading habitat. Coal bed methane/shale gas drilling is an ongoing activity in the vicinity of Big South Fork NRRRA, and has similar impacts to traditional oil and gas development. Acid mine drainage and abandoned mine impacts include degradation of habitat from sulfuric acid and ferric hydroxide runoff at active and abandoned coal mining sites, and loss of habitat at active mine sites. Residential development and industrial activity outside the park unit would also contribute to loss of special status species habitat.

Other cumulative actions that would contribute to impacts on special status species include visitor activities such as hiking, horseback riding, canoeing, and ORV use. Development and routine maintenance of facilities within the park would also disturb species locally. These activities would have long-term localized negligible adverse cumulative impacts on special status species through disturbance and loss or alteration of habitat.

Some plans and projects within the park would also have long-term beneficial effects on special status species, including implementation of the GMP at Big South Fork NRRRA. This plan outlines desired resource conditions and visitor experience that would protect habitat in the park. Implementation of an official roads and trails system and standards associated with the GMP would help limit the visitor use of important habitat by directing visitors away from these areas. An oil and gas management plan is also being developed and outlines specific objectives and operating standards to protect park resources, including special status species. Reclamation of abandoned mines would also have beneficial long-term effects on special status species as would the plugging and reclamation of other wells, including 11 orphaned wells that are known to occur in the park.

NPS staff at Big South Fork NRRRA routinely manages exotic species. Efforts to control exotic species primarily include spot treatments of herbicide at infested areas. The spread of exotic species

has an adverse effect on special status species and their habitat, but the active management of exotic species has a long-term localized beneficial effect.

Overall, when these impacts are combined with the short-term negligible to minor adverse, long-term moderate adverse, and long-term beneficial effects of alternative A, there would be short-term negligible to moderate adverse, long-term moderate adverse, and long-term beneficial cumulative impacts on special status species.

Conclusion. Plugging and reclamation activities under alternative A would result in localized short-term negligible to minor adverse impacts on special status species during implementation and until sites are fully reclaimed. No critical habitat would be harmed by implementation of well-plugging activities. There would be long-term beneficial effects to special status species, their habitat, and the natural processes sustaining them under alternative A by removing the threats associated with unplugged wells and moving the resource toward the desired condition. However, the risk of a spill would be greater due to the extended time period creating the potential for long-term moderate adverse impacts to special status species. Overall, when these impacts are combined with the short-term negligible to minor adverse, long-term moderate adverse, and long-term beneficial effects of alternative A, there would be short-term negligible to moderate adverse, long-term moderate adverse, and long-term beneficial cumulative impacts on special status species. As a result, the long-term beneficial effects of alternative A would move the resource toward the desired condition, and the adverse impacts under alternative B would contribute slightly to the overall adverse cumulative impacts of all the other past, present, and reasonably foreseeable future actions.

Preferred Alternative - Alternative B. Under this alternative, the NPS would plug at least 45 known orphaned oil and gas wells (see Figure 2 in chapter 1) and reclaim associated sites and access roads, in Big South Fork NRRRA as described for alternative A. The majority of these wells would be plugged and reclaimed using funding received under ARRA.

The same actions identified as contributing effects under alternative A would apply to alternative B. However, the risk of a spill occurring would be much lower over the long-term under alternative B. Alternative B would contribute localized short-term negligible to minor adverse effects during plugging and reclamation activities. Long-term beneficial impacts described for alternative A would also occur under alternative B. These benefits are more likely to be realized, and would be realized sooner under alternative B because at this time funding is available from ARRA to plug and reclaim the majority of these wells.

Cumulative Impacts. The same actions identified as contributing cumulative effects under alternative A would apply to alternative B. Overall, the short-term negligible to minor adverse and long-term beneficial impacts under alternative B, when combined with the adverse and beneficial effects of these cumulative actions, would result in short- and long-term negligible to moderate adverse and long-term beneficial cumulative impacts.

Conclusion. Plugging and reclamation activities under alternative B would result in localized short-term negligible to minor adverse impacts on special status species during implementation and until sites are fully reclaimed. There would be long-term beneficial effects to special status species, their habitat, and the natural processes sustaining them under alternative B by removing the threats

associated with unplugged wells and moving the resource toward the desired condition. The long-term benefits are more likely to be realized and would be realized sooner under alternative B because funding is available now from ARRA to plug and reclaim the majority of these wells. Overall, the short-term negligible to minor adverse and long-term beneficial impacts under alternative B, when combined with the adverse and beneficial effects of these cumulative actions, would result in short- and long-term negligible to moderate adverse and long-term beneficial cumulative impacts. As a result, the long-term beneficial effects of alternative B would move the resource toward the desired condition, and the adverse impacts under alternative B would contribute minimally to the overall cumulative impacts of all the other past, present, and reasonably foreseeable future actions.

VISITOR USE AND EXPERIENCE

Affected Environment

Visitor use and experience was analyzed in this EA because oil and gas operations could potentially conflict with visitor experiences in the park and pose threats to human health and safety. Areas within Big South Fork NRRRA support diverse outdoor recreation pursuits such as kayaking, hiking, rock climbing, mountain biking, picnicking, camping, hunting, trapping, photography, horseback riding, sightseeing, and livestock-drawn wagon riding.

Many areas of the park contain inactive, orphaned, and producing oil and gas wells and associated equipment. All of the wells proposed for plugging in this EA are inactive wells with no responsible party, a variety of equipment, surface contamination, and debris. The wells discussed in this EA are overgrown with vegetation and are generally not plainly visible to recreational park users. The visitor's perception of oil and gas operations, including plugging and reclamation, depends greatly on their previous experiences with these types of activities, the purpose of their visit, and the expectations of what the park has to offer the visitor. Some visitors are interested primarily in a nature experience, with minimal noise and visual disturbance. Others use the park for active recreation, such as boating, fishing, hiking, and horseback riding, and may perceive fewer impacts from oil and gas operations than other visitors.

Human Health and Safety. The NPS policy regarding public health and safety (contained in the 2006 Management Policies, Section 8.2.5) is that the saving of human life would take precedence over all other management actions. The NPS and its concessionaires, contractors, and cooperators would 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 2006 c).

The following discussion includes a brief description of each type of possible affected visitor use.

Trails

Hiking and Mountain Biking—More than 300 miles of hiking trails are 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. Hiking is pursued year-round, but peaks during traditional high-use periods including spring break (NPS 2005a).

Biking is permitted on three biking-dedicated trails, certain 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).

Affected Hiking and Biking Trails—Well-plugging activities could result in trail closures or sound disturbance at multiple trails. Well plugging activities could affect use of the John Muir Trail, Confluence Trail, O & W Road, Burnt Mill Bridge Loop Trail, John Hall Trail, Cowbone Trail, and Hicks Ridge Trails, John Branch Day Use Trail, Gentlemen’s Swimming Hole, Laurel Dale Cemetery Trails, Christian Cemetery Trail, Middle Creek Loop, Creek Loop, Terry Cemetery, and the Ranse Boyatt Trail.

All-terrain Vehicles—All-terrain vehicle (ATV) use is presently only allowed for the purpose of transporting big game during hunting seasons. Federal regulations require all ORVs, 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 GMP, actual designations for ORV use are still in the planning stages.

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 that accommodate horses. Concessionaire-operated activities are available through Bandy Creek Stables, and horses can be rented from licensed businesses inside and outside the park. Members of equestrian organizations visit the area often and can hold competitive events with a special use permit. Horseback riding is one of the most popular recreational activities in the park, it occurs in all but the coldest months. Approximately two-thirds of the park unit horse trails are comprised of 15- to 25-mile loops, located primarily between White Oak Creek and the Tennessee state line. Marked routes are also available for use by wagons drawn by livestock (e.g. horses or 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).

River Use

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 opportunities 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. Whitewater recreation occurs mostly in the spring and is popular with visitors from outside the local area. Commercially provided trips are available and are very popular (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.

Affected Visitor Use Areas. Well plugging activities could result in trail closures or sound disturbance at multiple trails. Well plugging activities at well sites and trails listed in the “Affected Hiking and Biking Trails” section could affect ATV visitor use. Activities could affect Mill Seat Creek Trail, which is in the ATV planning area. Well plugging activities could result in trail closures or sound disturbance at multiple horse trails, including Station Camp horse trail and Gobbler Knob horse trail. Well plugging activities could result in sound disturbance at multiple locations where rivers or other waterbodies are used by visitors, including Big South Fork River and Clear Fork River.

Environmental Consequences

Area of Analysis. The impact analysis area for evaluating direct and indirect effects is the park boundary. The area of analysis for cumulative effects was expanded to capture actions that affect visitor use both park-wide and within the Big South Fork of Cumberland watershed.

Methodology and Assumptions. Potential impacts on visitor use and experience were considered for all phases of oil and gas plugging and reclamation activities. Topics that contribute to a positive visitor experience at Big South Fork NRRA include public access, visual quality, sounds, odors, and human health and safety. The impacts to these attributes are analyzed in this section, and the assessment is based on personal observations during site visits and on discussions with NPS staff and EA team members.

In addition, the NPS developed the following definitions for intensity thresholds for impacts to visitor use and experience, including health and safety:

- **Negligible:** Visitors would likely be unaware of the effects associated with oil and gas operations and there would be no health and safety threats. 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 the oil and gas activities; however, the changes to visitor experience, use, and health and safety would be slight and would affect a small number of visitors. Current visitor experience and use would remain without derogation of park resources and values.
- **Moderate:** Changes in visitor use and experience and health and safety risks 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 (visitors could be either satisfied or dissatisfied). 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 the oil and gas activities. There would be a significant health and safety risk associated with the oil and gas operations that could affect a large number of visitors over a large geographic area. The change in visitor use and experience would affect many visitors and 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.

No Action - Alternative A. Under alternative A, the NPS would plug at least 45 known orphaned oil and gas wells (see Figure 2 in chapter 1), and reclaim associated sites and access roads, in Big South Fork NRRRA when NPS or state funding becomes available.

Plugging and reclamation activities would be closed to visitor access. The activities could restrict visitation in the park. Due to safety concerns, there may be additional stipulations on visitor access adjacent to these sites. Visitor restrictions would be limited in duration to the time needed to plug, abandon, and reclaim the operations site. Indirect impacts, such as increased noise, dust, odors, 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 the more remote southern portion of the park. There could be odors during plugging, abandonment, and reclamation operations from the exhaust of heavy equipment and from leaks and spills. Mitigation measures to reduce adverse impacts on visitor use and experience is provided by the offsets required under current legal and policy requirements, 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 the prompt cleaning of spills.

Visual impacts on visitor experience from plugging and reclamation activities would be more substantial, especially if well pads and access roads are located where visitors would be able to readily see the operation and all associated equipment. Noises from earth moving, demolition, and other equipment would be short in duration, and mitigation measures could be used to reduce engine noise and to avoid peak visitor use periods. When closure and reclamation are completed, noise levels

would return to background levels. As a result, activities related to plugging, abandonment, and reclamation of oil and gas production sites would likely be localized short-term and minor.

Due to the extended time period for the no action alternative wellhead and downhole conditions would continue to deteriorate. With the deterioration of conditions, there would be a higher risk of leaking fluids or spills causing short-term moderate impacts to visitor experience and use. Because of the potential risk visitor health and safety park staff would quickly respond to the situation and restrict visitor use of the area by closing area trails another short-term moderate impact.

Reclamation of the well pads following plugging and abandonment of the wells would serve to reduce longer-term visual impacts and eliminate the unnatural views of the park. 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. The removal of the rig and associated structures and equipment, in conjunction with site reclamation, would ultimately result in beneficial long-term impacts for visitors since the sites would be more aesthetically pleasing.

Plugging and reclamation operations should not interfere substantially with visitor access, and, when completed, would restore access to areas previously off limits to visitors. Some well sites and access roads are overgrown and are not easily utilized as hiking trails or natural areas. The clearing of vegetation would result in the ability of visitors to use and enjoy those areas that would be maintained for activities such as hiking or horse-back riding. Plugging and reclamation activities would ultimately result in beneficial long-term impacts for visitors as the sites could open up to visitor use.

Cumulative Impacts. Several cumulative actions described in the “Cumulative Impacts” section of this chapter would contribute both adverse and beneficial cumulative impacts on visitor use and experience. Oil and gas development, within and outside Big South Fork NRRRA, including new operations, would have adverse short- and long-term moderate impact on visitor use and experience from increased noise, dust, odors, lighting, human activity, and restrictions to park areas. Potential contamination of soils from leaking wells would also contribute impacts by causing closures of areas for remediation activity. Coal bed methane/shale gas drilling is an ongoing activity in the vicinity of Big South Fork NRRRA, and has impacts similar to traditional oil and gas development. Acid mine drainage and abandoned mine impacts include contamination of soils from sulfuric acid and ferric hydroxide runoff at active and abandoned coal mining sites, and trampling and compaction of soils at active mine sites, which would be detrimental to visitor experience.

Development outside the park could attract greater population in the region. Larger populations would have an adverse affect by causing more noise, pollution, and users to the park. This adverse affect to visitor use would be long-term, minor to moderate.

Exotic species are being managed by the park. The spread of non-native species presents serious problems to native vegetation and wildlife. The direct action of spot-spraying exotic species may have adverse effects on visitor use by shutting down areas temporarily. However, the overall effect is long-term, beneficial on the park because it protects the resources that visitors enjoy.

Other cumulative actions that would contribute to impacts on visitor use and experience include development and routine maintenance of facilities within the park. These activities would have short-

term localized negligible adverse cumulative impacts on visitor use and experience from noise and other disturbances (e.g., delays or closures), but would have long-term benefits for park visitors by providing adequate public facilities.

Some plans and projects within the park would also have long-term beneficial effects on visitor experience, including implementation of the GMP at Big South Fork NRRRA. This plan outlines desired resource conditions and visitor experience that would protect the park. Implementation of an official roads and trails system and standards associated with the GMP, would help maintain the quality of the trails. An oil and gas management plan is also being developed and outlines specific objectives and operating standards to protect park resources. Reclamation of abandoned mines would also have beneficial long-term effects on visitor use as oil and gas production equipment would be removed and well site areas would improve aesthetically. Other future plans include the plugging and reclamation of 11 other orphaned wells that are known to occur in the park.

Overall, when impacts of these actions are combined with the short-term minor to moderate adverse and long-term beneficial impacts of alternative A, there would be short-term negligible to moderate adverse, long-term minor to moderate adverse, and long-term beneficial cumulative impacts on visitor use and experience.

Conclusions. Plugging and reclamation activities under alternative A would result in localized short-term minor adverse impacts on visitor use and experience during implementation. The potential risk of spills due to the extended time period would result in short-term moderate adverse impacts. However, there would also be long-term beneficial effects under alternative A by removing the risks associated with unplugged wells. Overall, when impacts of these actions are combined with the short-term minor to moderate adverse and long-term beneficial impacts of alternative A, there would be short-term negligible to moderate adverse, long-term minor to moderate adverse, and long-term beneficial cumulative impacts on visitor use and experience. When compared to the broader area of analysis, the long-term beneficial effects of alternative A would move the resource toward the desired condition, and the adverse impacts under alternative A would contribute slightly to the overall cumulative impacts of all the other past, present, and reasonably foreseeable future actions.

Preferred Alternative - Alternative B. Under this alternative, the NPS would plug at least 45 known orphaned oil and gas wells (see Figure 2 in chapter 1) and reclaim associated sites and access roads in Big South Fork NRRRA as described for alternative A. The same contributing effects under alternative A would apply to alternative B. However, the risk from deteriorating conditions of equipment and the wellheads would be substantially less. Alternative B would contribute short-term minor adverse effects during plugging and reclamation activities. Long-term beneficial impacts described for alternative A would also occur under alternative B. These benefits are more likely to be realized, and would be realized sooner under alternative B because at this time funding is available from ARRA to plug and reclaim the majority of these wells.

Cumulative Impacts. The same actions identified as contributing cumulative effects under alternative A would apply to alternative B. Overall, the short-term minor adverse and long-term beneficial impacts from alternative B, when combined with the adverse and beneficial effects of these cumulative actions, would result in short-term negligible to moderate adverse, long-term minor to moderate adverse, and long-term beneficial cumulative impacts.

Conclusions. Plugging and reclamation activities under alternative B would result in localized short-term minor adverse impacts on visitor use and experience during implementation. However, there would be long-term beneficial effects under alternative B by removing the risks associated with unplugged wells. The long-term benefits are more likely to be realized and would be realized sooner under alternative B because funding is available now from ARRA to plug and reclaim the majority of these wells.

Overall, the short-term minor adverse and long-term beneficial impacts under alternative B, when combined with the adverse and beneficial effects of these cumulative actions, would result in short-term negligible to moderate adverse, long-term minor to moderate adverse, and long-term beneficial cumulative impacts. When compared to the broader area of analysis, the long-term beneficial effects of alternative B would move the resource toward the desired condition, and the adverse impacts under alternative B would contribute minimally to the overall cumulative impacts of all the other past, present, and reasonably foreseeable future actions.

PARK MANAGEMENT AND OPERATIONS

Affected Environment

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 NRRRA has approximately 50 full time employees and the number of seasonal employees varies from year to year based on available funds. There are five divisions: park management, administration, resource management, visitor services, and facility management (Blount 2009b).

Management. The annual budget of the park was \$4,458,000 as of 2009. Big South Fork NRRRA 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 NRRRA. 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 six full-time employees (Blount 2009b).

Resource Management. This division is responsible for all cultural and natural resources with regard to NEPA compliance, compliance with section 110 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, wildlife, 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 providing scientific information to ecological researchers from external institutions, biological monitoring, water quality monitoring, and the management of land records, archives, photographs, historic documents, and museum objects and artifacts associated with the park (Blount 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, and museum management technician.

Big South Fork NRRRA 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 three 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 ensure wells meet 9B regulations; and coordinating with operators for development and implementation 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 2009).

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 NRRRA. Their other responsibilities include managing special use permits, overseeing concession operations, firefighting, managing campgrounds, managing the fee program, emergency operations, attending to visitor safety, and assisting visitors. Interpretation is responsible for public outreach, education, and visitor center management. This includes activities such as outreach to schools, education programs, interpretive programs to visitors, and managing the park's website. Additionally, the interpretive section of this division staffs the visitor contact stations, including the main visitor center of the park. They also publish outreach materials, including the newsletter and all brochures. There are 15 full-time employees between both sections (Blount 2009b).

Facilities Management. This division is responsible for the care and maintenance of all Big South Fork NRRRA infrastructure including 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 2009b).

Environmental Consequences

Area of Analysis. The impact analysis area for evaluating direct and indirect effects, in addition to cumulative effects, is the park (both park operations and facilities).

Methodology and Assumptions. Discussions with park managers were held to establish an understanding of existing staffing levels and an assessment of current park operations that would be affected through implementation of the various alternatives.

In addition, the NPS developed the following definitions for intensity thresholds for impacts to park management and operations:

- **Negligible:** An action would have a no measurable impact on management or operation of the park unit.
- **Minor:** Actions would affect park management and operations in a way that would be difficult to measure. The impacts 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. Park staff workloads and priorities would need to be rearranged. Other ongoing park management programs or operations would be reduced in scope or potentially eliminated, and could be noticeable to the public.
- **Major:** Park management and operations would be noticeably affected, and would be markedly different from current conditions. Actions would require additional personnel over and above what would normally be expected to be funded.

No Action - Alternative A. Under alternative A, the NPS would plug at least 45 known orphaned oil and gas wells (see Figure 2 in chapter 1), and reclaim associated sites and access roads, in Big South Fork NRRA when NPS or state funding becomes available. Plugging would be done on a well by well basis or by small groupings of wells as funding becomes available over a period of years. Work would occur over an extended period of time and have less short-term impacts to park operations. However, threats to the environment and to public health and safety would increase as wellhead conditions continue to degrade.

Currently, a geologist and an oil and gas technician manage the park's oil and gas program and other staff members assist part-time as needed. Preparing sites, well plugging, and reclamation activities would require NPS oversight and supervision, which could temporarily cause shifts in priorities for park resource management responsibilities. Subsequent monitoring of well abandonment and site reclamation is expected to ensure that park resources are returned to approximate pre-disturbance conditions and natural conditions and processes are restored.

NPS supervision of contractors and monitoring activities would temporarily increase the workload of NPS staff, most notably in the resource management division and take away from other

responsibilities in the park during these operations. A short-term increase in work would be required for resource management staff to monitor and control exotic invasive species. There would be a short-term increased workload for the trails program in the maintenance division due to large amount of work that may be needed on the park roads and trails during the plugging projects. Road and trail work would be coordinated with the maintenance division to ensure that other work projects would not be impacted and that roads and trails would be repaired to park standards.

Visitor services would have a short-term minor adverse work impact by increasing their need to notify the public of temporary closures, and the law enforcement staff would need to ensure that unauthorized visitors and staff are not accessing work sites. There would be a long-term minor adverse impact on the law enforcement staff due to opening and improving access roads to oil and gas sites. Although roads would be closed after the work is completed, unauthorized access by ATVs, ORVs and horses may require ongoing monitoring and enforcement.

In addition, the standardized plugging and reclamation activities under alternative A would create consistent guidance for sub-contractors, which could reduce staff time dealing with plugging and reclamation requirements. Plugging and reclamation activities under alternative A would create intermittent short-term minor impacts to park management and operations over an extended period of time. Any changes in park management and operations would not be noticeable to visitors.

Ultimately, plugging and reclaiming these wells would remove the risks they pose to the park and decrease, if not ultimately eliminate oversight and monitoring requirements once reclamation is deemed successful. As a result, there would be long-term beneficial effects parks operations and management once reclamation is complete.

Cumulative Impacts. Several cumulative actions described in the “Cumulative Impacts” section of this chapter would contribute both adverse and beneficial cumulative impacts on park management and operations. Past, present and future oil and gas development within Big South Fork NRRRA would have adverse short-and long-term moderate impact on parks operations and management due to the time required of NPS staff to process plans of operations, assess the operator’s compliance with required mitigation measures, and to oversee associated activities. Potential contamination of soils from leaking wells and subsequent remediation activities would also contribute to impacts. Ongoing and future NPS plugging and reclamation activities in NRRRA include a recently completed EA to plug and reclaim 11 orphaned wells would also have intermittent, short-term, moderate effects on park management and operations. These cumulative activities could cause shifts in priorities for park resource management responsibilities. However, once complete, plugging and reclamation would have long-term beneficial effects by reducing the oversight needed for these wells.

Plans such as the GMP and oil and gas management plan contribute both adverse and beneficial impacts to park management and operations. For example, implementation of the provisions of the GMP requires staff and funding and causes priorities to shift, as does development of the oil and gas management plan. These actions can have short-term, moderate adverse impacts on park management and operations. However, these plans ultimately provide consistent guidance to NPS staff in managing the park, and help protect park resources, minimizing the oversight needed for activities such as oil and gas operations and road maintenance. As a result, these plans ultimately have long-term beneficial effects on park management and operations. Protection of park resources would

decrease remediation activities and would help to minimize exploitation of park resources and staffing.

Overall, when impacts of these actions are combined with the short- and long-term minor adverse and long-term beneficial effects of alternative A, there would be short-term minor to moderate adverse, long-term minor adverse, and long-term beneficial cumulative impacts on park management and operations.

Conclusion. Plugging and reclamation activities under alternative A would result in short- and long-term minor adverse impacts on park management and operations during implementation and until sites are fully reclaimed. However, there would be long-term beneficial effects under alternative A by removing the risks associated with unplugged wells and moving the resource toward the desired condition. Overall, when impacts of these actions are combined with the short- and long-term minor adverse and long-term beneficial effects of alternative A, there would be short-term minor to moderate adverse, long-term minor adverse, and long-term beneficial cumulative impacts on park management and operations. When compared to the broader area of analysis, the long-term beneficial effects of alternative A would move the resource toward the desired condition, and the adverse impacts would contribute minimally to the overall cumulative impacts of all the other past, present, and reasonably foreseeable future actions.

However, if well casing and wellhead equipment deteriorates to a point where there is an unregulated release of gas, oil or contaminants, there would be an increased short-term affect and a potential long-term affect on the public and park operations.

Preferred Alternative - Alternative B. Under this alternative, the NPS would plug at least 45 known orphaned oil and gas wells (see Figure 2 in chapter 1) and reclaim associated sites and access roads in Big South Fork NRR as described for alternative A. The majority of these wells would be plugged and reclaimed using funding received under ARRA

The same actions identified as contributing effects under alternative A would apply to alternative B. However, the plugging and reclamation activities under Alternative B would occur within a year after project initiation causing a more intense but short-term mobilization of park employees. This mobilization would result in short-term minor to moderate adverse impacts on park management and operations. However, there would also be long-term beneficial impacts from ultimately plugging and reclaiming the wells, due to the decreased amount of time needed for monitoring the wells. These benefits are more likely to be realized, and would be realized sooner under alternative B because at this time funding is available from ARRA to plug and reclaim the majority of these wells.

Cumulative Impacts.

The same actions identified under the cumulative effects under alternative A would apply to alternative B. Overall, when impacts of these actions are combined with the short-term minor to moderate adverse and long-term beneficial impacts of alternative B, there would be short- and long-term minor to moderate adverse and long-term beneficial cumulative impacts on park management and operations.

Conclusion. Plugging and reclamation activities under alternative B would result in short-term minor to moderate adverse impacts on park management and operations during implementation and until sites are fully reclaimed. However, there would also be long-term beneficial effects under alternative B by removing the risks associated with unplugged wells and moving the resource toward the desired condition. The long-term benefits are more likely to be realized and would be realized sooner under alternative B because funding is available now from ARRA to plug and reclaim the majority of these wells. Overall, when impacts of these actions are combined with the short-term minor to moderate adverse and long-term beneficial effects of alternative B, there would be short- and long-term minor to moderate adverse and long-term beneficial cumulative impacts on park management and operations. When compared to the broader area of analysis, the long-term beneficial effects of alternative B would move the resource toward the desired condition, and the adverse impacts under alternative B would contribute minimally to the overall adverse cumulative impacts of all the other past, present, and reasonably foreseeable future actions.

IMPAIRMENT DETERMINATION

Based on the above analysis, no impairment to geology and soils, water resources, vegetation, wetlands, wildlife and wildlife habitat, and special status species would occur under alternative A or B.

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CHAPTER 4: CONSULTATION AND COORDINATION

Throughout the development of this EA, the NPS has taken steps to provide and solicit information from federal, state, and local officials, as well as the general public. This chapter provides a summary of the outreach and consultation activities conducted during the compliance process, including a list of agencies, tribes, and other organizations that received the EA. Chapter 4 also contains lists of personnel that contributed to preparation of this EA.

HISTORY OF PUBLIC INVOLVEMENT

The public involvement activities for this Draft EA fulfill the requirements of the NEPA and 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. Taken together, internal and public scoping are essential elements of the NEPA planning process. Internal scoping involved discussions among NPS personnel regarding the purpose of and need for management actions, issues and impact topics, 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 EA, 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.

Public Notification

A Public Scoping Brochure was posted on the NPS Planning, Environment, and Public Comment (PEPC) website on October 7, 2009, and was mailed on October 8, 2009, to government agencies, tribes, organizations, businesses, and individuals. The brochure provided an overview and background of the project, the purpose of and need for action, issues and impact topics, and information on the planning process and methods for commenting.

In addition, stories announcing the NPS was seeking comment on this EA were published in four local newspapers between October 27 and October 29, 2009.

Public Comments

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.

The public was invited to submit comments on the scope of the planning process and potential alternatives from October 7 through November 6, 2009. During the public scoping period, eight unique pieces of correspondence were entered into the PEPC database either from direct entry by the commenter, or uploading of emails and hard copy letters by NPS staff.

All scoping comments were considered to be important as useful guidance and public input to the public scoping process. Comments in favor of or against the proposed action or alternatives, those that only agree or disagree with NPS policy, and those that offer opinions or provide information not directly related to the issues or impact analysis were considered non-substantive comments. Although the analysis process attempts to capture the full range of public concerns, it is important to note that comments from people who chose to respond do not necessarily represent the sentiments of the entire public.

Of the 24 comments received, 16 were related to the alternatives; four were related to impacts of the alternatives; three were related to consultation and coordination; and one was related to private oil and gas operators.

Agency Consultation

Letters of consultation under Section 7 of the ESA and Section 106 of the *National Historic Preservation Act* were sent to the USFWS, the Tennessee SHPO, and the Kentucky SHPO on October 7, 2009. Copies of these letters are provided in appendix A.

A response was received from the USFWS on November 16, 2009 (see appendix A) which identified species that may be affected by the proposed well plugging and reclamation. The USFWS response also requested that the NPS prepare a biological assessment to complete consultation under Section 7 of the ESA. As a result, the NPS has prepared a biological assessment that was submitted separately from this EA to fulfill this request and meet their obligations for compliance with the ESA.

After additional discussion on November 9, 2009, the Tennessee SHPO responded on November 12, 2009, concluding “there are no National Register of Historic Places listed or eligible properties affected by this undertaking.” In their response dated November 6, 2009, the Kentucky SHPO indicated they “consider the oil wells potentially eligible but the plugging of the oil wells to have No Adverse Effect if the location of each is thoroughly documented, including GPS coordinates and photo documentation.” Copies of these response letters are provided in appendix A.

The TDEC (Division of Water Pollution Control) and the KDNR (Division of Oil and Gas) also received a letter mailed on October 7, 2009. To date, no response has been received from these agencies.

Tribal Consultation

On October 7, 2009, the Superintendent of Big South Fork NRRRA sent a letter to the following Native American tribes (see appendix A), pursuant to Section 106 of the *National Historic Preservation Act*, which requires consultation with federally recognized tribes on a government-to-government basis;

- Cherokee Nation
- Chickasaw Nation
- Eastern Band of Cherokee Indians
- Eastern Shawnee Tribe of Oklahoma
- United Keetoowah Band of Cherokee Indians in Oklahoma
- Shawnee Tribe
- Absentee-Shawnee Tribe of Oklahoma

To date, one response was received from the Eastern Band of the Cherokee Indians (see appendix A). It is their opinion that the proposed action would not result in any new disturbance that would adversely affect any sites eligible for inclusion on the National Register of Historic Places.

LIST OF RECIPIENTS OF THE DRAFT ENVIRONMENTAL ASSESSMENT

The EA was sent to the following agencies, organizations, and businesses, as well as to other entities and individuals that requested a copy.

Federal Departments and Agencies

United States House of Representatives
Department of the Interior
 National Park Service
 Daniel Boone National Forest
 Office of Surface Mining
United States Environmental Protection Agency
 Atlanta Federal Center High Rise
United States Department of Agriculture Natural Resource Conservation Service
United States Army Corps of Engineers
United States Fish and Wildlife Service
United States Geological Survey
United States Senate
Advisory Council on Historic Preservation

Kentucky 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 Division
Kentucky Heritage Council
Kentucky House of Representatives
Kentucky Nature Preserves Commission
Kentucky Resources Council
Kentucky Senate
McCreary County
McCreary County Heritage Foundation
Wayne County

Tennessee Governmental Agencies

Division of Air Pollution Control
East Tennessee Development District
Fentress County
Morgan County
Pickett County
Tennessee Department of Agriculture
Tennessee Department of Conservation

Tennessee Department of Economic and Community Development
Tennessee Department of Environment and Conservation
 Environmental Policy Office
Tennessee Department of Natural Areas
Tennessee Department of Transportation
Tennessee Historical Commission
 Tennessee State Historical Preservation
Tennessee House of Representatives
Tennessee Senate
Tennessee State Parks
Tennessee Wildlife Resources Agency
Scott County

Virginia Governmental Agencies

Virginia Department of Game and Inland Fisheries

Native American Tribes

Cherokee Nation
Chickasaw Nation
Eastern Band of Cherokee Indians
Eastern Shawnee Tribe of Oklahoma
United Keetoowah Band of Cherokee Indians in Oklahoma
Shawnee Tribe
Absentee-Shawnee Tribe of Oklahoma

Organizations/Others

Bluegrass Wildwater Association
Bowater, Inc.
Charit Creek Lodge
Chattanooga Arabian Horse Club
Coalition for Global Warming Solutions
East Tennessee Whitewater Association
Eastern Professional River Outfitters
Goss, Sandra K.
Historic Rugby
Kentucky Nature Conservancy
Kentucky Oil and Gas Association
Save Our Cumberland Mountains
Sheltowee Trace Outfitters
Sierra Club
 Upper Cumberland Group
Society for Species Management and Survival
Station Camp Horse Camp
Tennessee Citizens for Wilderness Planning
Tennessee Clean Water Network
Tennessee Oil & Gas Association
Tennessee Parks and Greenways Foundation
Tennessee Scenic Rivers Association

Tennessee Trail Blazers
The Nature Conservancy of Tennessee
TVA
United Mountain Defense
University of Kentucky, Wildlife Extension Specialist
Van Stockum Law Office

LIST OF PREPARERS

Name	Title
------	-------

National Park Service, Big South Fork NRR

Steve Bakaletz	Wildlife Biologist, Big South Fork NRR
Tom Blount	Chief of Resource Management, Big South Fork NRR
Ron Cornelius	GIS Specialist, Big South Fork NRR
Tom DesJean	Cultural Resource Specialist/Archeologist, Big South Fork NRR
Marie Kerr	Botanist, Big South Fork NRR
Todd Knoedler	Geologist, Big South Fork NRR
Etta Spradlin	Biological Science Technician, Big South Fork NRR
Phyllis Trabold	Community Planner, Big South Fork NRR (Retired)

National Park Service, Denver Service Center

Margo Davis	Cultural Resource Specialist
Ginger Molitor	Natural Resource Specialist

National Park Service, Geologic Resource Division

Pat O'Dell	Petroleum Engineer
------------	--------------------

The Louis Berger Group

Stephen Anderson	Archeologist/GIS Analyst
Lucy Bambrey	Cultural Resource Specialist
Heather Beers	Technical Editor
Paul Bonaventura	Senior Communications Specialist
Wendy Chapin- Fields	Executive Assistant
Jeff Gutierrez	Environmental Planner
Dan Niosi	Project Manager/Environmental Scientist
Josh Schnabel	Environmental Planner
Denise Short	Senior Technical Editor
Chris Thomas	Ecologist/GIS Specialist
Laura Totten	Senior Ecologist
Nancy Van Dyke	Senior Consultant
Landon Vine	Environmental Scientist

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APPENDIX A—CONSULTATION AND COORDINATION



United States Department of the Interior



National Park Service
Big South Fork
National River and Recreation Area
4564 Leatherwood Road
Oneida, Tennessee 37841

L7617

OCT 07 2009

Joe Garrison
Tennessee Historical Commission
Tennessee State Historic Preservation Office
2941 Lebanon Road
Nashville, TN 37243-0042

Dear Mr. Garrison:


The National Park Service (NPS) is preparing an Environmental Assessment (EA) on a proposed project to plug and reclaim abandoned oil and natural gas (gas) wells at Big South Fork National River and Recreation Area. The purpose of this letter is to obtain your Department's comments on this project. The project background, including a map of wells that would be plugged and reclaimed, is described in the enclosed scoping brochure.

The EA will analyze and document potential environmental effects associated with NPS proposed plans to plug and reclaim abandoned oil and gas wells. The EA is being prepared in strict accordance with the National Environmental Policy Act of 1969 (NEPA), as amended (42 USC 4321 et seq.); the Council on Environmental Quality (CEQ) Regulations (40 CFR 1500-1508); and NPS Director's Order 12.

If you have questions or require further information, please contact me at the address above, by phone at 423-569-9778 or email at biso_superintendent@nps.gov.

We are looking forward to your reply and thank you in advance for your cooperation in this matter.

Sincerely,


Stennis R. Young
Superintendent

Enclosure



United States Department of the Interior

National Park Service
Big South Fork
National River and Recreation Area
4564 Leatherwood Road
Oneida, Tennessee 37841



L7617

OCT 07 2009

Mark E. Dennen
Kentucky Heritage Council
Kentucky State Historic Preservation Office
300 Washington Street
Frankfort, KY 40601

Dear Mr. Dennen:

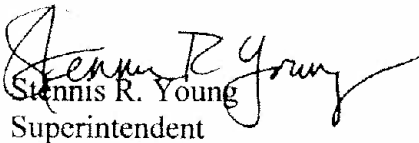
The National Park Service (NPS) is preparing an Environmental Assessment (EA) on a proposed project to plug and reclaim abandoned oil and natural gas (gas) wells at Big South Fork National River and Recreation Area. The purpose of this letter is to obtain your Department's comments on this project. The project background, including a map of wells that would be plugged and reclaimed, is described in the enclosed scoping brochure.

The EA will analyze and document potential environmental effects associated with NPS proposed plans to plug and reclaim abandoned oil and gas wells. The EA is being prepared in strict accordance with the National Environmental Policy Act of 1969 (NEPA), as amended (42 USC 4321 et seq.); the Council on Environmental Quality (CEQ) Regulations (40 CFR 1500-1508); and NPS Director's Order 12.

If you have questions or require further information, please contact me at the address above, by phone at 423-569-9778 or email at biso_superintendent@nps.gov.

We are looking forward to your reply and thank you in advance for your cooperation in this matter.

Sincerely,


Dennis R. Young
Superintendent

Enclosure



United States Department of the Interior



National Park Service
Big South Fork
National River and Recreation Area
4564 Leatherwood Road
Oneida, Tennessee 37841

L7617

OCT 07 2009

Mary Jennings, Field Supervisor
United States Fish and Wildlife Service
Tennessee Ecological Services Field Office
446 Neal Street
Cookeville, TN 38501

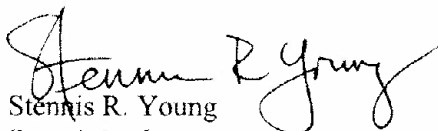
Dear Ms. Jennings:

The National Park Service (NPS) is preparing an Environmental Assessment (EA) on a proposed project to plug and reclaim abandoned oil and natural gas (gas) wells at Big South Fork National River and Recreation Area (park unit). The purpose of this letter is to obtain your Department's comments on this project pursuant to the Fish and Wildlife Coordination Act, as amended; to request a list of any federally-listed threatened or endangered species that may occur in the area; and to initiate informal Section 7 consultation. The project background, including a map of wells that would be plugged and reclaimed, is described in the enclosed scoping brochure.

The EA will analyze and document potential environmental effects associated with NPS proposed plans to plug and reclaim abandoned oil and gas wells. The EA is being prepared in strict accordance with the National Environmental Policy Act of 1969 (NEPA), as amended (42 USC 4321 et seq.); the Council on Environmental Quality (CEQ) Regulations (40 CFR 1500-1508); and NPS Director's Order 12.

If you have questions or require further information, please contact me at the address above, by phone at 423-569-9778 or email at biso_superintendent@nps.gov. We are looking forward to your reply and thank you in advance for your cooperation in this matter.

Sincerely,


Stennis R. Young
Superintendent

Enclosure

cc: Lee Andrews, Kentucky Ecological Services Field Station



United States Department of the Interior

National Park Service
Big South Fork
National River and Recreation Area
4564 Leatherwood Road
Oneida, Tennessee 37841



L7617

OCT 07 2008

Paul Schmierbach
Tennessee Department of Environment and Conservation
Water Pollution Control
Knoxville Environmental Field Office
3711 Middlebrook Pike
Knoxville, TN 37921

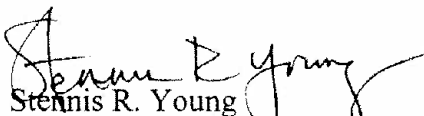
Dear Mr. Schmierbach:

The National Park Service (NPS) is preparing an Environmental Assessment (EA) on a proposed project to plug and reclaim abandoned oil and natural gas (gas) wells at Big South Fork National River and Recreation Area. The purpose of this letter is to obtain your Department's comments on this project. The project background, including a map of wells that would be plugged and reclaimed, is described in the enclosed scoping brochure.

The EA will analyze and document potential environmental effects associated with NPS proposed plans to plug and reclaim abandoned oil and gas wells. The EA is being prepared in strict accordance with the National Environmental Policy Act of 1969 (NEPA), as amended (42 USC 4321 et seq.); the Council on Environmental Quality (CEQ) Regulations (40 CFR 1500-1508); and NPS Director's Order 12.

If you have questions or require further information, please contact me at the address above, by phone at 423-569-9778 or email at biso_superintendent@nps.gov. We are looking forward to your reply and thank you in advance for your cooperation in this matter.

Sincerely,


Stennis R. Young
Superintendent

Enclosures



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



L7617

OCT 07 2009

Bill Anoatubby, Governor
Chickasaw Nation
P.O. Box 1548
Ada, OK 74821

Dear Governor Anoatubby:

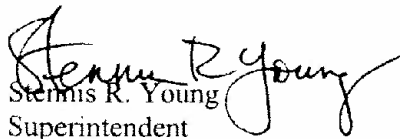
Federal regulations for the implementation of Section 106 of the National Historic Preservation Act of 1966, as amended, require consultation with federally recognized American Indian tribes (36 CFR 800.2) on a government-to-government basis, as specified in Executive Order 13175. The administration of the Big South Fork National River and Recreation Area 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 project to plug and reclaim abandoned oil and natural gas (gas) wells at Big South Fork National River and Recreation Area. We are also making a similar inquiry of six other tribal governments traditionally associated with Eastern Tennessee. The project background, including a map of wells that would be plugged and reclaimed, is described in the enclosed scoping brochure.

If the Chickasaw Nation wishes to consult with the National Park Service regarding the proposed project 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, 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,


Stennis R. Young
Superintendent

Enclosure





United States Department of the Interior



National Park Service
Big South Fork
National River and Recreation Area
4564 Leatherwood Road
Oneida, Tennessee 37841

L7617

OCT 07 2009

Marvin Combs, Assistant Director
Kentucky Department of Natural Resources
Division of Oil and Gas
P.O. Box 2244
Frankfort, KY 40601

Dear Mr. Combs:

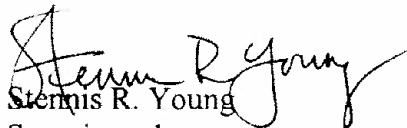
The National Park Service (NPS) is preparing an Environmental Assessment (EA) on a proposed project to plug and reclaim abandoned oil and natural gas (gas) wells at Big South Fork National River and Recreation Area. The purpose of this letter is to obtain your Department's comments on this project. The project background, including a map of wells that would be plugged and reclaimed, is described in the enclosed scoping brochure.

The EA will analyze and document potential environmental effects associated with NPS proposed plans to plug and reclaim abandoned oil and gas wells. The EA is being prepared in strict accordance with the National Environmental Policy Act of 1969 (NEPA), as amended (42 USC 4321 et seq.); the Council on Environmental Quality (CEQ) Regulations (40 CFR 1500-1508); and NPS Director's Order 12.

If you have questions or require further information, please contact me at the address above, by phone at 423-569-9778 or email at biso_superintendent@nps.gov.

We are looking forward to your reply and thank you in advance for your cooperation in this matter.

Sincerely,


Stennis R. Young
Superintendent

Enclosure



United States Department of the Interior



National Park Service
Big South Fork
National River and Recreation Area
4564 Leatherwood Road
Oneida, Tennessee 37841

L7617

OCT 07 2009

Paul E. Davis, Director
Tennessee Department of Environment and Conservation
Division of Water Pollution Control
6th Floor, L & C Annex
401 Church Street, Nashville, TN 37243

Dear Mr. Davis:

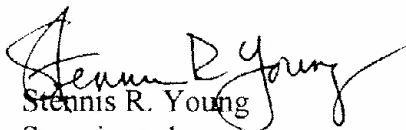
The National Park Service (NPS) is preparing an Environmental Assessment (EA) on a proposed project to plug and reclaim abandoned oil and natural gas (gas) wells at Big South Fork National River and Recreation Area. The purpose of this letter is to obtain your Department's comments on this project. The project background, including a map of wells that would be plugged and reclaimed, is described in the enclosed scoping brochure.

The EA will analyze and document potential environmental effects associated with NPS proposed plans to plug and reclaim abandoned oil and gas wells. The EA is being prepared in strict accordance with the National Environmental Policy Act of 1969 (NEPA), as amended (42 USC 4321 et seq.); the Council on Environmental Quality (CEQ) Regulations (40 CFR 1500-1508); and NPS Director's Order 12.

If you have questions or require further information, 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.

We are looking forward to your reply and thank you in advance for your cooperation in this matter.

Sincerely,


Steinn R. Young
Superintendent

Enclosure



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



L7617

OCT 07 2009

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 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 project to plug and reclaim abandoned oil and natural gas (gas) wells at Big South Fork National River and Recreation Area. We are also making a similar inquiry of six other tribal governments traditionally associated with Eastern Tennessee. The project background, including a map of wells that would be plugged and reclaimed, is described in the enclosed scoping brochure.

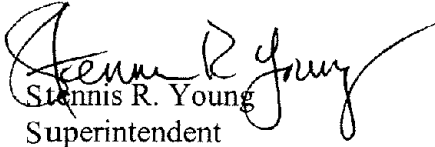
If the Eastern Shawnee Tribe of Oklahoma wishes to consult with the National Park Service regarding the proposed project as provided for under the regulations for the National Historic Preservation Act, please contact me at the address above, by phone at 423-569-9778 or email at biso_superintendent@nps.gov 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, 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,


Dennis R. Young
Superintendent

Enclosures



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



L7617

OCT 07 2009

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 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 project to plug and reclaim abandoned oil and natural gas (gas) wells at Big South Fork National River and Recreation Area. We are also making a similar inquiry of six other tribal governments traditionally associated with Eastern Tennessee. The project background, including a map of wells that would be plugged and reclaimed, is described in the enclosed scoping brochure.

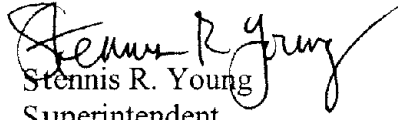
If the Absentee-Shawnee Tribe of Oklahoma wishes to consult with the National Park Service regarding the proposed project as provided for under the regulations for the National Historic Preservation Act, please contact me at the address above, by phone at 423-569-9778 or email at biso_superintendent@nps.gov 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, 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,


Stennis R. Young
Superintendent

Enclosure

cc: Ms. Karen Kaniatobe, THPO



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



L7617

OCT 07 2009

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 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.

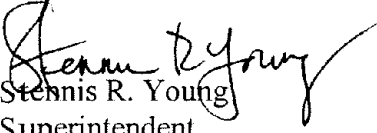
As part of my responsibility to "make a reasonable and good faith effort to identify Indian tribes...that shall be consulted in the 106 process," I am writing to inquire if the Shawnee Tribe desires to consult with the National Park Service regarding a proposed project to plug and reclaim abandoned oil and natural gas (gas) wells at Big South Fork National River and Recreation Area. We are also making a similar inquiry of six other tribal governments traditionally associated with Eastern Tennessee. The project background, including a map of wells that would be plugged and reclaimed, is described in the enclosed scoping brochure.

If the Shawnee Tribe wishes to consult with the National Park Service regarding the proposed project 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, 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,



Stennis R. Young
Superintendent

Enclosures

cc: Ms. Rebecca Hawkins, Administrator/THPO



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



L7617

OCT 07 2009

Chad "Comtassle" 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 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.

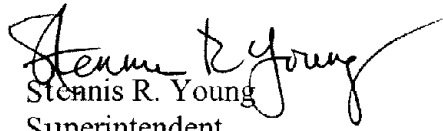
As part of my responsibility to "make a reasonable and good faith effort to identify Indian tribes...that shall be consulted in the 106 process," I am writing to inquire if the Cherokee Nation desires to consult with the National Park Service regarding a proposed project to plug and reclaim abandoned oil and natural gas (gas) wells at Big South Fork National River and Recreation Area. We are also making a similar inquiry of six other tribal governments traditionally associated with Eastern Tennessee. The project background, including a map of wells that would be plugged and reclaimed, is described in the enclosed scoping brochure.

If the Cherokee Nation wishes to consult with the National Park Service regarding the proposed project 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, 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,


Stennis R. Young
Superintendent

Enclosure



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



L7617

OCT 07 2009

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 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 project to plug and reclaim abandoned oil and natural gas (gas) wells at Big South Fork National River and Recreation Area. We are also making a similar inquiry of six other tribal governments traditionally associated with Eastern Tennessee. The project background, including a map of wells that would be plugged and reclaimed, is described in the enclosed scoping brochure.

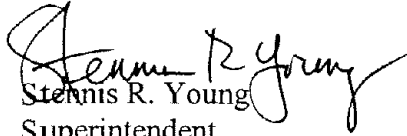
If the United Keetoowah Band of Cherokee Indians in Oklahoma wishes to consult with the National Park Service regarding the proposed project as provided for under the regulations for the National Historic Preservation Act, please contact me at the address above, by phone at 423-569-9778 or email at biso_superintendent@nps.gov 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, 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,


Stennis R. Young
Superintendent

Enclosure

cc: Lisa C. Stopp, Acting THPO



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



L 7617

OCT 07 2009

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 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 project to plug and reclaim abandoned oil and natural gas (gas) wells at Big South Fork National River and Recreation Area. We are also making a similar inquiry of six other tribal governments traditionally associated with Eastern Tennessee. The project background, including a map of wells that would be plugged and reclaimed, is described in the enclosed scoping brochure.

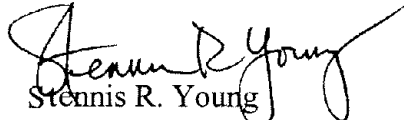
If the Eastern Band of Cherokee Indians wishes to consult with the National Park Service regarding the proposed project as provided for under the regulations for the National Historic Preservation Act, please contact me at the address above, by phone at 423-569-9778 or email at biso_superintendent@nps.gov 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, 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,



Stennis R. Young
Superintendent

Enclosure

cc: Russell Townsend, THPO



United States Department of the Interior

FISH AND WILDLIFE SERVICE

446 Neal Street
Cookeville, TN 38501

November 12, 2009

COPY

RECEIVED

NOV 16 2009

Big South Fork NRRRA

Mr. Stennis Young
Superintendent
Big South Fork National River and Recreation Area
4564 Leatherwood Road
Oneida, Tennessee 37841

Re: FWS #2010-CPA-0052

Dear Mr. Young:

Thank you for your letter and enclosure of October 7, 2009, concerning preparation of an environmental assessment for the proposed plugging and reclamation of abandoned gas and oil wells on the Big South Fork National River and Recreation Area. Fish and Wildlife Service biologists have reviewed the information submitted and we offer the following comments.

Our endangered species database indicates that the following federally listed species may occur in the impact area of the proposed action:

Duskytail darter – *Etheostoma percnurum* (E)

Cumberland bean – *Villosa trabalis* (E)

Cumberland elktoe – *Alasmidonta atropurpurea* (E)

Cumberlandian combshell – *Epioblasma brevidens* (E)

Tan riffleshell – *Epioblasma walkeri* (E)

Littlewing pearlymussel – *Pegias fabula* (E)

Cumberland sandwort – *Arenaria cumberlandensis* (E)

Cumberland rosemary – *Conradina verticillata* (T)

Virginia spiraea – *Spiraea virginiana* (E)

The environmental assessment should contain an evaluation of potential impacts to these species and describe measures that will be implemented to avoid impacts. Please note, however, that preparation and approval of an environmental assessment does not constitute compliance with the Endangered Species Act. You should also prepare a biological assessment with findings of whether or not the proposed action is likely to adversely affect the species. The biological assessment may be prepared concurrently with the environmental assessment, but it should be a “stand alone” document. It may be attached as an appendix to the environmental assessment.

Thank you for the opportunity to comment. If you have any questions, please contact Jim Widlak of my staff at 931/528-6481, ext. 202.

Sincerely,

A handwritten signature in blue ink that reads "Mary E. Jennings". The signature is written in a cursive style with a large, stylized "M" and "J".

Mary E. Jennings
Field Supervisor

RECEIVED

NOV 18 2009



November 12, 2009

TENNESSEE HISTORICAL COMMISSION
DEPARTMENT OF ENVIRONMENT AND CONSERVATION
2941 LEBANON ROAD
NASHVILLE, TN 37243-0442
(615) 532-1550

Big South Fork NRRA

Mr. Stennis Young
Big South Fork NRRA
4564 Leatherwood Road
Oneida, Tennessee, 37841

COPY

RE: NPS, OIL & GAS WELLS CAPPING, UNINCORPORATED, MULTI COUNTY

Dear Mr. Young:

In response to your request, received on Monday, November 9, 2009, we have reviewed the documents you submitted regarding your proposed undertaking. Our review of and comment on your proposed undertaking are among the requirements of Section 106 of the National Historic Preservation Act. This Act requires federal agencies or applicant for federal assistance to consult with the appropriate State Historic Preservation Office before they carry out their proposed undertakings. The Advisory Council on Historic Preservation has codified procedures for carrying out Section 106 review in 36 CFR 800. You may wish to familiarize yourself with these procedures (Federal Register, December 12, 2000, pages 77698-77739) if you are unsure about the Section 106 process.

After considering the documents you submitted, we determine that THERE ARE NO NATIONAL REGISTER OF HISTORIC PLACES LISTED OR ELIGIBLE PROPERTIES AFFECTED BY THIS UNDERTAKING. We have made this determination either because of the specific location, scope and/or nature of your undertaking, and/or because of the size of the area of potential effect; or because no listed or eligible properties exist in the area of potential effect; or because the undertaking will not alter any characteristics of an identified eligible or listed property that qualify the property for listing in the National Register or alter such property's location, setting or use. Therefore, we have no objections to your proceeding with your undertaking.

If your agency proposes any modifications in current project plans or discovers any archaeological remains during the ground disturbance or construction phase, please contact this office to determine what further action, if any, will be necessary to comply with Section 106 of the National Historic Preservation Act. If you are applying for federal funds, license or permit, you should submit this letter as evidence of consultation under Section 106 to the appropriate federal agency, which, in turn, should contact us as required by 36 CFR 800. If you represent a federal agency, you should submit a formal determination of eligibility and effect to us for comment. You may find additional information concerning the Section 106 process and the Tennessee SHPO's documentation requirements at <http://www.tennessee.gov/environment/hist/federal/sect106.shtm>. You may direct questions or comments to Joe Garrison (615) 532-1550-103. This office appreciates your cooperation.

Sincerely,

E. Patrick McIntyre, Jr.
Executive Director and
State Historic Preservation Officer

EPM/jyg



STEVEN L. BESHEAR
GOVERNOR

**TOURISM, ARTS AND HERITAGE CABINET
KENTUCKY HERITAGE COUNCIL**

MARCHETA SPARROW
SECRETARY

THE STATE HISTORIC PRESERVATION OFFICE
300 WASHINGTON STREET
FRANKFORT, KENTUCKY 40601
PHONE (502) 564-7005
FAX (502) 564-5820
www.heritage.ky.gov

MARK DENNEN
EXECUTIVE DIRECTOR AND
STATE HISTORIC PRESERVATION OFFICER

November 6, 2009

Mr. Stennis R. Young
National Park Service
Big South Fork National River and Recreation Area
4564 Leatherwood Road
Oneida, TN 37841

Re: Abandoned oil and natural gas wells

Dear Mr. Young:

We have reviewed your correspondence on the above-mentioned project. As indicated there are nine wells that are to be plugged within the Big South Fork National River and Recreation Area. These abandoned wells posed many issues, including health and safety of the visitors to the park. A number similar oil wells have been documented in the Daniel Boone National Forest. In Estill County Kentucky, an industrial complex related to the oil industry has been determined to be eligible for listing in the National Register of Historic Places and the abandoned oil wells throughout the nearby area to be contributing resources. With the situation in the Big South Fork, we consider the oil wells to be potentially eligible but the plugging of the oil wells to have **No Adverse Effect** if the location of each is thoroughly documented, including GPS coordinates and photo documentation. We also suggest that the Park consider developing a context for the oil industry in the Big South Fork area, including the history of the oil workers in the area, the economics of oil and the downturn of the oil industry.

If you have any questions, please do not hesitate to contact Lori Stahlgren of my staff at (502) 564-7005 ext 151.

Sincerely,

Mark Dennen, Executive Director
Kentucky Heritage Council and
State Historic Preservation Officer

LCS/lcs

Big South Fork NRRRA Obad WSR				
RECEIVED				
NOV 12 2009				
Act	Info	Unit	Init	Date
	✓	Superintendent	SD	11/13
		Chief of Admin		
		Chief of Vis Ser		
		Br Chief of Vis Ser		
		Chief of Maint		
	✓	Chief of Reg Mgmt	BS	11/13
		Files		
		Manager, OBED		
	✓	ETRA		





Eastern Band of Cherokee Indians
Tribal Historic Preservation Office
P.O. Box 455
Cherokee, NC 28719
Ph: 828-554-6852 Fax 828-488-2462

DATE: October 16, 2009

TO: National Park Service
Big South Fork
National River and Recreation Area
Attn: Tom Des Jean
4564 Leatherwood Road
Oneida, TN 37841

PROJECT(S):

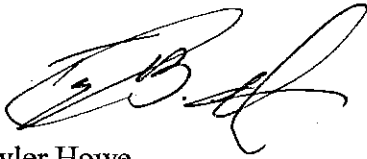
- 1). (Project ID: 23212), Annual NPS Routine Parkwide Trail Maintenance FY 2009.
- 2). (Project ID: 26459 ARRA), Replace Inefficient Restroom Facilities.
- 3). (Project ID: 26457 ARRA), Replace Roof of Stearns Ranger District.
- 4). (Project ID: 24976), Install Gate to Protect Visitors and Preserve Resource Habitat.
- 5). (Project ID: 24977), Close Eight Hazardous Abandoned Oil and Gas Wells and Restore Natural Landscape.

The Tribal Historic Preservation Office of the Eastern Band of Cherokee Indians would like to thank you for the opportunity to comment on this proposed Section 106 activity under 36 C.F.R. 800.

It is the opinion of the EBCI THPO that the proposed undertaking will not result in any new ground disturbing activities which might adversely affect any sites eligible for inclusion on the National Register of Historic Places. As such, the EBCI THPO believes that the proposed project may proceed as planned. In the event that project plans change, or cultural resources or human remains are discovered, all work should cease, and this office should be contacted to continue government to government consultation as defined under Section 106 of the National Historic Preservation Act of 1966, as amended.

If we can be of further service feel free to contact me at (828) 554-6852.

Sincerely,

A handwritten signature in black ink, appearing to read 'T. Howe', with a large, stylized 'H' and a long, sweeping underline.

Tyler Howe
Tribal Historic Preservation Specialist
Eastern Band of Cherokee Indians



STATE OF TENNESSEE
DEPARTMENT OF ENVIRONMENT AND CONSERVATION

Division of Resource Management
Tennessee Natural Heritage Program
7th Floor L&C Annex
401 Church Street
Nashville, Tennessee 37243
Phone 615/532-0431 Fax 615/532-0046

October 27, 2009

Superintendent
Big South Fork NRRA
4564 Leatherwood Road
Oneida, Tennessee 37841

Attn: Plug and Reclaim Abandoned Oil and Gas Wells

I am responding to the oil and gas well plugging and reclamation project scoping in which you seek comments related to the planned activities. The Tennessee Natural Heritage Program has a long and positive working relationship with Big South Fork (BISO) staff from our shared goals of rare species and natural community searches, monitoring and management, as well as management of two state natural areas that predate the creation of the national river and recreation area.

We concur with the need, and support the plans, to plug and reclaim abandoned oil and natural gas wells at BISO and agree that such actions will reduce environmental risks including subsurface and groundwater contamination and provide for greater public safety. We support abandonment of roads no longer needed and support the natural revegetation or, when required, reclamation with native species. We do ask that you consult with our division should any of the proposed activities lie within either of the two state natural areas, Honey Creek and Twin Arches, or if actions might impact state or federally listed species.

Thank you for the opportunity to comment and we wish you the best for this project.

Sincerely,

A handwritten signature in black ink that reads "Roger McCoy". The signature is written in a cursive, slightly slanted style.

Roger McCoy
Natural Heritage Inventory Coordinator
Roger.mccoy@tn.gov

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APPENDIX B—ADDITIONAL DETAILS OF WELL PLUGGING

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 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 National Park Service Representative 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 National Park Service representative .

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 National Park Service representative. In case of failure by the contractor to comply promptly with any order by the National Park Service representative to remove rejected material and workmanship, the National Park Service representative 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 National Park Service representative. 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 National Park Service representative 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 National Park Service representative 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 National Park Service representative. The Contractor shall be present along with his supervisor 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 National Park Service representative 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

Project completion will be within 365 days from the contract award date. 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 such as high river base flow and above average rainfall. 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 National Park Service representative.

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 or chipped and scattered in the woods. Material placed to the sides of the road should not be left in large piles and should be pushed into the woods. 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 BSFNRRRA 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 BSFNRRRA 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.

Standing water in access roads will be drained and depressions will be filled in order to allow access by equipment. Fill material and/or limestone rock may be used at the discretion of the project officer. Where standing water has been drained (mud holes) and at the outlets of water bars, staked straw bales and/or sediment traps will be installed.

Any gravel used on access roads will not be removed after construction.

Gravel size will be at the discretion of the project officer, see section on Road Rock.

Measurement and payment for upgrading and maintaining access roads shall be one job for all work completed and accepted. Payment shall be made lump sum price which will be full compensation for

furnishing materials, labor, supervision, equipment and all incidentals necessary to complete the work. Payment of road rock will be separate.

Road Rock. The contractor will be responsible for supplying and applying road rock where necessary. The project officer will designate the size and location of the gravel to be applied. Screened gravel (gravel without fine material) is required. Any road rock used on access roads will not be removed. Exceptions to this statement may apply in areas of cultural or historic significance. The decision to remove or leave gravel in place on the production pads will be at the discretion of the National Park Service Representative. For example, rock would be removed at cultural sites if it affects the cultural landscape and on other sites if it impedes natural restoration.

Measurement and payment for stone placed on access roads, production pads or in mud holes shall be to the nearest ton supplied, placed and accepted. Weight tickets will be required for all stone used on this project. Payment for rock will be made at the unit price bid per ton.

Temporary Drainage. This item includes any temporary drainage ditches necessary to facilitate work, or to divert water away from all work areas. All temporary ditches and other erosion and sediment control measures shall be maintained in serviceable condition until such time as they are no longer needed.

Sediment Control Measures. Sediment runoff shall be controlled by the placement of silt fences, straw bales, sediment sumps and rock check dams at the locations outlined by the project officer at the time of construction. Standard size straw bales shall be utilized, secured to the ground with 2" x 2" x 4' wooden stakes. The sediment control structures shall be properly maintained during construction. If damaged or destroyed, erosion control structures shall be immediately repaired or replaced at the Contractor's expense.

Road and Site Security. Some roads may require the contractor to install gates. The number of gates will be identified when contract specs are finalized. Access roads will be chained or cabled during construction and plugging activities to prevent unauthorized use, as requested by the project officer or his/her authorized representative. All chains or cables will be provided and secured by BSFNRRRA personnel. Keys will be made available to the contractor and the project officer.

Garbage Removal. The Contractor shall be responsible for managing debris. Any household garbage, debris associated with the plugging operation, rubbish, metal or other man made cleared and grubbed material shall be disposed of in a licensed landfill. Landfill tickets shall be required to indicate proof of proper disposal.

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 or their designee 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 than 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. Waste manifests shall be required to indicate proof of proper disposal.

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. For sites located adjacent to streams or identified as high risk for downstream or downhill resource impacts, spill containment materials and equipment will be staged on-site to prevent loss of fluids.

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 or spills that have no potential to travel off-site, 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 or spills that may immediately impact sensitive resources, actions will be taken 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. For sites located adjacent to streams or identified a high risk for downstream or downhill resources, spill containment materials and equipment will be staged on-site to prevent loss of fluids.

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 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. Proof of proper disposal shall be required.

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. Where oil and gas access roads coincide with established horse and/or multiple use trails, the contractor will restore these trails to General Management Plan specifications upon egress.

Obvious surficial hydrocarbon contamination would be removed by the contractor. Should contamination be discovered in quantities or concentrations that would require additional 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:

<u>Seed Material</u>	<u>lbs/acre</u>
little bluestem (<i>Andropogon scoparius</i>)	3 lbs/acre
indian grass (<i>Sorghastrum nutans</i>)	3 lbs/acre
big bluestem (<i>Andropogon gerardi</i>)	3 lbs/acre
switchgrass (<i>Panicum virgatum</i>)	1 lb/acre
winter/common oats (<i>Avena sativa</i>)	30 lbs/acre

Virginia wild rye (<i>Elymus virginicus</i>)	10 lbs
crimson clover (<i>Trifolium incarnatum</i>)	15 lbs/acre
partridge pea (<i>Chamaecrista fasciculata</i>)	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 will be used as needed to meet state erosion control standards or as deemed appropriate by the on-site project lead. 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 National Park Service representative before shipments are made so that arrangements can be made for inspection and testing of stock.

The vendor shall furnish the National Park Service representative 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 National Park Service representative, 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 National Park Service representative. 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.

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**APPENDIX C— SUMMARY OF ACCESS, PLUGGING, AND RECLAMATION
REQUIREMENTS FOR 45 KNOWN ORPHANED OIL AND GAS WELLS**

Well Plugging and Surface Reclamation for 45 Known Wells

Well Number	Location in Park, Site Access	Vegetative Clearing Requirements	Structures to be Removed	Well Pad and Access Road Reclamation
350	In gorge. Access via O&W Road and travel 100 meters to beginning of access road to well. Access road, no future use listed in the GMP. Estimated time to open access is 0.5 day.	Clear site and access road overgrown with small live trees and downed trees.	Surface casing cut off and covered. Remove barrel tank.	O&W Road would be repaired and retained. Access road would be blocked and reclaimed to natural conditions. Well site area would be replanted with native seeds.
481	Adjacent area, access via the Confluence Road. This road is identified in the Big South Fork GMP. Estimated time to open access is 1.0 day.	Clear site and access road overgrown with pine regrowth and downed timber.	Wellhead equipment, separator, surface casing cut off and covered.	Confluence Road would be repaired and retained. Access to well would be blocked and reclaimed to natural conditions. Well site area would be replanted with native seeds. Private minerals may be accessed in the future
581	Adjacent area, approximately 300 feet from the gorge. Access via Sheep Ranch Road to common lease road to well site. Estimated time to open access is 0.5 day.	Clear site of the few downed trees and trim side growth.	Surface casing cut off and covered, if necessary.	Sheep Ranch Road would be repaired and retained. Common lease road would be blocked and reclaimed to natural conditions. Well site area would be replanted with native seeds. Private minerals may be accessed in the future.
916	Adjacent area, access via Burnt Mill Bridge Road to common lease road to well access road. Travel along a multiple use trail for a short distance. Estimated time to open access is 1.5 days.	Clear site and access road of saplings and removal of many downed pines across road.	Wellhead equipment, surface casing cut off and covered.	Burnt Mill Bridge Road and common road would be repaired and retained. Access road would be blocked and reclaimed to natural conditions. Well site area would be replanted with native seeds. Private minerals may be accessed in the future.
1018	Adjacent area, less than 500 feet from the gorge. Access via share route with Rugby Trail and Gentlemen's Swimming Hole Hiking Trail. Travel county road to cemetery. Wellhead located just inside	Trim to original road width.	Surface casing cut off and covered, if necessary.	County road and trailhead parking would be repaired and retained. Well site area would be replanted with native seeds.

Well Plugging and Surface Reclamation for 45 Known Wells

Well Number	Location in Park, Site Access	Vegetative Clearing Requirements	Structures to be Removed	Well Pad and Access Road Reclamation
	boundary near a trailhead. Estimated time to open access is 0.5 day.			
1056	Adjacent area. Access via Station Camp Road to Station Camp Horse Camp. Enter horse camp and travel 600 feet on the Station Camp Horse Camp connector trail to the Pilot/Wines Loop horse trail. Travel on horse trail to well site. All roads and trails are in the GMP except for the 400-foot section of access off the horse trail. Estimated time to open access is 0.5 day.	Clear site overgrown with saplings and pines.	Surface casing cut off and covered, if necessary.	Station Camp Road, Station Camp Horse Camp, Station Horse Camp connector trail, and the Pilot/Wines Loop horse trail would be repaired and retained. Well site area would be replanted with native seeds.
1231	Adjacent area, access via Grassy Knob Road to well site adjacent to oil and gas access road. Estimated time to open access is 10.0 days.	Clear site of downed timber.	Wellhead equipment, surface casing cut off, covered.	Grassy Knob Road would be repaired and retained. Access road would be blocked and reclaimed to natural conditions. Well site area would be replanted with native seeds. Private minerals may be accessed in the future.
1319	Adjacent area. Access via Grassy Knob Road to oil and gas access road. Estimated time to open access is 10.0 days.	Clear site of downed timber.	Wellhead equipment, surface casing cut off, covered.	Grassy Knob Road would be repaired and retained. Access road would be blocked and reclaimed to natural conditions. Well site area would be replanted with native seeds. Private minerals may be accessed in the future.
1575	Adjacent area. Access via county road to oil and gas access road in park. Access road is overgrown but easily accessible; reclamation would not be needed because other producing wells exist beyond this one. Estimated time to open access is 0.5 day.	Clear site and access road of small pines and shrubs.	Wellhead equipment, surface casing cut off, covered.	County road would be repaired and retained. Well site area would be replanted with native seeds.

Well Plugging and Surface Reclamation for 45 Known Wells

Well Number	Location in Park, Site Access	Vegetative Clearing Requirements	Structures to be Removed	Well Pad and Access Road Reclamation
1773	Adjacent area. Access via Burnt Mill Bridge Road to oil and gas access road. Estimated time to open access is 2.0 days.	Clear site and access road overgrown with pine saplings and downed timber.	Wellhead equipment, surface casing cut off, covered.	Burnt Mill Bridge Road would be repaired and retained. Access road would be blocked and reclaimed to natural conditions. Well site area would be replanted with native seeds. Private minerals may be accessed in the future.
3454	Access crosses private property in the adjacent area and enters NPS lands. Wellhead and a portion of the oil and gas access road (approximately 140 feet) are in gorge. Improvements would need to be made to access along private property. Estimated time to open access is 1.0 day.	Clear private property access and site and access road overgrown with brush. Trim and remove downed timber.	Wellhead equipment, separator, surface casing cut off, covered.	Access road would be blocked at the NPS boundary and reclaimed. Repair and reclaim private land, if necessary. Well site area would be replanted with native seeds.
3626	Access crosses private property in the adjacent area and enters NPS lands. Wellhead and oil and gas access road are in the adjacent area. Improvements would need to be made to access along private property. Estimated time to open access is 1.0 day.	Trim and remove the few fallen trees.	Wellhead equipment, separator, surface casing cut off, covered.	Access road would be blocked at the NPS boundary and reclaimed. Repair and reclaim private land if necessary. Well site area would be replanted with native seeds.
3849	Adjacent area, access via Darrow Ridge Road to access road. Access along multiple use trail, located in the adjacent area. Estimated time to open access is 1.0 day.	Clear pine growth and the few fallen trees.	Wellhead equipment, surface casing cut off, covered.	Access road would be repaired and retained as a proposed multiple use trail. Well site area would be replanted with native seeds. Private minerals may be accessed in the future.
3850	Adjacent area, access via Darrow Ridge Road to access road. Access along multiple use trail, located in the adjacent area. Estimated time to open access is 1.0 day.	Clear site and access road overgrown with saplings.	Surface casing cut off and covered, if necessary.	Access road would be repaired and retained as a proposed multiple use trail. Well site area would be replanted with native seeds. Private minerals may be accessed in the future.

Well Plugging and Surface Reclamation for 45 Known Wells

Well Number	Location in Park, Site Access	Vegetative Clearing Requirements	Structures to be Removed	Well Pad and Access Road Reclamation
4121	Adjacent area. Access via Joe Branch Road to Joe Branch Day Use Area. Travel 3,100 feet on oil and gas access road to well site. Proposed horse trail nearby may use part of the access road to this well, located on the adjacent area. Reclamation would be necessary unless the proposed horse trail utilizes part of this road. Estimated time to open access is 1.0 day.	Clear site and access road overgrown with pine growth and remove downed timber.	Wellhead equipment, surface casing cut off, covered.	Joe Branch Road would be repaired and retained. Access road would be blocked and reclaimed to natural conditions. If access road is used by proposed horse trail, this portion would be repaired and retained. Well site area would be replanted with native seeds. Private minerals may be accessed in the future.
4554	Adjacent area. Access via Joe Branch Road to park road to Joe Branch Day Use Area. Travel 2,400 feet on common lease road to well-specific lease road. Reclamation would be needed only on the short access spur to the well; other producing wells exist beyond this one. Repairs may be needed to the access road because of the additional wells in the area. Estimated time to open access is 3.0 days.	Clear common and well access road of small pines.	Surface casing cut off and covered, if necessary.	Joe Branch Road would be repaired and retained. Well access road would be blocked and reclaimed to natural conditions. Common road would be repaired and retained. Well site area would be replanted with native seeds. Private minerals may be accessed in the future.
4652	Access crosses private property in the adjacent area and enters NPS lands. Access park via Hurricane Ridge Road to common lease road to well-specific lease road. Common road is a proposed multiple use trail. Estimated time to open access is 5.0 days.	Clear overgrowth of pines and saplings and downed trees along road and pad.	Surface casing cut off and covered, if necessary.	Hurricane Ridge Road would be repaired and retained. Repair and reclaim private land, if necessary. Well access road would be blocked and reclaimed to natural conditions. Common road / proposed multiple use trail would be repaired and retained. Well site area would be replanted with native seeds. Private minerals may be accessed in the future.

Well Plugging and Surface Reclamation for 45 Known Wells

Well Number	Location in Park, Site Access	Vegetative Clearing Requirements	Structures to be Removed	Well Pad and Access Road Reclamation
5115	Access crosses private property and enters the gorge at the boundary. Estimated time to open access is 1.5 days.	Clear site and access road overgrown with pines and saplings.	Surface casing cut off and covered, if necessary.	Access road would be blocked at the NPS boundary and reclaimed. Repair and reclaim private land, if necessary. Well site area would be replanted with native seeds.
5875	Adjacent area, access via Burnt Mill Bridge Road to common lease road to well-specific lease road. Access along hiking trail for a short distance. Estimated time to open access is 0.5 day.	Clear site and access road overgrown with scattered saplings.	Surface casing cut off and covered, if necessary.	Burnt Mill Bridge Road would be repaired and retained. Well access road would be blocked and reclaimed to natural conditions. Common road and hiking trail would be repaired and retained. Well site area would be replanted with native seeds. Private minerals may be accessed in the future.
5945	Adjacent area, access via Burnt Mill Bridge Road to common lease road to well-specific lease road. Access along hiking trail for a short distance. Estimated time to open access is 1.5 days.	Mostly open, but with a few downed pines across the road. Clear access road of downed pines.	Wellhead equipment, surface casing cut off, covered.	Burnt Mill Bridge Road would be repaired and retained. Well access road would be blocked and reclaimed to natural conditions. Common road and hiking trail would be repaired and retained. Well site area would be replanted with native seeds. Private minerals may be accessed in the future.
6211	Adjacent area, access via Burnt Mill Bridge Road to common lease road to well-specific lease road. Access along hiking trail for a short distance. Estimated time to open access is 1.0 day.	Mostly open, but with a few downed pines across the road. Clear access road of downed pines.	Wellhead equipment, surface casing cut off, covered.	Burnt Mill Bridge Road would be repaired and retained. Well access road would be blocked and reclaimed to natural conditions. Common road and hiking trail would be repaired and retained. Well site area would be replanted with native seeds. Private minerals may be accessed in the future.
6439	Adjacent area. Access via Grassy Knob Road. Continue past well-specific access to Well #1319 and continue an additional 650 feet to well adjacent to the road. Estimated time to open access is 10.0 days.	Clear site and access road of downed timber.	Wellhead equipment, surface casing cut off, covered.	Grassy Knob Road would be repaired and retained. Access road would be blocked and reclaimed to natural conditions. Well site area would be replanted with native seeds. Private minerals may be accessed in the future.

Well Plugging and Surface Reclamation for 45 Known Wells

Well Number	Location in Park, Site Access	Vegetative Clearing Requirements	Structures to be Removed	Well Pad and Access Road Reclamation
6459	Adjacent area. Access via Grassy Knob Road. Continue past Well #6439 for 1,200 feet. Road ends at this well. Estimated time to open access is 10.0 days.	Clear site and access road of downed timber.	Wellhead equipment, surface casing cut off, covered.	Grassy Knob Road would be repaired and retained. Access road would be blocked and reclaimed to natural conditions. Well site area would be replanted with native seeds. Private minerals may be accessed in the future.
6810	Adjacent area. Access crosses private property in the adjacent area and enters NPS lands. Enter park on well access road from private property. Estimated time to open access is 0.5 day.	Trim access road and clear of downed timber. Clear site of standing and dead pines.	Wellhead equipment, surface casing cut off, covered.	Access road would be blocked and reclaimed to natural conditions. Repair and reclaim private land, if necessary. Well site area would be replanted with native seeds. Private minerals may be accessed in the future.
6895	Adjacent area, access via Darrow Ridge Road to access road. Access along multiple use trail to well specific road, located in the adjacent area. Estimated time to open access is 1.0 day.	Clear site and access road overgrown with pine and remove downed timber. . Vegetation would need to be trimmed to haul an abandoned storage tank from this site.	Wellhead equipment, surface casing cut off, covered.	Darrow Ridge Road and multiple use trail would be repaired and retained. Access road would be blocked and reclaimed to natural conditions. Well site area would be replanted with native seeds. Private minerals may be accessed in the future.
6896	Adjacent area, access via Darrow Ridge Road and multiple use trail. Well pad located just adjacent to multiple use trail. Estimated time to open access is 0.5 day.	Trim along access road.	Surface casing cut off and covered, if necessary.	Darrow Ridge Road would be repaired and retained. Access road would be repaired and retained as a proposed multiple use trail. Well site area would be replanted with native seeds. Private minerals may be accessed in the future.
6911	Adjacent area, access via Darrow Ridge Road and multiple use trail, to well specific road. Estimated time to open access is 1.0 day.	Clear site and access road overgrown with pine and remove downed timber	Wellhead equipment, surface casing cut off, covered.	Darrow Ridge Road and multiple use trail would be repaired and retained. Access road would be blocked and reclaimed to natural conditions. Well site area would be replanted with native seeds. Private minerals may be accessed in the future.

Well Plugging and Surface Reclamation for 45 Known Wells

Well Number	Location in Park, Site Access	Vegetative Clearing Requirements	Structures to be Removed	Well Pad and Access Road Reclamation
6912	Adjacent area. Access via Darrow Ridge Road and multiple use trail to common lease road to well site. Estimated time to open access is 0.5 day.	Clear site of pine trees.	Wellhead equipment, surface casing cut off, covered.	Darrow Ridge Road and multiple use road would be repaired and retained. Common lease road to well site would be blocked and reclaimed to natural conditions when second well on this common lease road is plugged. Well site area would be replanted with native seeds. Private minerals may be accessed in the future.
6969	In gorge. Access crosses private property i and enters NPS lands. Wellhead and oil and gas access road are in gorge. Estimated time to open access is 0.5 day.	Trim access road and clear of downed timber. Clear site of standing and dead pines.	Wellhead equipment, surface casing cut off, covered.	Access road to well would be blocked and reclaimed to natural conditions. Repair and reclaim private land if necessary. Well site area would be replanted with native seeds.
7007	Adjacent area. Access via Confluence Road to well access road. Estimated time to open access is 2.0 days.	Clear site and access road overgrown with pines and saplings and remove downed timber.	Wellhead equipment, surface casing cut off, covered.	Confluence Road would be repaired and retained. Access road to well would be blocked and reclaimed to natural conditions. Well site area would be replanted with native seeds. Private minerals may be accessed in the future.
7120	Adjacent area, access via Darrow Ridge Road and multiple use trail. Estimated time to open access is 0.5 day.	Clear site of pine.	Wellhead equipment, separator, surface casing cut off, covered.	Darrow Ridge Road and multiple use trail would be repaired and retained. Well site area would be replanted with native seeds. Private minerals may be accessed in the future.
7121	Adjacent area, access via Darrow Ridge Road and multiple use trail to well access road. Estimated time to open access is 1.0 day.	Clear site and access road overgrown with pines and saplings.	Wellhead equipment, surface casing cut off, covered.	Darrow Ridge Road and multiple use trail would be repaired and retained. Access road would be blocked and reclaimed to natural conditions. Well site area would be replanted with native seeds. Private minerals may be accessed in the future.

Well Plugging and Surface Reclamation for 45 Known Wells

Well Number	Location in Park, Site Access	Vegetative Clearing Requirements	Structures to be Removed	Well Pad and Access Road Reclamation
7192	In gorge. Enter park on pipeline corridor and travel 700 feet. Well is approximately 100 feet from corridor. Care would need to be taken not to damage the pipeline during plugging; the pipeline corridor would be used to access the well. Estimated time to open access is 4.0 days.	Clear and trim site and utility corridor overgrown with pine and shrubs.	Surface casing cut off and covered, if necessary.	Access road to well would be blocked and reclaimed to natural conditions. The NPS would work with the pipeline company, Citizens Gas to mitigate against damage to pipeline. Well site area and utility corridor would be replanted with native seeds.
7208	In gorge. Road outside gorge remains within 500 feet of gorge. Enter park on common lease road. Travel 100 feet on common lease road. Continue on well specific road to well. Estimated time to open access is 1.0 day.	Clear site and access road overgrown with pine growth and remove the few fallen trees.	Wellhead equipment, surface casing cut off, covered.	Common road would be repaired and retained. Access road to well would be blocked and reclaimed to natural conditions. Well site area would be replanted with native seeds.
7359	Adjacent area. Enter park on Darrow Ridge Road and multiple use trail to common lease road for Permit 6912. Permit 7359 is at the end of the common lease road. Estimated time to open access is 1.0 day.	Trim and remove the few fallen trees. Clear site of small pines.	Wellhead equipment, surface casing cut off, covered.	Darrow Ridge Road and multiple use trail would be repaired and retained. Common road would be blocked and reclaimed to natural conditions. Well site area would be replanted with native seeds. Private minerals may be accessed in the future.
7365	Adjacent area, access via Darrow Ridge Road and multiple use trail to well specific accessroad. Estimated time to open access is 1.0 day.	Clear site and access road overgrown with scattered saplings.	Wellhead equipment, surface casing cut off, covered.	Darrow Ridge Road and multiple use trail would be repaired and retained. Access road blocked and reclaimed to natural conditions. Well site area would be replanted with native seeds. Private minerals may be accessed in the future.
8292	Adjacent area. Access via common lease road to well-specific lease road. Common road also used for access to logging area outside of boundary. Over half the access crosses private	Clear site and access road overgrown with pine saplings.	Wellhead equipment, surface casing cut off, covered.	Well access road would be blocked and reclaimed to natural conditions. Common road would be repaired and retained. Well site area would be replanted with native seeds. Private

Well Plugging and Surface Reclamation for 45 Known Wells

Well Number	Location in Park, Site Access	Vegetative Clearing Requirements	Structures to be Removed	Well Pad and Access Road Reclamation
	property. Other wells are accessed from this road so reclamation would be minimal. Estimated time to open access is 1.0 day.			minerals may be accessed in the future.
8293	Adjacent area. Access via well specific access road. A portion of the access crosses private property. Estimated time to open access is 4.0 days.	Trim small trees.	Wellhead equipment, surface casing cut off, covered.	Well access road would be blocked and reclaimed to natural conditions. Well site area would be replanted with native seeds. Private minerals may be accessed in the future.
8366	Adjacent area, access via Darrow Ridge Road and multiple use trail to Christian Cemetery Multiple Use Trail. Travel on Christian Cemetery Multiple Use Trail to proposed horse trail to well pad. Estimated time to open access is 2.0 days.	Clear site and access road and trail overgrown with pines.	Wellhead equipment, surface casing cut off, covered.	Darrow Ridge Road and multiple use trail and Christian Cemetery Multiple Use Trail would be repaired and retained. Proposed horse trail would be blocked and repaired. Well site area would be replanted with native seeds. Private minerals may be accessed in the future.
8408	Adjacent area. Access crosses private property in the adjacent area and enters NPS lands. Enter park on access road from private property. Estimated time to open access is 0.5 day.	Clear site and access road overgrown with saplings and remove downed timber.	Surface casing cut off and covered, if necessary.	Access road would be blocked at the NPS boundary and reclaimed. Repair and reclaim private land, if necessary. Well site area would be replanted with native seeds. Private minerals may be accessed in the future.

Well Plugging and Surface Reclamation for 45 Known Wells

Well Number	Location in Park, Site Access	Vegetative Clearing Requirements	Structures to be Removed	Well Pad and Access Road Reclamation
151-02	In gorge. Access via Divide Road to Terry Cemetery Road. Continue on Terry Cemetery Road to Terry Cemetery trail head. Follow the Longfield Branch horse trail to No Business Creek. Ford No Business Creek. Follow the proposed Ranse Boyatt trail for 3,000 feet to well located in a field. Reclamation would be needed on all sections of the access that are in the gorge in order to repair the horse trail after plugging. Reclamation at the well head would be minimal because the well is in an open field. Entire access is identified in GMP as existing and proposed. Estimated time to open access is 1.0 day.	Minimal - Some standing trees in the field at the wellhead.	Surface casing cut off and covered, if necessary.	Access routes would be repaired and reclaimed to road or horse trail conditions. Well site area would be replanted with native seeds.
151-13	Adjacent area. Access via Station Camp Road to Station Camp Horse Camp. Enter horse camp and travel 600 feet on the Station Camp Horse Camp connector trail to the Pilot/Wines Loop horse trail. Travel on horse trail to well site. All roads and trails are in the GMP except for the 400-foot section of access off the horse trail. Estimated time to open access is 2.0 days.	Remove downed trees, brush and standing trees.	Surface casing cut off and covered, if necessary.	Station Camp Road, Station Camp Horse Camp, Station Horse Camp connector trail, and the Pilot/Wines Loop horse trail would be repaired and retained. Well specific road will be blocked and reclaimed to natural conditions. Well site area would be replanted with native seeds. Private minerals may be accessed in the future.

Well Plugging and Surface Reclamation for 45 Known Wells

Well Number	Location in Park, Site Access	Vegetative Clearing Requirements	Structures to be Removed	Well Pad and Access Road Reclamation
Beatty Well (1818)	In gorge. Access via Bald Knob/Hill Cemetery Multiple Use Trail to the Ledbetter Trailhead. Travel on Ledbetter Trail to the Oil Well Branch Trail to the gorge and to Beatty Well access. Access is part of a multiple use trail and proposed horse trail. A short access would need to be constructed from the trail to the well site. Estimated time to open access is 10.0 days.	Cut back brush, remove downed trees. Clear access to well.	Surface casing filled with cement and left in place to maintain historic integrity of 1818 oil well.	Bald Knob/Hill Cemetery Multiple Use Trail, Ledbetter Trail, and Oil Well Branch Trail would be repaired and retained. Well access road would be blocked and reclaimed to natural conditions. Maintain historic integrity of 1818 historic well and site (mark well and protect with NPS sign). Well site area would be replanted with native seeds.
Beatty Well A (adjacent to trail)	In gorge. Access via Bald Knob/Hill Cemetery Multiple Use Trail to the Ledbetter Trailhead. Travel on Ledbetter Trail to the Oil Well Branch Trail to the gorge and to Beatty Well access. Access is part of a multiple use trail and proposed horse trail. Well is adjacent to trail. Estimated time to open access is 10.0 days.	Clear site and access, overgrown with brush, and remove downed timber.	Surface casing cut off and covered, if necessary.	Bald Knob/Hill Cemetery Multiple Use Trail, Ledbetter Trail, and Oil Well Branch Trail would be repaired and retained. Well site area would be replanted with native seeds.
Beatty Well B (on bench adjacent to Oil Well Branch)	In gorge. Access via Bald Knob/Hill Cemetery Multiple Use Trail to the Ledbetter Trailhead. Travel on Ledbetter Trail to the Oil Well Branch Trail to the gorge and to Beatty Well access. Approximately 500 feet of access would need to be cleared in the Oil Well Branch drainage to access the well. Estimated time to open access is 10.0 days.	Cut back brush, remove downed trees. Clear access to well.	Surface casing cut off and covered, if necessary.	Bald Knob/Hill Cemetery Multiple Use Trail, Ledbetter Trail, and Oil Well Branch Trail would be repaired and retained. Well access road would be blocked and reclaimed to natural conditions. Well site area would be replanted with native seeds.

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As the nation's principal conservation agency, the Department of the Interior has the responsibility for most of our nationally owned public lands and natural resources. This includes fostering sound use of our land and water resources; protecting our fish, wildlife, and biological diversity; preserving the environmental and cultural values of our national parks and historic places; and providing for the enjoyment of life through outdoor recreation. The department assesses our energy and mineral resources and works to ensure that their development is in the best interests of all our people by encouraging stewardship and citizen participation in their care. The department also has a major responsibility for American Indian reservation communities and for people who live in island territories under U.S. Administration.

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