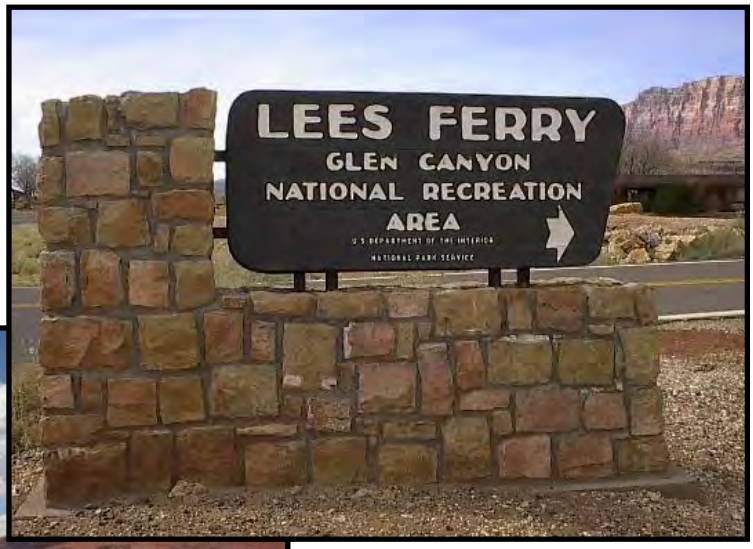
Glen Canyon National Recreation Area
Arizona / Utah

Lees Ferry Road Rehabilitation and Paria River Bridge Stabilization

Environmental Assessment

July 2012



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Environmental Assessment
Lees Ferry Road Rehabilitation and Paria River Bridge Stabilization
GLEN CANYON NATIONAL RECREATION AREA
Coconino County, Arizona
July 2012

The National Park Service (NPS), Glen Canyon National Recreation Area, in cooperation with the Federal Highway Administration, Central Federal Lands Division, proposes to restore, rehabilitate, and repave the 6-mile-long Lees Ferry Road to near the confluence of the Paria River and Colorado River. This project in Coconino County, Arizona, would enhance safety, improve road drainage, reduce erosion, and stabilize the banks near the Paria River Bridge and along the Paria River west shore. The project is needed because conditions along the Lees Ferry Road need to be improved, and because riverbank erosion threatens to undermine the Paria River Bridge and Lonely Dell Access Road.

This environmental assessment evaluates two alternatives:

- Alternative A, the No Action Alternative: This alternative would continue routine maintenance of the Lees Ferry Road and Paria River Bridge. No change would be made in management of the Paria River banks.
- Alternative B, the Preferred Alternative: This alternative would restore, rehabilitate, and resurface the Lees Ferry Road; improve erosion protection; control drainage along the road; and reduce erosion along the banks of the Paria River.

This environmental assessment was prepared in compliance with the National Environmental Policy Act to provide the decision-making framework that 1) analyzes a reasonable range of alternatives to meet objectives of the proposal, 2) evaluates potential issues and impacts on the park's resources and values, and 3) identifies mitigation measures to lessen the degree or extent of impacts. No major effects were identified as a result of this project. Public scoping was conducted to assist with the development of this document and comments were received and considered in the evaluation of effects.

PUBLIC REVIEW AND COMMENT

This environmental assessment will be available for public review for **30** days. If you wish to comment, you are encouraged to submit your comments directly on the NPS Planning, Environment, and Public Comment (PEPC) website: http://parkplanning.nps.gov/glca, and follow the links for the Lees Ferry Road Rehabilitation and Paria River Bridge Stabilization environmental assessment. The "Open for Public Comment" link on the left column provides access to the environmental assessment.

Paper copies of the environmental assessment are available for review upon request by phone at 928-608-6200.

Please **mail written comments** to:

Glen Canyon National Recreation Area
ATTN: Lees Ferry Road Rehabilitation and Paria River Bridge Stabilization EA Comments
P.O. Box 1507, Page, AZ 86040

Before including your address, phone number, e-mail address, or other personal identifying information in your comments, you should be aware that your entire comment – including your personal identifying information – may be made publicly available at any time. While you can ask us in your comment to withhold your personal identifying information from public review, we cannot guarantee that we will be able to do so.

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CONTENTS

Chapter 1: Purpose and Need

Chapter 2: Proposed Action and Alternatives

Chapter 3: Affected Environment and Environmental Consequences

Chapter 4: Consultation and Coordination

Chapter 5: References

Tables

Figures

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Chapter 1: Purpose and Need

INTRODUCTION

COOPERATING AGENCIES

The National Park Service is the lead agency for the Lees Ferry Road Rehabilitation and Paria River Bridge Stabilization environmental assessment and supporting documents. Design of the proposed action is being developed by the Federal Highway Administration under an interagency agreement with the National Park Service.

BRIEF DESCRIPTION OF PROPOSAL

The purpose of the project is to improve resource protection and enhance safety on and near the Lees Ferry Road in Coconino County, Arizona near the confluence of the Paria River and Colorado River. On the Lees Ferry Road, the project would:

- Restore, rehabilitate, and repave the road;
- Enhance safety by making lane widths consistent and resurfacing the road;
- Adjust curve radii to meet safety standards; and
- Improve drainage.

The banks of the Paria River just upstream of the Lees Ferry Road are eroding. This erosion endangers the support abutments and pier of the bridge over the Paria River. It also threatens Lonely Dell Access Road, which provides access to the Lonely Dell Ranch National Historic District (about 1,000 feet upstream of the bridge and about 3,000 feet upstream of the confluence of the Paria River and the Colorado River). The project would stabilize the riverbanks and reduce erosion near the bridge and along the Paria River's west bank below the Lonely Dell Access Road. Additional bank stabilization would be implemented in select locations, including Cathedral and No Name Washes, where erosion poses a risk to the road or drainage conveyance features.

LOCATION

The project area is shown in figure 1, with more detail in figures 2 and 3. The project area includes:

- The Lees Ferry Road from its junction with U.S. Highway 89A at Marble Canyon to about 6 miles northeast at the road's terminus at the boat launch ramp parking lot;
- The Paria River's banks and river bottom at and adjacent to the Paria River Bridge; and
- A site along the Paria River where it flows adjacent to the Lonely Dell Access Road about 2,600 feet upstream from its confluence with the Colorado River.

SUMMARY OF NATIONAL ENVIRONMENTAL POLICY ACT / ENVIRONMENTAL ASSESSMENT PROCESS

This environmental assessment was prepared to provide compliance with the National Environmental Policy Act. It supports decision-making by 1) analyzing a reasonable range of alternatives to meet project objectives, 2) evaluating issues and impacts to Glen Canyon National Recreation Area resources and values, and 3) identifying mitigation measures to lessen the degree or extent of impacts. This project will also be conducted in accordance with section 106 of the National Historc Preservation Act and other applicable laws, regulations, and policies.

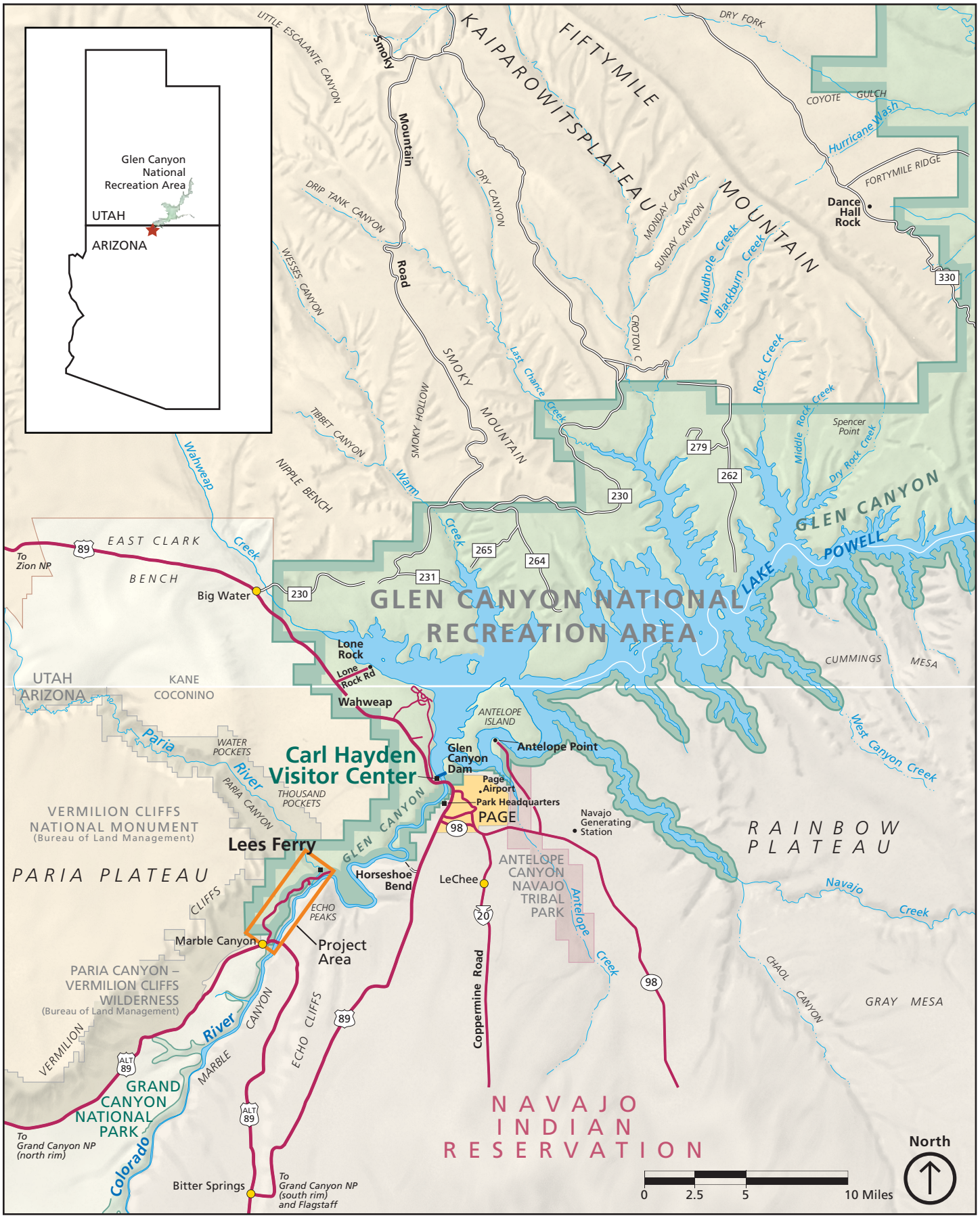

Figure 1: Vicinity Map

Glen Canyon National Recreation Area

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

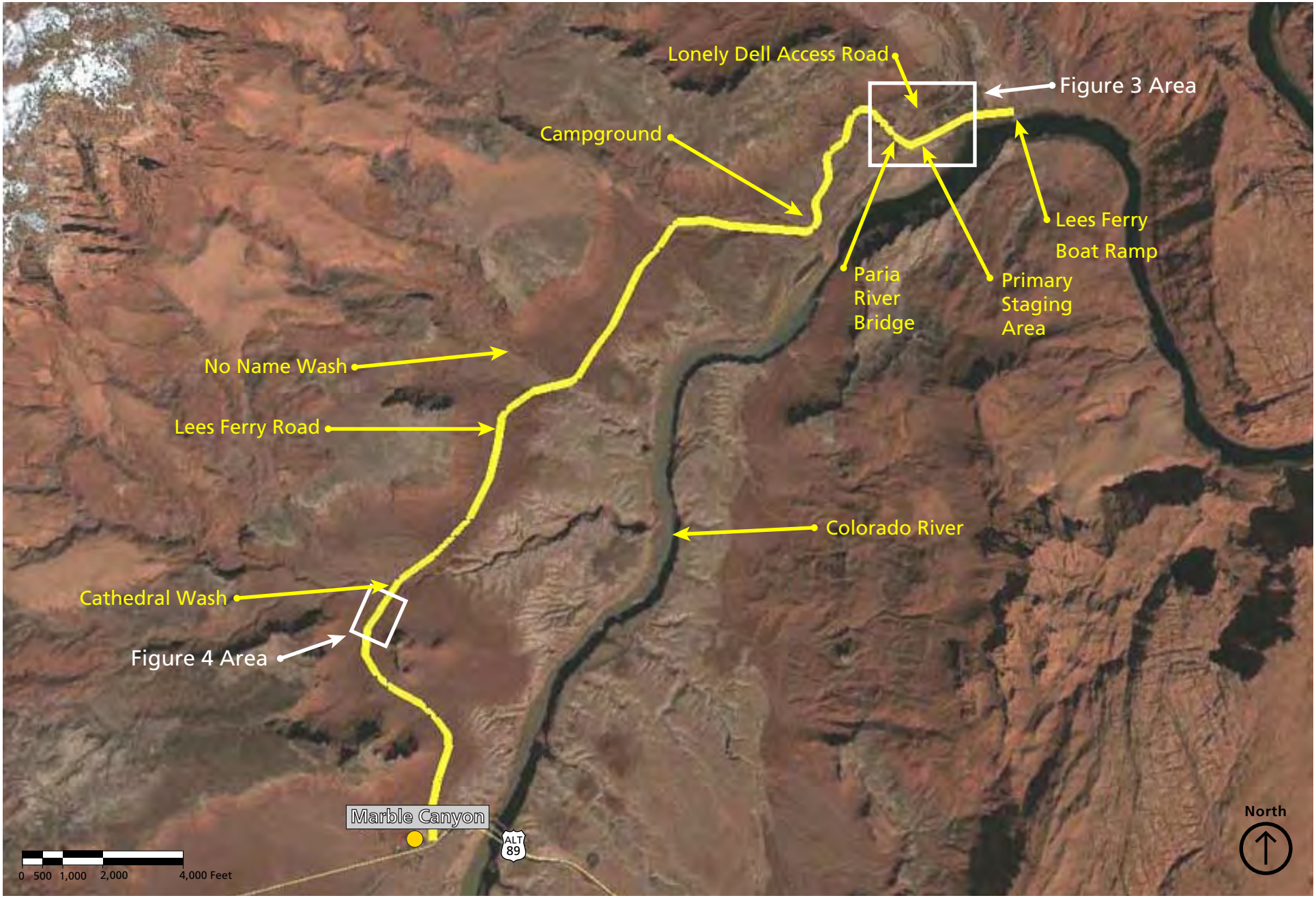

Figure 2: Lees Ferry Road Project Site Map
Glen Canyon National Recreation Area
U.S. Department of the Interior / National Park Service

Figure 3: Paria River Bridge Vicinity Site Map

Glen Canyon National Recreation Area

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

PURPOSE OF THE ACTION

The purpose of the project is to improve resource protection and enhance safety on and near the Lees Ferry Road. An additional purpose is to reduce erosion and stabilize the banks near the Paria River Bridge and in areas along the Paria River's west bank.

To enhance safety, curves along Lees Ferry Road would be adjusted to meet current standards and the road would be resurfaced. Drainage issues would be addressed to minimize erosion, reduce the potential for road degradation, and improve maintenance capabilities.

The project would enhance safety for all vehicle occupants, protect infrastructure of the Lees Ferry Road and Lonely Dell Access Road, and implement drainage improvement and erosion control measures that would reduce maintenance needs. The project would also protect the Paria River Bridge infrastructure. The project will be considered successful if it meets the following objectives:

- Lane widths along the Lees Ferry Road are consistent.
- Road surface undulations and shoulder degradations along Lees Ferry Road are corrected.
- Maintenance needs are reduced and roadside and cross-road drainage is more efficient.
- Erosion along the banks of the Paria River near the bridge and in the riverbed under the bridge is reduced to protect the bridge abutments and minimize the potential for pier failure.
- The Lonely Dell Access Road is protected from erosion where the Paria River is eroding the bank supporting the road.

NEED FOR THE ACTION

Conditions on the Lees Ferry Road reduce functional operation on the road and, are degrading the road structure. The Lees Ferry Road currently has inconsistent lane widths and erosion poses risks to the Lees Ferry Road, Lonely Dell Access Road, and Paria River Bridge. Additionally, the current drainage configuration presents maintenance challenges. The project is needed to enhance safety, reduce maintenance, and protect assets.

Specific issues supporting the need for the project include the following:

- The inconsistent lane widths and narrow curves cause some drivers to stray from their lane.
- Large trucks and buses, which are major components of the vehicle use on the Lees Ferry Road, sometimes cut curves too sharply because the radii of the curves are too tight. As a result, their rear wheels encroach on the pavement edge or earthen shoulder and cause damage that must continually be repaired.
- Drainage problems currently exist because of degradation of drainage components such as intake structures, culverts, and outlets. Action is needed to correct the drainage deficiencies, improve cross-road drainage, and replace deteriorating infrastructure. New drainage designs and components would reduce maintenance and require less frequent attention, freeing recreation area maintenance staff to address other needs.
- The Paria River Bridge provides the only access across the Paria River and is heavily used by private and commercial users of the Colorado River boat launch ramp at the end of the Lees Ferry Road. The continued erosion of the Paria River banks poses a severe risk to the integrity of the river crossing. Access to the Colorado River boat launch ramp would be lost if the Paria River Bridge failed. The Paria River Bridge lacks redundancy in design and function and would be very susceptible to failure if the abutment fill or pier foundation was undermined. In addition, replacement of the bridge if it failed would be extremely expensive.

- The Paria River has widely fluctuating flows and a high potential for flash flooding. These features contribute to its continued undermining of the bank flanking the Lonely Dell Access Road. If unchecked erosion continues, access to an important national recreation area resource could be lost, and costly repairs would be needed. Loss of the bridge would also interrupt the potable water supply to the Lonely Dell Ranch.

BRIEF DESCRIPTION OF GLEN CANYON NATIONAL RECREATION AREA AND THE LEES FERRY AREA

Congress established Glen Canyon National Recreation Area in 1972 for public outdoor recreation use and enjoyment of the lake and lands adjacent to it and to preserve scenic, scientific, and historic features for public enjoyment.

Glen Canyon National Recreation Area encompasses more than 1.2 million acres. It offers numerous opportunities for water-based and backcountry recreation. The national recreation area stretches from Lees Ferry in Arizona upstream to the Orange Cliffs of southern Utah, encompassing scenic vistas, geologic wonders, and a wide range of human history. The national recreation area is bordered by Capitol Reef National Park and Canyonlands National Park on the north, Grand Staircase-Escalante National Monument on the west, Vermilion Cliffs National Monument and the northeastern reaches of Grand Canyon National Park on the southwest, and the Navajo Nation on the southeast.

Lees Ferry is in a development and cultural zone in the national recreation area. The only vehicle access to Lees Ferry is provided by the approximately 6-mile-long road from U.S. Highway 89A. The area is named after the settler, John D. Lee, who established a ferry across the Colorado River and the Lonely Dell Ranch in 1871. The site features a natural slope from the cliffs to the riverbank, which facilitated crossing of the Colorado River in otherwise impassable terrain. In the late 19th century and early 20th century, Lees Ferry was the only crossing of the Colorado River by ferry between Moab, Utah and Needles, California; it was heavily used by travelers between Utah and Arizona. The ferry was closed in 1928 when the Navajo Bridge over Marble Canyon was built about 4 miles southwest of Lees Ferry. The subject of this proposed action is the road from near the Navajo Bridge to Lees Ferry.

Today, Lees Ferry is used as a launching point for fishing trips upstream on the Colorado River and for raft trips through the Grand Canyon downstream. Trips upstream may be made without special permit (other than a day-use boating fee) and users can travel 15 miles upstream on relatively calm waters to the foot of Glen Canyon Dam. The Lees Ferry site features several remnant structures from the Lonely Dell Ranch dating to the 1870s, along with the wreckage of the *Charles H. Spencer*, a steamboat abandoned in 1913 by a mining company working nearby. A steel wire cable and basket is used by the U.S. Geological Survey to cross the Colorado River at the old ferry site. The Lonely Dell Ranch and the ferry site are managed by the National Park Service within Glen Canyon National Recreation Area and are listed in the National Register of Historic Places.

RELATIONSHIP TO OTHER PLANS AND POLICIES

The National Park Service and other entities have developed plans and implemented management actions that could affect or be affected by the rehabilitation and stabilization project. These plans and actions are identified in table 1, with a brief description of their potential relevance to the proposed action. Table 2 lists additional planned projects expected to occur within or near the road rehabilitation and river stabilization project.

The infrastructure improvement plans in table 2 would likely be implemented within the next 5 to 10 years. These plans and policies are considered as part of the cumulative impact scenario that was

used for all retained impact topics to determine the additive effects of each alternative in concert with all past, present, and reasonably foreseeable actions.

Table 1: Relationship of the Proposed Action to Other Plans and Policies

Plan or Policy	Relationship to the Proposed Action
Glen Canyon National Recreation Area General Management Plan, 1979	The general management plan established management zones, including land-based Natural, Cultural, and Development Zones and a Recreation and Resource Utilization Zone on Lake Powell. The proposed action would occur within the Development and Cultural Zones.
Colorado River Management Plan, 2006	This plan established the process for allotting commercial and private use for visitor use of the Colorado River through Grand Canyon. The river trips, serving up to 24,657 users a year, launch at the Lees Ferry boat ramp.
Commercial use authorizations	Several commercial use authorizations manage fishing and sight-seeing ventures that use Lees Ferry as a starting and ending point.
Telecommunication line upgrades	This project would install new telecommunication utility lines in the Lees Ferry Road corridor and would need to coordinate with the proposed action to avoid inconsistencies.
Future Lees Ferry campground improvements	The planned improvements would address infrastructure and visitor use needs without a change in capacity.
Lees Ferry 10-Acre Site Restoration Plan, 2001	The Arizona Water Protection Fund financed the restoration of 10 acres of tamarisk-dominated riparian land to its native condition between 2002 and 2005. The project involved tamarisk removal, native plant restoration, and restoration effectiveness monitoring. Approximately 950 native plants were planted. The National Park Service continues to maintain the site.
Water tank removal at Lees Ferry residential compound / visitor center	The large, highly visible water tower is planned to be replaced with an underground tank, likely in 2014.

Table 2: Other Planned Projects Associated with the Lees Ferry Area

Planned Projects	
Stabilize National Historic District	Maintain irrigation system at National Historic District
Repair and rehabilitate 11 historic buildings used by visitors	Monitor remnant terrace erosion between Glen Canyon Dam and Lees Ferry
Upgrade water treatment plant	Upgrade septic systems
Remove and replace four leach fields	Stabilize Weaver ranch house
Paint Lees Ferry water tank	Replace visitor courtesy dock
Replace recreational vehicle dump station	Upgrade campground waterline
Replace housing utilities	Rehabilitate water intake
Replace potable water treatment plant	Update interpretive waysides

SCOPING

Scoping is described in chapter 4 under the heading "Scoping and Agency Consultation." Documents related to scoping are provided in appendix A. Briefly, activities included the following.

- An internal scoping meeting and a site visit were held in the park on July 11-14, 2011. A teleconference to continue internal scoping discussions was held July 26, 2011.
- A description of the project and request for public comments was posted on the NPS' Planning, Environment, and Public Comment Internet site on August 23, 2011.
- At the same time, a similar press release was provided to area news media and letters requesting scoping input were sent to potentially interested government agencies and Native American tribes.

During scoping, specific resources and other values were identified as important to this project. These included water resources and hydrology, wetlands and waters of the United States (U.S.), floodplains, geology and soils, vegetation, species of special concern, cultural resources, park operations, and public health and safety. Specifically, the U.S. Fish and Wildlife Service and the Arizona Game and Fish Department identified the need to address species of special concern that might occur in the proposed construction area. These species and their designated critical habitats are evaluated in the biological assessment and n chapter 3. There also was concern about construction effects on historic and other cultural resources near the Lees Ferry Road; these also are considered in chapter 3. Along with the purpose and need for the proposed action, these topics guided the development of alternatives and contributed to the selection of impact topics, as identified in the next section.

ISSUES AND CONCERNS

The primary issues associated with the project relate to the risks posed to the Paria River Bridge, Lonely Dell Access Road, and Lees Ferry Road infrastructure. Loss of the bridge or any section of road would require costly repair and replacement. The Paria River Bridge and Lees Ferry Road, in particular, provide the only access to the boat ramp where Grand Canyon River trips leave daily and Glen Canyon National Recreation Area river trip buses pick up passengers. Visitors accessing historic and natural features use the bridge to cross the river. Loss of access would adversely affect visitor use. Specific issues that contribute to the need for this project include:

- Paria River Bridge loss – in addition to providing the only vehicle access to Lees Ferry, utility lines cross the river on the bridge. The bridge is needed to maintain public and commercial use and service, as well as NPS operation, maintenance, and emergency services access.
- Lonely Dell Access Road loss – the only road to the Lonely Dell historic site has a water line in the roadside utility corridor. The road is also needed to maintain public access and NPS operation, maintenance, and emergency services access.
- Lees Ferry Road configuration –some curve radii do not meet current standards and the lane/road width is inconsistent.
- Lees Ferry Road infrastructure – with the area's high potential for flash-flooding and associated erosion, road damage or loss is likely in a number of locations. Inadequate or damaged culvert intakes, scouring at culvert outlets, and migrating river/drainage channels, such as along the road segment at Cathedral Wash, may cause road damage or road failure. In addition, there is a need throughout the project area to improve the maintainability of the infrastructure, such as by designing culverts to be less likely to collect silt or other materials and making drainage ditches easier to grade and maintain.

IMPACT TOPICS

This section identifies the resources and other values (impact topics) that could be affected by the alternatives. Candidate impact topics for this project were identified from internal and public scoping; based on federal laws, regulations, and orders; from NPS guidance such as *Management Policies 2006* (NPS 2006a); and from NPS knowledge of resources at Glen Canyon National Recreation Area.

Justifications are provided regarding why there was no need to examine some impact topics in detail. Other impact topics were carried forward for further analysis in "Chapter 3, Affected Environment and Environmental Consequences" of this environmental assessment. Effects on these impact topics were evaluated based on the issues that were identified during scoping, which also are presented in chapter 3.

RETAINED IMPACT TOPICS

Nine impact topics were retained for detailed analysis in this environmental assessment. Consideration of effects of the proposed action on each of these is provided in chapter 3. These impact topics include water resources and hydrology, wetlands and waters of the U.S., floodplains, soils, vegetation, special status species, cultural resources (which includes archeological resources, ethnographic resources, cultural landscapes, and historic structures), park operations, and public health and safety. Table 3 presents the impact topics retained and the laws, regulations, and policies that are relevant to these resources and values.

IMPACT TOPICS DISMISSED FROM DETAILED CONSIDERATION

In this section, the National Park Service takes a hard look at all potential impacts by considering the direct, indirect, and cumulative effects of the proposed action on the environment, along with connected and cumulative actions. Impacts are described in terms of context and duration. The context or extent of the impact is described as localized or widespread. The duration of impacts is described as short-term, generally ranging from days to three years in duration, or long-term, extending to 20 years or longer.

The intensity and type of impact are described as negligible, minor, moderate, or major, and as beneficial or adverse. The National Park Service equates major effects as significant effects. The identification of major effects would trigger the need for an environmental impact statement. Where the intensity of an impact could be described quantitatively, the numerical data are presented; however, most impact analyses are qualitative and use best professional judgment in making the assessment. The National Park Service defines "measurable" impacts as moderate or greater effects. It equates "no measurable effects" as minor or less effects. "No measurable effect" is used by the National Park Service in determining if a categorical exclusion applies or if impact topics may be dismissed from further evaluation in an environmental assessment or environmental impact statement.

The use of "no measurable effects" in this environmental assessment pertains to whether the National Park Service dismisses an impact topic from further detailed evaluation in the environmental assessment. The National Park Service uses "no measurable effects" to determine whether impact topics are dismissed from further evaluation so it can concentrate on the issues that are truly significant to the action in question, rather than amassing needless detail. This approach complies with Council on Environmental Quality regulations at 40 *Code of Federal Regulations* 1500.1(b).

For impact topics that are dismissed from detailed consideration, the National Park Service provides a limited evaluation and explanation as to why these impact topics are not evaluated in more detail. Impact topics are dismissed from further evaluation in this environmental assessment if:

- They do not exist in the analysis area; or
- They would not be affected by the proposal, or the likelihood of impacts are not reasonably expected; or
- Through the application of mitigation measures, there would be minor or less effects (that is, no measurable effects) from the proposal, and there is little controversy on the subject or reasons to otherwise include the topic.

Because there are no effects or no measurable effects, there would either be no contribution toward cumulative effects or the contribution would be low. For each issue or topic presented below, if the resource is found in the analysis area or the issue is applicable to the proposal, then a limited analysis of direct and indirect impacts and cumulative effects is presented.

AIR QUALITY

Best management practices during construction would minimize air pollution. However, construction activities, including equipment operation and the hauling of material, could result in short-term increases of vehicle exhaust and emissions, as well as inhalable particulate matter. Construction dust associated with exposed soils would be controlled with the application of water or other approved dust palliatives. Any emissions of hydrocarbons, nitrogen oxides, and sulfur dioxide, and the airborne particulates created by fugitive dust plumes, would be rapidly dissipated. There could be a local, short-term, negligible degradation of air quality during construction activities, but no measurable effects outside the immediate construction vicinity would be anticipated. Any construction-related, adverse effects on air quality would be short-term, lasting only as long as construction. Change would not be discernible at a regional scale. No measurable change in emissions would occur after construction was completed. Therefore, air quality was dismissed from further evaluation.

CLIMATE CHANGE

Climate change refers to any significant changes in average climatic conditions (such as mean temperature, precipitation, or wind) or variability (such as seasonality and storm frequency) lasting for an extended period (decades or longer). Recent reports by the U.S. Climate Change Science Program (2007) and Intergovernmental Panel on Climate Change (2007a, 2007b) provide evidence that climate change is occurring as a result of rising greenhouse gas emissions and could accelerate in coming decades.

While climate change is a global phenomenon, it manifests differently depending on regional and local factors. General changes that are expected in the future as a result of climate change include hotter, drier summers; warmer winters; warmer water; higher ocean levels; more severe wildfires; degraded air quality; more frequent heavy downpours; and increased drought. Climate changes in the U.S. southwest, including Glen Canyon National Recreation Area, could include higher average temperatures and decreases in precipitation, with increased potential for long-term drought (MacDonald 2010).

Table 3: Impact Topics Retained for Further Evaluation and Relevant Laws, Regulations, and Policies

Impact Topic	Reasons for Retaining Impact Topic	Relevant Laws, Regulations, and Policies
Water resources and hydrology	The project area includes the Paria River, a tributary to the Colorado River and a primary sediment source for the Colorado River through the Grand Canyon.	Executive Order 12088; Executive Order 11990; *Management Policies 2006* section 4.6.3 (NPS 2006a); Federal Water Pollution Control Act [The Clean Water Act of 1972 (as amended in 1977)]
Wetlands and waters of the United States	The project area includes jurisdictional wetlands that are regulated under the Clean Water Act and additional areas that are defined as wetlands using the Cowardin system (Cowardin *et al.* 1979)	Executive Order 11990 - Protection of Wetlands; Director's Order #77-1
Floodplains	Parts of the project area fall within the 100-year floodplain, including an approximately 540-foot section of Lees Ferry Road across Cathedral Wash, 560-foot section of Lees Ferry Road across No Name Wash, and 1,900-foot section of Lees Ferry Road northeast from the Paria River Bridge.	*Management Policies, 2006*, section 4.6.4
Soils	The Paria River floodplain consists of more recent sandy alluvial soils. Sand bars in this area and in spot locations along the Colorado River support narrow areas of riparian vegetation.	*Management Policies, 2006*, section 4.8.2.4
Vegetation	While vegetation in the project area is limited, small plant communities are present. Plant communities are found on both the Moenkopi and Kaibab limestone formations within the project area.	*Management Policies, 2006*, section 1.4.6
Special status species	The Brady pincushion cactus, razorback sucker, California condor, southwestern willow flycatcher, and Mexican spotted owl are special status species that have the potential to be found in the project area and/or be affected by the proposed action.	Endangered Species Act of 1973
Cultural resources (includes archeological resources, cultural landscapes, ethnographic resources, and historic structures)	The project area includes part of the Lees Ferry / Lonely Dell historic district, which is listed in the National Register of Historic Places. Historic structures are present. The district has also been classified as a cultural landscape. Furthermore, ground disturbance included in the action alternative have the potential to affect archeological and/or ethnographic resources.	National Historic Preservation Act of 1966, as amended; Executive Order 11593; Archeological Resources Protection Act; the Secretary of the Interior's Standards and Guidelines for Archeology and Historic Preservation
Park operations	NPS maintenance staff is burdened by maintenance needs associated with Lees Ferry Road. In addition, failure of the bridge over the Paria River would affect access.	*Management Policies, 2006*, section 1.8 and 4.1.1
Public health and safety	The current condition of Lees Ferry Road is considered to need improvement.	*Management Policies 2006*, section 8.2.5

Although some effects of climate change are considered known or likely to occur, many potential impacts are unknown. Much depends on the rate at which the temperature would continue to rise and whether global greenhouse gas emissions can be reduced or mitigated. Climate change science is a rapidly advancing field and new information is being collected and released continually.

While construction activities associated with the proposed action would contribute to increased greenhouse gas emissions, such emissions would be short-term, ending with the completion of construction. It is not possible to meaningfully link the greenhouse gas emissions of individual project actions to quantitative effects on regional or global climatic patterns. Construction–related greenhouse gas emissions from the proposed action would not be discernible at a regional scale and the topic was not retained for full evaluation.

CONFLICTS WITH LAND USE PLANS, POLICIES, OR CONTROLS

The proposed action would not change any current land uses and would not conflict with any plans, policies, or controls on land use within the national recreation area. The topic was dismissed from detailed evaluation because the project would not create any conflicts.

CULTURAL RESOURCES – MUSEUM COLLECTIONS

The proposed action would not involve altering any structures that contain museum collections. Neither of the alternatives contains elements that would affect museum collections. The project area is oriented around road corridors, while any museum collections would likely be housed in the national recreation area's Bullfrog Visitor Center. Thus, there would be no potential effects to museum collections resulting from implementation of either alternative. Thus, this topic was dismissed from further consideration.

ENERGY REQUIREMENTS AND CONSERVATION POTENTIAL

The National Park Service strives to incorporate the principles of sustainable design and development into all facilities and park operations. Sustainability can be described as the result achieved by doing things in ways that do not compromise the environment or its capacity to provide for present and future generations. Sustainable practices minimize the short- and long-term environmental impacts of developments and other activities through resource conservation, recycling, waste minimization, and the use of energy-efficient and ecologically responsible materials and techniques. Value analysis and value engineering, including life-cycle cost analysis, is also performed to examine energy, environmental, and economic implications of proposed management decisions and development. The National Park Service also encourages suppliers, permittees, and contractors to follow sustainable practices. Consequently, any adverse impacts relating to energy use, availability, or conservation would be negligible. Therefore, energy requirements and conservation potential were dismissed from further consideration.

ENVIRONMENTAL JUSTICE

Presidential Executive Order 12898, "General Actions to Address Environmental Justice in Minority Populations and Low-Income Populations" requires all federal agencies to incorporate environmental justice into their missions by identifying and addressing the disproportionately high and/or adverse human health or environmental effects of their programs and policies on minorities and low-income populations and communities.

According to the Environmental Protection Agency, environmental justice is the

> fair treatment and meaningful involvement of all people, regardless of race, color, national origin, or income, with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Fair treatment means that no group of people, including a racial, ethnic, or socioeconomic group, should bear a disproportionate share of the negative environmental consequences resulting from industrial, municipal, and commercial operations or the execution of federal, state, local, and tribal programs and policies.

The goal of 'fair treatment' is not to shift risks among populations, but to identify potentially disproportionately high and adverse effects, and identify alternatives that may mitigate these impacts.

Page, Arizona and other nearby small communities contain both minority and low-income populations; however, environmental justice was dismissed as an impact topic for the following reasons:

- The park staff and planning team actively solicited public participation as part of the planning process and gave equal consideration to all input from persons regardless of age, race, income status, or other socioeconomic or demographic factors. Implementation of the preferred alternative would not result in any identifiable adverse human health effects. Therefore, there would be no direct or indirect adverse effects on any minority or low-income population.
- The impacts associated with implementation of the preferred alternative would not disproportionately affect any minority or low-income population or community.
- Implementation of the preferred alternative would not result in any identified effects that would be specific to any minority or low-income community.
- The economic impacts resulting from implementation of the preferred alternative may be short-term and adverse, but the long-term effects would be beneficial. In addition, the park staff and planning team do not anticipate that the impacts on the socioeconomic environment would alter the physical and social structure of nearby communities.

GEOLOGY

Geology was dismissed because potential effects would be no greater than negligible. Section 4.8 of *Management Policies* 2006 (NPS 2006a) states, "The Park Service will preserve and protect geologic resources as integral components of park natural systems. As used here, the term 'geologic resources' includes both geologic features and geologic processes. The Service will (1) assess the impacts of natural processes and human activities on geologic resources; (2) maintain and restore the integrity of existing geologic resources; (3) integrate geologic resource management into Service operations and planning; and (4) interpret geologic resources for park visitors."

Under both alternatives, geological processes would continue to occur within the project area. Altering of any geological features under either alternative would have little impact on geologic resources because the site maintenance and/or management actions would occur in localized areas and would serve to stabilize features from further erosion. Impacts on geologic resources from these actions would be negligible because the area affected would be small, any excavations would be shallow, and the bedrock integrity around and beneath any disturbances would be maintained. Therefore, geology was dismissed from additional analysis.

INDIAN TRUST RESOURCES

There are no Indian trust resources within Glen Canyon National Recreation Area that would be affected by the project. Thus, the impact topic is dismissed from full evaluation.

NATURAL LIGHTSCAPES

Management Policies 2006 (NPS 2006a), section 4.10, Lightscape Management, directs the National Park Service to preserve, to the greatest extent possible, the natural lightscapes of parks, which are natural resources and values that exist in the absence of human-caused light. Although there would be night construction on the project, all lighting would be oriented downward to minimize potential effects on the night sky. Therefore, because the no action alternative would have no effect and the proposed action would have at most a negligible, short-term, adverse effect on the visibility of night skies, this impact topic was dismissed from further analysis.

PRIME AND UNIQUE AGRICULTURAL LANDS

All federal agencies are required to analyze the effects of their actions on soils classified as prime or unique by the Natural Resources Conservation Service, as required by the Council of Environmental Quality in a memorandum from August 1980. The Farmland Protection Policy Act of 1981, as amended, also requires federal agencies to consider adverse effects to prime and unique farmlands that would result in conversion of prime and unique farmland to non-agricultural uses. Prime farmland is defined as soil that particularly produces general crops as common foods, forage, fiber, and oil seed; unique farmland produces specialty crops such as fruits, vegetables, and nuts. Both categories require that the land is available for farming uses (Council on Environmental Quality 1980). No prime and unique agricultural lands or other high-quality lands are identified near the project area in Coconino County, Arizona (NRCS 2012) and the lands associated with the proposed action would not be available for farming uses because it lies entirely inside the national recreation area boundary. Therefore, this impact topic was not evaluated.

SOCIOECONOMICS

Socioeconomics were dismissed because there would be no meaningful effects on the local or regional economy and reallocation of visitor-oriented services would not occur. Jobs and purchases associated with construction of the proposed action would not be detectable from normal variation in the labor or retail markets of Coconino County. The project would not produce measurable, indirect socioeconomic impacts, such as increased national recreation area visitation, that could result in more demand for food and lodging. There would not be any changes in the need for services such as schools, fire protection, or street maintenance. Because the project would have a negligible effect on social and economic conditions, a more detailed investigation is not included.

SOUNDSCAPE

In accordance with *Management Policies 2006* (NPS 2006a) and *Director's Order #47, Sound Preservation and Noise Management* (NPS 2000), an important part of the NPS mission is preservation of natural soundscapes associated with national park units. During construction, human-caused sounds would likely increase because of equipment, vehicular traffic, and construction crews. Best management practices would be employed during construction to minimize noise. Sounds generated from construction would be short-term, lasting only as long as the construction activity was occurring. Adverse construction-related

effects on soundscapes would likely be minor or less in intensity. Therefore, this topic was dismissed from further analysis.

TRAFFIC

The proposed action would affect traffic because of the work on the Lees Ferry Road and stabilization of the Paria River Bridge, but there would be no long-term change in traffic volumes or visitor destinations(approximately 200,000 visitors to Lees Ferry in 2011). Traffic delays related to construction along the road, which are included in the proposed action description in chapter 2, would not affect the ability of users to access the Lees Ferry boat ramp to launch river trips because trip participants typically arrive a day before actual launches and would not be substantially affected by short delays. Daytime delays during the high-use season would primarily be limited to 15 minutes. These delays would not interfere with launch times. Similarly, other users, such as fisherman, sightseers, and bus tour participants, would be able to accommodate delays within their schedules with only minimal adverse effects. Any effects on traffic would be short-term and negligible to minor. As a result, traffic was not retained as an impact topic for full evaluation.

VISITOR USE AND EXPERIENCE

This topic was dismissed from detailed evaluation because impacts of the proposed action would only be short-term and negligible to minor. Visitor use impacts related to short-term construction for travelers on the Lees Ferry Road are addressed under the public health and safety impact topic.

WILDERNESS

The proposed action would occur along a road in a non-wilderness setting. No designated or proposed wilderness is within the range of effects of the proposed action. As a result, the proposed action would have no effect on wilderness and the topic will not be fully evaluated.

WILDLIFE / FISH

Fish and wildlife resources were dismissed because potential effects would be no greater than minor. The proposed action would occur in a developed zone where human presence and vehicle use is common. Thus, the use of construction equipment would not have unusual or exceptional effects on terrestrial or avian wildlife species. Potential effects on fish as a result of installation of erosion and scour control structures were anticipated and the design incorporates features to avoid or minimize adverse effects.

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Chapter 2: Proposed Action and Alternatives

INTRODUCTION

This chapter describes the alternatives for rehabilitating the Lees Ferry Road and stabilizing the banks of the Paria River near and upstream of the Paria River Bridge. The National Park Service developed one action alternative that would address all of the concerns described in chapter 1 and also considered an alternative that would continue to manage existing conditions. Following the descriptions of the alternatives, this chapter lists the measures that would be implemented to minimize impacts from the alternatives, identifies the NPS' preferred alternative and the environmentally preferred alternative, and presents alternatives or options eliminated from further consideration. The important features of the alternatives and the effects of the alternatives are summarized in tables at the end of the chapter.

Alternative A represents no action or a continuation of current management. Under this alternative, the National Park Service would continue to use, maintain, and repair the existing Lees Ferry Road, Paria River Bridge, and existing drainage components in their current condition, despite drainage and erosion concerns. Road and drainage infrastructure would continue to degrade as a result of vehicle loading and environmental influences.

To help develop alternative B, the action alternative, Federal Highway Administration personnel surveyed the Lees Ferry Road with NPS staff on multiple occasions to observe pavement, drainage, traffic, and infrastructure conditions. The Federal Highway Administration (2009) prepared a technical memorandum that was used as the basis for the project evaluated in this environmental assessment.

A fluvial geomorphic evaluation of the project area was conducted by Ralph Weeks, professional geologist, of AMEC Earth & Environmental, Inc. in December 2007, to support the development and design of channel stabilization measures. As reported in the Federal Highway Administration (2009) technical memorandum, the results of this evaluation are summarized in a letter report dated January 30, 2008. The report notes that significant historical migration of the Paria River has occurred within the project reach and comments on the many changes that have occurred over the past 25 years. Although the channel is more incised than it was historically, the lateral erosive potential remains and threatens the long-term integrity of the Paria River Bridge foundation.

ALTERNATIVE A - NO ACTION / CONTINUE CURRENT MANAGEMENT

Current conditions along the Lees Ferry Road result in a high level of maintenance because of the degradation of the road shoulders caused by heavy truck / trailer and bus traffic and challenging drainage issues in an environment that can be overwhelmed by infrequent but heavy rainfall. Inadequate drainage systems and insufficient erosion control would continue to pose problems along the Lees Ferry Road in multiple locations. The banks of the Paria River upstream from the Paria River Bridge are experiencing serious erosion. The erosion along the northern bank threatens to undermine the Lonely Dell Access Road. The Paria River Bridge is at risk from erosion of the river bank on the south side of the bridge. Important features of this alternative with regard to the Lees Ferry Road, existing drainage components, and Paria River banks are described below and summarized in a table at the end of this chapter.

ROAD COMPONENTS

Lanes along the 6-mile-long Lees Ferry Road would continue to vary in width. This would present less than optimum driving conditions.

The curve radii along Lees Ferry Road would continue to be inconsistent and not meet current standards. The existing curve radii would be maintained and would continue to contribute to road damage from encroachment by large trucks and buses that sometimes cut curves too sharply because the lane widths in curves are inadequate.

The existing Lees Ferry Road surface would be maintained. Cracking, shoulder deterioration, and undulations in the pavement resulting from poor soil, age, and wear would continue to require maintenance and repair in spot locations.

DRAINAGE COMPONENTS

The following drainage system components would be maintained in their current condition along Lees Ferry Road:

- Paved ditches along the road generally have a “U” shape and are difficult to clean. The existing ditches are in poor condition and do not adequately convey storm runoff.
- Curbing along the road is deteriorated and/or not sufficient in length to prevent erosion of fill areas from sheet flow conditions.
- Culvert cross-drains frequently become plugged with sediment, particularly where the cross-slope of the road is shallow or in locations with acute culvert inlet angles.
- Drop inlets and outlets along the roadside may degrade road infrastructure where they are near the road edge.

Additionally, the following conditions in locations along Lees Ferry Road would continue under the no action alternative:

- The outlet of the box culvert where Lees Ferry Road crosses Cathedral Wash is being undermined by erosion.
- About a quarter-mile above where the road crosses Cathedral Wash, the Lees Ferry Road runs roughly parallel to the wash. When the wash is flowing, the adjacent fill slope of the road is threatened by erosion. Flows occasionally inundate the road, leaving sediment deposits in the roadway.

- At No-Name Wash, drainage conditions at the existing stream crossing result in the wash overtopping the road two to three times per year. Short-term road closures are required and unsightly debris is deposited.
- About 0.2 mile north of the Balanced Rock pullout, the road has been undermined where the ditch line flows through a constricted section. The large culverts just downgradient of this area are showing signs of deterioration, including pitting and corrosion.

PARIA RIVER BANKS

Channel erosion along the Paria River (see figure 3) would continue as a result of storm flow events that would create the high velocities at the bridge (FHWA 2009). This erosion would continue to threaten the stability of the east Paria River Bridge abutment, the bridge pier, and the banks supporting the Lonely Dell Access Road. No management actions would occur along the banks of the Paria River and erosion would continue to threaten the integrity of the Paria River Bridge and the Lonely Dell Access Road, potentially preventing access to national recreation area resources.

BRIDGE ABUTMENTS

Scour around the bridge abutments and pier at the Paria River Bridge would continue. Scour at this site has historically been a problem. In 1989, supplemental concrete was poured around the slope paving of the existing concrete abutments to fill undermined areas and protect against further scour (FHWA 2009). More recently, the east abutment protection was extended laterally upstream in response to continued scour and bank erosion. Although bedrock outcrops are evident around the bridge, the bridge pier and abutments are not necessarily founded on bedrock. According to the most recent Federal Highway Administration Bridge Inspection Report (Structure No. 1440-001P – 5/8/07), the foundations are spread footings on constructed fill.

LONELY DELL ACCESS ROAD

The channel bank adjacent to the Lonely Dell Access Road would continue to actively erode and undermine the edge of the road. The National Park Service would continue small maintenance actions to prevent failure of the access road.

For a distance of about 1,000 feet upstream of the bridge, the Lonely Dell Access Road parallels the river above a highly erosion-resistant bedrock material (Moenkopi Formation) that constrains the west bank of the Paria River in this reach. Upstream of this point, the bedrock formation turns to the north, and the river angles to the east (figure 3). At the location where the river first contacts the Moenkopi Formation, the Lonely Dell Access Road is near the edge of the bedrock formation and the channel bank is actively eroding the floodplain material along the limits of the bedrock. The access road is approximately 20 feet above the channel, directly adjacent to a vertical, eroded bank. Bank material above the bedrock formation would continue to slough down the slope and compromise the road.

ALTERNATIVE B – ROAD REHABILITATION AND BRIDGE / BANK STABILIZATION

Alternative B was designed to address all of the concerns that were identified in chapter 1. Important features of this alternative with regard to the Lees Ferry Road, existing drainage components, and Paria River banks are described below and summarized in a table at the end of this chapter.

LEES FERRY ROAD COMPONENTS

The Lees Ferry Road pavement structure would be restored, rehabilitated, and resurfaced. The entire 6-mile road would be pulverized, reshaped, compacted, and repaved with consistent lane widths. The radii of curves that are too tight would be widened by up to 4 feet.

The road profile would be raised by about 6 inches for approximately 4,700 feet, starting 0.6 miles north of the intersection of U.S. Highway 89A and Lees Ferry Road. The road profile would be raised along Cathedral Wash to account for the grade improvements to the pullout. These actions would remove existing pavement undulations, provide a smoother driving surface, and improve the pavement structure. The concrete pad at the fee station would be removed as part of the proposed action.

Multiple pullouts provide vehicle parking for access to scenic viewpoints, trailheads, or other points of interest. Some of these pullouts are planned, paved parking areas, while others have developed over time as a result of use. Alternative B would close some of these pullouts and improve others:

- About 0.9 acre (39,429 square feet) of existing pullouts would be removed. All removed pullouts would be graded to blend with the landscape and revegetated.
- About 0.21 acre (9,099 square feet) would be paved to accommodate revised designs of pullouts at Cathedral Wash and Balanced Rock and to formalize a river overlook approximately 0.1 mile south of the Lees Ferry Campground turnout. Each of these pullouts would be approximately 300 feet long. A portion of the parking and pullout areas at Cathedral Wash and Balanced Rock would meet the Architectural Barriers Act Accessibility Standard so that people with impaired mobility could access the interpretive signs.
- In addition to the lengthened pullout at Cathedral Wash, the Cathedral Wash trailhead would be formalized. The trailhead change would allow pedestrians to access Cathedral Wash on the same side of the road as the pullout instead of crossing the road as is currently done.

STAGING AREAS

Construction materials would be stockpiled and construction equipment would be staged at various NPS-approved locations along the Lees Ferry Road. The primary staging area would be several hundred feet east of the Paria River Bridge along the Lees Ferry Road. Staging locations would be in existing staging areas, designated NPS storage sites, and in areas along the road corridor that have been previously disturbed. Equipment and materials would be stored in areas approved by the National Park Service. The asphalt and concrete batch plant would be outside the national recreation area in a previously disturbed area and would not affect natural or cultural resources in or outside the national recreation area.

DRAINAGE COMPONENTS

Drainage improvements would occur along and across Lees Ferry Road, including culvert improvements, providing positive drainage along ditches, and installing revet mattresses (wire

enclosed riprap) adjacent to the road to prevent future erosion at many locations. The following improvements would be made to drainage components along Lees Ferry Road.

- All paved ditches would be evaluated for effectiveness and rehabilitated or reconstructed accordingly. Existing U-shaped ditches would be replaced with straight-sloped paved ditch sections (with curb and gutter in the Cathedral Wash area). These types of paved ditch sections may also be used where new roadside drainage improvements were required. Revet mattress or loose riprap may be placed at the end of paved ditches to prevent future erosion.
- Curb reconstruction/extension would be completed as needed along the road to ensure fill slope protection.
- Solutions to preventing culvert cross-drains from becoming plugged with sediment would be implemented. Actions could include replacing some culverts with larger diameters and/or installing additional cross-culverts to improve drainage capacity. Additional solutions could include skewing cross-culverts relative to the road for improved hydraulic flow.
- Existing drop inlets along the roadside would be replaced with flared end sections.

The following actions would take place in areas along the Lees Ferry Road:

- Near Cathedral Wash, the existing pullout would be lengthened approximately 150 feet to the south to better accommodate visitor vehicles. Embankment protection, in the form of revet mattresses and gabions (cylindrical wire baskets filled with rock), would be placed on the east bank of Cathedral Wash to protect the bank and the Lees Ferry Road from further erosion (see figure 4). Improvements associated with Cathedral Wash also would include outlet protection for the large box culvert under the road to prevent further erosion and scour.
- At No Name Wash, larger culverts would be constructed to prevent road overtopping. Slope paving and a headwall would be installed to minimize erosion.
- Undermining of Lees Ferry Road a quarter-mile north of the Lees Ferry campground turnoff would be repaired by installing erosion protection using a gabion wall adjacent to the road.

PARIA RIVER BANKS

Erosion stabilization along the banks of the Paria River would consist of added bank protection with channel spurs, also known as spur dikes, to deflect the strongest high-water flows away from the bank. A gabion retaining wall and revet mattresses would be installed to cover vulnerable slopes.

Upstream and Downstream West Bank. The bridge's western end-wall would be extended upstream and downstream by 10 to 15 feet and the area above it would be graded to allow runoff from the road to flow onto the slope paving. This would reduce water and rock movement onto the bridge deck and would minimize erosion at the end of the bridge. Concrete lining at the toe of the east and west slope paving would be extended to the bridge pier footing.

East Bank. Bank protection would consist of a 1-foot-thick revet mattress placed on the riverbank (wire-enclosed riprap) at a 2 horizontal to 1 vertical slope, extending approximately 240 feet upstream from the existing left bridge abutment and incorporating two channel spurs upstream. Plan views of the preliminary design are shown in figures 5 and 6. The revet mattress would be underlain with a geotextile fabric and filled with 4- to 8-inch diameter rock. Larger riprap would be preferable, but is not locally available and hauling costs would be prohibitive. The toe of the revet mattress would be tied to a row of 3-foot by 3-foot gabion baskets embedded at least 6 feet below the minimum channel bed profile.

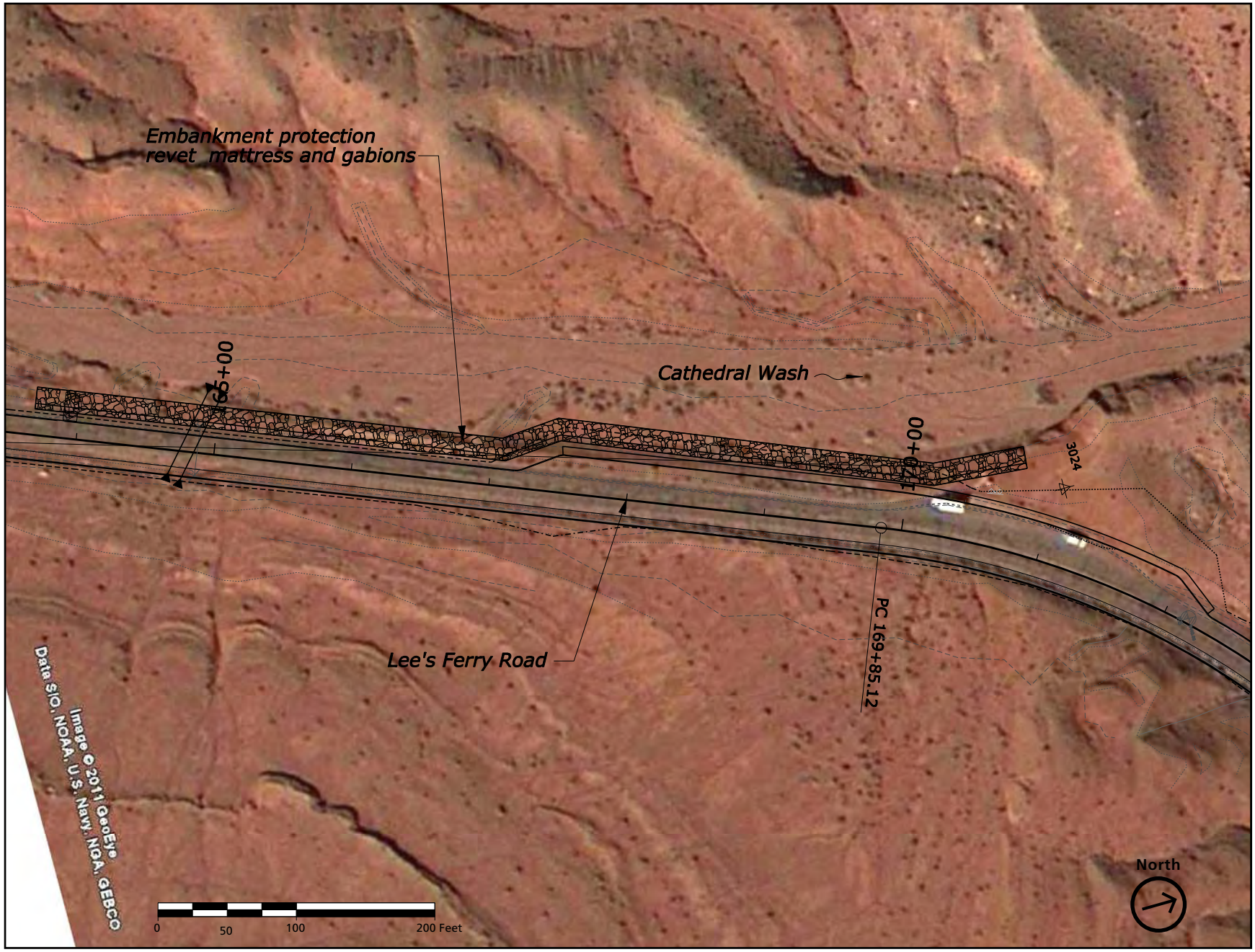

Figure 4: Cathedral Wash Bank Stabilization and Pullout

Glen Canyon National Recreation Area

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

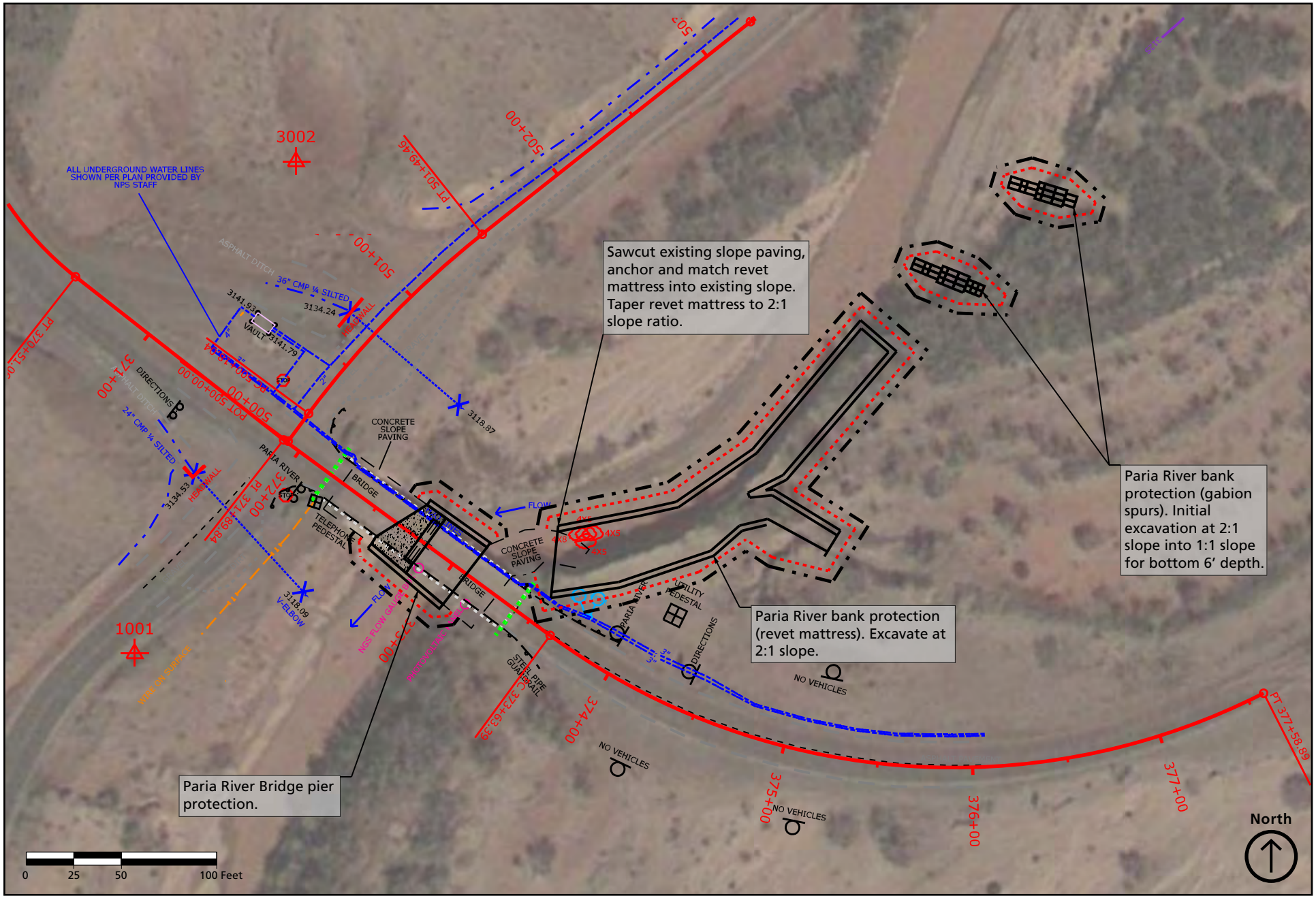

Figure 5: Paria River Bank Protection with Two Channel Spurs - Design Plan

Glen Canyon National Recreation Area

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

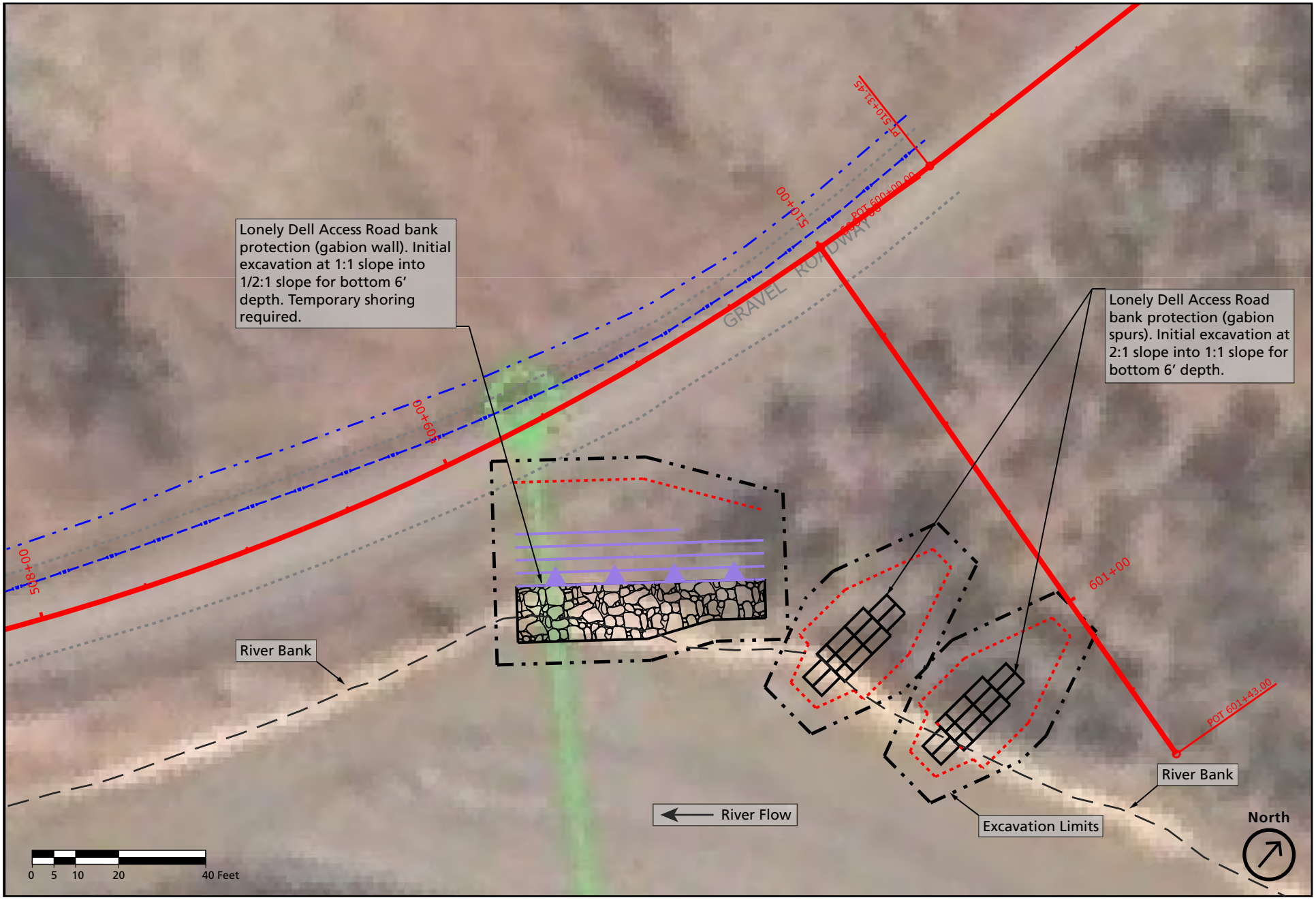

Figure 6: Lonely Dell Access Road Bank Repairs / Protection

Glen Canyon National Recreation Area

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

The channel spurs would reduce the risk of flanking of the revetment by limiting channel bank erosion immediately upstream of the revetment and redirecting the flood flows away from the susceptible banks. The spurs would extend into the channel approximately 30 feet from the top of bank, be embedded approximately 20 feet horizontally, and be at least 3 feet below the channel elevation at the bank line. The two spurs would be adjacent to an existing sandbar, with contact limited to flood level flows.

BRIDGE ABUTMENT

Additional concrete paving would be added to the riverbed area under the bridge to protect the existing bridge abutment fills and pier footing, and minimize the potential for scour. This would extend from the east side to the west side bottom edge of the existing slope paving. A low-flow channel for fish passage would be incorporated into the lining. This area would be approximately 45 feet long by 45 feet wide under the bridge. Approximately 6 inches of riverbed would be excavated to prepare the surface for placement of concrete. Turndown walls would be installed on the upstream and downstream edges to prevent undercutting.

LONELY DELL ACCESS ROAD

A gabion retaining wall at the Lonely Dell Access Road would stabilize the bank slope and restore the road section. In addition, two channel spurs would be installed to prevent further bank erosion. As shown in figure 6, the gabion wall would span approximately 40 feet of riverbank and be founded on the bedrock formation, which is approximately 15 feet below the road surface. The two channel spurs would be immediately upstream at approximately 50-foot intervals. They would be oriented downstream, extending into the channel approximately 20 feet from the top face of the bank and transitioning down to the channel bed.

Because of the highly erosive upstream bank, the spurs have a high risk of flanking (FHWA 2009). However, the other alternative is to armor a longer portion of the upstream channel, which would have greater environmental impacts and higher costs. Therefore, alternative B includes future maintenance of the spurs in response to channel migration.

The Lonely Dell Access Road could be closed for up to two weeks during construction of the bank stabilization. The adjacent parking area could be used for staging materials and equipment, but would be restored to its original condition following completion of the work. The construction contractor would maintain rough vehicular access around the excavation to facilitate construction, and this access could be used for emergency response, if needed. Staging and disturbance would be limited to the Lonely Dell Access Road prism and would not extend into the uphill cut-slope.

When it was necessary to perform work from within the riverbed, equipment would enter the river near the Paria River Bridge and travel though the riverbed. If riverbed access was unavailable, an alternate route using an old gravel-surfaced road east and south of the Lonely Dell work site would be used.

CONCRETE REMOVAL

A concrete slab (24 feet x 10 feet with a thickness of 0.5 to 3 feet) is in the Paria River channel about 700 feet upstream from the proposed Lonely Dell channel improvements. The concrete was part of a road that previously crossed the Paria River. Alternative B would remove this slab and dispose of the waste outside Glen Canyon National Recreation Area. Because of the steep riverbanks at this location, it would be accessed through the riverbed by driving equipment up from the Lonely Dell work site. Work would be done during low flow

to minimize impacts. Care would be taken to minimize disturbance to vegetation and the streambed when accessing and removing the concrete.

TRAFFIC CONTROL AND SCHEDULING

Construction night work may be done at any time throughout the year. Vehicle traffic would be controlled during road rehabilitation and bank stabilization. Delays would likely be greater during the evening and nighttime hours. Table 4 show the projected seasonal and daily delays.

Table 4: Potential Traffic Delays Due to Construction

Season	Potential Delay	Daily Variation (delays not to exceed)
December - February	30 to 60 minutes	4:00 AM - 7:00 PM, 30 minutes; 7:00 PM - 4:00 AM, 60 minutes
March - April	15 to 60 minutes	8:00 AM -1:00 PM and 3:30 PM - 7:00 PM, 30 minutes; 1:00 PM - 3:30 PM, 15 minutes; 7:00 PM - 8:00 AM, 60 minutes
May - September	15 to 60 minutes	8:00 AM - 5:00 PM, 15 minutes; 5:00 PM - 7:00 PM and 4:00 AM - 8:00 AM, 30 minutes; 7:00 PM - 4:00 AM, 60 minutes
October - November	15 to 60 minutes	8:00 AM -1:00 PM and 3:30 PM - 7:00 PM, 30 minutes; 1:00 PM - 3:30 PM, 15 minutes; 7:00 PM - 8:00 AM, 60 minutes

MITIGATION MEASURES

Mitigation measures are designed to prevent or minimize adverse impacts during and after project implementation. The following mitigation measures were developed to minimize the degree and/or severity of adverse effects and are specific to the project area and to the resource issues analyzed in this document. The measures in table 5 would be implemented during the action alternative, as needed. The Federal Highway Administration or the construction contractor would obtain any federal and state environmental permits required for this project. As part of the permitting process, additional mitigation measures could be required by other agencies.

Glen Canyon National Recreation Area commits to the mitigation measures identified in this section as a part of implementing the project. The organization or entity that would be responsible for implementing each mitigation measure is listed. The impacts for the action alternative in chapter 3 were determined with these mitigation measures in place, with tailoring to meet site-specific conditions.

Table 5: Mitigation Measures for Each Impact Topic and Responsible Organization

Mitigation Measure	Responsible Organization
Soils	
Work on only on the road bench for most of the project. Delineate those construction areas outside the existing road bench using fencing or other highly visible means to prevent impacts on resources outside the approved construction boundaries.	Federal Highway Administration (FHWA), construction contractor
Whenever possible, schedule construction during dry periods and when surface and ground water levels are low to minimize soil compaction.	Construction contractor
Pile the top 6 inches of soil adjacent to the road away from the pavement and then spread it back once paving is completed in the area.	Construction contractor
Inspect equipment for leaks of oil, fuels, or hydraulic fluids before and during use to prevent soil and water contamination. Require contractors to have and implement a plan to promptly clean up any leakage or accidental spills from equipment, such as hydraulic fluid, oil, fuel, or antifreeze.	FHWA, construction contractor
Use erosion control best management practices to minimize soil erosion at all project sites. These could include, but may not be limited to, silt fences, sediment traps, erosion check screens and filters, jute mesh, and hydromulch.	FHWA, construction contractor
Where appropriate, use materials such as weed-free straw bales, fabric barriers, and sandbags to prevent soil and debris from entering drainage inlet areas.	FHWA, construction contractor
Maximize the use of previously disturbed areas for staging and stockpile areas to minimize ground disturbance.	FHWA, construction contractor
Require dust control during construction using methods such as watering, covering haul loads, and controlling vehicle speeds.	FHWA, NPS
Obtain any fill materials from a source approved by the national recreation area ecologist or other recognized expert.	FHWA, construction contractor, NPS
Maximize use of excess excavated soil within the larger project area. Excess excavated soil would be used as fill to minimize impacts whenever possible.	FHWA, construction contractor

Table 5: Mitigation Measures for Each Impact Topic and Responsible Organization (continued)

Mitigation Measure	Responsible Organization
Vegetation	
Prior to construction, develop a project revegetation plan. The plan should include, but not be limited to, the use of native species (preferably from the same gene pool), native seed/plant mixes, mulching, plant salvage potential, exotic vegetation control, monitoring to ensure successful recovery, and actions to be taken if monitoring indicates problems. Include reconstruction of the natural spacing, abundance, and diversity of native plant species.	NPS
Ensure that there would be no irrigation needs beyond plant establishment whenever possible.	NPS
In establishing construction boundaries, minimize impacts on vegetation by avoiding shrubs and trees (including their root systems) where possible.	FHWA, NPS
Require contractors to pressure-wash construction equipment before it enters the national recreation area to ensure that it is free of mud or seed-bearing material. All construction equipment would be inspected prior to entering the national recreation area.	FHWA construction contractor, NPS
Prohibit the damage or removal of vegetation without prior approval via the project documents or by national recreation area vegetation management staff.	FHWA, NPS
Follow construction best management practices for topsoil management, revegetation preparation, and revegetation as outlined in the national recreation area revegetation plan.	NPS
Whenever possible, salvage and preserve disturbed vegetation for reuse.	FHWA, construction contractor, NPS
After site work is completed, scarify compacted soils and reestablish original contours.	FHWA, construction contractor
Spread topsoil in as near to its original location as possible to help preserve microorganisms and seeds of native plants.	Construction contractor
Use mulching, seeding, and/or planting with species native to the immediate area to improve revegetation success.	NPS
For the Paria River Bridge stabilization project, plant willows in, on, or around gabion baskets and revet mattresses. For the Lees Ferry Access Road project, conditions are not conducive for willow establishment so willow will not be planted.	FHWA, construction contractor, NPS
Conduct pre- and post-project exotic plant monitoring in the project area	NPS
Treat existing populations of exotic vegetation at the site prior to other activities.	NPS
Implement exotic plant control measures during construction.	FHWA, Construction contractor, NPS
Require a management plan that includes continual maintenance to monitor and mitigate impacts for at least three years after construction.	NPS
For soil stabilization and erosion control, use only certified weed-free materials to avoid introduction of exotic plant species. Review all proposed materials on a case-by-case basis. Allowable materials for erosion control may include rice straw, straw or hay determined by the National Park Service to be weed-free, materials purchased from a certified source, cereal grain straw that has been fumigated to kill weed seed, and wood excelsior bales.	FHWA, construction contractor, NPS
Water Resources	
Prepare a storm water pollution prevention plan. Specify site-specific measures to reduce and control erosion, sedimentation, and compaction that can lead to water quality degradation.	FHWA, construction contractor

Table 5: Mitigation Measures for Each Impact Topic and Responsible Organization (continued)

Mitigation Measure	Responsible Organization
Where possible, plan and maintain vegetated buffers between areas of soil disturbance and waterways.	FHWA, NPS
Use soil erosion best management practices such as sediment traps, erosion check screen filters, jute mesh, and sterile hydromulch to prevent the entry of sediment into waterways.	FHWA, construction contractor, NPS
Promptly remove any hazardous waste that is generated in the project area.	FHWA, construction contractor
Obtain inspection and certification from the National Park Service that any piece of equipment that is placed in or near the river is free of invasive species.	FHWA, construction contractor, NPS
Inspect equipment for leaks of oil, fuels, or hydraulic fluids before and during use to prevent soil and water contamination. Require contractors to have and implement a plan to promptly clean up any leakage or accidental spills from equipment, such as hydraulic fluid, oil, fuel, or antifreeze.	FHWA, construction contractor
Minimize onsite fueling and maintenance. If these activities cannot be avoided, store fuels and other fluids, and perform fueling and maintenance, in designated areas that are contained and lined to contain spills. Require provisions for the containment of spills and the removal and safe disposal of contaminated materials, including soils.	Construction contractor
Delineate wetland vegetation and clearly mark it prior to construction work. Avoid wetlands unless wetland disturbance is specified in the contract documents. Apply general protection measures described above during construction in areas where wetland disturbances cannot be avoided.	NPS
Along the banks of the Paria River, use best management practices to minimize river, corridor, and water quality impacts. These include, but are not limited to, the following. • Conduct work during low-flow conditions.	FHWA, construction contractor
• Salvage and stockpile wetland topsoil, and replace it to restore the disturbed areas.	Construction contractor, NPS
• Stockpile all excavated material outside wetlands, in areas where drainage would not be constrained, and where loss from erosion would not be likely. Do not place fill in wetlands or riparian areas unless specified in contract documents.	FHWA, construction contractor, NPS
• Install silt fences around all soil stockpile areas. Remove the fences after site rehabilitation is completed.	Construction contractor
Add the contract specifications (section 208.05 Channel Preservation) to mitigate effects to the Paria River and downstream waters: • Prior to working in the stream, divert the stream flow around the work area. Use structures such as temporary sediment traps, erosion check screens, coffer dams, or water-inflated coffer dams to divert the main flow and reduce turbidity downstream from the project site. Construct diversions in a manner that would provide a continuous flow to downstream reaches and would not affect the quality, quantity, or temperature of flows below the diversion in a manner that would adversely affects fish or other aquatic life. Remove diversions upon completion of the work at that location. • Use the details provided by the U.S. Fish and Wildlife Service regarding pump placement and intake screens to protect fish. These details will be included in the construction specifications.	FHWA, NPS

Table 5: Mitigation Measures for Each Impact Topic and Responsible Organization (continued)

Mitigation Measure	Responsible Organization
• Build temporary work pads on gravel or rock consisting of onsite alluvium, clean silt-free gravel, or river rock for large, stationary equipment working in the stream channel to provide a stable substrate. Limit fill to the minimum amount necessary to accomplish the work. Place approved barriers to contain any fluids that might leak from equipment around temporary fill and work areas in the streambed. Upon completion of the work, remove temporary fills and barriers.	FHWA, NPS
• Slowly and carefully drive heavy equipment operated in the stream channel to minimize sediment movement and resulting increases in turbidity.	FHWA, construction contractor
• Prior to anticipated high flows, remove from the natural bed of the waterway all temporary structures not designed to withstand high water flows and materials considered deleterious to aquatic life if inundated.	FHWA, construction contractor
Wildlife	
Conduct nesting bird surveys a week ahead of construction. If nests are found, modify the location or timing of the construction plan to prevent nesting disturbance. Conduct additional surveys for all new disturbances that occur during the bird breeding period.	FHWA, NPS
Inform construction workers and supervisors that under the Migratory Bird Treaty Act, no migratory bird, nest, or egg can be disturbed, removed, or destroyed. Provide instructions for notification of recreation area staff if the potential for disturbance is discovered.	FHWA, NPS
Monitor fish to determine if they are congregating in the area where a diversion or cofferdam would narrow the Paria River channel.	FHWA, NPS
Fit pump intakes with mesh debris screens designed to specifications provided by the U.S. Fish and Wildlife Service to protect fish, particularly flannelmouth suckers. Monitor the intake screens for debris buildup. Notify an NPS fish biologist if any juvenile fish are found impinged on the screen or any fish are entrained through the screen mesh.	Construction contractor
Special Status Species	
Inform construction workers and supervisors about the potential for special status species in the work vicinity and actions to take if individuals or populations of a special status species are identified.	FHWA, NPS
If appropriate, include contract provisions that require a stop in construction activities if a special status species is discovered in the project area, until recreation area staff evaluate the situation. This would allow modification for any protection measures determined necessary to protect the species.	FHWA, NPS
Implement the following conservation measures specific to the California condor: • Instruct construction workers and supervisors to avoid interaction with condors and to immediately contact the Glen Canyon National Recreation Area, Division of Resource Management at 928-608-6267 if a condor settles at the construction site.	FHWA, construction contractor
• Clean up the construction site up at the end of each day (for example, trash removed, scrap materials picked up) to minimize the likelihood of condors visiting the site.	Construction contractor

Table 5: Mitigation Measures for Each Impact Topic and Responsible Organization (continued)

Mitigation Measure	Responsible Organization
• Specify that the contractor must immediately dispose of any dead animals found within the construction limits by placing the carcass in the nearest available dumpster. If any dead animals are observed outside the construction limits, the contractor will inform the contracting officer. The contracting officer will contact the park for removal of any dead animals found outside the construction limits and within 500 feet of the construction zone. Dispose of all carcasses by placing the carcass in the nearest available dumpster. Park staff will empty the dumpsters on a regular basis so roosting by condors is not encouraged from odor coming from the dumpsters.	Construction contractor, NPS
• To prevent water contamination and potential poisoning of condors, develop and implement a spill prevention and cleanup plan for this project. Include provisions for immediate clean-up of any hazardous substance, and define how each hazardous substance would be treated in case of leakage or spill. Ensure that the plan considers possible leakage from all equipment, materials, and vehicles being used. Provide this plan at least two weeks prior to start of construction (including preliminary set-up activities).	FHWA, construction contractor
• Any project activity that may cause imminent harm to condors would be temporarily suspended until permitted personnel could assess the situation and determine the correct course of action.	FHWA, construction contractor, NPS
• Prior to the start of project activities, Glen Canyon National Recreation Area staff would contact personnel (Peregrine Fund 928-355-2270) monitoring condor locations and movement to determine the locations and status of condors in or near the project area.	NPS
• All project workers would be advised of the possibility of the occurrence of California condors in the project area.	FHWA, construction contractor, NPS
• All project workers would be instructed to avoid interaction with condors and to immediately contact the appropriate Glen Canyon National Recreation Area or Peregrine Fund personnel if and when condor(s) occur at the project area. To avoid injury both to condors and to personnel, project workers would not haze condors.	FHWA, construction contractor, NPS
• If a condor occur at the project site, only permitted personnel would employ appropriate techniques to cause the condor to leave the site. "Permitted" personnel means those individuals with the necessary federal and state permits.	NPS
Cultural Resources	
During the design stage, ensure that the proposed action would avoid identified cultural resources.	FHWA, NPS
To avoid impacts to documented historic properties, including the Honeymoon Trail, which intersects the Lees Ferry Road in several locations, make sure that project activities stay within the previously disturbed road prism and do not exceed established protective construction boundaries.	FHWA, construction contractor
Monitor for previously unidentified archeological resources by having a professionally qualified archeologists on hand during all project activities that could include subsurface disturbance to areas determined to be sensitive and/or to possess the potential for presence of intact subsurface archeological remains.	FHWA, construction contractor, NPS
Stop all work in the immediate vicinity if previously unidentified archeological resources are discovered during construction until the resources could be identified and documented.	FHWA, construction contractor

Table 5: Mitigation Measures for Each Impact Topic and Responsible Organization (continued)

Mitigation Measure	Responsible Organization
If archeological resources eligible for listing in the National Register of Historic Places are discovered, alter the project design to avoid them. If the project component cannot be rerouted and the resources preserved in situ, prepare an appropriate mitigation strategy in consultation with the Arizona State Historic Preservation Officer and American Indian tribes traditionally associated with recreation area lands.	FHWA, NPS
In the unlikely event that human remains, funerary objects, sacred objects, or objects of cultural patrimony are discovered during construction, stop all work in the immediate vicinity and comply with the provisions outlined in the Native American Grave Protection and Repatriation Act.	FHWA, construction contractor, NPS
Inform all contractors and subcontractors of the penalties for illegally collecting artifacts or intentionally damaging archeological sites or historic properties. Instruct them regarding procedures to follow in case previously unknown archeological resources are uncovered during construction.	FHWA, NPS
Health and Safety	
Implement measures to close and/or redirect visitor access in areas that would be affected by construction to ensure visitor health and safety. Provide information on alternatives that would help visitors achieve their goal while maintaining a safe distance from the work area.	FHWA, construction contractor, NPS
Implement a traffic control plan during construction, as warranted. Include strategies to maintain safe and efficient traffic flow.	FHWA, construction contractor
Implement measures to reduce adverse effects of construction on visitor health and safety.	FHWA, construction contractor, NPS
Operations of the National Park Service and Partners	
Coordinate activities of contractors and national recreation area staff to minimize disruption of normal recreation area activities. Inform construction workers and supervisors about the special sensitivity of recreation area values, regulations, and appropriate housekeeping.	FHWA, NPS
Share information regarding implementation of this and other foreseeable future projects with the public. This could include methods such as postings on the national recreation area's website, posters on bulletin boards, and/or press releases. The goal would be to steer activities away from project areas and minimize the potential for negative impacts on the visitor experience.	FHWA, NPS
To minimize potential impacts on concessioners and visitors, develop a construction schedule providing details of traffic delays, closures, and night work. Provide the schedule to concessioners, post it on all bulletin boards and on the national recreation area website, and update it regularly.	FHWA, NPS
Orient lighting in night work areas so that downward-facing illumination would be focused on the immediate area where work was being performed. This would minimize potential effects to the natural lightscape.	FHWA, construction contractor
Prior to construction, conduct a meeting with concessioners, project managers, and business resources staff to provide information on anticipated issues that may occur.	FHWA: NPS
General Construction Best Management Practices	
Clearly state all protection measures in the construction specifications.	FHWA, NPS
Minimize the amount of ground disturbance for activities not directly related to construction, such as staging and stockpiling areas. Return all staging and stockpiling areas to pre-construction conditions following construction. Limit parking of construction vehicles to designated staging areas or existing roads and parking lots.	FHWA, construction contractor, NPS

Table 5: Mitigation Measures for Each Impact Topic and Responsible Organization (continued)

Mitigation Measure	Responsible Organization
Identify and define construction zones with construction tape or other material prior to any construction activity. Use the zone to confine activity to the minimum area required for construction. Stipulate that construction activities, including material staging and storage, cannot occur beyond the construction zone as defined by the construction zone fencing, where appropriate.	FHWA, construction contractor, NPS
Comply with federal and state regulations for the storage, handling, and disposal of all hazardous material and waste. If hazardous materials will be used on site, make provisions for storage, containment, and disposal.	FHWA, construction contractor
In the contract, identify specific provisions and implementation measures to prevent storm water pollution during construction activities, in accordance with the Clean Water Act's National Pollutant Discharge Elimination System permit program and all other federal, state, and local regulations, and in accordance with the storm water pollution prevention plan to be prepared for this project.	FHWA, construction contractor
Provide the contractor with a copy of U.S. Environmental Protection Agency document EPA 832-F-99-003, Storm Water Management Fact Sheet-Dust Control. Require the contractor to submit a dust control plan prior to construction.	FHWA
Ensure that construction equipment uses the best available technology for sound dampening muffler and exhaust systems.	FHWA, construction contractor
Require contractors to develop and implement a plan that would prevent excessive idling of all vehicles used in construction. The goal of the plan will be to save fuel and reduce noise and emissions.	FHWA, NPS
Place construction debris in refuse containers at least daily. Dispose of refuse at least weekly. No burning or burying of refuse is allowed in the national recreation area.	Construction contractor

THE PREFERRED ALTERNATIVE AND ENVIRONMENTALLY PREFERABLE ALTERNATIVE

THE ALTERNATIVE PREFERRED BY THE NATIONAL PARK SERVICE

Alternative B is preferred by the National Park Service because it is the only alternative that addresses the need for action. It is the only approach that would reduce the risk from erosion to the Paria River Bridge and Lonely Dell Access Road. Rehabilitation of the Lees Ferry Road and protection of its banks under alternative B would maximize infrastructure preservation and enhance visitor and staff safety. Other benefits associated only with alternative B include increased visitor opportunities because of improved vehicle pullouts at Cathedral Wash, Balanced Rock, and the river overlook.

THE ENVIRONMENTALLY PREFERABLE ALTERNATIVE

According to the U.S. Department of the Interior regulations in 43 *Code of Federal Regulations* section 46.30 that implement the National Environmental Policy Act, the environmentally preferable alternative "causes the least damage to the biological and physical environment and best protects, preserves, and enhances historical, cultural, and natural resources. The environmentally preferable alternative is identified upon consideration and weighing by the Responsible Official of long-term environmental impacts against short-term impacts in evaluating what is the best protection of these resources."

Alternative B is the environmentally preferable alternative for several reasons. It would reduce the potential for continued erosion of the Paria River banks upstream of the bridge and below the Lonely Dell Access Road. Erosion control would also be implemented along Cathedral Wash. Visitors and staff could continue to use and enjoy the Lees Ferry Road and the attractions it leads to because safety would be enhanced under alternative B. There would be less likelihood of road closures associated with extreme precipitation events as a result of enhanced drainage features. Short-term adverse impacts to natural resources as a consequence of construction activities would be outweighed by the beneficial effects and resource protections afforded by alternative B.

Alternative A was not the environmentally preferable alternative for a number of reasons. Channel erosion along the Paria River would continue as a result of storm flow events, with the highest velocities occurring at the bridge. In addition to threatening the road and bridge, this would result in increased sediment flowing into the Paria River and continued degradation of the Paria River banks. Alternative A would also continue to impede access to the natural recreation area resources, and would maintain the current road conditions that challenge commercial buses and vehicles towing long, heavy trailers.

ALTERNATIVES AND ACTIONS DISMISSED FROM FURTHER CONSIDERATION

Some of the alternatives or actions suggested during scoping were not incorporated into either of the alternatives examined in detail in this environmental assessment. Consistent with section 1502.14 of the Council on Environmental Quality (1978) regulations for implementing the National Environmental Policy Act, this section identifies those alternatives or actions and briefly discusses why each was eliminated.

The options that were initially considered to meet the bank stabilization need are documented in the Federal Highway Administration Paria River Technical Memorandum (FHWA 2009). These options included the use of additional spur dikes, increased length of bank armoring with revet mattresses, and installation of as many as six bendway weirs that would have tied into the revet mattress bank protection at 50-foot intervals. Generally, the options not selected were dismissed because of a combination of feasibility questions, too great an adverse environmental impact, and/or the inability to meet the Paria River Bridge protection element of the project's purpose and need.

Other options for protection of the bridge included a vertical reinforced-concrete retaining wall and the use of a soil/cement mixture to stabilize the bank of the river upstream of the bridge. The former was dismissed because of its unacceptable environmental impact and the latter because there were doubts about the method's technical feasibility or ability to provide protection for the long term.

An option to have the bank stabilization revet mattress extend only halfway up the bank with vegetation planted on the upper half was dismissed because of difficulties establishing vegetation in the area and the potential for a high-flow event to circumvent the structure, destabilize the bank protection features, and potentially undermine the bridge. Another option considered was to have bank protection extend an additional 150 feet upstream beyond the proposed 240 feet. While this option would enhance bank stabilization and protect the flanks of the Paria River Bridge, the environmental impacts would be too great and the cost would be prohibitive. As a result, this option was dismissed from further consideration.

There was concern that accessing the Lonely Dell work site through the Paria River channel would not be feasible. As a result, an access route was considered across the uplands between the Lees Ferry Road and the riverbank directly south of the Lonely Dell work site. However, because access through the river was deemed feasible and because of the potential impacts to biological soil crusts along the overland route, this option was dismissed from further consideration.

SUMMARY COMPARISON OF THE ALTERNATIVES

In accordance with NPS guidance on preparing environmental assessments, this section provides comparisons of the alternatives.

- Table 6 summarizes the important features of the alternatives.
- Table 7 summarizes the degree to which each alternative meets the project purpose, need, and objectives.
- Table 8 summarizes the environmental consequences of each alternative. A more detailed explanation of the impacts is presented in Chapter 3: Affected Environment and Environmental Consequences.

There would not be any conflicts between either of the alternatives and any environmental laws or policies.

Table 6: Important Features of the Alternatives to Rehabilitate the Lees Ferry Road and Stabilize the Paria River Banks

Feature	Alternative A: No Action / Continue Current Management	Alternative B: NPS Preferred, Road Rehabilitation and Bridge / Bank Stabilization
Lees Ferry Road curve radii	No changes to existing conditions; radii would remain inconsistent with latest design standards.	Curve radii would meet current design standards.
Repeated damage to road shoulders s	No changes from current management of repairing shoulders on an as-needed basis would take place. Informal and formal vehicle pullouts would remain in their current configuration with ongoing management efforts to minimize and avoid resource damage.	Consistent road widths and adequate curve radii would help to minimize degradation of shoulders on curves. Redesign, relocation, and removal of a number of vehicle pullouts would reduce driving off the shoulders into informal pullouts.
Road surface	Hot patching of cracks would continue as necessary. Undulations resulting from heavy truck and trailer traffic would not be addressed.	The entire, 6-mile-long road would be rebuilt and repaved. The road profile would be raised by 6 inches for 4,700 feet starting 0.6 miles north of the intersection of U.S. Highway 89A and Lees Ferry Road (approximate values) to remove existing pavement undulations, provide a smoother driving surface, and improve the pavement structure.
Cross-road drainages	Culvert inlets and outlets would continue to be maintained on an as-needed basis. Roadside ditches would not adequately convey storm runoff in multiple locations.	Improvements to culvert inlets and outlets, redesign of culvert alignments, and regrading of roadside ditches would improve cross-road drainage and minimize maintenance.
Vehicle pullouts and turn-arounds	No action would be taken to eliminate informal pullouts and turn-arounds that have developed over time or to improve any pullouts.	Approximately eight informal turn-arounds and pullouts would be eliminated. Redesigned, paved pullouts would be installed at Cathedral Wash, Balanced Rock, and the Colorado River overlook.
Paria River Bridge	Continue maintenance and other reactive measures to address continuing erosion of the Paria River banks upstream and at the river crossing.	Installation of upstream gabion spurs would decrease the river's erosion capabilities and the revet mattress on the upstream bank would reduce erosion. The slope protection and tie-in to the revet mattress would stabilize the banks upstream and under the bridge. Scour protection under the bridge would enhance long-term stability of the bridge supports.
Lonely Dell Access Road	No changes to current management actions to ensure long-term stability of the banks under the access road would be taken. Erosion would continue and would eventually threaten to undermine the road.	A gabion wall would be installed to reinforce the existing unstable bank and upstream spur dikes would assist in redirecting the river's flow to minimize future erosion of the bank.
Cathedral Wash	Current management actions, including the addition of waste soil and rock would continue, even though the material is carried away during high flow events. No action would be taken to address erosion under the box culvert outlet.	A revet mattress would be installed along the road bank adjacent to and parallel to Cathedral Wash to inhibit erosion. Erosion under the box culvert outlet would be corrected and hardened surfaces would resist further degradation of the culvert surroundings.

Table 7: Ability of Each Alternative to Meet the Project Purpose, Need, and Objectives

Feature	Alternative A: No Action / Continue Current Management	Alternative B: NPS Preferred, Road Rehabilitation and Bridge / Bank Stabilization
Lane widths along the Lees Ferry Road are consistent.	Poor ability. Lanes along the 6-mile-long Lees Ferry Road would continue to vary in width.	Good ability. The road would be pulverized, reshaped, compacted, and repaved to provide consistent lane widths.
Road surface undulations and shoulder degradations along Lees Ferry Road are corrected.	Poor ability. Cracking, shoulder deterioration, and undulations in the pavement would continue to require repeated maintenance.	Good ability. Road restoration, rehabilitation, and resurfacing would produce a smoother driving surface and improve the pavement structure, which would enhance safety.
Maintenance needs are reduced and roadside and cross-road drainage is more efficient.	Poor ability. Undersized or difficult-to-maintain drainage structures, shoulder deterioration, and cracked pavement resulting from age and wear would continue to require high levels of maintenance and repair.	Good ability. Improved design of road and drainage features would allow them to function effectively with less maintenance.
Erosion along the banks of the Paria River near the bridge and in the riverbed under the bridge is reduced to protect the bridge abutments and minimize the potential for pier failure.	Poor ability. The absence of protection of bridge abutments would continue to threaten the integrity of the bridge.	Good ability. Channel spurs would deflect high-water flows away from the bank and a gabion retaining wall and revet mattresses would protect vulnerable slopes. Additional concrete placed in the riverbed area under the bridge would stabilize the existing bridge abutment and minimize the potential for scour.
The Lonely Dell Access Road is protected from erosion where the Paria River is eroding the bank supporting the road.	Poor ability. For a distance of about 1,000 feet upstream of the bridge, the Lonely Dell Access Road would continue to be threatened by active erosion of the channel bank.	Good ability. A gabion retaining wall at the Lonely Dell Access Road would stabilize the bank slope and restore the road section. Two channel spurs would help prevent further bank erosion.

Table 8: Impacts of the Alternatives

Impact Topic	Alternative A: No Action / Continue Current Management	Alternative B: NPS Preferred / Road Rehabilitation and Bridge / Bank Stabilization
Water resources and hydrology	Impacts that were negligible, short-term, and adverse would continue because of potential interference by the drainage infrastructure across the Lees Ferry Road during large precipitation events. The cumulative effect of the no action alternative combined with other projects and plans would be negligible, short-term, and adverse.	Construction impacts would be negligible to minor, short-term, and adverse because of activity in the Paria River bed. Long-term impacts from drainage infrastructure improvements and bank stabilization would be beneficial but of negligible intensity because the free-flowing character of the water in the channel would not be altered and sediment loading would not change from historical norms. The cumulative effect of the action alternative combined with other projects and plans would be negligible and adverse.
Wetlands and waters of the United States	The effects of alternative A on wetlands would be negligible. It would not make any contribution to cumulative effects.	Because of the ephemeral nature of area wetlands, the small area affected at each individual project site, and the very low to absent functional values of affected wetlands, alternative B would have short-term, minor, adverse impacts. The long-term, adverse impacts would be of negligible intensity for the same reasons. It would contribute minimally to cumulative effects.
Floodplains	Impacts would be negligible. The cumulative effect of the no action alternative, combined with other projects and plans, would be long-term, negligible, and adverse.	Construction impacts on floodplains would be negligible, short-term, and adverse. In the long term, negligible, beneficial impacts would result from reduced erosion. The installation of spurs and a gabion wall to protect the bridge would have a long-term, minor, adverse impact to floodplains. Alternative B would contribute small, adverse and beneficial effects to the negligible, adverse cumulative impacts on the Paria River floodplain.
Soils	Alternative A would have short-term, minor, adverse and beneficial, localized impacts. Long-term impacts would be negligible. Cumulatively, adding the impacts from alternative A to the minor, adverse effects from other actions would result in continued, minor, adverse effects. This alternative would make a minimal contribution to cumulative impact.	Short-term impacts would be adverse and minor. Long-term impacts would be beneficial and minor and would result from reduced erosion along the Paria River banks. These effects, when combined with other actions, would result in continued minor, adverse effects. The incremental contribution of alternative B to cumulative impacts would be small.

Table 8: Impacts of the Alternatives (continued)

Impact Topic	Alternative A: No Action / Continue Current Management	Alternative B: NPS Preferred / Road Rehabilitation and Bridge / Bank Stabilization
Vegetation	Alternative A would have short-term, localized, minor, adverse impacts. Long-term impacts would be negligible to moderate, adverse, and primarily associated with erosion. Cumulatively, adding the impacts from alternative A to the minor, adverse effects from other actions would result in continued, minor, adverse effects. The contribution of this alternative to the cumulative impact would be small.	Construction-related adverse impacts would be short-term, minor, and adverse. Long-term, minor, beneficial impacts would be associated with reduced erosion. Cumulatively, adding the impacts from alternative B to the minor, adverse effects from other actions would result in continued, minor, adverse effects. The incremental contribution of alternative B to cumulative impacts would be small.
Special status species	Negligible to minor, adverse impacts would occur on the Brady pincushion cactus, with negligible impacts on all other special status species. Other actions in the project area would have a negligible or small, beneficial cumulative impact on special status species and the contribution of alternative A to their cumulative impacts would be negligible. For section 7 of the Endangered Species Act, a *may affect, but is not likely to adversely affect* determination would be applicable to the Brady pincushion cactus, razorback sucker, California condor, southwestern willow flycatcher, and Mexican spotted owl. This alternative would not alter designated critical habitat for any of the federally listed species addressed by this analysis.	During construction, short-term adverse impacts up to minor intensity would occur on the Brady pincushion cactus because of continued access for illegal collection, razorback sucker habitat because of increased sediment loading, and desert bighorn sheep because of increased human activity. All other short- and long-term impacts on special status species or their habitats would be negligible. Other actions in the project area would have a negligible or small, beneficial cumulative impact on special status species. The negligible or minor, adverse effects of alternative B combined with other projects and plans would continue to have negligible or small, beneficial cumulative impacts and the contribution of alternative B to the cumulative effect would be small. For section 7 of the Endangered Species Act, a *may affect, but is not likely to adversely affect* determination would be applicable to the Brady pincushion cactus, razorback sucker, California condor, southwestern willow flycatcher, and Mexican spotted owl. This alternative would not destroy or adversely modify designated critical habitat for any of the federal special status species addressed by this analysis.
Cultural resources – historic structures	Alternative A would result in negligible impacts to historic structures. It would not contribute to cumulative impacts.	Implementation of alternative B would result in negligible impacts to historic structures because it would not disturb any contributing elements of the historic district. It would not contribute to the long-term, negligible cumulative impacts.

Table 8: Impacts of the Alternatives (continued)

Impact Topic	Alternative A: No Action / Continue Current Management	Alternative B: NPS Preferred / Road Rehabilitation and Bridge / Bank Stabilization
Cultural resources – archeological resources	Alternative A would result in long-term, negligible to minor, adverse impacts on archeological resources as a result of continued erosion. It would very slightly contribute to the long-term, negligible to minor, cumulative impacts to archeological resources.	Alternative B would result in long-term, minor, adverse impacts to archeological resources because of its ground-disturbing activities. It would slightly contribute to the long-term, minor, adverse cumulative impacts.
Cultural resources – ethnographic resources	Alternative A would result in long-term, negligible to minor adverse impacts on ethnographic resources as a result of continued erosion. It would very slightly contribute to the long-term, negligible to minor, cumulative impacts to ethnographic resources.	Alternative B would result in short- and long-term, negligible to minor, adverse impacts to ethnographic resources as a result construction disturbances and the removal of plants that have ethnographic significance to Native Americans. It would slightly contribute to the long-term, negligible to minor, adverse cumulative impacts.
Park operations	Impacts would be short- and long-term, moderate, and adverse because maintenance needs would continue to tax park resources. Cumulative impacts would be beneficial but alternative A would detract from these benefits.	Alternative B would result in short- and long-term, minor to moderate, beneficial impacts because the need for repeated maintenance would be reduced, and short- and long-term, negligible adverse impacts from the need for additional vegetation management. It would make a modest, beneficial contribution to the cumulative, long-term, beneficial impacts on park operations.
Public health and safety	Impacts would be short- and long-term, moderate, and adverse because existing road conditions would continue. The cumulative effect of the no action alternative combined with other projects and plans would be long-term, minor to moderate, and adverse.	Impacts would be long-term, minor to moderate, and beneficial because the proposed action would improve road conditions and protect the Paria River Bridge. The cumulative effect of the action alternative combined with other projects and plans would be long-term and beneficial.

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Chapter 3: Affected Environment and Environmental Consequences

INTRODUCTION

This chapter analyzes the potential environmental consequences, or impacts, that would occur as a result of implementing the alternatives for the proposed project. Topics analyzed in this chapter include water resources and hydrology, wetlands and waters of the United States, floodplains, soils, vegetation, special status species, cultural resources, park operations, and public health and safety.

METHODS

GENERAL METHODS

Direct, indirect, and cumulative effects were analyzed for each resource topic that was analyzed in detail. Potential impacts are described in terms of type (are the effects beneficial or adverse?), context (are the effects site-specific, local, or even regional?), duration (are the effects short-term, lasting only during construction, or long-term, extending beyond construction?), timing (is the project seasonally timed to avoid adverse effects?), and intensity (are the effects negligible, minor, moderate, or major?).

Impact type describes the classification of the impact as either beneficial or adverse:

- *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 moves the resource away from a desired condition or detracts from its appearance or condition.

Context describes the area or location in which the impact will occur, such as site-specific, local, regional, or even broader. The methods description for each impact topic identifies the geographic area that was considered. The term "disturbance area" is used for the area where activities such as clearing and grading occur in association with the project.

Duration describes the length of time an effect will occur, either short-term or long-term:

- *Short-term* impacts generally last only during construction, and the resources resume their pre-construction conditions following construction.
- *Long-term* impacts last beyond the construction period, and the resources may not resume their previous conditions for an extended period of time.

Intensity describes the degree, level, or strength of an impact. For this analysis, intensity has been categorized into negligible, minor, moderate, and major. Because definitions of intensity vary by resource topic, intensity definitions are provided separately for each impact topic analyzed in this environmental assessment.

CUMULATIVE IMPACTS

Sections 1508.7 and 1508.25 (a)(2) of the Council on Environmental Quality (1978) regulations for implementing the National Environmental Policy Act require assessment of cumulative effects in the decision-making process for federal actions. Cumulative effects 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."

The past actions that are considered in the analysis of cumulative impacts are limited to approximately the past 10 years so that the effects that are considered represent a baseline condition. Actions that occurred in the distant past, while potentially affecting a resource, are not considered because they do not have a relationship to the alternatives being considered and do not contribute substantially to the current baseline condition. Cumulative impacts are considered for all alternatives, including the alternative of no action / continue current management.

To determine cumulative impacts for this project, other past, ongoing, or reasonably foreseeable future actions from the vicinity of the Lees Ferry Road project and in the surrounding region were identified. The plans and policies that were identified earlier in tables 1 and 2, and the actions associated with those plans and policies, were considered in conjunction with the alternatives to determine cumulative effects. Although there are many other plans and policies associated with Glen Canyon National Recreation Area and other land managers in northern Arizona, only those actions that have relevance to the Lees Ferry Road were considered in the evaluation of cumulative effects.

WATER RESOURCES AND HYDROLOGY

AFFECTED ENVIRONMENT

Paria River

The Paria River is a tributary to the Colorado River and a primary sediment source for the Colorado River through the Grand Canyon. The Paria River flows south-southwest from its headwaters in southern Utah through agricultural lands in Garfield County, Utah and south through Grand Staircase-Escalante National Monument into Arizona. Its confluence with the Colorado River is below Glen Canyon Dam (Millennium Science and Engineering, Inc. no date). While most of its tributary streams and washes are intermittent, the Paria River is perennial for most, but not all, of its length.

Annual mean discharge of the Paria River at Lees Ferry is approximately 24 cubic feet per second for the Lees Ferry gauge period of record from water years 1995 through 2010. During this time, mean monthly flows ranged from a low of 2.95 cubic feet per second in July 2002 to a high of 196.5 cubic feet per second in September 1997. The typical flow pattern is quite variable with low flows typically occurring during the summer months (U.S. Geological Survey 2011).

Within the vicinity of the Paria River Bridge, the Paria River main channel is approximately 80 to 100 feet wide, with bank heights ranging from approximately 8 to 20 feet. A fluvial geomorphic evaluation of the project reach was conducted in December 2007. The report notes the significant historic migration of the Paria River that has occurred in the project reach over the past 25 years (FHWA 2009). Although the channel is more incised than it was historically, there is still a potential for lateral movement. Under current conditions, it is possible that the existing, less sinuous channel will transition to a more meandering form in the reach immediately upstream of the bridge (FHWA 2009).

Earthen berms were constructed in the Paria River upstream from the bridge in 1983 to divert the Paria River away from a channel alignment that it had migrated to around 1980. The limits of this berm may deter channel migration immediately upstream of the bridge, but does not likely eliminate upstream migration potential (FHWA 2009).

The Paria River is listed on Arizona's Impaired Waters list for 2010. The Arizona Department of Environmental Quality identifies the causes of impairment as suspended sediment concentration and coliform bacteria. Approximately 29.4 miles of the Paria River are affected (ADEQ 2010). The causes for this listing are likely a result of natural processes (that is, erosion in a desert environment).

Colorado River

The Colorado River flows in a generally southwest direction from its headwaters in Colorado over 1,450 miles towards the Gulf of California. The nature of the Colorado River at Lees Ferry is dominated by the Glen Canyon Dam. Originally, the Colorado River was a large, sediment-laden desert waterway, but the dam has altered the river's temperature, sediment load, and hydrograph. The temperature is relatively constant year-round, averaging 46° Fahrenheit. The sediment load now drops out of suspension in the upper reaches of Lake Powell so that at Lees Ferry, the river water is clear and nutrient levels are low. The hydrograph, which varied greatly throughout the year before the dam, is now fairly constant, with the greatest variation occurring on a daily cycle and ranging from 5,000 cubic feet per second to about 20,000 cubic feet per second. Occasional floods, limited by dam capability, are carried out for natural-resource-related values and research. Details of the hydrograph

are determined by the Secretary of the Interior through the Bureau of Reclamation based on recommendation of the Glen Canyon Dam Adaptive Management Program (NPS 2006b).

Public Law 93-493 allocates Glen Canyon National Recreation Area 260 acre-feet of water from the Colorado River annually. Currently, about 15% of this allocation is used. The proposed action would use up to 10,000 gallons of water, or about 0.03 acre-foot.

Intermittent Washes

The Lees Ferry area contains several intermittent washes. These washes are typically dry, but flow during rain events with high run-off. These washes typically include pools and other catchments that can hold water after the washes have stopped flowing.

Groundwater

Alluvial groundwater near the surface at Lees Ferry is hydraulically linked with the Colorado and Paria Rivers. Deeper water-bearing strata in the project area are poorly known.

IMPACT ANALYSIS METHODS

Intensity Definitions

Available information on water resources and hydrology in the project area was compiled. Potential impacts for the alternatives were based on professional judgment and experience with similar actions. The intensity thresholds for impacts on water resources and hydrology are defined below:

- *Negligible:* The impacts on water flow and quality would be below or at a very low level of detection (for example, no changes in water flow would be apparent). Hydrologic processes would not be affected.
- *Minor:* The impact would be detectable (for example, there would be apparent changes in water flow) and natural hydrological processes may be affected in a localized area.
- *Moderate:* The impacts would have a detectable effect on hydrology, either by changes in volume or timing of flow, and the potential for the impact to persist would be present.
- *Major:* The impact would result in highly noticeable changes in hydrological processes, and substantial changes in flow would be present and would persist after the action was complete.

Duration:

- *Short-term*: Recovers in less than one year after construction was completed.
- *Long-term*: Recovers in one or more years after construction was completed.

Geographic Area Considered

The geographic area evaluated to assess the effects of the proposed action included the Lees Ferry Road corridor, the areas that would be disturbed by project actions, and those areas that could be disturbed by project effects to surface water or groundwater.

ALTERNATIVE A: NO ACTION / CONTINUE CURRENT MANAGEMENT

Impact Analysis

Surface hydrology in relation to the Lees Ferry Road is intermittent. Except for the Paria River, there are no perennial waterways that intersect the road in the project boundaries. The intermittent washes that cross the road are channeled to culverts under the road. At times, with exceptionally heavy flow or if a culvert was blocked, the flows would continue to overtop the road. These events, although usually short-lived, would represent a negligible, short-term adverse effect on hydrology as the flows would be disrupted for a brief time.

Hydrology and water resources in the Paria River would not change from current management actions. Flows in the Para River are primarily driven by precipitation in its upstream basin, although interaction with and the contribution of groundwater is poorly known. Because most of the Paria River flows through alluvium (Utah Department of Environmental Quality 2003), the potential for the river to become sediment-laden is high, particularly during precipitation events such as thunderstorms, which often produce flash flooding of varying intensities. As a result, baseline turbidity in the Paria River is high and fluctuates directly with local and regional precipitation. The no action alternative would not have an effect on hydrological conditions in the Paria River and the river's flows, turbidity, and water quality would stay within its range of natural variation.

The no action alternative would not affect the Paria River listing on the Arizona Impaired Waters list.

Cumulative Impacts

None of the other plans and projects shown in tables 1 and 2 would have cumulative effects on natural water resources or hydrology other than potential short-term negligible adverse effects associated with local construction activity. Because of best management practices associated with all NPS construction and infrastructure upgrade projects, the intensity of these effects is low. These actions would have a negligible cumulative effect because the actions associated with these plans and projects would not affect the Paria River watershed or any of the intermittent washes that intersect the Lees Ferry Road. Alternative A would contribute minimally to cumulative effects on water resources or hydrology as a result of the potential disruption of local surface water flows during heavy precipitation effects. The cumulative effects would be adverse, short-term, and negligible.

Conclusions

Alternative A would have a negligible, short-term, adverse effect on water resources and hydrology as a result of potential interference by the drainage infrastructure across the Lees Ferry Road during large precipitation events. The cumulative effects of other plans and projects combined with the effects of alternative A would be negligible, short-term, and adverse.

ALTERNATIVE B: THE NPS PREFERRED ALTERNATIVE

Impact Analysis

The Lees Ferry Road rehabilitation portion of the project would have few impacts on water resources or hydrology. Resurfacing of the road and altering curve radii would have negligible effects that would occur during the construction of the upgrades to culvert inlets and outlets for the numerous intermittent washes that intersect the road. These effects would

occur if a precipitation event occurred during construction when the drainage features were not fully available. Although best management practices to minimize sediment transport and the degradation of water quality would be used, a large precipitation event could represent negligible, short-term, adverse impacts on water resources and hydrology.

The bank stabilization portions of the project have a greater potential to affect water resources and hydrology. Water volume and flow in the Paria River would not be affected, but the heavy machinery using the riverbed to access the riverbanks and excavate slopes for installation of revet mattresses and spur dikes could increase sediment loads. Best management practices would be used along with scheduling the work during the Paria River low-flow season to minimize sediment loading. Because the river naturally carries high sediment loads, particularly during flash floods, sediment increases associated with the proposed action would be within the range of natural variation. As a result, the impacts to water resources and hydrology would be negligible to minor, short-term, adverse effects.

Following installation of the bank stabilization features, the potential for erosion would be reduced. This would represent a beneficial effect on water resources and hydrology as sudden bank collapses that could increase sediment loads would be prevented. However, similar to the adverse effects described above for construction, the beneficial effects of reduced erosion would be within the natural range of variation as represented by a dry period. As a result, the beneficial effects of bank stabilization on water resources and hydrology would be negligible. The benefit would be inversely related to a major flood with the potential to overwhelm the stabilization features.

As it relates to the Paria River's listing on the Arizona Impaired Waters list, the bank stabilization features of alternative B would help to reduce sediment loads and would reduce the suspended sediment concentrations in the river. However, compared to the large size of the Paria River watershed, the benefits of bank stabilization in the project area would be negligible. There would be no impact on concentrations of coliform bacteria in the Paria River under alternative B. There would be short-term negligible to minor adverse impacts to the suspended sediment concentrations due to the construction activities, and long-term, negligible, beneficial impacts.

Cumulative Impacts

The other plans and projects associated with the Lees Ferry Road area are predominantly infrastructure upgrade projects and plans that manage recreational use on the Colorado River. As a result, there would be few cumulative impacts to water resources and hydrology from these projects. None of the projects would affect the drainage basin of the Paria River or either of the large intermittent washes (Cathedral Wash and No Name Wash) that cross the Lees Ferry Road. As described for alternative A, the only likely potential effects would be associated with the construction of infrastructure upgrades. Their use of best management practices would minimize the potential for water resources to be affected by runoff from these construction sites in the event of a large storm. These potential cumulative effects would be short-term, sporadic, and adverse if they occurred. Alternative B would make a small contribution to the cumulative effect on water resources, with a slightly increased potential for adverse effects because of the actions that would occur directly in the bed of the Paria River. The cumulative impacts of alternative B on water resources and hydrology would be negligible, short-term, and adverse if the actions of other plans and projects were concurrent with precipitation events.

Conclusions

Construction impacts would be negligible to minor, short-term, and adverse because of activity in the Paria River bed. Long-term impacts from drainage infrastructure improvements and bank stabilization would be beneficial but of negligible intensity because the free-flowing character of the water in the channel would not be altered and sediment loading would not change from historical norms. The cumulative effects of other plans and projects combined with the effects of alternative B would be negligible and adverse.

WETLANDS AND WATERS OF THE UNITED STATES

AFFECTED ENVIRONMENT

A wetland is defined in section 404 of the Clean Water Act as:

> Those areas that are inundated or saturated by surface or groundwater (hydrology) at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation (hydrophytes) typically adapted for life in saturated soil conditions (hydric soils). Wetlands generally include swamps, marshes, bogs, and similar areas (40 *Code of Federal Regulations* 232.2(r)).

Wetlands that exhibit all three characteristics (hydrology, hydrophytes, and hydric soils, as described above) are termed "jurisdictional wetlands" and are regulated by the U.S. Army Corps of Engineers under section 404 of the Clean Water Act as a subset of "waters of the United States." The term "waters of the United States" has broad meaning and incorporates both deep-water aquatic habitats and special aquatic sites, including wetlands (USACE 1987).

A wetland delineation and preliminary jurisdictional determination form completed on April 14, 2010 by SWCA Environmental Consultants determined that there are 0.103 acre of jurisdictional wetlands, according to the U.S. Army Corps of Engineers definition, within the project area. Seven discrete wetland areas were observed within the project boundaries. Each wetland was within the boundaries of the ordinary high water mark, and each wetland area abutted the water's edge. Each was adjacent to or abutting the active stream channel and each was solely populated with one or more species of rush (*Juncus* spp.) (SWCA Environmental Consultants 2009).

In accordance with *National Park Service Procedural Manual #77-1: Wetland Protection* (NPS 2012), the National Park Service requires that wetlands be categorized and evaluated according to the Cowardin system (Cowardin *et al.* 1979). According to this system, the jurisdictional wetlands along the river's edge can be qualified as "areas with hydrophytes and hydric soils, such as those commonly known as marshes, swamps, and bogs." The river would fall under the category "areas without hydrophytes but with hydric soils—for example, flats where drastic fluctuations in water level, wave action, turbidity, or high concentration of salts may prevent the growth of hydrophytes." Wetlands identified using the U.S. Army Corps of Engineers' definition also meet the Cowardin definition. The Paria River in the project area meets the Cowardin definition of a riverine wetland with an unconsolidated bottom that is permanently flooded. For the purposes of this environmental assessment, this area is defined as the river and its channel below the ordinary high water mark.

The total area of wetlands, including both U.S. Army Corps of Engineers-defined jurisdictional wetlands and those characterized as wetlands under the Cowardin system, is approximately 3.3 acres. This value was estimated using 2010 aerial photographs. No additional wetlands were observed in the proposed project area using either the Cowardin or U.S. Army Corps of Engineers' wetland classification systems.

The project area wetlands are ephemeral. Scour from flash floods can damage or entirely remove existing wetlands. Conditions for new wetlands can be created as the same type of flooding deposits debris and sediment that provides a suitable substrate for wetland development. This long-term process of removal and replacement occurs along the river throughout the project area except in areas of steep riverbanks.

The functional values of the wetlands in the project area that meet the U.S. Army Corps of Engineers' definition were evaluated by SWCA (2009). The categories that were assessed included biotic functions, hydrologic functions, cultural values, research and scientific values, and economic values. Because of the wetlands' proximity to each other and the

similarity of their vegetation and hydrologic regime, they were considered the same in the functional analysis. Based on the extremely small size of the wetlands and their ephemeral nature, all the wetlands in the project area were deemed to have very low to no functional value for each of the functions evaluated (SWCA 2009). These wetlands would provide some value for bank stabilization and animal and fish habitat.

The most important function and value for the Paria River is flood conveyance, which is described and analyzed under the floodplains impact topic. Vegetation in the project area along the Paria River is limited. The river and associated riparian corridor also provide habitat for fish and wildlife. The potential project impacts to these species are described and analyzed under the special status species impact topic.

IMPACT ANALYSIS METHODS

Available information on wetlands in the project area was compiled and scientific literature was reviewed. Potential impacts from the alternatives were based on expected disturbance to wetland communities and professional judgment and experience with previous projects. The analysis of effects to wetlands considers both wetlands and waters of the United States as defined by the U.S. Army Corps of Engineers as well as wetlands defined under the Cowardin system.

Intensity Definitions

The intensity of impacts to wetlands are characterized using the threshold definitions defined below.

- *Negligible:* Impacts to wetlands would be barely perceptible (for example, there would be no changes in extent or plant species composition in wetlands). Impacts would have no principal effect on wetland functions and values.
- *Minor:* Impacts would be detectable and would not be expected to have an overall effect on wetland functions and values. The proposed action would remove less than 0.1 acre of wetlands.
- *Moderate:* Impacts would be detectable and could have an appreciable effect on individual plant species composition or wetland functions and values. The proposed action would remove more than 0.1 acre of wetlands and would require mitigation. The mitigation would likely be successful.
- *Major:* Impacts would result in substantial loss of wetlands resources, and there may be noticeable effects on wetland functions and values. Mitigation would be at a larger scale, and mitigation success would not be guaranteed.

Duration:

- *Short-term*: Recovers in less than one year after construction was completed.
- *Long-term*: Recovers in one or more years after construction was completed.

Long-term impacts to wetlands would include any disturbance that resulted in a loss of wetland area and function, such as placement of fill in a wetland or excavation within a wetland. Short-term impacts would occur from actions such as crossing a wetland to access a work site. Short-term impacts would be removed after completing the construction activities. Evidence of the short-term impacts would be gone one year after construction was completed.

ALTERNATIVE A: NO ACTION / CONTINUE CURRENT MANAGEMENT

Impact Analysis

This alternative would not include actions that would affect the wetlands. The existing jurisdictional wetlands would continue to provide minimal wetland functions along the edge of the Paria River. No actions would be taken that would affect the wetlands. Variation in flow volumes in the Paria River channel is normal as a result of extreme precipitation events and flash floods. These variations have the potential to remove soils and vegetation along the river, depending on intensity. As a result, existing wetland conditions would persist, resulting in no effects to wetlands under alternative A until high flows and natural channel alignments potentially redistribute soils and the wetland seedbank so that wetlands would regenerate in new locations along the riverbanks. The flood conveyance function of the Cowardin-defined wetlands would not be affected under alternative A. The effect of the alternative on wetlands would be negligible.

Cumulative Impacts

None of the other plans and projects presented in tables 1 and 2 would be expected to have any effect on the wetlands along the Paria River. Native plants were planted to replace tamarisk under the 2001 restoration plan. Management of those plants continues. The tamarisk eradication plan also uses native plants to replace tamarisk. Although detailed wetland delineations of the areas affected by these plans are not available, cumulative effects on wetlands on or adjacent to the restored areas would be beneficial. None of the other plans and projects would affect the upstream Paria River watershed, which could in turn affect the river's flow and ultimately, the wetlands. These wetlands are small and isolated and are subject to frequent natural changes as a result of changes in river flow and channel alignment. The no action alternative would not contribute to any cumulative effects on these wetlands. There would be no cumulative effects on wetlands associated with alternative A or other plans and projects.

Conclusions

The effects of alternative A on wetlands would be negligible. Alternative A would not make any contribution to cumulative effects.

ALTERNATIVE B: THE NPS PREFERRED ALTERNATIVE

Impact Analysis

The installation of revet mattresses, gabions, spur dikes, and slope paving to stabilize the riverbanks at and upstream of the Paria River Bridge and to minimize erosion of the banks supporting the Lonely Dell Access road would impact some jurisdictional wetlands, waters of the United States, and Cowardin system wetlands.

The proposed action would likely partly or completely fill three of the seven jurisdictional wetlands. The remaining four discrete jurisdictional wetlands would not be affected. The Paria River would also experience long-term impacts from fill (that is, the revet mattresses, gabions, and spur dikes installed in and along the channel). Short-term impacts would result from equipment accessing the site and from constructing a short-term river diversion around work sites.

According to the *National Park Service Procedural Manual #77-1: Wetland Protection* (NPS 2012), acreage limits in excepted actions apply to "single and complete projects." Single and

complete projects are on discrete sites and have "independent utility" (are fully functional units by themselves). None of the individual project areas is contingent on the other or would have greater than 0.1 acre of long-term impact to wetlands. The proposed projects, described in detail in the alternatives, would qualify as excepted actions for maintenance, repair, or renovation (but not full reconstruction or expansion) of currently serviceable facilities or structures, in this case the Paria River Bridge and the Lonely Dell Access Road. Excepted actions are actions that may be excepted from the statement of findings and compensation requirements described in the wetland procedural manual. Short-term impacts would be included in this exception because the Paria River would be largely back to full function after one year.

Table 9 summarizes long- and short-term impacts to jurisdictional and Cowardin-system wetlands and waters of the United States. Long-term impacts would result from installing hardened surfaces to stabilize the banks and minimize erosion. Short-term impacts to the river bed would affect riverine wetlands and would result from placing working platforms for equipment, short-term river diversions, and equipment access into and through the river channel. Details related to the various work sites follow the table.

Table 9: Impacts to Wetlands and Waters of the United States

Location Affected	Long-Term Impacts (acres)	Short-Term Impacts (acres)
Concrete removal site	0.000	0.269
Lonely Dell bank stabilization site	0.003	0.639
Paria River bank stabilization site	0.089	0.206
Paria River Bridge slope paving	0.041	0.071
Total	0.133	1.185

Removal of the large slab of concrete from the Paria River channel about 700 feet upstream of the Lonely Dell work site would produce short-term impacts to a total of about 0.269 acre. This would include 0.029 acre of the Paria River channel at the site of the slab and 0.24 acre of channel that would be disturbed because the steep banks dictate that equipment would need to reach the slab via the riverbed. This work would be done during low flow conditions to minimize impacts as much as possible. By removing this concrete, the river would be less constricted, especially during low flows, which would have long-term, beneficial impacts on river flows upstream and downstream of the site.

The installation of the gabion wall and spur dikes at the Lonely Dell site would produce a long-term impact to an estimated 0.003 acre of wetland. About 0.069 acre of the Paria River channel would experience short-term impacts from the installation work and diversions of the river channel around the site. About 0.57 acre of the Paria River channel would experience short-term impacts from accessing the site through the riverbed.

About 0.089 acre of wetland would experience long-term impacts by fill associated with installing the revet mattresses, gabion baskets, spur dikes, and slope paving along the bank upstream of the Paria River Bridge. Also, approximately 0.206 acre of the Paria River channel would experience short-term impacts from the installation work and the diversions of the river channel around this site.

Approximately 0.041 acre of the Paria River channel would experience a long-term impact from extending the concrete slope paving from the existing concrete paving beneath the bridge to the existing pier. About 0.071 acre of the channel would experience a short-term impacts from equipment accessing the area beneath the bridge. The impacts for the diversion around this site are included in the 0.206 acre of short-term impact described above for the Paria River bank stabilization work.

In this dynamic riverine environment with limited vegetation, the impact on functions of the wetlands found in the individual project areas would be minor.

Because of the ephemeral nature of area wetlands, the small area affected at each individual project site, and the very low to absent functional values of the wetlands that would be lost or affected, alternative B would have short-term, minor, adverse impacts on wetlands. The long-term, adverse impacts would be of negligible intensity for the same reasons.

Cumulative Impacts

As described for alternative A, the other plans and projects associated with the Lees Ferry area would have little to no adverse cumulative impacts on wetlands except for potential beneficial cumulative effects resulting from the Lees Ferry 10-Acre Site Restoration Plan of 2001. Alternative B would contribute minimally to cumulative effects.

Conclusions

Because of the ephemeral nature of area wetlands, the small area affected at each individual project site, and the very low to absent functional values of the wetlands that would be lost or affected, alternative B would have short-term, minor, adverse impacts on wetlands. The long-term, adverse impacts would be of negligible intensity for the same reasons. Alternative B would contribute minimally to cumulative effects.

FLOODPLAINS

AFFECTED ENVIRONMENT

Most of the project area is outside of the floodplain, as illustrated in Federal Emergency Management Administration Flood Insurance Rate Maps 04005C0750G and 04005C0725G, effective September 3, 2010 (figures 7 and 8) (FEMA 2010). Interpretations of the flood zone designations are:

- Zone A has a 1% annual chance of flooding and is commonly called the 100-year floodplain.
- Zone D has possible but undetermined flood hazards because a flood hazard analysis was not conducted.
- Zone X has minimal flood hazard and is usually depicted as above the 500-year flood level.

A few areas are in the 100-year floodplain, including a 540-foot-long section of Lees Ferry Road across Cathedral Wash, a 560-foot-long section of Lees Ferry Road across No Name Wash, and a 1,900-foot-long section of Lees Ferry Road northeast from the Paria River Bridge. (All values are approximate.)

The main channel of the Paria River near the bridge is approximately 80 to 100 feet wide, with bank heights ranging from approximately 8 to 20 feet. The 100-year Paria River floodplain in this area is approximately 1,000 feet wide. Flow depths can range from around 6 inches for normal low flows to nearly 20 feet during a 100-year flood event (FHWA 2009).

Flood flows upstream of the bridge are contained within the main channel up to approximately a 2-year event. Water from larger events spills into the floodplain area south of the main channel where it ponds behind the Lees Ferry Road, eventually draining back into the channel to pass under the bridge. When the discharge exceeds a 10-year event, flows overtop the Lees Ferry Road (FHWA 2009).

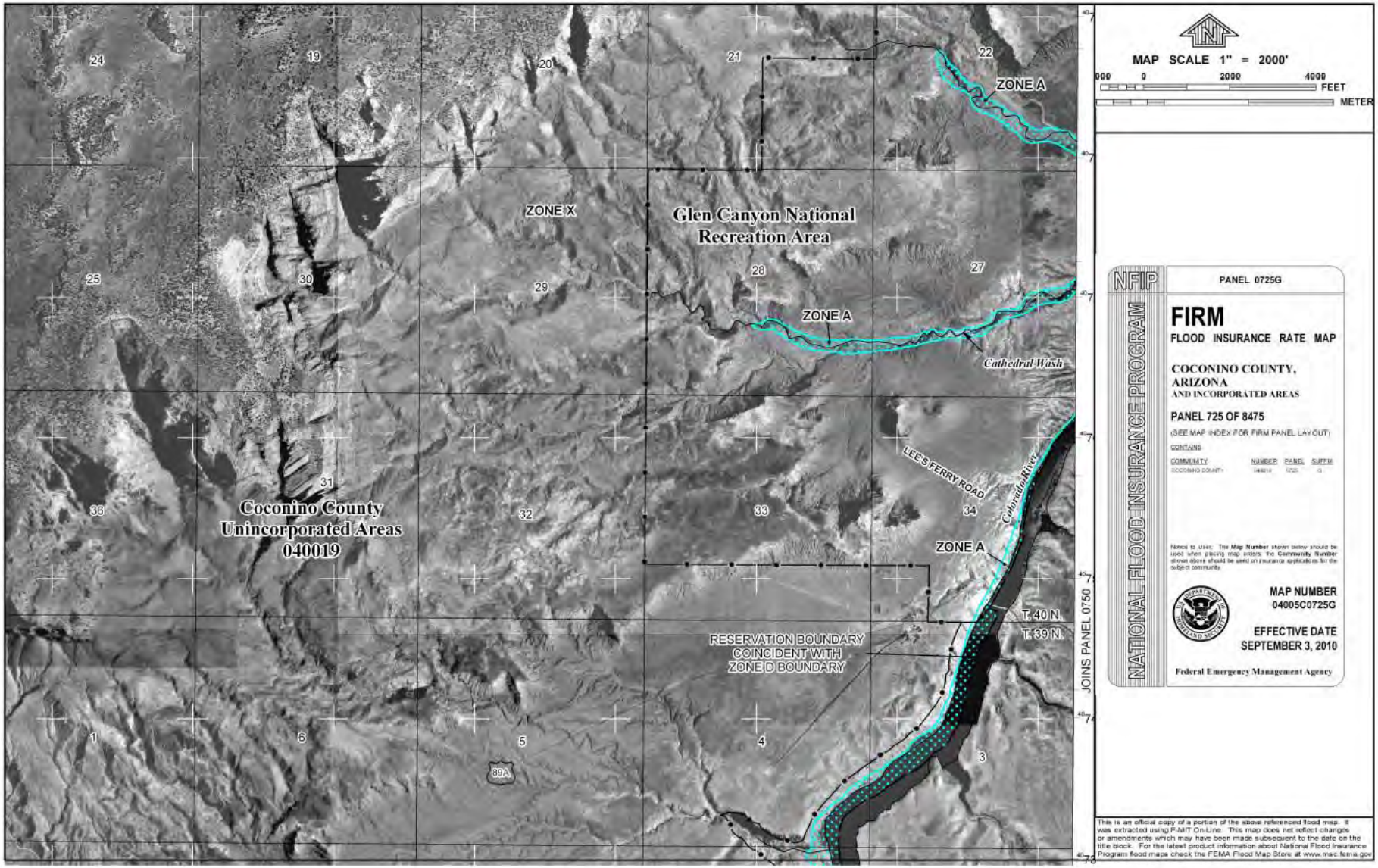
As indicated by the eroded, vertical bank lines throughout the project reach, velocities and shear stresses during flood flows are relatively high. During a 2-year event, the estimated average depth is about 9 feet and the velocity is about 6 feet per second. As flood flows increase, depths approach 20 feet at some locations, and average channel velocities reach 8 feet per second. The highest velocities occur at the bridge where the channel is constricted and flows accelerate up to and under the bridge. High velocities are also present along the outside (south side) of the channel bend upstream of the bridge (FHWA 2009).

A floodplain statement of findings was prepared because part of the proposed action is in the 100-year floodplain for the Paria River. The floodplain statement of findings is included as appendix B of this environmental assessment.

IMPACT ANALYSIS METHODS

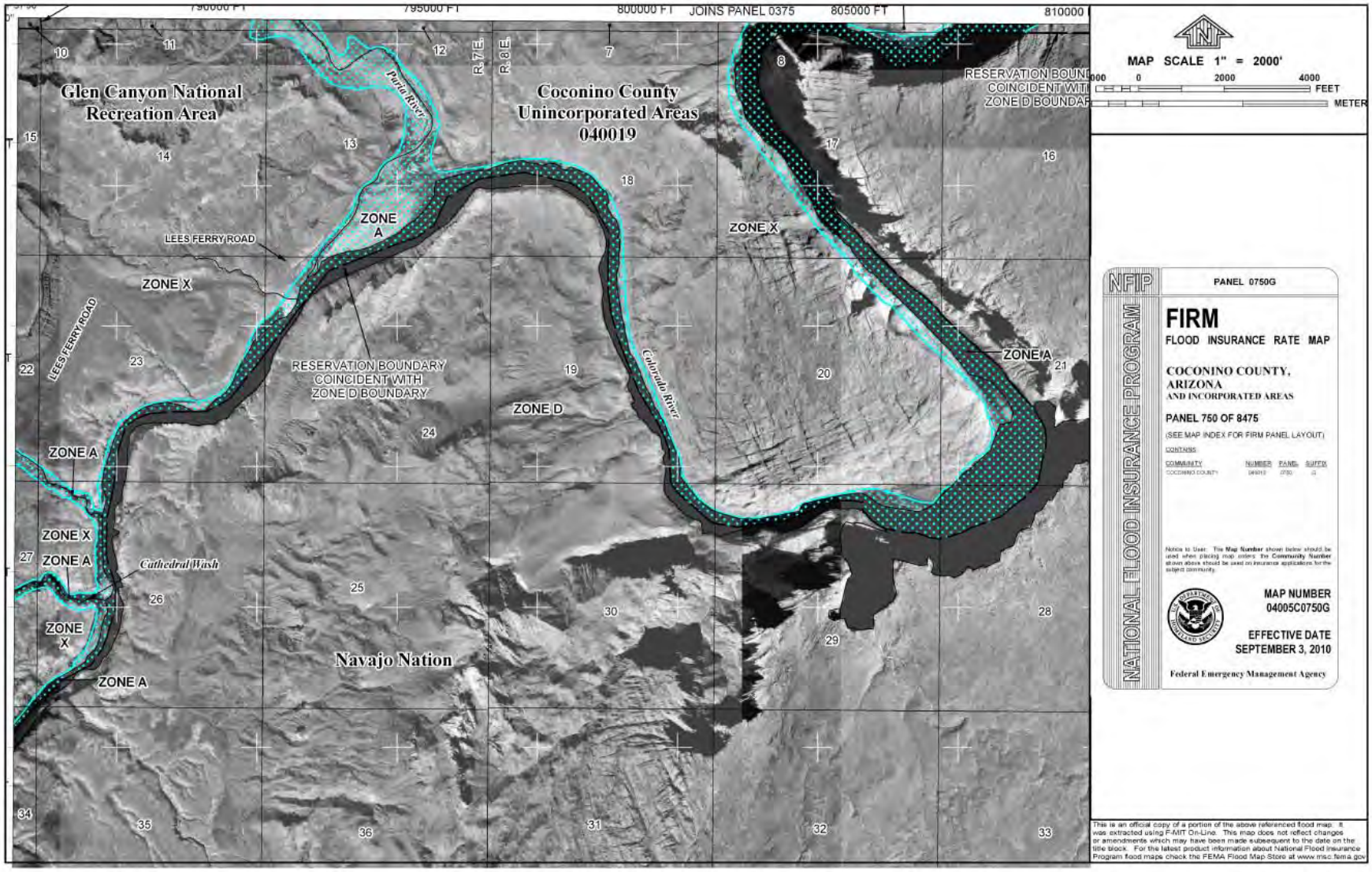
Intensity Definitions

The impact assessment for floodplains focused on natural river processes and flooding potential and frequency. The intensity of impacts was defined using *Procedural Manual 77-2, Floodplain Management* (NPS 2004) and the extent of alteration to natural river processes.



Source: FEMA Flood Insurance Rate Map September 3, 2010

Figure 7: FEMA Floodplain Map, Panel 04005C0725G



Source: FEMA Flood Insurance Rate Map September 3, 2010

Figure 8: FEMA Floodplain Map, Panel 04005C0750G

- *Negligible*: Impacts would be outside the regulatory floodplain as defined by the floodplain procedural manual (100-year or 500-year floodplain, depending on the type of action), or no measurable or perceptible change in natural river processes or aquatic habitat would occur.
- *Minor*: Actions within the regulatory floodplain would potentially change river processes or aquatic habitat in a limited way or in a localized area.
- *Moderate*: Actions within the regulatory floodplain would change river processes or aquatic habitat in a substantial way or in a large area.
- *Major*: Actions within the regulatory floodplain would change the river processes or aquatic habitat of a large area of the floodplain so that the functions typically provided by the floodplain would be substantially altered and noticeable on a regional scale.

Duration:

- *Short-term*: Recovers in less than one year after construction was completed.
- *Long-term:* Recovers in one or more years after construction was completed.

Geographic Area Considered

The geographic area evaluated to assess the effects of the proposed action includes 100-year floodplain as defined on Federal Emergency Management Agency Flood Insurance Rate Maps 04005C0750G and 04005C0725G depicted on figures 7 and 8.

ALTERNATIVE A: NO ACTION / CONTINUE CURRENT MANAGEMENT

Impact Analysis

There would be no impact to the 100-year floodplain of the Colorado River or Paria River in the project area. Erosion along the Lees Ferry Road, Lonely Dell Access Road, and Paria River Bridge would continue; however, this erosion would not change the natural river processes and flooding potential and frequency of the Paria River. As a result, the no action alternative would have a negligible impact on floodplains.

Cumulative Impacts

None of the other plans and projects presented in tables 1 and 2 would affect the 100-year floodplain of the Paria River. Continued routine maintenance of the Lees Ferry Road and Paria River Bridge would occur, which could result in periodic increases in runoff or could concentrate erosion related to maintenance activities. Additionally, the erosion in areas along Lees Ferry Road would continue. Combined, these factors would have long-term, negligible, adverse impacts to floodplains by contributing sediment to the floodplain and slightly varying the margins of the Paria River channel. These impacts would not measurably change river processes or aquatic habitat. Alternative A would not contribute to these effects.

Conclusions

Alternative A would result in negligible impacts to the 100-year floodplain of the Paria River. Combined with the cumulative impacts of this alternative, namely the natural erosion processes and periodic maintenance of the road and drainage structures in the project area, this alternative would result in long-term, negligible, adverse impacts to floodplains.

ALTERNATIVE B: THE NPS PREFERRED ALTERNATIVE

Impact Analysis

Actions under alternative B would improve the drainage components along the Lees Ferry Road. This alternative would improve culverts, inlets, and curbs, and would install erosion protection measures adjacent to the road. These improvements would have a long-term, negligible, beneficial impact by reducing erosion and uncontrolled runoff from the road into the floodplain.

Bank stabilization features along the Paria River would help control ongoing erosion of the riverbank upstream of the bridge. The bank stabilization would have a long-term, negligible, beneficial impact to the floodplains in the project area by reducing erosion.

During construction, the Paria River banks and the area adjacent to the road would be susceptible to erosion in a heavy storm event. Most of the construction would be scheduled during the low-water season to minimize the potential for having to deal with the effects of a large storm. However, a large storm would not likely result in the deposition of sediment outside of the natural range of variation associated with Paria River flood flows, and any adverse impacts resulting from these short-term activities would be negligible.

Long-term, adverse effects would result from the installation of spurs and a gabion wall. These features would change the river's erosion capabilities and divert the river's flow in localized areas, resulting in a long-term, minor, adverse impact to floodplains.

Cumulative Impacts

Similar to alternative A, none of the other plans and projects presented in tables 1 and 2 would be expected to have any effect on the 100-year floodplains of the Paria River. Routine maintenance of the Lees Ferry Road and Paria River Bridge would continue and could result in periodic increases in runoff related to maintenance activities. This would have long-term, negligible, adverse impacts to floodplains by contributing sediment to the floodplain and slightly varying the margins of the Paria River channel; however, the impacts would not measurably change river processes or aquatic habitat. Alternative B would contribute relatively small, adverse and beneficial effects to the negligible, adverse cumulative impacts on the Paria River floodplain.

Conclusions

Construction impacts on floodplains would be negligible, short-term, and adverse. In the long term, negligible, beneficial impacts would result from reduced erosion. The installation of spurs and a gabion wall to protect the bridge would have a long-term, minor, adverse impact to floodplains. Alternative B would contribute small, adverse and beneficial effects to the negligible, adverse cumulative impacts on the Paria River floodplain.

SOILS

AFFECTED ENVIRONMENT

The disturbance area includes five primary or dominant soil map units. General physical characteristics of the dominant soil map units are summarized in table 10.

Table 10: Dominant Soil Map Units in the Disturbance Area [a/]

Soil Map Unit (Number)	Characteristics	General Project Location
Somorent family-rock outcrop complex, 5 to 12 percent slopes (39)	Shallow, somewhat excessively drained soils are made up of 85% Somorent family and similar soils and 10% rock outcrop. These soils are on plateaus, summits, and between rivers in the same drainage system. Soil permeability is very low.	Along most of Lees Ferry Road between the turnoff from U.S. Highway 89A and the Paria River Bridge, except in areas that cross washes.
Myton very gravelly sandy loam, 5 to 18 percent slopes (16)	Deep, somewhat excessively drained soils are made up of 95% Myton and similar soils. These soils are on plateaus, footslopes, and the bases of slopes. Soil permeability is moderately high to high.	Areas along the Lees Ferry Road that cross Cathedral Wash, the two other unnamed washes, and the alluvial fan of the Paria River.
Razito-Riverwash complex, 1 to 4 percent slopes (23)	Deep, excessively drained soils are made up of 55% Razito and similar soils and 40% riverwash. These soils are on floodplains and toeslopes. Soil permeability is high to very high.	The area of the Lees Ferry Road south and east of the Paria River Bridge.
Rock outcrop – Torriorthents complex, 20 to 65 percent slopes (33)	Shallow, somewhat excessively drained soils are made up of 60% rock outcrop and 40% Torriorthents and similar soils. These soils are on plateaus, footslopes, and the bases of slopes. Soil permeability is very low to moderately high.	In small pocket areas adjacent to the Lees Ferry Road south of Cathedral Wash.
Pennell cobbly loam, 3 to 10 percent slopes (22)	Shallow, well-drained soils are made up of 85% Pennell and similar soils. These soils are on plateaus and summits, and between rivers in the same drainage system. Soil permeability is very low to moderately high.	A small part of the Lees Ferry Road immediately north of the turn off from U.S. Highway 89A.

a/ Sources: Natural Resource Conservation Service 2010 and 2011.

Most of Lees Ferry Road has soils that developed from eolian (wind-transported) sands and/or weathered sandstone and shale. These soils are nutrient-poor and do not support an extensive vegetative community.

The Paria River floodplain consists of recent, sandy, alluvial (water-transported) soils. Sand bars in this area and in spot locations along the Colorado River support narrow areas of riparian vegetation.

A U.S. Geologic Survey (2000) mapping project in the Lees Ferry area identified surface geology of the late Quaternary deposits that record the physical effects of environmental change on the Colorado River, Paria River, and relatively small tributaries draining the rim of Glen Canyon. Four types of surface deposits are important in the landscape of the Lees Ferry area:

- Gravels in high-level, abandoned channels of the Colorado River that were deposited during the late Pleistocene, probably in response to glacial activity in the Rocky Mountains;
- Terraces related to accumulation of sand in the channels of the Colorado and Paria Rivers, resulting from changes in stream flow and sediment load;

- Debris flow deposits at the mouths of relatively small tributaries that form boulder-strewn, fan-like surfaces; and
- Late Holocene flood deposits of the Colorado River that were laid down by unusually large floods.

The installation of Glen Canyon Dam changed the flooding regime and sediment-carrying capacity of the Colorado River. This altered features at the confluence of the Paria and Colorado Rivers. In the absence of backwater and sediment deposits from spring flooding events of the Colorado River, the Paria River channel has become incised as the river channel bends to the west away from its previous floodplain. As a result, the geologic features around the Paria River Bridge crossing are subject to increased erosion (Smillie 2006).

In an effort to slow the increased erosion, the National Park Service routinely takes sediment that is removed during the cleaning of culverts and drainage ditches along Lees Ferry Road and deposits it upstream of the Paria River Bridge and along Lees Ferry and Lonely Dell Access Roads in areas of high erosion. These deposits are eroded during and after spring runoff and storm events.

IMPACT ANALYSIS METHODS

Intensity Definitions

The following impact intensities were used to evaluate the potential impacts on soils:

- *Negligible*: The impact on soils would not be measurable. Any effects on productivity or erosion potential would be slight or imperceptible.
- *Minor*: The action would change a soil's profile in a relatively small area, but it would not appreciably increase the potential for changes to soils in the surrounding area.
- *Moderate*: The action would change the quantity or would alter the topsoil, biological productivity, or the potential for erosion to remove small quantities of additional soil. Changes to localized ecological processes would occur but would be of limited extent.
- *Major*: The action would change the potential for erosion or would alter topsoil and biological productivity in a relatively large area. Significant ecological processes would be altered, and landscape-level changes would be expected.

Duration:

- *Short-term*: Soils would recover in less than one year after construction was completed.
- *Long-term:* Soils would recover in one or more years after construction was completed.

Geographic Area Considered

The geographic area evaluated to assess the effects of the proposed action includes the Lees Ferry Road corridor and the areas that would be disturbed by project actions, including areas directly affected by rehabilitation and stabilization and indirectly affected areas such as those used for staging and short-term construction access.

ALTERNATIVE A: NO ACTION / CONTINUE CURRENT MANAGEMENT

Impact Analysis

Impacts to soils would occur during maintenance of the Lees Ferry and Lonely Dell Access Roads in spot locations. These ongoing actions would be restricted to small areas that had been disturbed previously during road construction. Impacts associated with ongoing maintenance consist of shallow, mechanical mixing of the surface soil layers by vehicles traveling off-road to the work site and localized excavations and filling of soils to repair sections of road and/or drainage systems. Excavated areas would be backfilled with the original soil and stabilized with standard erosion- and sediment-control measures. The short-term impacts would be localized, minor, and adverse. Long-term impacts would be negligible.

The design and condition of Lees Ferry Road and its drainage components, the Paria River Bridge and its abutments, and the Lonely Dell Access Road would continue to create areas of increased erosion during storm flow events. Supplemental soil material would be needed to fill eroded areas that would compromise road integrity. Such areas would be treated with rock, vegetation, or other materials on top of soil fill to minimize erosion. Soil areas affected by disturbances would be limited to the immediate activity area and a small zone around its perimeter. This increased erosion would continue to result in long-term, minor, adverse impacts to soils in specific locations.

Rain and wind activity would continue eroding soils exposed by road maintenance and other mechanical disturbances. Eroded soils could be transported downslope into drainages. NPS placement of sediment removed from culverts and drainage ditches into spot locations upstream of the Paria River Bridge and along Lees Ferry Road would continue to slow further erosion of these areas. These actions would result in minor, short-term benefits until the placed sediment was removed during storm or seasonal runoff events.

Cumulative Impacts

Other past and present actions that affect soils include telecommunication line upgrades, water tank removal at the Lees Ferry visitor's center, actions under the Lees Ferry 10-Acre Site Restoration Plan of 2001. These projects have resulted in actions such as site excavation, mixing of soil strata, and/or the placement or removal of fill. Other disturbed areas were successfully restored and are not contributing to cumulative effects.

Reasonably foreseeable actions that would impact soil include improvements to the Lees Ferry developed area, including repair and rehabilitation of historic buildings, upgrades or replacement of the water treatment and potable water treatment plants, replacement of utilities, and removal and replacement of four leach fields. Long-term, adverse impacts from each of these projects would continue in zones surrounding buildings and paved areas.

On a site-specific basis, the effects of other actions on soil are substantial, but their disturbed areas represent a small part of the national recreation area and the project area. Therefore, the collective effect of the other actions on soil is adverse and of minor intensity.

The short-term, minor, adverse and beneficial impacts and long-term, negligible impacts from alternative A, when added to the minor, adverse effects from other actions, would result in continued, minor, adverse effects on soil in the project area. This alternative would make a minimal contribution to cumulative impact.

Conclusions

Alternative A would have short-term, minor, adverse and beneficial, localized impacts. Long-term impacts would be negligible. Cumulatively, adding the impacts from alternative A to the minor, adverse effects from other actions would result in continued, minor, adverse effects. This alternative would make a minimal contribution to cumulative impact.

ALTERNATIVE B: THE NPS PREFERRED ALTERNATIVE

Impact Analysis

After rehabilitation of Lees Ferry Road is complete, impacts to soils produced during the maintenance of the Lees Ferry and Lonely Dell Access Roads would be the same as described under alternative A. Soil disturbances would continue to be localized, minor, and adverse. However, the need for such maintenance activities and the associated soil disturbances should be reduced compared to alternative A because improved drainage and road surface conditions would decrease the soil erosion potential of storm water runoff. Long-term impacts would be negligible.

During construction along Lees Ferry Road, actions taken to restore, rehabilitate, and resurface the road, remove and upgrade pullouts, improve drainage components, and install erosion protection would result in new disturbance to soils. Soil disturbance would occur along the entire length of the road rehabilitation corridor and would extend on each side of the existing road within the construction limits. Soils would be excavated, mixed, transported, compacted, backfilled, and stabilized using a variety of soil best management techniques. The proposed soil erosion protection techniques have proven to be effective in minimizing wind and water erosion and producing a stable soil condition suitable for plant regrowth.

Erosion stabilization along the banks of the Paria River would include installing additional concrete slope paving on the northwest and southwest banks, installing revet mattress and channel spurs, and installing erosion-resistant channel lining at the Paria River Bridge abutment. Along Lonely Dell Access Road, a gabion retaining wall would be constructed to stabilize the bank slope. The road would be restored in this area, and two channel spurs would be installed to prevent further bank erosion. Construction and installation of these features would disturb soils that would be covered with erosion resistant, impervious surfaces. Some soils would be excavated and transported to new locations. All exposed and mechanically disturbed soils would be stabilized with conventional and effective soil mitigation techniques. The estimated area of soil that would be newly disturbed as a result of alternative B would be 23,679 square feet (0.54 acre).

Floodplain, river channel, and drainage channel soils and sediment would be disturbed by equipment, excavation, and filling activities to construct drainage and road features. Alluvial soils and sediments in these settings are constantly mixed and transported by water. They are unstable, frequently being replaced during high flows and, thus, would be relatively unaffected by the mechanical construction or disturbance. Surface soils altered by equipment movement and construction activities would be reshaped or replaced by the next flood or rain runoff, so soil effects would be short term.

If access to the work sites through the Paria River channel becomes unavailable, an alternate overland route east and south of the Lonely Dell work site would be used. This route consists of an old, unused gravel surface road through stands of tamarisk and shrubs. However, there are pockets of biological soil crusts alongside the route that could be impacted. The small area involved would limit the adverse impacts to soil as local, negligible, and long-term, and would occur only if it was necessary to use this alternate route.

During construction, the soils mitigation measures would be followed to minimize adverse soil erosion impacts, stabilize disturbed soil, and reestablish native vegetative. As a result, construction would have minor, short-term, adverse effects.

Over the long term, road improvements and the installation of stabilization components under alternative B would reduce erosion in the target locations and result in minor, beneficial impacts.

Cumulative Impacts

Alternative B would result in short-term, minor, adverse and long term, minor, beneficial impacts on soil. Other actions affecting soil would be the same as those described for alternative A and would result in minor, adverse effects.

The short-term, minor, adverse and long-term, minor, beneficial impacts associated with alternative B, when added to the minor, adverse effects from other actions, would result in continued, minor, adverse effects on project area soil. The contribution of this alternative to the cumulative impact would be small.

Conclusions

Construction-related impacts on soil would be short-term, adverse, and minor in intensity and related to soil disturbance and compaction. Long-term impacts would be minor and beneficial. Cumulatively, adding short-term, minor, adverse and long-term, minor, beneficial impacts from alternative B to the minor, adverse effects from other actions would result in continued minor, adverse effects. The incremental contribution of alternative B to cumulative impacts would be small.

VEGETATION

AFFECTED ENVIRONMENT

Glen Canyon National Recreation Area is characterized by an arid desert climate. While vegetation in the project area is limited, small plant communities are present on both the Moenkopi formation and the Kaibab limestone formation within the project area. These communities are dominated by shrubland shadscale (*Atriplex confertifolia*), although some herbaceous species are present. The nakedstem sunray (*Enceliopsis nudicaulis*), a flowering plant in the daisy family, is found within the Moenkopi formation along the Lees Ferry Road. The roots of this plant are used and collected by the Navajo in an area north of the project site (Spence 2011).

The shrublands that occur on limestone are more diverse than those on the Moenkopi soils and contain numerous forbs and annuals. Plant communities on the Kaibab limestone formation support the endangered Brady's pincushion cactus (*Pediocactus bradyi,* see the "Special Status Species" section). However, the exotic grass species, *Schismus arabicus* has invaded this limestone community, and may pose a threat to the endangered cactus.

The dry wash communities, including Cathedral and No Name Washes, contain mixed shrubs, forbs, and annual species. These areas also support an Arizona state species of concern, the Marble Canyon spurge (*Euphorbia aaron rossii*, see the "Special Status Species" section).

Within the narrow wetland communities along the Paria River, rush (*Juncus* sp.) is the dominant (and only) wetland species.

In addition to the *Schismus* grass discussed previously, a number of nonnative plant species pose threats to Glen Canyon National Recreation Area's sensitive habitats, native plant communities, and landscape aesthetics. Russian olive (*Elaeagnus angustifolia*) and salt cedar or tamarisk (*Tamarix chinensis*) are present throughout the park's riparian communities. Sahara mustard (*Brassica tournefortii*) is found along roadsides within the project area. Ongoing efforts have focused on removing saltcedar from sandbars along the Colorado and Paria Rivers in the Lees Ferry area (NPS 2009) and treating locations with Russian olive (in the fall or winter) and Sahara mustard (in the spring). Cultivated plants are also present in the national recreation area, including desert willow (*Chilopsis linearis*), which grows in the Lees Ferry Campground (NPS 2009).

Because of the arid conditions, absence of soil, and past roadside maintenance activities, existing vegetation occupies a small portion (estimated at 5 to 15% ground cover) of the road shoulders, drainage channels, and construction corridor that could be affected by road and drainage channel rehabilitation. Many sections of the corridor are bare rock or unvegetated. Figure 9 illustrates typical existing vegetation conditions along the road, including the Paria River bridge crossing area.

Typical sparse upland vegetation and soil conditions along the Lees Ferry Road.

Sparse, but slightly more dense roadside upland vegetation and soil conditions along the Lees Ferry Road.

Sparse riparian vegetation on the far bank erosion site at the Lonely Dell Access Road stabilization site.

Relatively dense riparian vegetation and channel conditions upstream of the Paria River Bridge. Only a small area close to the bridge would be affected.

Figure 9. Upland and Riparian Vegetation along the Lees Ferry Road and Paria River

IMPACT ANALYSIS METHODS

Intensity Definitions

Information on vegetation was obtained from the site reconnaissance and sources that included resource inventories and resource managers. The following impact intensities were used to evaluate the potential impacts on vegetation:

- *Negligible*: The impact on vegetation (individual plants and/or communities) would not be measurable. Changes in the abundance or distribution of individuals would not be detected. Ecological processes and biological productivity would not be affected.
- *Minor*: The action would not alter the area's biological productivity. It could affect the abundance or distribution of individual plants in a localized area but would not affect the viability of local or regional populations or communities.
- *Moderate*: The action would change biological productivity in a small area. An action would affect a local population sufficiently to change plant abundance or distribution, but it would not affect the viability of the regional population or communities. Limited changes to ecological processes could occur.
- *Major*: The action would change biological productivity in a relatively large area. The action would affect the abundance or distribution of a regional population sufficiently that the it would not be likely to return to its former level (adverse), or would return to a sustainable level (beneficial). Important ecological processes would be altered.

Duration:

- *Short-term*: Recovers in less than one year after construction ended.
- *Long-term*: Recovers in one or more years after construction ended.

Geographic Area Considered

The geographic analysis area includes the Lees Ferry Road corridor and the areas that would be disturbed by project actions, including areas directly affected by rehabilitation and stabilization and indirectly affected areas such as those used for staging and short-term construction access locations.

ALTERNATIVE A: NO ACTION / CONTINUE CURRENT MANAGEMENT

Impact Analysis

Impacts to vegetation would occur in association with routine maintenance of the Lees Ferry and Lonely Dell Access Roads in spot locations along the roadsides and drainage channels. These impacts could consist of construction vehicles traveling off-road to the work site and disturbing small areas to repair sections of road and/or drainage systems. Impacts would consist of driving over, excavating, or covering up individual plants or clusters of plants in small work areas. Much of the road shoulders of the corridor are unvegetated or sparsely vegetated, which would limit the effects to existing vegetation. Existing vegetation would be avoided when possible, equipment would be washed beforehand to minimize the potential for transport of invasive species, and disturbed areas would be stabilized with standard erosion and sediment control measures and reseeded (see the mitigation measures in chapter 2). The short-term impacts would be localized, minor, and adverse. Long-term impacts would be negligible.

The location, design, and/or condition of the Lees Ferry Road, Paria River Bridge and its abutments, and Lonely Dell Access Road would continue to create areas susceptible to erosion during storm flow events. High flow in the river would continue to scour streambank vegetation from areas where it provides limited protection of the bridge and Lonely Dell Access Road foundations. This increased erosion would continue to hinder the establishment of vegetation in these areas, resulting in long-term, moderate, adverse impacts.

Cumulative Impacts

Other past and present actions that affect vegetation include telecommunication line upgrades, water tank removal at the Lees Ferry visitor's center, and actions under the Lees Ferry 10-Acre Site Restoration Plan of 2001. These projects have resulted in removal of vegetation in spot locations. Other disturbed areas were successfully restored and are not contributing to cumulative effects. Tamarisk eradication efforts and other invasive plant treatment practices in the Lees Ferry area have resulted in long-term, beneficial impacts to native vegetation species by reducing completion with invasive plant species.

Reasonably foreseeable actions that would impact vegetation include improvements to the Lees Ferry developed area, including repair and rehabilitation of historic buildings, upgrades or replacement of the water treatment and potable water treatment plants, replacement of utilities, and removal and replacement of four leach fields. Short-term impacts to vegetation during construction would be minor to moderate and adverse depending on the location and abundance of vegetation. Following restoration and reseeding, long-term impacts to vegetation abundance and distribution would be negligible.

On a site-specific basis, the effects of other actions on soil are substantial, but their disturbed areas represent a small part of the national recreation area and the project area. Therefore, the collective effect of the other actions on vegetation is adverse and of minor intensity.

The short-term, minor, adverse impacts and long term, negligible to moderate, adverse impacts from alternative A, when added to the minor, adverse effects from other actions, would result in continued, minor, adverse effects on vegetation in the project area. The contribution of this alternative to the cumulative impact would be small.

Conclusions

Alternative A would have short-term, localized, minor, adverse impacts. Long-term impacts would be negligible to moderate, adverse, and primarily associated with erosion. Cumulatively, adding the impacts from alternative A to the minor, adverse effects from other actions would result in continued, minor, adverse effects. The contribution of this alternative to the cumulative impact would be small.

ALTERNATIVE B: THE NPS PREFERRED ALTERNATIVE

Impact Analysis

After rehabilitation of Lees Ferry Road is complete, impacts to vegetation produced during the maintenance of the Lees Ferry and Lonely Dell Access Roads would be the same as described under alternative A. Vegetation effects from maintenance activities would continue to be localized, minor, adverse, short-term impacts. However, the need for such maintenance activities and the associated vegetation disturbances should be reduced because of the improved drainage and road surface conditions. Long-term impacts would be negligible.

Additional disturbances and removal of vegetation would result from constructing the multiple components of alternative B. Road components would include resurfacing and realigning the road, adding several pullouts, and improving drainage components along Lees Ferry Road and several washes. These components would affect small areas of vegetation, ranging from individual plants to sparsely vegetated sites of several hundred to several thousand square feet. A total of less than 0.5 acre of vegetation alteration would be associated with this alternative. This small effect is the result of sparse vegetation ground cover and the limited amount of new ground disturbance. Roadside disturbance would be restricted to lane widening and roadside pullout locations. Vegetation would be driven over, excavated, and covered up. Post-construction revegetation actions would mitigate these effects, resulting in net minor, adverse, short-term vegetation effects.

Along the Paria River, installing concrete paving, revet mattress, and channel spurs for erosion stabilization along the northwest, southwest, and east banks would remove existing streambank vegetation in the construction sites. The size of these areas and the amount of vegetation to be affected by these activities would be minor because much of the area is unvegetated or vegetation occupies small areas. Due to the erosive nature of these locations, existing vegetation is sparse and few plants would be affected. Along the Lonely Dell Access Road, installing a gabion retaining wall and two channel spurs to stabilize the bank slope to prevent further bank erosion would also remove small clumps and individual plants of salt cedar and willow in spot locations.

During and after construction, the vegetation mitigation measures in chapter 2 would be followed to offset the minor adverse impacts to vegetation, control and monitor the spread of invasive species, and reestablish native vegetative in disturbed areas. As a result, construction would have minor, short-term, adverse effects.

Over the long-term, the alternative B road improvements and the installation of channel and streambank stabilization components would affect a small area of vegetation and would facilitate the restoration and growth of native vegetation. This would result in minor, beneficial impacts.

Cumulative Impacts

Alternative B would result in short-term, minor, adverse impacts and long-term, minor, beneficial impacts on vegetation. Other actions affecting vegetation would be the same as those describe for alternative A and would result in minor, adverse effects.

The impacts associated with alternative B, when added to the minor, adverse vegetation effects from other actions, would result in continued, minor, adverse effects on vegetation in the project area. The contribution of this alternative to the cumulative impact would be small.

Conclusions

Construction-related adverse impacts on vegetation would be short-term, minor, and adverse. Long-term, minor, beneficial impacts would be associated with reduced erosion. Cumulatively, adding the impacts from alternative B to the minor, adverse effects from other actions would result in continued, minor, adverse effects. The incremental contribution of alternative B to cumulative impacts would be small.

SPECIAL STATUS SPECIES

AFFECTED ENVIRONMENT

To comply with the Endangered Species Act of 1973, the National Park Service is responsible for protecting federally listed, candidate, and proposed species and their designated critical habitats. The National Park Service also is sensitive to the need to protect species of concern that have been identified by the state of Arizona or the Navajo Nation. Collectively, these are referred to as "special status species."

Table 11 includes the special status species that the U.S. Fish and Wildlife Service identified as having potential to occur in Glen Canyon National Recreation Area. They include three plant, four fish, and four bird species. A biological assessment was prepared by the National Park Service and submitted to the U.S. Fish and Wildlife Service for review. The biological assessment is included in appendix C.

Table 11: Special Status Species with the Potential to Occur in Glen Canyon National Recreation Area

Common Name	Scientific Name	Status [a/]	Suitable Habitat near Project?
Plants			
Navajo sedge	*Carex specuicola*	FT	No
Jones cycladenia	*Cycladenia humilis* var. *jonesii*	FT	No
Brady pincushion cactus	*Pediocactus bradyi*	FE	Yes
Marble Canyon spurge	*Euphorbia aaron-rossii*	SSC, NNSSC	Yes
Mojave indigobush	*Psorothamnus arborescens* var. *pubescens*	NNSSC	Yes
Nakedstem sunray	*Enceliopsis nudicaulis*	NNCI	Yes
Fish			
Colorado pikeminnow [b/]	*Ptychocheilus lucius*	FE	Yes
Razorback sucker [b/]	*Xyrauchen texanus*	FE	Yes
Bonytail [b/]	*Gila elegans*	FE	Yes
Humpback chub [b/]	*Gila cypha*	FE	Yes
Birds			
California condor	*Gymnogyps californianus*	FE**	Yes
Southwestern willow flycatcher	*Empidonax traillii extimus*	FE	Yes (marginal)
Mexican spotted owl	*Strix occidentalis lucida*	FT	Yes (marginal)
Yellow-billed cuckoo	*Coccyzus americanus*	FC	No
Mammals			
Desert bighorn sheep	*Ovis canadensis nelsoni*	WSC	Yes

a/ Key to status: FE = federally endangered; FE** = nonessential experimental population in northern Arizona; FT = federally threatened; FC = federal candidate for listing; NNSSC = Navajo Nation species of special concern; NNCI = Navajo Nation culturally important; SSC = Arizona state species of concern; WSC = Arizona wildlife of special concern.

b/ These fish species are found in designated critical habitat in the Colorado River.

As shown in table 11, a total of 15 special status species were identified as potentially occurring in Glen Canyon National Recreation Area. An evaluation of habitat conditions and known distribution suggests that six of these species can be dismissed from further discussion for the reasons that follow. The remaining nine species, including the Brady pincushion cactus, Marble Canyon spurge, Mojave indigobush, nakedstem sunray, razorback

sucker, California condor, southwestern willow flycatcher, Mexican spotted owl, and desert bighorn sheep, are discussed in greater detail.

Navajo sedge has been confirmed along the San Juan River in Glen Canyon National Recreation Area but does not occur in the Lees Ferry area. The Jones cycladenia is found in the Purple Hills and Moody Canyon areas about 100 miles upstream from Lees Ferry (Pilkington 2011). As a result, neither of these federally threatened plant species would be affected by the project.

The Colorado pikeminnow, bonytail, and humpback chub fish species generally occur in the Colorado River. These species would not be affected by the proposed action because there would be no meaningful or detectable change in hydrology or availability of water as a result of the proposed action. There would be short term, localized water quality changes at the Paria River and Colorado River confluence as a result of increased sediment loading. However, these changes would not be outside the natural range of variation caused by the area's extreme precipitation events. As a result, there would be no effect on these federally endangered fish species.

The yellow-billed cuckoo, a candidate species, is considered a rare transient in dense riverside tamarisk thickets. Historically, the cuckoo has only been observed twice in the Lees Ferry area, with both occurrences in 1995 (Spence *et al*. 2011). The extremely low likelihood of a yellow-billed cuckoo being present in the project area, and its preference for mature riparian forest habitat (not found in the immediate project area), indicate that the cuckoo would not be affected by the proposed action.

In addition to the special status species included in table 11, six species of fish are protected under a conservation agreement with the Arizona Game and Fish Department (2006) that was signed by the National Park Service. These species include the roundtail chub, headwater chub, flannelmouth sucker, Little Colorado River sucker, bluehead sucker, and Zuni bluehead sucker. The goal of the agreement is to ensure the conservation of these fish populations throughout Arizona. Although not all these species are found near the project area, actions taken in association with the proposed action would be consistent with the goals of the conservation agreement.

Brady Pincushion Cactus

The federally endangered Brady pincushion cactus is known from a geographical area of about 27 square miles in Coconino County, Arizona. This cactus grows in the restricted habitat of Kaibab limestone chips overlying soil derived from Moenkopi shale and sandstone outcrops. Chert and quartz pebbles eroded from the Shinarump member of the Chinle Formation are also present at some sites. The potential habitat in the Marble Canyon / Lees Ferry area is estimated to be 17,000 acres, but within this area, plants were identified on only 10%-20% of the potential habitat that was searched. The cactus typically grows between 3861 and 4488 feet elevation, which is typically the same as the elevation of the Kaibab Formation. The plants grow in gravelly alluvium on the gently sloping benches, in exposed, sunny situations (USFWS 1985). The actual area to be affected by project activities, including the road edges, was surveyed for this species in 2011 by the National Park Service (Spence 2012). This species was not located in the surveyed area. At one or two locations, the nearest plants were located about 300 to 500 feet east of the planned work locations.

Natural factors affecting the continued existence of the Brady pincushion cactus are its restriction to a unique, localized soil type; its restriction to flat or gentle slopes in an area that has very dissected topography; its rather low population level with resultant restricted gene pool; and its restriction to a small geographic area. Individual plants are subject to root rot, so

this may be a factor in thinning the population during very wet years (USFWS 1985). Critical habitat is not designated for the Brady pincushion cactus.

Marble Canyon Spurge

The Marble Canyon spurge, an Arizona species of concern, is a shrubby perennial herb with dense clusters of erect, wiry stems. The spurge typically occurs in river canyons in relatively loose, sandy soils and occasionally on rocky slopes (NatureServe Explorer 2011). Within the Lees Ferry area, the spurge occurs where small dry washes reach the cliffs along the Colorado River.

Marble Canyon spurge is not a federally listed species. Therefore, while the species is geographically restricted, no critical habitat has been designated.

Mojave Indigobush

The Mojave indigobush, also known as Marble Canyon dalea, is considered a rare plant by the Navajo Nation (NNDFW 2008). This plant is a shrub typically growing no more than 3 feet tall, with highly branching stems, sometimes with thorns. It is found on soils derived from the Moenkopi Formation in mixed desert shrub communities between 3,400 and 4,900 feet above sea level in northern Coconino County, Arizona (Roth 2008). The indigobush is known from Marble Canyon near Lees Ferry.

Mojave indigobush is not a federally listed species. Therefore, while the species may be considered relatively rare, no critical habitat has been designated.

Nakedstem Sunray

Nakedstem sunray is considered a culturally important plant by the Navajo Nation. This plant is a perennial flowering forb resembling a yellow daisy. The sunray is known to grow along the Lees Ferry Road corridor (Spence 2012).

Nakedstem sunray is not a federally listed species. Therefore, while the species may be considered special, no critical habitat has been designated.

Razorback Sucker

The razorback sucker, which is federally listed as endangered, is endemic to the Colorado River basin of the southwestern United States. The Colorado River is divided into upper and lower basins at Lee Ferry, Arizona, by the Colorado River Compact of 1922. Historically, the razorback sucker occurred throughout 3,500 miles of the Colorado River basin, primarily in the main stem and major tributaries in Arizona, California, Colorado, Nevada, New Mexico, Utah, and Wyoming; and in the states of Baja California Norte and Sonora of Mexico (USFWS 1991). In the lower Colorado River basin, razorback suckers occurred from the Colorado River delta upstream to Lees Ferry, Arizona (USFWS 1998). In the upper Colorado River basin, razorback suckers occurred in the Colorado, Green, and San Juan River basins. Presently in the upper basin, the razorback sucker is restricted to about 750 miles (USFWS 1991) of the lower Yampa and Green Rivers, mainstream Colorado River, and lower San Juan River (USFWS 1994). In the lower basin, the species occurs only in Lake Mohave, upstream in Lake Mead and the Grand Canyon, and downstream sporadically on the main stem and associated impoundments and canals (USFWS 1991).

Habitats required by adults in rivers include deep runs, eddies, backwaters, and flooded off-channel environments in spring; runs and pools often in shallow water associated with submerged sandbars in summer; and low-velocity runs, pools, and eddies in winter.

Spawning in rivers occurs over bars of cobble, gravel, and sand substrates during spring runoff at widely ranging flows and water temperatures (typically greater than 57° F). Spawning also occurs in reservoirs over rocky shoals and shorelines. Young fish require nursery environments with quiet, warm, shallow water such as tributary mouths, backwaters, or inundated floodplain habitats in rivers, and coves or shorelines in reservoirs. Threats to the species include streamflow regulation, habitat modification, competition with and predation by nonnative fish species, and pesticides and pollutants (USFWS 2002a). The nearest segment of designated critical habitat for the razorback sucker occurs on the Colorado River starting at the confluence of the Paria and Colorado Rivers (USFWS 1994), about 0.5 mile downstream of the proposed Paria River Bridge stabilization actions. It includes the Colorado River 100-year floodplain from the confluence on downstream.

It is unlikely that the razorback sucker is currently present in the Paria River. The last records of razorback suckers in the Paria River were in 1978 and 1979 when four fish were documented (USFWS 2011a). Additionally, surveys for flannelmouth suckers in the Colorado and Paria Rivers were performed between 1992 and 1997 and no razorback suckers were documented (Weiss 1993; McKinney *et al.* 1999). Nonetheless, because of the proximity to designated critical habitat in the Colorado River, the razorback sucker is retained for evaluation.

California Condor

The California condor is federally listed as endangered, although the reintroduced population in northern Arizona is considered a nonessential experimental population (USFWS 1996).

The California condor is among the largest flying birds in the world and the most endangered. Condors have a wingspan of 9.5 feet and adults can weigh up to 25 pounds. California condors are opportunistic scavengers that feed primarily on large, dead mammals such as deer, elk, bighorn sheep, range cattle, and horses (AGFD 2011a). A condor may eat up to 3 to 4 pounds at a time and may not need to feed again for several days. After eating, condors bathe in rock pools and will spend many hours preening and drying their feathers.

The California condor is a cavity-nesting species that requires caves, ledges, or large trees for nesting. High perches are necessary for roosting and to create the strong updrafts required for lift into flight. Open grasslands or savannahs are important to condors while searching for food. In Arizona, condors are found at elevations between 2,000 and 8,000 feet, and the reintroduction site is in the northern part of the state on the Vermilion Cliffs. The Vermilion Cliffs are on the Paria Plateau and provide the necessary remoteness, ridges, ledges, and caves favored by condors.

Reproductively mature, paired California condors normally lay a single egg between late January and early April. At two to three months of age, condor chicks leave the nest cavity but remain near the nest where they are fed by their parents. The chick takes its first flight at about six to seven months of age, but may not become fully independent of its parents until the following year. Parent birds occasionally continue to feed a fledgling even after it has begun to make longer flights to foraging grounds (USFWS 2011b).

Designated critical habitat for the California condor exists in California in the select areas (USFWS 1977) where the species is federally listed as endangered (in contrast with the nonessential experimental designation for the Arizona population). There is no critical habitat for the species within or adjacent to the project area.

Southwestern Willow Flycatcher

The southwestern willow flycatcher, which is federally listed as endangered, nests in dense riparian habitats along streams, lakesides, and other wetlands. Some of the most common plants used for nesting include willow, boxelder, tamarisk (salt cedar), Russian olive, buttonbush, cottonwood, and mesquite. Nests are found in dense thickets of these and other plant species that are about 12-24 feet high. Migration habitat is believed to occur primarily along riparian corridors. Nesting habitat is currently known to occur at elevations below 8,500 feet (USFWS 2011c).

Critical habitat was designated in 2005 (USFWS 2005) but is currently being revised. However, there is no designated or proposed critical habitat for the southwestern willow flycatcher in or near the proposed construction areas or Lees Ferry.

Although the tamarisk and willow thickets along the Colorado and Paria Rivers have characteristics similar to the preferred habitat for the southwestern willow flycatcher, The area around the bridge lacks any suitable habitat components, as it consists of sparse, open, low-growing tamarisk and scattered willows next to fast-moving, very muddy water in the Paria River. Suitable habitat would have to include very dense tall riparian vegetation adjacent to slow-moving water or pools, such as in eddies (Spence 2012).The generally unsuitable nature of the riparian corridor is reflected by the low number of sightings of this species. There have been only three confirmed observations of the species in the Lees Ferry area (Spence *et al.* 2011). The species currently does not breed near Lees Ferry.

Mexican Spotted Owl

The Mexican spotted owl, federally listed as threatened, has not been sighted in the Lees Ferry area (Spence *et al.* 2011), although the U.S. Fish and Wildlife Service indicated that the species may be found in nearby canyon habitats. The U.S. Fish and Wildlife Service letter is included in appendix A.

The Mexican spotted owl occurs in varied habitats, including mature montane forest and woodland, shady wooded canyons, and steep canyons. Potential modeled canyon habitat exists in the national recreation area, with the closest examples to the bridge located about 2 miles up the Paria River and 2.5 miles away in the Vermillion Cliffs (Spence 2012). In forested habitat, uneven-aged stands with a high canopy closure, high tree density, and a sloped terrain appear to be key habitat components. They also occur in mixed conifer and pine-oak vegetation types and generally nest in older forests of mixed conifer or ponderosa pine/Gambel oak. Nests are built in live trees with natural platforms such as dwarf mistletoe brooms, in snags, and on canyon walls (AGFD 2011b). Critical habitat is designated for the Mexican spotted owl (USFWS 2004), but none is present within or near the proposed action.

Desert Bighorn Sheep

Desert bighorn sheep, considered a wildlife species of concern by the Arizona Game and Fish Department, inhabits the steep, rocky terrain around Lees Ferry. The desert subspecies has the ability to persist for long periods with little or no access to perennial water; their intake is satisfied by temporary pools or moisture in their food (mainly grasses). During hot summer weather when water sources dry up completely, desert bighorns seek shade and rest most daylight hours and feed at night. During this season, they rely on desert plants for both food and moisture (DesertUSA 2012). The gregarious species often occurs in bands of up to 20 individuals. Lamb survival varies greatly in the desert, ranging from as low as 10% to as high as 80% because of variation in rainfall and forage availability (CDFG 2012).

Desert bighorn sheep are not a federally listed species. Therefore, no critical habitat has been designated.

IMPACT ANALYSIS METHODS

The following definitions of impact intensity are used in the analysis of effects on special status species:

- *Negligible*: State- and federally listed species and their habitats would not be affected, or the effects to an individual of a listed species or its designated critical habitat would be at or below the level of detection. Effects would not be measurable or of perceptible consequence to the protected individual or its population. The Endangered Species Act section 7 determination associated with a negligible effect finding in the National Environmental Policy Act evaluation could be *no effect* or *may affect but is not likely to adversely affect*.
- *Minor*: The action would result in detectable effects to an individual (or individuals) of a state- or federally listed species or its critical habitat, but the effects would not result in population-level changes with measurable, long-term effects on species, habitats, or natural processes sustaining them. Minor effects would equate with a *may affect but is not likely to adversely affect* determination in Endangered Species Act section 7 terms.
- *Moderate*: An action would result in detectable effects on individuals or population of a state- or federally listed species, its critical habitat, or the natural processes sustaining them. Key ecosystem processes may experience disruptions that may result in population or habitat condition fluctuations that would be outside the range of natural variation. Moderate adverse effects would equate with a *may affect / likely to adversely affect / adversely modify critical habitat* determination in Endangered Species Act section 7 terms.
- *Major*: Individuals or the population of a state- or federally listed species, its critical habitat, or the natural processes sustaining them would be measurably affected. Key ecosystem processes might be permanently altered, resulting in long-term changes in population numbers and permanently modifying critical habitat. Major adverse effects would equate with an *is likely to jeopardize the continued existence of a listed species / adversely modify critical habitat* determination in Endangered Species Act section 7 terms.

Duration: Not applicable to federally listed species because of definitions in accordance with Endangered Species Act section 7 terminology.

- *Short-term* (Arizona and Navajo Nation species of special concern): Effects last less than one year after construction ends.
- *Long-term* (Arizona and Navajo Nation species of special concern): Effects last longer than one year after construction ends.

For each species that is federally listed, the impact analysis provides a finding under the National Environmental Policy Act and a separate determination under section 7 of the Endangered Species Act.

ALTERNATIVE A: NO ACTION / CONTINUE CURRENT MANAGEMENT

Impact Analysis

The physical presence of the Lees Ferry Road and its supporting infrastructure does not have any substantial effect on any special status species. However, Vehicle use on and in the Lees

Ferry Road corridor has the primary effect on special status species of introducing humans and potential disturbance to the habitat used by special status species.

Brady Pincushion Cactus. The Brady pincushion cactus has the continued potential to be affected by the no action alternative because one of the threats to this species is illegal collecting. Although protections and enforcement of regulations in Glen Canyon National Recreation Area are strong, there is still the possibility that continued access by illegal collectors to the cactus' habitat along the Lees Ferry Road would result in a negligible to minor, adverse, long-term impact on the Brady pincushion cactus. This impact would equate to a section 7 Endangered Species Act characterization of *may affect, but is not likely to adversely affect* the Brady pincushion cactus.

Cumulative Impacts - The primary threats to Brady pincushion cactus include collection, off-road vehicle use, livestock grazing, and mining within habitats of populations on Federal lands (USFWS 1985). These activities are not present within the project area, thus the cacti are somewhat protected from their primary threats. However, because of the proximity of the plants to the road and relatively high levels of visitor use within the project area, there is potential for unauthorized take by cacti collectors. The effects of planned upgrades to telecommunication utility lines in the road corridor, access by fishermen, and tamarisk eradication projects have the potential to result in adverse cumulative effects, although each of these actions and projects have associated conservation measures and best management practices that would minimize and avoid adverse impacts to this listed plant species. The overall cumulative effects of other plans and projects on the Brady pincushion cactus would be negligible to minor and adverse. The protections afforded by the National Park Service through awareness of where the cacti grow provide a long-term, cumulative benefit as its habitat is protected. The no action alternative would allow continued access on the Lees Ferry Road to persons intent on unauthorized take, thus having a negligible contribution to adverse cumulative effects. The cumulative impact to the Brady pincushion cactus from alternative A would be negligible.

Marble Canyon Spurge. Because typical use of the Lees Ferry Road conveys people to specific destinations such as the Lees Ferry boat ramp, Lonely Dell Ranch, the campground, or other area attractions, almost all human traffic is routed to locations where this state species of concern would not be subject to impacts. No action would have negligible effects on individual Marble Canyon spurge plants or its population.

Cumulative Impacts - The cumulative impacts of other plans and projects on the Marble Canyon spurge would be negligible. Each of these plans and projects takes the spurge into consideration and if effects are possible, mitigation measures to keep actions from affecting the spurge would be implemented. The negligible impacts of the no action alternative would not contribute to cumulative effects. The protections afforded by the National Park Service through awareness of where the spurge populations grow would continue to provide a long-term cumulative benefit as its habitat is protected.

Mojave Indigobush. Because typical use of the Lees Ferry Road conveys people to specific destinations such as the Lees Ferry boat ramp, Lonely Dell Ranch, the campground, or other area attractions, almost all human traffic is routed to locations where this Navajo Nation species of concern would not be subject to impacts. No action would have negligible adverse effects related to incidental off-trail foot traffic on individual Mojave indigobush plants or its population.

Cumulative Impacts - The cumulative impacts of other plans and projects on the Mojave indigobush would be negligible. Each of these plans and projects takes the Mojave indigobush into consideration and if effects are possible, mitigation measures to keep actions from affecting the Mojave indigobush would be implemented. The negligible impacts from no action alternative would not contribute to cumulative effects. The protections afforded by the National Park Service through awareness of where the Mojave indigobush populations grow provide a long-term cumulative benefit as its habitat is protected.

Nakedstem Sunray. Because typical use of the Lees Ferry Road conveys people to specific destinations such as the Lees Ferry boat ramp, Lonely Dell Ranch, the campground, or other area attractions, almost all human traffic is routed to locations where this plant would not be subject to impacts. No action would have negligible effects on individual nakedstem sunray plants and the population.

Cumulative Impacts - The cumulative impacts of other plans and projects on the nakedstem sunray would be negligible. Each of these plans and projects takes plants important to the Navajo Nation into consideration, and if effects are possible, mitigation measures to keep actions from affecting the sunray would be implemented. The negligible impacts from the no action alternative would not contribute to cumulative effects. The protections afforded by the National Park Service through awareness of where the sunray populations grow provide a long-term cumulative benefit as its habitat is protected.

Razorback Sucker. The razorback sucker may be found in the Colorado River downstream from the confluence of the Paria River and Colorado River. There would be potential effects to water quality in the Paria River as a result of continued bank erosion and sediment loading. However, the increased sediment loads that could occur if unstable banks erode into the river would be no greater than the natural range of variation associated with thunderstorms and extreme precipitation events that recur with regularity in the Paria River basin. The razorback sucker and its designated critical habitat are subjected to these effects regularly and the species is adapted to deal with high sediment loads. Effects of the no action alternative on the primary constituent elements of razorback sucker critical habitat, including water temperature, dissolved oxygen, turbidity, potential spawning habitat, food supply, and presence of predators, would be inconsequential and discountable. As a result, the impacts to the razorback sucker from the no action alternative would be adverse and negligible. The Endangered Species Act section 7 determination for the razorback sucker would be *may affect, but is not likely to adversely affect.*

Cumulative Impacts - Decline of the razorback sucker has been associated with substantial changes in its riverine ecosystem, including water diversion, water depletion, and construction and operation of dams. These long-term, adverse cumulative effects have been partially offset by recovery efforts and by protection of its critical habitat. The other plans and projects in the vicinity would not contribute substantially to any of the adverse cumulative effects on the sucker. The negligible impacts from the no action alternative would not contribute to cumulative effects.

California Condor. The continued presence of vehicles and their passengers on the Lees Ferry Road would continue to represent a threat to the California condor because these scavengers would continue to be attracted to trash or food left by visitors. This long-term, negligible, adverse impact would occur despite NPS actions to educate visitors. The Endangered Species Act section 7 determination for the California condor would be *may affect, but is not likely to adversely affect.*

Cumulative Impacts – Despite some recovery successes, substantial adverse cumulative effects on the California condor remain because of historical and, in some cases, ongoing actions, including poisoning and collisions with man-made objects. Conservation measures to minimize effects of interactions with humans have slightly reduced the threat to the population. The other plans and projects listed in tables 1 and 2 all include conservation measures, and their cumulative impacts on the condor would be minor and adverse. The negligible, adverse impact to the California condor from alternative A would make a small contribution to the minor, adverse cumulative impacts from other actions.

Southwestern Willow Flycatcher. Because of the rare, transient presence of the southwestern willow flycatcher in the project area, there would be negligible effects to the species as a result of the no action alternative. The Endangered Species Act section 7 determination for the southwestern willow flycatcher would be *may affect, but is not likely to adversely affect.*

Cumulative Impacts - The southwestern willow flycatcher is endangered primarily due to the reduction, degradation, and elimination of riparian habitat from agricultural and urban development. Other reasons for the decline and vulnerability of the flycatcher include: the fragmented distribution and low numbers of the current population; predation; cowbird brood parasitism; and events such as fires and floods that are naturally occurring, but have become more frequent and intense as a result of the proliferation of exotic vegetation and degraded watersheds. Although many of these threats can be considered as cumulative, the other plans and projects that are listed in tables 1 and 2 do not contribute to these adverse effects. Thus, their cumulative impacts are negligible. The negligible impacts of the no action alternative would not contribute to the negligible cumulative impacts from other actions in the project area.

Mexican Spotted Owl. The owl's preferred habitats do not exist in or near the project area. In the event that a transient Mexican spotted owl passed through the project area, there are no aspects of the no action alternative that would change the current impacts on the species, which are related to the presence of humans using the road. The no action alternative would have a negligible impact on this species. The Endangered Species Act section 7 determination for the Mexican spotted owl would be *may affect, but is not likely to adversely affect.*

Cumulative Impacts - The Mexican spotted owl is listed as threatened because of destruction and modification of its nesting habitat. One of the primary threats is believed to be unnatural fuel loadings and the resultant threat of high-severity, stand-replacing wildfire (USFWS 1995). Actions that affect and modify its preferred nesting habitat, including logging, development, and habitat fragmentation activities, combine to have a substantial adverse cumulative effect on the owl. However, these actions are not present in Glen Canyon National Recreation Area and are not associated with any of the plans and projects in the project area. The negligible impacts of the no action alternative would not contribute to the negligible cumulative impacts from other actions.

Desert Bighorn Sheep. Because the Lees Ferry Road regularly conveys people to area attractions, such as the Lees Ferry boat ramp, Lonely Dell Ranch, and campground, desert bighorn sheep are regularly exposed to the presence of humans. Most sheep avoid heavily used areas. Alternative A would maintain current levels of human and sheep activity in the project area and would have a negligible impact on individual desert bighorn sheep or the sheep population.

Cumulative Impacts - The impacts of other plans and projects on the desert bighorn sheep would be negligible. Each of these plans and projects takes the sheep into consideration and if effects were possible, mitigation measures to keep actions from affecting the desert bighorn sheep would be implemented. The protections afforded by the National Park Service through awareness and conservation of the desert bighorn sheep population would continue to provide a long-term benefit to this state species of concern. Therefore, the net cumulative impact on this species from other actions is beneficial. The negligible impacts of the no action alternative would not contribute to the beneficial cumulative impacts from other actions in the project area.

Conclusions

This alternative would have negligible to minor, adverse impacts on the Brady pincushion cactus and negligible impacts on all other special status species. Other actions in the project area would have a negligible or small, beneficial cumulative impact on special status species and the contribution of alternative A to their cumulative impacts would be negligible.

In terms of section 7 of the Endangered Species Act, a *may affect, but is not likely to adversely affect* determination of effect would be applicable to the Brady pincushion cactus, razorback sucker, California condor, southwestern willow flycatcher, and Mexican spotted owl. This alternative would not affect designated critical habitat for any of the federally listed species addressed by this analysis.

ALTERNATIVE B: THE NPS PREFERRED ALTERNATIVE

Impact Analysis

Brady Pincushion Cactus. Prior to initiating rehabilitation and stabilization activities in the project area, surveys for Brady pincushion cactus would be performed. Areas found to contain the cactus would be delineated so that equipment and personnel would not adversely affect any plants. Staff would be educated about the cactus locations that are near work areas and precautions would be implemented to avoid affecting this listed species. As a result, alternative B construction activities would have a negligible effect on the Brady pincushion cactus. However, there is a continued potential for illegal cacti collectors to use the Lees Ferry Road to access cacti habitat, a potential negligible to minor adverse impact. This equates to a section 7 Endangered Species Act characterization of *may affect, but is not likely to adversely affect* the Brady pincushion cactus. This species does not have designated critical habitat so this alternative would not affect designated critical habitat.

Cumulative Impacts - The primary threats to Brady pincushion cactus include unauthorized plant collection, off-road vehicle use, livestock grazing, and mining within habitats of populations on Federal lands (USFWS 1985). These activities are not present along the Lees Ferry Road or in the project area, so the cacti are protected from some of their primary threats. However, because of the proximity of the plants to the road and relatively high levels of visitor use along the Lees Ferry Road corridor, there is potential for unauthorized take by cacti collectors and trampling by off-road foot traffic. The effects of planned upgrades to telecommunication utility lines in the road corridor, river access by fishermen, and tamarisk eradication projects have the potential to result in adverse cumulative effects. However, each of these actions and projects have associated conservation measures and best management practices that would minimize and avoid adverse impacts to this listed plant species. The cumulative effects of other plans and projects on the Brady pincushion cactus would be negligible to minor and adverse. The proposed action would contribute to these potential

adverse effects in a small way, if at all, because the conservation measures to be implemented by the rehabilitation and stabilization project would try to ensure no or negligible impacts.

Marble Canyon Spurge. Surveys for the Marble Canyon spurge prior to project initiation would identify its location relative to work or staging areas. Any known spurge locations would be delineated so that no adverse effects would occur. With implementation of conservation measures similar to those proposed to protect the Brady pincushion cactus, alternative B would have a negligible impact on the Marble Canyon spurge. This state-listed species does not have designated critical habitat, so this alternative would not affect designated critical habitat.

Cumulative Impacts - The cumulative impacts of other plans and projects on the Marble Canyon spurge would be negligible. Each of these plans and projects takes the spurge into consideration and if effects are possible, conservation measures to keep actions from affecting the spurge would be implemented. Alternative B would not contribute to any cumulative effects. The protections afforded by the National Park Service through awareness of where the spurge populations grow would continue to provide a long-term cumulative benefit as its habitat would be protected.

Mojave Indigobush. As described for alternative A, relatively small numbers of people would continue to use the habitat of this Navajo Nation species of concern as they traveled off-trail by foot. Alternative B would not change the numbers of people, their activities, or locations. Therefore, this alternative would have negligible effects on individual Mojave indigobush plants or the population.

Cumulative Impacts - The cumulative impacts of other plans and projects on the Mojave indigobush would be negligible. Each of these plans and projects takes the plant into consideration and if effects were possible, mitigation measures to keep actions from affecting the indigobush would be implemented. The negligible impacts from alternative B would not contribute to cumulative effects. The protections afforded by the National Park Service through awareness of where the Mojave indigobush populations grow provide a long-term cumulative benefit by protecting its habitat.

Nakedstem Sunray. The project activities along the Lees Ferry Road corridor would result in the loss of some individual nakedstem sunray plants, which would represent a long-term, local, negligible adverse effect. There would be no adverse effects at the population level. The loss of individual plants would be minimized by surveys for the nakedstem sunray that would be performed prior to construction and impacts would be limited to as few plants as possible.

Cumulative Impacts - The cumulative impacts of other plans and projects on the nakedstem sunray would be negligible. Each of these plans and projects takes plants important to the Navajo Nation into consideration, and if effects are possible, mitigation measures to keep actions from affecting the sunray would be implemented. The action alternative would contribute to adverse cumulative effects in a very small manner, with negligible effects at the plant's population level. The protections afforded by the National Park Service through awareness of the sunray's importance to the Navajo Nation would provide a long-term cumulative benefit as surveys for the plant would help the National Park Service to understand its distribution and population status.

Razorback Sucker. Alternative B would use heavy construction equipment to install the revet mattresses and spur dikes. The equipment would access the bank locations to be stabilized through the Paria River channel at and upstream of the Paria River Bridge. This

could cause increased water turbidity and sediment loads in the river and transport of the sediment downstream. Some of this sediment could be carried to the Colorado River, about 0. 5 mile downstream, depending on precipitation and flow levels in the Paria River. However, because similarly high sediment loads also result from the watershed's relatively frequent extreme precipitation events and flash floods, this effect would be within the range of natural variation and would not represent an adverse effect for the razorback sucker. Conservation measures and best management practices would ensure that toxic chemicals, such as spilled chemicals or fuel, would not enter the river. Effects of the proposed action on the primary constituent elements of razorback sucker critical habitat, including water temperature, dissolved oxygen, turbidity, potential spawning habitat, food supply, and the presence of predators, would be inconsequential and discountable.

Any adverse effects to the razorback sucker would be short-term and negligible. This impact would equate to a section 7 Endangered Species Act characterization of *may affect, but is not likely to adversely affect* the razorback sucker.

Construction activities in the Paria River channel would produce short-term increases in water turbidity and sediment loads, some of which may escape the water quality mitigation measures. Some of these constituents might reach the critical habitat reach downstream. However, it is expected that the concentrations and durations of these increases would be of negligible to minor intensity by the time the suspended sediments reached the designated critical habitat. These increase would be well within the turbidity and suspended sediment concentrations that would be naturally generated by storm runoff. Therefore, the water quality effects produced by construction would be too small to adversely affect designated critical habitat for the razorback sucker.

Cumulative Impacts - The cumulative effects of alternative B would be similar to alternative A in that neither other plans and projects nor the action alternative would contribute to adverse cumulative effects in a measurable way because the project would employ conservation and best practice mitigation measures to minimize effects on water quality. Any effects that would occur would be within the natural range of variation that would result from precipitation events and flash floods.

California Condor. The potential for effects to the California condor from alternative B would be related to trash or food scraps that could be left by construction personnel and potential exposure to contaminated water. As a result, conservation and mitigation measures, previously detailed in chapter 2, would be implemented with the proposed action.

Implementation of these measures would avoid adverse effects to the California condor. As a result, alternative B would have a negligible, adverse effect on the California condor. This effect would equate to a section 7 Endangered Species Act characterization of *may affect, but is not likely to adversely affect* the California condor. This alternative would not have any direct or indirect effects on designated critical habitat, so there would be no effect to designated critical habitat.

Cumulative Impacts – As described for alternative A, substantial adverse cumulative effects on the California condor remain because of historical and, in some cases, ongoing actions. The other plans and projects listed in tables 1 and 2 all include conservation measures, and their cumulative impacts on the condor would be minor and adverse. The negligible, adverse impact to the California condor from alternative B would make a small contribution to the minor, adverse cumulative impacts from other actions.

Southwestern Willow Flycatcher. Because of the rare, transient presence of the southwestern willow flycatcher in the project area, the implementation of alternative B

would have a negligible, adverse impact. This equates to a section 7 Endangered Species Act characterization of *may affect, but is not likely to adversely affect* the southwestern willow flycatcher. This alternative would not have any direct or indirect effects on designated critical habitat, so there would be no effect to designated critical habitat.

Cumulative Impacts - The southwestern willow flycatcher is endangered primarily due to the reduction, degradation, and elimination of riparian habitat from agricultural and urban development. Other reasons for the decline and vulnerability of the flycatcher include the fragmented distribution and low numbers of the current population; predation; cowbird brood parasitism; and other events such as fires and floods that are naturally occur. Fires have become more frequent and intense as a result of the proliferation of exotic vegetation and degraded watersheds.

The recent introduction, spread, and effect of the tamarisk-eating leaf beetle threatens the flycatcher by defoliating and killing nesting habitat. The leaf beetle has expanded into the southwestern United States and into the flycatcher's range beyond where the beetle was expected to survive and persist. Accidental and purposeful human transportation appears to be accelerating its distribution. Tamarisk often flourishes in areas where native tree growth is affected by land/water management actions such as river damming, flow regulation, diversion, groundwater pumping, and overgrazing. Because tamarisk provides structure and density, over half of all known flycatcher territories contain tamarisk. Loss of tamarisk vegetation without replacement by native trees will likely impact the flycatcher and other riparian obligate wildlife in Arizona (USFWS 2011c). All the impacts described contribute to substantial adverse cumulative effects on the flycatcher.

Biologists at Glen Canyon National Recreation Area forecast improvements to potential flycatcher habitat over the next 10 years as a result of the Lees Ferry 10-Acre Site Restoration Plan of 2001 just downstream from the boat ramp (Pilkington 2011). Also, the current revision of critical habitat designations, combined with actions consistent with the species' recovery plan (USFWS 2002b), represent beneficial cumulative impacts that would offset some of the continuing adverse effects.

Alternative B would not contribute to adverse cumulative effects on the southwestern willow flycatcher because the project would not adversely affect potential future flycatcher habitat.

Mexican Spotted Owl. The owl's preferred habitats do not exist within the boundary of or near the project. Because there is an extremely low likelihood that the Mexican spotted owl is present in the area that would be affected by alternative B, there would be a negligible, adverse effect to the species. his equates to a section 7 Endangered Species Act characterization of *may affect, but is not likely to adversely affect* the Mexican spotted owl. This alternative would not have any direct or indirect effects on designated critical habitat, so there would be no effect to designated critical habitat.

Cumulative Impacts - The Mexican spotted owl is listed as threatened because of destruction and modification of its nesting habitat. One of the primary threats is believed to be the accumulation of natural fuel loads and the resultant threat of high-severity, stand-replacing wildfire (USFWS 1995). Various projects that affect and modify its preferred nesting habitat, including logging, development, and habitat fragmentation activities, combine to have substantial adverse cumulative effects on the owl. None of the other plans and projects in the area of the Lees Ferry Road and Paria River bank stabilization project would contribute to cumulative effects on the Mexican spotted owl, and the proposed action also would not contribute to cumulative effects.

Desert Bighorn Sheep. As described for alternative A, most sheep already avoid the heavily used Lees Ferry Road area. The presence of construction might make the area even less attractive, which would result in minor, short-term, adverse effects on individual desert bighorn sheep and the population.

Cumulative Impacts - The cumulative impacts of other plans and projects on the desert bighorn sheep would be negligible. Each of these plans and projects takes the sheep into consideration and if effects were possible, mitigation measures to keep actions from affecting the desert bighorn sheep would be implemented. Alternative B would contribute to any adverse effects in a minor fashion. The protections afforded by the National Park Service through awareness and conservation of the desert bighorn sheep population would provide a long-term cumulative benefit.

Conclusions

During construction, short-term adverse impacts up to minor intensity would occur on the Brady pincushion cactus because of continued access for illegal collection, razorback sucker habitat because of increased sediment loading, and desert bighorn sheep because of increased human activity. All other short- and long-term impacts on special status species or their habitats would be negligible.

Other actions in the project area would have a negligible or small, beneficial cumulative impact on special status species. The negligible or minor, adverse effect of alternative B combined with other projects and plans would continue to have negligible or small, beneficial cumulative impacts and the contribution of alternative B to the cumulative effect would be small.

In terms of section 7 of the Endangered Species Act, a *may affect, but is not likely to adversely affect* determination of effect would be applicable to the Brady pincushion cactus, razorback sucker, California condor, southwestern willow flycatcher, and Mexican spotted owl. Except for the razorback sucker, this alternative would have no effect on designated critical habitat for any of the federal special status species addressed by this analysis. Small increases in water turbidity from construction activities in the Paria River may affect, but is unlikely to adversely affect, razorback sucker critical habitat downstream in the Colorado River.

CULTURAL RESOURCES

AFFECTED ENVIRONMENT

Historic Structures

Lees Ferry Historic District was listed in the National Register of Historic Places in 1976 (NPS 1974). Lonely Dell Ranch was listed in 1978 (NPS 1977). In 1997, these two separate historic districts were combined into a single district based on their interrelated nature (NPS 1997). A 2010 reevaluation of the combined district resulted in the addition of contributing features, an expansion of the period of significance, and a larger boundary.

The current boundary of the district includes all extant historic resources associated with the ferry and ranch sites within lands owned and managed by the National Park Service and Bureau of Land Management. The south boundary follows the north bank of the river, and the west, north, and most of the east boundary generally follow the 3,200-foot elevation contour. The remainder of the east boundary is defined by the top of the slope (roughly the 4,500-foot elevation contour), which encompasses the extent of the Spencer Trail. The revised period of significance for the historic district extends from 1871, when John D. and Emma Lee started the first agriculture and ferrying operations, until 1974, when the National Park Service assumed control of the entire district, ending a century of continuous residential occupation (NPS 2010a).

The following excerpt from the 2010 update to the National Register nomination (NPS 2010a) provides a brief overview of the district's history:

> The Lees Ferry and Lonely Dell Ranch Historic District, which covers approximately 630 acres, is located within Glen Canyon National Recreation Area, just north of Marble Canyon and U.S. Highway 89A. The district includes three ferry sites at Lees Ferry, three ranch sites at Lonely Dell Ranch and all associated features pertaining to the ferrying, ranching, and mining history of the district. The area was first used by early explorers of the region, as it was one of the few points of crossing the Colorado River in the 19th century and into the 20th century. Later the district became associated with John D. Lee, an excommunicated member of the Church of Jesus Christ of Latter-day Saints, and his families. Lee established a ferry operation on the Colorado River and built Lonely Dell Ranch on the right bank of the Paria River in order to sustain the ferrying operation within the isolated environment of Glen Canyon.
>
> Lee and his families constructed cabins, built irrigation ditches, and planted fields to survive the harsh frontier at the juncture of the two rivers. In the early 1900s, mining claims were established in the area of Lees Ferry and Lonely Dell Ranch. Charles H. Spencer of the Black Sand Gold Recovery Company arrived in the area in 1910 intent on mining gold from the rock formations that surrounded the ferry site.
>
> Although his mining operations ultimately failed, he left behind several buildings, a mining trail, scattered remnants of mining equipment, and a partially sunken sternwheeler named the *Charles H. Spencer* on the right bank of the Colorado River. Following the mining quests, the United States Geological Survey (USGS) took interest in Lees Ferry in the early 1920s, erecting a number of gauging stations. As the 20th century progressed, the area was used for dude ranching and recreational activities, until the National Park Service acquired Lees Ferry in the 1960s and Lonely Dell Ranch in 1974. Today, historic character is maintained, and integrity to the 1871-1974 period of significance remains high.

The Lees Ferry and Lonely Dell Ranch Historic District is significant under national register criterion A for its association with settlement by members of the Church of Jesus Christ of Latter-day Saints (areas of significance: transportation, agriculture, commerce, and ethnic

heritage), and its association with exploration and development of the Colorado Plateau (areas of significance: exploration/settlement, industry, and tourism). The district is also significant under criterion B for its association with John D. Lee, the Warren Johnson family, and Zane Grey; and under criterion C as an example of regional pioneer architecture within an evolved vernacular landscape. The period of significance for Lees Ferry and Lonely Dell Ranch extends from 1871, when John D. and Emma Lee initiated the first agriculture and ferrying operations, until 1974, when the National Park Service assumed control of the entire district, ending a century of continuous residential occupation (NPS 2010a).

The combined historic district contains a total of 58 contributing elements that cover a wide range of resources, such as buildings and structures, a cemetery, irrigation features, and the remains of a historic steamboat. The district also includes 17 non- contributing elements, such as modern maintenance buildings, a launch ramp, and visitor comfort station (NPS 2010a).

Cultural Landscapes

A cultural landscape is defined by the National Park Service 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. Like historic buildings and districts, these special places reveal aspects of our country's origins and development through their form and features and the ways they were used. Cultural landscapes also reveal much about our evolving relationship with the natural world (NPS 2011).

A cultural landscapes inventory identifies and documents a historic landscape's location, size, physical development, condition, landscape characteristics, and character-defining features. A cultural landscapes inventory was conducted at the Lees Ferry and Lonely Dell Ranch Historic District (NPS 2010b). According to the cultural landscapes inventory:

> The Lees Ferry and Lonely Dell Ranch component landscape contains many character-defining features, such as spatial patterns, natural systems, buildings and structures, and small-scale elements that were significant characteristics during the period of significance from 1871 to 1974. As a result, the character of the landscape is important as it evolved through time with various uses from an early transportation route and ranch to later mining and USGS [U.S. Geological Survey] operations. Landscape features important to retaining the integrity of the site, have remained with relatively few changes, despite new contemporary uses and visitor impacts.

In the case of Lees Ferry, the cultural landscapes inventory states that the existing landscape

> demonstrates continuity and remnants of historic elements with some alterations also noted. The character of spatial organization has remained throughout time with retention of key features, including natural features along the Colorado River. Views to the broader landscape remain intact, although views within the historically open landscape have changed with the addition of modern visitor facilities. Additions of modern features and the loss of some historic features limit the evocation of the historic landscape character of the property. Though losses are noted at Lees Ferry, other historic features remain in remnant form and help to establish a link from the existing landscape to the earlier historic period. Extant features such as the remaining buildings, Arizona Road, and mining remnants are tangible traces of the former ferry landscape.

For Lonely Dell Ranch, the cultural landscapes inventory notes that:

> While changes have been made within the three ranch sites, the original character and broader landscape patterns of the ranch are evident in the landscape today. Additionally, the continued presence of the site's small-scale features contributes to the "sense of

place" or historic character. There has been no loss in any of the spatial elements that comprise the Lonely Dell landscape and most of the acreage is in the ownership of the National Park Service. Although the activities that historically occurred within this historic landscape have changed, the areas are still definable and may be interpreted for today's visitor. The spatial organization of this landscape contributes to its significance and integrity. Due to the lack of modern intrusions, the views are relatively unaltered with the exception of a reduction in the number of structures in the landscape such as corrals and fences. Lonely Dell Ranch is a highly-intact surviving early example of the late 19th century agricultural complex in Northern Arizona.

Archeological Resources

The project area is in the Canyonlands subprovince of the Colorado Plateau, near the confluence of the Colorado and Paria Rivers. Bedrock in the area consists of Permian to Jurassic limestone, shale, siltstone, and sandstone and has been eroded over time to create a rugged landscape. The climate is characterized by sparse precipitation and extreme temperatures. These factors have combined to generally limit prehistoric or historic human occupation (Geib 1990).

Of the prehistoric archeological sites in or near the project area, approximately half are lithic scatters, many of which date to the Archaic period. Projectile points discovered in the area date to roughly 4250-2550 BC. Petroglyphs depicting animals such as sheep or antelope have been documented along the Colorado River and are considered a significant demonstration of Archaic symbolic expression. Sites demonstrating Ancestral Puebloan occupation in the area from approximately AD 1000 to 1150 are also found near the Colorado and Paria Rivers. This evidence suggests a seasonal occupation by Ancestral Puebloans, but does not indicate the presence of any groups inhabiting the area for long periods (Geib 1990).

Historic archeological sites show that the project area was likely occupied by Paiutes and Navajos, who lived in stone dwellings referred to as hogans. Trash associated with these hogans indicates that the Native Americans who lived in them were present during the early 1900s, overlapping with Euroamerican settlement.

The first Euroamerican settler was John Doyle Lee, who established a homestead at the confluence of the Paria and Colorado Rivers in 1871. Lee was sent by Brigham Young to promote the Church of Jesus Christ of Latter-day Saints in Arizona. He “spent much of 1872 erecting buildings for his family and livestock, planting trees and vines, clearing fields and sowing crops, and generally establishing a self-sustaining farm” (Geib 1990). Archeological remains from this homestead, as well as Lees Ferry, are in the project area.

A relatively high concentration of archeological remains linked to Lees Ferry has been documented in conjunction with previous stabilization activities in the area. It is believed that the original ferry site has been substantially impacted by later historic activities, especially the Spencer mining operation. Archeological remains from the mining operation have also been identified.

Ethnographic Resources

Ethnographic resources are cultural and natural features that are of traditional significance to traditionally associated peoples (NPS 2006a). “Traditionally associated peoples” are the contemporary ethnic or occupational communities that have been associated with a resource for two or more generations. These groups can include American Indian tribes, as well as Euroamerican cultural communities. The traditionally associated peoples of Glen Canyon National Recreation Area include American Indian tribes, ranchers, and the Church of Jesus Christ of Latter-day Saints (Mormon) community. Glen Canyon National Recreation Area is

part of the Mormon Pioneer National Heritage Area that includes the Lees Ferry District, in addition to other park districts.

The American Indian tribes include the:

- Hopi Tribe;
- Kaibab Paiute Tribe;
- Navajo Nation (including the following chapters: Coppermine; Gap/Bodaway; Inscription House; Kaibeto; LeChee; Navajo Mountain; and Shonto);
- Paiute Indian Tribe of Utah (Kanosh; Koosharem; and Shivwits);
- Pueblo of Zuni;
- San Juan Southern Paiute; and
- Ute Mountain Ute (including the White Mesa Ute Band).

Tribes are determined to be affiliated with the national recreation area through archeological remains found within its boundaries, through documented oral tradition, and through tribal statements of association.

The project area includes cultural sites that contain artifacts and/or features that may identify a relationship with contemporary Indian tribes. Two sites have been recorded that contain Ancestral Puebloan ceramics.

While no known Navajo cultural manifestations were found in the project area, the Navajo are nevertheless associated with the project area. The south side of the Colorado River is part of the Navajo Nation, and the Navajo historically have crossed and inhabited the north side of the river in the Lees Ferry area. Several hogans are found in the vicinity of the project area. Navajo have herded their sheep in the Lees Ferry area, and they have worked for both developers of the district and for the federal government for multiple decades. Two plants that are of significance to Navajo traditionalists may be in the project area, but neither is threatened or endangered.

The project area also includes the congressionally designated Mormon Pioneer National Heritage Area. The Arizona Road/Honeymoon Trail was a historic route used by Mormon pioneers to settle in Arizona after crossing the Colorado River at Lees Ferry, and it transects the project area at least six times. After completion of the temple of the Church of Jesus Christ of Latter-day Saints at St. George in 1877, young Mormon couples, married by civil authorities in the Arizona settlements, began traveling north to have their marriages solemnized in the temple. They would return by the same route (Rusho 2003).

IMPACT ANALYSIS METHODS

In this environmental assessment, impacts to cultural resources are described in terms of type, context, duration, and intensity, which is consistent with the regulations of the Council on Environmental Quality (1978) that implement the National Environmental Policy Act. These impact analyses also are intended to reflect the determinations made in compliance with section 106 of the National Historic Preservation Act. In accordance with the Advisory Council on Historic Preservation (2004) regulations implementing section 106, impacts to cultural resources were identified and evaluated by:(1)determining the area of potential effects; (2) identifying cultural resources present in the area of potential effects that are either listed in or eligible to be listed in the national register; (3) applying the criteria of adverse effect to affected National Historic Preservation Act -eligible or -listed cultural resources; and (4) considering ways to avoid, minimize, or mitigate adverse effects.

A separate section 106 compliance document was submitted to the Arizona State Historic Preservation Officer and to interested tribes. It requests concurrence with the area of potential effects, the determination of properties within the area of potential effects, and the assessment of effects to the properties by the proposed project.

Under Advisory Council on Historic Preservation (2004) regulations, a determination of either adverse effect or no adverse effect must be made for affected cultural resources that are listed or eligible for listing in the National Register of Historic Places. An adverse effect occurs whenever an impact alters, directly or indirectly, any characteristic of a cultural resource that qualifies it for inclusion in the national register. For example, this would include diminishing the integrity (or the extent to which a resource retains its historic appearance) of its location, design, setting, materials, workmanship, feeling, or association. Adverse effects also include reasonably foreseeable effects of an action that would occur later in time, be farther removed in distance, or be cumulative. A determination of no adverse effect means there is an effect, but the effect would not diminish the characteristics of the cultural resource that qualify it for inclusion in the national register.

Council on Environmental Quality (1978) regulations and the NPS handbook for implementing those regulations (NPS 2001) also require a discussion of mitigation and an analysis of how effective the mitigation would be in reducing the intensity of a potential impact, such as from major to moderate. Any resultant reduction in the intensity of an impact due to mitigation, however, is an estimate of the effectiveness of mitigation under National Environmental Policy Act only. It does not suggest that the level of effect, as defined by section 106, is similarly reduced. Cultural resources are nonrenewable resources and adverse effects generally consume, diminish, or destroy the original historic materials or form, resulting in a loss in the integrity of the resource that can never be recovered. Therefore, although actions determined to have an adverse effect under section 106 may be mitigated, the effect remains adverse.

A section 106 summary is included in the applicable impact analysis sections. This summary is an assessment of the effect, based on the criteria in Advisory Council regulations, of the alternative on cultural resources that are listed or eligible for listing in the National Register of Historic Places.

Intensity Definitions

The following definitions of impact intensity were used in the analysis of effects on cultural resources:

Historic Structures.

- *Negligible*: An effect is absent or at the lowest levels of detection – barely perceptible and not measurable. The determination of effect for section 106 would be no effect.
- *Minor*: Impacts would affect character-defining features but would not diminish the integrity of the structure. The determination of effect for section 106 would be no adverse effect.
- *Moderate*: Impacts would alter a character-defining features, diminishing the integrity of the structure to the extent that its National Register of Historic Places eligibility could be jeopardized. The determination of effect for section 106 would be adverse effect.
- *Major*: Impacts would alter character-defining features, diminishing the integrity of the structure to the extent that it would no longer be eligible to be listed on the National

Register of Historic Places. The determination of effect for section 106 would be adverse effect.

Cultural Landscapes.

- *Negligible*: An effect is absent or at the lowest levels of detection – barely perceptible and not measurable. The determination of effect for section 106 would no effect.
- *Minor*: Impacts would affect character-defining features or patterns, but would not diminish the integrity of the landscape. The determination of effect for section 106 would be no adverse effect.
- *Moderate*: Impacts would alter character-defining features or patterns, diminishing the integrity of the landscape to the extent that its National Register of Historic Places eligibility would be jeopardized. The determination of effect for section 106 would be adverse effect.
- *Major*: Impacts would alter character-defining features or patterns, diminishing the integrity of the landscape to the extent that it would no longer be eligible to be listed on the National Register of Historic Places. The determination of effect for section 106 would be adverse effect.

Archeological Resources.

- *Negligible*: An effect is absent or at the lowest levels of detection – barely perceptible and not measurable. The determination of effect for section 106 would be no effect.
- *Minor*: The impact affects an archeological site with modest data potential and no significant ties to a living community's cultural identity. The determination of effect for section 106 would be no adverse effect.
- *Moderate*: The impact affects an archeological site with high data potential and no significant ties to a living community's cultural identity. The determination of effect for section 106 would be adverse effect.
- *Major*: The impact affects an archeological site with exceptional data potential or that has significant ties to a living community's cultural identity. The determination of effect for section 106 would be adverse effect.

Ethnographic Resources.

- *Negligible*: Impacts would be absent or at the lowest levels of detection and barely perceptible. Impacts would neither alter resource conditions, such as traditional access or site preservation, nor alter the relationship between the resource and the associated group's body of practices and beliefs. The determination of effect for section 106 would be no effect.
- *Minor*: Impacts would be slight but noticeable and would neither appreciably alter resource conditions, such as traditional access or site preservation, nor alter the relationship between the resource and the associated group's body of beliefs and practices. The determination of effect for section 106 would be no adverse effect.
- *Moderate*: Impacts would be apparent and would alter resource conditions or interfere with traditional access, site preservation, or the relationship between the resource and the associated group's beliefs and practices, even though the group's practices and beliefs would survive. The determination of effect for section 106 would be adverse effect.

- *Major*: Impacts would alter resource conditions. Proposed actions would block or greatly affect traditional access, site preservation, or the relationship between the resource and the associated group's body of beliefs and practices to the extent that the survival of a group's beliefs and/or practices would be jeopardized. The determination of effect for section 106 would be adverse effect.

Duration:

All effects on cultural resources would be long term because these resources are non-renewable.

ALTERNATIVE A: NO ACTION / CONTINUE CURRENT MANAGEMENT

Historic Structures Impact Analysis

No construction activities would take place. Therefore, there would not be any potential to affect the Lees Ferry and Lonely Dell Ranch Historic District or its contributing elements. Furthermore, no potential repercussions to the district have been indentified in conjunction with a failure to address the current deficiencies in the road or bridge. As such, alternative A would result in negligible impacts to historic structures.

Historic Structures Cumulative Impacts

Several of the past, present, or future plans or actions identified in tables 1 and 2 could affect historic structures in or near the project area. Future plans include an emergency stabilization of the historic district, repair and rehabilitation of 11 historic buildings used by visitors, and the removal of an aboveground water storage tank. These future projects could to slow the deterioration of contributing elements of the district, rehabilitate some buildings, and alter the viewshed by removing a modern intrusion. The projects would have long-term, negligible impacts to the historic structures in the Lees Ferry and Lonely Dell Ranch Historic District. The negligible impacts of these future plans in combination with the negligible impacts of alternative A would result in a long-term, negligible cumulative effect on historic structures. Alternative A would not contribute to the cumulative impacts.

Historic Structures Conclusions

Alternative A would result in negligible impacts to historic structures. It would not contribute to cumulative impacts.

Historic Structures Section 106 Summary

After applying the Advisory Council on Historic Preservation's (2004) criteria of adverse effect, the National Park Service concludes that implementation of alternative A would result in a determination of *no adverse effect*.

Cultural Landscapes Impact Analysis

Because no construction activities would take place, there would be no effect on the cultural landscapes' identified character-defining features, such as its spatial patterns, natural systems, buildings and structures, and small-scale elements. Furthermore, no potential repercussions to these features have been indentified in conjunction with a failure to address the current deficiencies in the road or bridge. The impacts of alternative A on cultural landscapes would be negligible.

Cultural Landscapes Cumulative Impacts

Several of the past, present, or future plans or actions identified in tables 1 and 2 could affect the cultural landscape in or near the project area. These include future emergency stabilization of the historic district, repair and rehabilitation of 11 historic buildings used by visitors, and the removal of an aboveground water storage tank. These future projects would address the deterioration of and/or rehabilitate many structures that are contributing elements to the identified cultural landscape and would alter the viewshed by removing a modern intrusion. The projects are anticipated to result in long-term, negligible impacts to the Lees Ferry and Lonely Dell Ranch cultural landscape. The negligible effects of these future plans in combination with the negligible impacts of alternative A would result in a long-term, negligible effect on the cultural landscape. Alternative A would not contribute to the cumulative impacts.

Cultural Landscapes Conclusions

Alternative A would result in negligible impacts to the cultural landscape. It would not contribute to cumulative impacts.

Cultural Landscapes Section 106 Summary

After applying the Advisory Council on Historic Preservation's (2004) criteria of adverse effect, the National Park Service concludes that implementation of alternative A would result in a determination of *no adverse effect*.

Archeological Resources Impact Analysis

Because no construction activities would take place, there would be no ground disturbance that could affect buried archeological resources. However, failure to address the current deficiencies in the road or bridge would continue to result in substantial erosion along the Paria River banks. Greater than normal erosion could possibly lead to an increased degree of exposure of previously buried archeological resources, which could then be carried away downstream or looted by collectors. However, based on previous archeological surveys in the project area, the probability for such occurrences is unlikely. As such, alternative A would result in long-term, negligible to minor impacts to archeological resources.

Archeological Resources Cumulative Impacts

Over time, archeological resources within the project area are subject to disturbances associated with natural erosion, inclement weather that can uproot vegetation and dislodge buried sites, inadvertent disturbance by visitors, and artifact looting. These ongoing factors can diminish the integrity of archeological resources and reduce or eliminate their potential to yield important prehistoric or historic information.

Several of the past, present, or future plans or actions identified in tables 1 and 2 could affect archeological resources in or near the project area. Future plans such as upgrading or replacing the water treatment plant and/or septic systems would involve ground disturbance. However, any ground disturbance for such projects would be conducted in surveyed areas and archeological resources would be avoided by the project design. As a result, other projects would have a long-term, negligible to minor, adverse cumulative impacts to archeological resources. These effects in combination with alternative A would result in a long-term, negligible to minor impact, on archeological resources. Alternative A would very slightly contribute to the cumulative impacts.

Archeological Resources Conclusions

Alternative A would result in long-term, negligible to minor, adverse impacts on archeological resources as a result of continued erosion. It would very slightly contribute to the long-term, negligible to minor, cumulative impacts to archeological resources.

Archeological Resources Section 106 Summary

After applying the Advisory Council on Historic Preservation's (2004) criteria of adverse effect, the National Park Service concludes that implementation of alternative A would result in a determination of *no adverse effect*.

Ethnographic Resources Impact Analysis

Because alternative A would not change facilities, management, or visitation, it would not affect Native American, Latter-day Saints, or rancher ethnographic resources within the project area. The possible indirect effects from continued erosion on archeological resources that constitute a part of the ethnographic connection of associated American Indian tribes are considered in the archeological resources analysis, and would be long-term, negligible to minor, and adverse.

Ethnographic Resources Cumulative Impacts

No specific past, present, or future plans or actions have been identified that possess the potential to affect the ethnographically associated Latter-day Saints or rancher communities. However, some projects have a low potential to affect archeological resources that offer tangible evidence of the ethnographic connection held by associated American Indian tribes. These projects are considered in the archeological resources analysis and would result in long-term, negligible to minor, adverse impacts on ethnographic resources. These effects in combination with the effects of continuing no action would result in a long-term, negligible to minor impact on ethnographic resources. Alternative A would very slightly contribute to the cumulative impacts.

Ethnographic Resources Conclusions

Alternative A would result in long-term, negligible to minor adverse impacts on ethnographic resources as a result of continued erosion. It would very slightly contribute to the long-term, negligible to minor, cumulative impacts to ethnographic resources.

Ethnographic Resources Section 106 Summary

After applying the Advisory Council on Historic Preservation's (2004) criteria of adverse effect, the National Park Service concludes that implementation of alternative A would result in a determination of *no adverse effect*.

ALTERNATIVE B: THE NPS PREFERRED ALTERNATIVE

Historic Structures Impact Analysis

Implementation of alternative B would result in construction activities within the boundaries of the Lees Ferry and Lonely Dell Ranch historic district. These activities would consist of road improvements generally within the existing alignment, installation of gabion spurs and revet mattress upstream from the Paria River Bridge, and construction of a gabion wall at the

Lonely Dell Access Road. None of these activities would directly impact any contributing elements of the historic district. The project is at the southern and western edges of the historic district in areas that only contain non-contributing elements such as the modern NPS maintenance area. As such, historic structures would be unaffected and alternative B would have negligible impacts to historic structures. (Impacts to the viewshed in the district are detailed in the cultural landscape analysis.)

Historic Structures Cumulative Impacts

The effects of past, present, and future plans or actions on historic structures would be the same as described in alternative A and would be long-term and negligible. The negligible effects of these plans in combination with no effects of alternative B would result in a long-term, negligible cumulative effect on historic structures. Alternative B would not contribute to or detract from the cumulative impacts.

Historic Structures Conclusions

Implementation of alternative B would result in negligible impacts to historic structures. It would not contribute to the long-term, negligible cumulative impacts.

Historic Structures Section 106 Summary

After applying the Advisory Council on Historic Preservation's (2004) criteria of adverse effect, the National Park Service concludes that implementation of alternative B would result in a determination of *no adverse effect*.

Cultural Landscapes Impact Analysis

The cultural landscape would be impacted by the introduction of modern elements to the landscape, including gabion spurs and a revet mattress upstream from the Paria River Bridge and a gabion wall at the Lonely Dell Access Road. These installations would occur within the identified cultural landscape. However, the 2010 cultural landscapes inventory notes that the existing landscape has previously been subjected to the construction of modern NPS facilities. Therefore, the visual impacts resulting from the new structures would be minimal because of prior construction of many other non-historic elements throughout the Lees Ferry and Lonely Dell Ranch cultural landscape. The spatial organization of historic ranching and ferry operation elements would remain unchanged and would continue to demonstrate to an observer the link between the existing landscape and the earlier historic period. As a result, implementation of alternative B would have long-term, minor, adverse effects on the cultural landscape.

Cultural Landscapes Cumulative Impacts

As described in alternative A, the effects of past, present, and future plans or actions on the cultural landscape would be long-term and negligible. In combination with the long-term, minor, adverse effects of alternative B, they would result in a long-term, negligible to minor, adverse cumulative effect on the cultural landscape. The contribution from alternative B would be slight.

Cultural Landscapes Conclusions

Alternative B would result in long-term, minor, adverse impacts to the cultural landscape as a result of the introduction of new elements to the viewshed. They would make a slight contribution to the long-term, negligible to minor, adverse, cumulative impacts.

Cultural Landscapes Section 106 Summary

After applying the Advisory Council on Historic Preservation's (2004) criteria of adverse effect, the National Park Service concludes that implementation of alternative B would result in a determination of *no adverse effect*.

Archeological Resources Impact Analysis

Implementation of alternative B would include ground disturbance along the edges of the existing road, as well as excavations along the Paria River for installation of gabions and a revet mattress. The road corridor was previously disturbed during original construction, and areas of potential excavation along the Paria River have generally been surveyed for archeological resources. Most ground disturbance under alternative B would occur in corridors of previous disturbance and/or in areas that have been previously surveyed.

Although excavations in previously disturbed or surveyed areas are unlikely to encounter archeological resources, an archeological monitor would be present during all ground-disturbing activities. In the unlikely event that national register-eligible archeological resources were discovered and could not be avoided, such as by relocating a gabion, an appropriate mitigation strategy would be developed in consultation with the State Historic Preservation Officer and, if necessary, associated American Indian tribes. Because of these measures, any adverse impacts to archeological resources associated with inadvertent discoveries would be long-term and minor.

Archeological Resources Cumulative Impacts

As described in alternative A, the effects of past, present, and future plans or actions on archeological resources would be long-term, negligible to minor, and adverse. The effects of these plans in combination with the long-term, minor, adverse effects of alternative B would result in a long-term, adverse, minor, cumulative effect on archeological resources. The adverse impacts from alternative B would slightly contribute to the cumulative impacts.

Archeological Resources Conclusions

Alternative B would result in long-term, minor, adverse impacts to archeological resources as a result of ground-disturbing activities. It would slightly contribute to the long-term, minor, adverse cumulative impacts.

Archeological Resources Section 106 Summary

After applying the Advisory Council on Historic Preservation's (2004) criteria of adverse effect, the National Park Service concludes that implementation of alternative B would result in a determination of *no adverse effect*.

Ethnographic Resources Impact Analysis

Alternative B contains construction activities with the potential to affect ethnographic resources. Although there are no elements of the alternative that would cause impacts to the

ethnographically associated Latter-day Saints or rancher communities, ethnographic ties with the associated American Indian tribes could be impacted. These tribes have ethnographic ties to the land within the project area due to the potential existence of archeological resources. These impacts are discussed in the archeological resources analysis, and would be long-term, minor, and adverse.

In addition, there is the potential for plants that have ethnographic significance to Native Americans to be found alongside the road. Any removal or damage of these plants during construction would have short-term impacts on ethnographic resources. The intensity would be negligible because the plants of concern probably grow in many nearby areas. Impacts on ethnographic resources under alternative B would be short- and long-term, negligible to minor, and adverse.

Ethnographic Resources Cumulative Impacts

As described in alternative A, the effects of past, present, and future plans or actions on ethnographic resources would be long-term, negligible to minor, and adverse. The effects of these plans in combination with the short- and long-term, negligible to minor, adverse effects of alternative B would result in a long-term, negligible to minor, cumulative effect on ethnographic resources. Alternative B would slightly contribute to the cumulative impacts.

Ethnographic Resources Conclusions

Alternative B would result in short- and long-term, negligible to minor, adverse impacts to ethnographic resources as a result construction disturbances and the removal of plants that have ethnographic significance to Native Americans. It would slightly contribute to the long-term, negligible to minor, adverse cumulative impacts.

Ethnographic Resources Section 106 Summary

After applying the Advisory Council on Historic Preservation's (2004) criteria of adverse effect, the National Park Service concludes that implementation of alternative B would result in a determination of *no adverse effect*.

PARK OPERATIONS

AFFECTED ENVIRONMENT

Routine operation and maintenance activities for the Lees Ferry Road are performed in accordance with established schedules. Additional maintenance on the road embankments, the shoulder at numerous curves, and drainage ditches and culverts occurs seasonally and when necessary.

Labor resources in the park are assigned to ensure that personnel with the proper experience and skills perform each task. Operations at Lees Ferry are integrated with operations at other sites throughout the national recreation area. While staffing levels are adequate to maintain operations, there is little or no surplus to meet needs beyond the normally planned and scheduled activities.

In general, park operations in the project area center around maintenance issues (for example, culverts are difficult to clean, drainage ditches are difficult to grade and maintain, and pavement is cracking and has undulations). Park operations depend on uninterrupted use of the Lonely Dell Access Road to allow staff to perform maintenance and provide services to visitors. The road is currently at risk due to erosion along the Paria River.

IMPACT ANALYSIS METHODS

The larger context for analyzing the impact of each alternative on park operations and management is established by the legislation establishing the park, and *Management Policies* (NPS 2006a). National Park Service policies provide service-wide guidelines and mandates for the preservation, management, and use of park resources and facilities.

This impact analysis addresses the ability of NPS staff to carry out its daily activities to protect and preserve resources. It also addresses the effectiveness and efficiency with which NPS staff can perform such tasks. Information about NPS operations was gathered from park staff, especially those in facilities and maintenance roles, and from other planning documents.

Intensity Definitions

The following definitions of impact intensity are used in the analysis of effects on park operations:

- *Negligible*: Effects on NPS operations and management would be at or below the level of detection.
- *Minor*: Effects on NPS operations and management would be small but detectable. The change would be noticeable to park staff.
- *Moderate*: Effects on NPS operations and management would be readily apparent to park staff.
- *Major*: Effects on NPS operations and management would be substantial, widespread, and obvious to park visitors.

Duration:

- *Short-Term*: Occurs only during project implementation.
- *Long-Term*: Persists beyond the period of the project implementation.

Geographic Area Considered

The geographic area evaluated for impacts on park operations includes the Lees Ferry Road corridor and Paria River Bridge.

ALTERNATIVE A: NO ACTION / CONTINUE CURRENT MANAGEMENT

Impact Analysis

Implementation of alternative A would result in a continuation of maintenance difficulties in the project area. Inadequate drainage systems and erosion would continue to pose problems along the Lees Ferry Road in various locations, which would lead to increased maintenance activities required of NPS staff. Cracking, shoulder deterioration, and undulations in the pavement resulting from age and wear would also continue to require maintenance and repair by park staff. At No-Name Wash, drainage conditions would likely remain so severe that they would require short-term road closures. As a result, alternative A would have moderate, short- and long-term, adverse effects on park operations.

Cumulative Impacts

Several future plans or actions identified in tables 1 and 2 would affect park operations. These primarily include plans to upgrade the infrastructure in or near the project area. These include plans to upgrade the water treatment facility, rehabilitate the water intake, upgrade or replace septic and sewage systems, upgrade a campground waterline, and replace housing utilities. All of these projects would result in long-term, beneficial impacts to park operations because of expected reductions in necessary maintenance. These effects in combination with the effects of continuing no action would result in a beneficial impact on park operations. However, alternative A would detract from the cumulative impacts.

Conclusions

Alternative A would result in moderate, short- and long-term, adverse impacts on park operations because maintenance needs would continue to tax park resources. Cumulative impacts would be beneficial but alternative A would detract from these benefits.

ALTERNATIVE B: THE NPS PREFERRED ALTERNATIVE

Impact Analysis

Alternative B would improve park operations in the project area by correcting road and drainage design inefficiencies. The new infrastructure would require less maintenance because wider curve radii would help large vehicles stay on the road and off the shoulders, culverts would be more self-cleaning, inlets would be easier to clean, drainage ditches would be easier to grade and maintain, and pavement would be new and less likely to have undulations. These upgraded features would improve NPS staff productivity and availability because they would require less frequent attention. Furthermore, vehicular access across No-Name Wash and along the Lonely Dell Access Road would no longer be threatened by erosion. These improvements would result in short- and long-term, minor to moderate, beneficial impacts on park operations.

Additional duties could be assigned to park staff as part of mitigation measures enacted to control the spread of invasive plant species. Upon completion of the alternative B construction, a revegetation plan would be implemented and would include strategies to

establish willows in, on, and through gabion baskets and revet mattresses. Execution of mitigation measures to control invasive species and establish and maintain willows would have short- and long-term, negligible, adverse impacts on park operations.

Cumulative Impacts

The effects of past, present, and future plans or actions on park operations would be long-term and beneficial, as described in alternative A. These effects in combination with the effects of alternative B, would result in a beneficial impact on park operations. Alternative B would make a modest beneficial contribution to the cumulative impacts.

Conclusions

Alternative B would result in short- and long-term, minor to moderate, beneficial impacts on park operations because the need for repeated maintenance would be reduced, and short- and long-term, negligible adverse impacts from the need for additional vegetation management. It would make a modest, beneficial contribution to the cumulative, long-term, beneficial impacts on park operations.

PUBLIC HEALTH AND SAFETY

AFFECTED ENVIRONMENT

The affected environment information that supports the analysis of impacts on health and safety was included in the description of the need for the project in chapter 1. As discussed under "Need for the Action," there are concerns in the project area resulting from the following:

- Inconsistent lane widths and inadequate curve radii along Lees Ferry Road.
- Drainage problems caused by design issues and degradation of drainage components.
- Erosion of the Paria River banks, which poses a severe risk to the integrity of the Paria River Bridge and the bank supporting the Lonely Dell Access Road. This erosion threatens to prevent access to historic and other national recreation area resources and/or strand visitors in the event of a catastrophic bridge or road failure.

IMPACT ANALYSIS METHODS

Intensity Definitions

The following definitions of impact intensity were used in the analysis of effects on public health and safety:

- *Negligible*: Public health and safety would not be affected, or the effects would be at low levels of detection.
- *Minor*: The effect would be detectable, but would not have an appreciable effect on public health and safety. If mitigation was needed, it would be relatively simple and likely successful.
- *Moderate*: The effect would be readily apparent, and would result in substantial, noticeable effects on public health and safety in the park on a local scale. Changes in rates of accidents or injuries could be measured. Mitigation measures would probably be necessary and would likely be successful.
- *Major*: The effects would be readily apparent, and would result in substantial, noticeable effects on public health and safety in the park and in the county around the park. Effects could lead to changes in the rate of mortality. Extensive mitigation measures would be needed, and their success would not be assured.

Duration:

- *Short-Term*: Occurs only during project implementation.
- *Long-Term*: Persists beyond the period of the project implementation.

Geographic Area Considered

The geographic area evaluated to assess the effects of the proposed action included the Lees Ferry Road corridor, the areas that would be disturbed by project actions, and destinations along the road, such as the campground, trailheads, and the boat ramp.

ALTERNATIVE A: NO ACTION / CONTINUE CURRENT MANAGEMENT

Impact Analysis

Implementation of alternative A would result in a continuation of existing concerns with the project area. Varying curve radii, inconsistent lane widths, undulations, degraded road shoulders, and drainage outlets along the roadside would pose less than optimum conditions for automobile, bus, and truck traffic using Lees Ferry Road. In addition, the road would continue to flood, leaving sediment deposits on the roadway and, with higher floods, posing a threat of carrying away any vehicle that attempted to cross. Along the Paria River banks, erosion would continue to present a risk to the integrity of the Paria River Bridge, with the resulting potential to injure or strand visitors in the event of a catastrophic bridge or road failure. As a result, alternative A would have moderate, long-term, adverse effects on public health and safety.

Cumulative Impacts

Future plans or actions with the potential to impact public health and safety include plans to upgrade the infrastructure in or near the project area. These include plans to upgrade the water treatment facility, rehabilitate the water intake, upgrade or replace septic and sewage systems, upgrade a campground waterline, and replace housing utilities. Upgrades that provide safe potable water, uninterrupted electrical service, and sanitary disposal of wastewater would all contribute to improved public health and safety, which would have long-term, beneficial impacts. These effects, in combination with the moderate, adverse impact of alternative A, would result in a minor to moderate, adverse impact on public health and safety. Alternative A would make a substantial contribution to cumulative impacts.

Conclusions

Alternative A would result in moderate, long-term, adverse impacts on public health and safety because existing road conditions would continue. The cumulative impact would be minor to moderate and adverse, and this alternative would be a substantial contributor to the cumulative impact.

ALTERNATIVE B: THE NPS PREFERRED ALTERNATIVE

Impact Analysis

Public health and safety on the Lees Ferry Road would be improved by actions that would include widening the radii of the curves, providing consistent lane widths, and rebuilding and repaving the road. Measures to reduce erosion along the Paria River banks would improve the stability of the Paria River Bridge. Drainage improvements would substantially reduce erosion and flows that currently inundate portions of the road or leave hazardous sediment deposits. As a result, alternative B would have long-term, minor to moderate, beneficial effects on public health and safety.

Cumulative Impacts

As described for alternative A, the other plans and projects that would occur in the Lees Ferry area would have long-term, beneficial impacts on public health and safety. These effects, in combination with the minor to moderate, beneficial effects of alternative B, would result in a moderate beneficial impact on public health and safety. Alternative B would make a substantial contribution to cumulative impacts.

Conclusions

Alternative B would result in long-term, minor to moderate, beneficial impacts on public health and safety because of improved road conditions and better protection of the Paria River Bridge. The cumulative impact would be moderate and beneficial, and this alternative would be a substantial contributor to the cumulative impact.

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Chapter 4: Consultation and Coordination

SCOPING AND AGENCY CONSULTATION

Scoping is an early and open process to determine the breadth of environmental issues and alternatives to be addressed in an environmental assessment. Glen Canyon National Recreation Area conducted internal scoping with NPS staff and external scoping with the public and interested and affected groups and agencies. Copies of the scoping notice, press release, and letters to agencies and tribes are included in appendix A.

INTERNAL SCOPING

An internal scoping meeting and a site visit were held in the park on July 11-14, 2011. A teleconference to continue internal scoping discussions was held July 26, 2011. Participants included the project interdisciplinary team and representatives from the NPS Denver Service Center and the consultant preparing the environmental assessment. Products included the clarification of the project scope and features, and information on site visit findings, scoping and consultation, definition of the action alternative, determination of the relevant impact topics, and identification of issues.

EXTERNAL SCOPING

The following actions were taken to inform the public about the intent to prepare a National Environmental Policy Act environmental assessment on this Lees Ferry Road rehabilitation and Paria River Bridge stabilization project. The scoping period was from August 26, 2011 through September 26, 2011.

- A public notice and press release were published on August 23, 2011.
- Scoping letters or notices were sent to approximately 360 people and organizations on the national recreation area's core mailing list. These included local, tribal, state, and federal agencies; organizations; and individuals.
- The scoping notice was made available electronically on the National Park Service Planning, Environment, and Public Comment website at http://parkplanning.nps.gov/GLCA.

Public scoping produced six responses, as follows.

- The Arizona Ecological Services Office of the U.S. Fish and Wildlife Service confirmed the special status species that would be evaluated in the environmental and biological assessments and recommended that the National Park Service also contact the Arizona Game and Fish Department and any affected tribes.
- The Arizona Game and Fish Department identified the special status species known to occur within a 3-mile radius of the project and indicated that it does not anticipate any significant adverse impacts to wildlife resources as a result of the project.
- The Church of Jesus Christ of Latter-day Saints responded with an email request to be included in the compliance process as a consulting party for the section 106 review of the project. The response also included a request for a copy of the cultural sites inventory report when it is completed.
- The Hopi Tribe responded with a request for a copy of the cultural sites inventory report when it is completed and to be consulted if any cultural resources are discovered or adversely affected by the project.

- The Navajo Nation concluded that there would likely not be any impacts to Navajo traditional cultural resources. If, however, habitation sites, plant gathering areas, human remains, or objects of cultural patrimony were discovered during the project, they requested to be notified and for actions to be taken, as appropriate, in accordance with the Native American Graves Protection and Repatriation Act.
- Two responses came from members of the public, including a Grand Canyon National Park employee and an unnamed, unaffiliated individual from Lubbock, Texas. One comment provided concern and recommendations for best management practices to control and minimize invasive species. The other comment questioned whether gabions would be the best way to stabilize the banks in regards of aquatic wildlife.

The agency response letters are provided in appendix A. The contents of the environmental assessment were reviewed to ensure that all of the concerns identified in public scoping were adequately addressed.

AGENCY CONSULTATION

The agencies, organizations, and experts who were consulted in the process of preparing this environmental assessment are listed below. Where specific information from one of these people was cited, complete source information was provided in the "Bibliography" section.

- U.S. Department of Transportation, Federal Highway Administration, Central Federal Lands Highway Division.
- Marjorie E. Blaine, U.S. Army Corps of Engineers, Arizona Branch, Regulatory Division.

The undertakings described in this document are subject to section 106 of the National Historic Preservation Act. Consultations with the Arizona State Historic Preservation Office have been ongoing since inception of the project. This environmental assessment will also be submitted to the Arizona State Historic Preservation Office for review and comment to fulfill NPS obligations in conformance with instructions on the use of the National Environmental Policy Act process for section 106 purposes that are included in 36 *Code of Federal Regulations*, section 800.8[c]).

NATIVE AMERICAN CONSULTATION

A number of tribes, traditionally and currently, value the Lees Ferry area for gathering, ceremonial, and other practices. Traditionally associated tribes include the:

- Hopi Tribe;
- Kaibab Paiute Tribe;
- Navajo Nation (including the following chapters: Coppermine; Gap/Bodaway; Inscription House; Kaibeto; LeChee; Navajo Mountain; and Shonto);
- Paiute Indian Tribe of Utah (Kanosh; Koosharem; and Shivwits);
- Pueblo of Zuni;
- San Juan Southern Paiute; and
- Ute Mountain Ute (including the White Mesa Ute Band).

The Hopi Tribe and Navajo Nation responded, as described above. When the environmental assessment is released to the public, the National Park Service will send letters to the tribes, formally asking for their input.

LIST OF PREPARERS

The people identified in table 12 were primarily responsible for preparing this environmental assessment. The table includes their expertise, experience, and roles in preparing this document.

Table 12: Preparers

National Park Service, Glen Canyon National Recreation Area	
Brian Carey	Assistant superintendent
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Parsons	
Don Kellett	Environmental scientist. B.S. in wildlife biology, 22 years of experience. Task manager.
Alexa Miles	Environmental scientist. B.A. in environmental studies, M.S. in landscape architecture, and 9 years of experience. Contributing author.
Aaron Sidder	Environmental scientist. B.S. in environmental science, 5 years of experience. Contributing author.
Bruce Snyder	Environmental scientist. B.S. in biology, M.S. in wildlife biology, and 35 years of experience. Project manager for Parsons, document preparation oversight.
Seth Wilcher	Cultural resources specialist. Masters in historic preservation, 8 years of experience. Contributing author.

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