



National Park Service
U. S. Department of the Interior
Glen Canyon National Recreation Area
Page, Arizona

Environmental Assessment for Hidden Slough Pilot Site

September 2008



Revegetation of the Hidden Slough Pilot Site

Environmental Assessment

Summary

The National Park Service is requesting public comments on an Environmental Assessment for the tamarisk removal and revegetation activities at the Hidden Slough pilot site on the Colorado River. The project site is located on the right bank, 6.5 miles upstream from Lees Ferry. In 2006, Glen Canyon National Recreation Area conducted public scoping for the initiated an environmental assessment (EA) for a 20 year master plan for tamarisk removal and native vegetation restoration of the Colorado River between Glen Canyon Dam and Lees Ferry: currently identified as the Colorado River Riparian Revegetation Plan (CRRRP). During the public scoping period, the park staff determined that there was insufficient data to conduct impact analysis for the entire project corridor; therefore the focus of the EA was narrowed to just the initial pilot site at Hidden Slough. Data, including information about vegetation success and bird diversity and density will be collected for the next three years. This data, along with lessons learned about conducting tamarisk removal and revegetation activities at a remote site along the river will help us identify impacts and plan for the remaining sites identified in the CRRRP. Appropriate NEPA documentation will be developed for the CRRRP before any further revegetation activities occur.

This environmental assessment evaluates two alternatives: a No- Action Alternative and a Proposed Action Alternative. The No- Action Alternative addresses current and future conditions at Hidden Slough project site. The Proposed Action Alternative addresses impacts from the removal of tamarisk and planting of native species.

Public Comment

This notice is an opportunity for the public to identify any issues or concerns they may have regarding this project.

If you wish to comment on this environmental assessment, you may post comments online at <http://parkplanning.nps.gov/> or mail comments to the name to the following address: Hidden Slough EA, Glen Canyon NRA, P.O. Box 1507, Page, AZ 86040 or fax to (928) 608- 6259.

This environmental assessment will be on public review for 30 days.

Please be aware that your entire comment, including your personal identifying information, such as address, phone number, etc., may be 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.

All comments must be received by October 4, 2008.

Sincerely,

Stan Austin
Superintendent

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Introduction

Encompassing over 1.2 million acres, Glen Canyon NRA stretches for over 185 miles from Lees Ferry in Arizona to the Orange Cliffs of southern Utah. Managed by the National Park Service, this NRA was established on October 27, 1972 “. . .to provide for public outdoor recreation use and enjoyment of Lake Powell and lands adjacent thereto. . . and to preserve scenic, scientific, and historic features contributing to public enjoyment of the area” (Public Law 92- 593, 92nd Congress, S. 27, October 27, 1972). Glen Canyon NRA recreational opportunities include river running, boating, sport fishing, backcountry hiking, and wildlife viewing. Its canyons provide habitat for more than 1300 species of plants, birds, fish, reptiles, and mammals.

Glen Canyon Dam, completed in 1963, inundated 186 miles of the Colorado River through Glen Canyon to form Lake Powell—the most widely known and visited feature in the recreation area. Within the 15.5 miles of canyon below the dam flows the only remaining stretch of river through Glen Canyon NRA, described by Major John Wesley Powell in 1869 as “. . .a curious ensemble of wonderful features; carved walls, royal arches, glens, alcoves, gulches, mounds and monuments (J.W. Powell, 1961).”

This canyon- bound section of river is inaccessible by road until it reaches a natural break in the landscape at Lees Ferry, Arizona. Glen Canyon Dam, operated by the Bureau of Reclamation, affects the volume, pattern, temperature, and sediment load of river flows through Glen Canyon NRA. Habitats include upland, riparian and wetland/marsh areas. The project area is located on the north bank of the Colorado River, about 6.5 miles upstream of Lees Ferry. The project site consists of eroded sandstone from the canyon wall overlain with river sediments that got trapped in the area after Glen Canyon Dam was constructed.

The purpose of this Environmental Assessment is to examine the environmental impacts associated with the design and implementation of revegetation activities at the Hidden Slough site, which is the pilot site for the Colorado River Riparian Revegetation Plan (CRRRP). This project is designed to provide park management with information needed to complete impact analysis on the remaining revegetation activities identified in the CRRRP. Revegetation of the Hidden Slough site would replace non- native species (primarily tamarisk) with native vegetation in order to rehabilitate and enhance the native biodiversity and ecological functionality associated with indigenous riparian and upland habitat. This EA has been prepared in accordance with the National Environmental Policy Act (NEPA) of 1969 (P.L. 91-190), regulations of the Council on Environmental Quality (CEQ) (40 CFR 1508.9), and the National Park Service Director’s Order (DO)- 12 (*Conservation Planning, Environmental Impact Analysis, and Decision- making*).

Background

Dynamic native riparian and wetland ecosystems are renowned for their high levels of biodiversity and productivity. The 15.5- mile reach of the Colorado River between Glen Canyon Dam and Lees Ferry is highly valued for its natural features and recreational opportunities. However, the ecological function of this system has been changed by invasion of tamarisk and the creation of Glen Canyon Dam.

Historically, large annual floods averaging about 90,000 cubic feet per second (cfs) scoured the Colorado River channel between Glen Canyon Dam and Lees Ferry, preventing establishment of woody lower riparian zone vegetation (Topping et al. 2003). These floods scoured and deposited sediments, flushed salts from the soils, and helped disperse the seeds of native riparian vegetation that were adapted to flooding. Middle riparian zone terraces, which were less intensively scoured by those floods, supported native Goodding's willow (*Salix gooddingii*), coyote willow (*Salix exigua*), arrowweed (*Pluchea sericea*), seepwillows (*Baccharis emoryi* and *B. salicifolia*), rare Fremont cottonwood (*Populus fremontii*), and common reed (*Phragmites australis*). Pre- dam upper riparian zone terraces, flooded on a decadal basis, supported native hackberry (*Celtis laevigata*), snowberry (*Symphoricarpos* sp.), scrub oak (*Quercus turbinella*), prince's plume (*Stanleya pinnata*), Apache plume (*Fallugia paradoxa*), inkweed (*Sarcobatus vermiculatus*), rabbitbrush (*Chrysothamnus nauseosus*), and saltbush (*Atriplex canescens* and other species) as well as non- native tamarisk (Carothers et al. 1979, Turner and Karpiscak 1980, Webb 1996). Tamarisk was first seen in the park at Lees Ferry in the 1920's and became widely established on upper riparian terraces between 1938 and 1963 (Clover and Jotter 1944, Turner and Karpiscak 1980, Johnson 1991).

Construction of Glen Canyon Dam in 1963 altered the river and riparian ecosystem (Turner and Karpiscak 1980, Stevens et al. 1995, Webb 1996). Although native lower riparian zone vegetation was historically sparse through the Glen Canyon corridor, present- day stabilized conditions created by the dam (Topping et al. 2003) support a profuse growth of riparian vegetation. This includes large new stands of non- native tamarisk. Tamarisk was able to colonize and dominate the riparian zone because of its prolific seed production through the growing season, rapid growth rate, and its tolerance of fire, salinity, and drought stresses (Neill 1985, Brotherson and Field 1987, Stevens 1989, Cleverly et al. 1997, Glenn et al. 1998). However, post dam floods have slowly removed fine sediments from the existing alluvial deposits thus gradually coarsening the soils supporting riparian vegetation. Although tamarisk provides habitat, shade and erosion control, because it has a dense canopy structure and relatively low stature, and it does not provide ideal conditions for species adapted to the native willow- cottonwood forests. Also, its growth in dense single species stands often precludes establishment of native riparian species. Therefore, although it provides habitat for some species of neotropical migrant birds the quality of that habitat is relatively low (Engel- Wilson and Ohmart 1978; Hunter et al. 1988; Ohmart et al. 1988; Zavaleta 2000).

Wetland and riparian habitats are rare throughout the middle and lower elevations of the arid Southwest, yet provide essential habitat for a large proportion of the region's wildlife, avian and invertebrate species. Less than 0.5% of the Glen Canyon region is occupied by riparian and wetland habitat, but that habitat supports more than one third of the region's floral and avifaunal diversity (Stevens and Ayers 2002).

Purpose and Need

The purpose of the proposal is to remove non- native, invasive tamarisk and revegetate with a variety of native species, which will enhance essential riparian habitat for avifauna and wildlife, provide a stock of native seed for down- stream dispersal, enhance recreational opportunities, as well as to refine understanding of methods, effectiveness, and costs associated with revegetation activities at a remote site. The goals and objectives of this project are to conduct a tamarisk removal and native

plant revegetation project at the Hidden Slough Site at mile - 6.5R (6.5 miles upstream from Lees Ferry, on the right side of the river looking downstream). Additionally, data gathered during revegetation and subsequent monitoring of this site would be used to narrow focus of activities as well as address possible impacts associated with completing an Environmental Assessment for the remaining sites identified in the Colorado River Riparian Revegetation Plan.

Relationship to Other Plans and Policies

This project is consistent with the 1979 Glen Canyon National Recreation Area General Management Plan (GMP) and 2006 *Management Policies*. The GMP identified zones that define how different sections of the recreation area will be managed to achieve desired resource conditions and meet the recreation area's goals and objectives. The recreation area is divided into four zones: Natural Zone, Recreation and Resource Utilization (RRU) Zone, Cultural Zone, and Development Zone. The project area (Fig. 1) falls within the Natural Zone. The entire Natural Zone within Glen Canyon NRA encompasses approximately 668,670 acres, and includes the recreation area's outstanding scenic resources—relatively undisturbed areas isolated and remote from the activities of man—or areas bordering on places with established land-use practices complementary to those of the Natural Zone. In this zone, management focuses on maintaining isolation and natural processes. The majority of the natural zone is also classified a potential wilderness, including a portion of the project area. NPS policy is to manage potential wilderness so as to not adversely affect the wilderness characteristics and values that make them eligible for consideration for inclusion in the National Wilderness Preservation System.

Appropriate Use

Sections 1.4 and 1.5 of the 2006 *Management Policies* requires the National Park Service to ensure that park uses that are allowed would not cause impairment of, or unacceptable impacts to, park resources and values. A new form of park use may be allowed within a park only after a determination has been made in the professional judgment of the park manager that it will not result in unacceptable impacts.

Section 8.1.2 Of the NPS 2006 *Management Policies*, Process for Determining Appropriate Uses, provides evaluation factors for determining appropriate uses. All proposals for park uses are evaluated for:

- consistency with applicable laws, executive orders, regulations, and policies;
- consistency with existing plans for public use and resource management;
- actual and potential effects on park resources and values;
- total costs to the service; and
- whether the public interest will be served.

Park managers must continually monitor all park uses to prevent unanticipated and unacceptable impacts. If unanticipated and unacceptable impacts emerge, the park manager must engage in a thoughtful, deliberate process to further manage or constrain the use, or discontinue it. More information on the definition of unacceptable impacts as cited in §1.4.7.1 of NPS 2006 *Management Policies* can be found in the Affected Environment and Environmental Consequences chapter.

Maintenance and revegetation of natural habitat is a vital part of resource management in most park units. The proposed removal of invasive tamarisk and revegetation of natural habitat is consistent with the park's general management plan and other related park plans. With this in mind, the NPS finds that the proposed revegetation project at the Hidden Slough site would be an acceptable use at Glen Canyon National Recreation Area.

Public Scoping

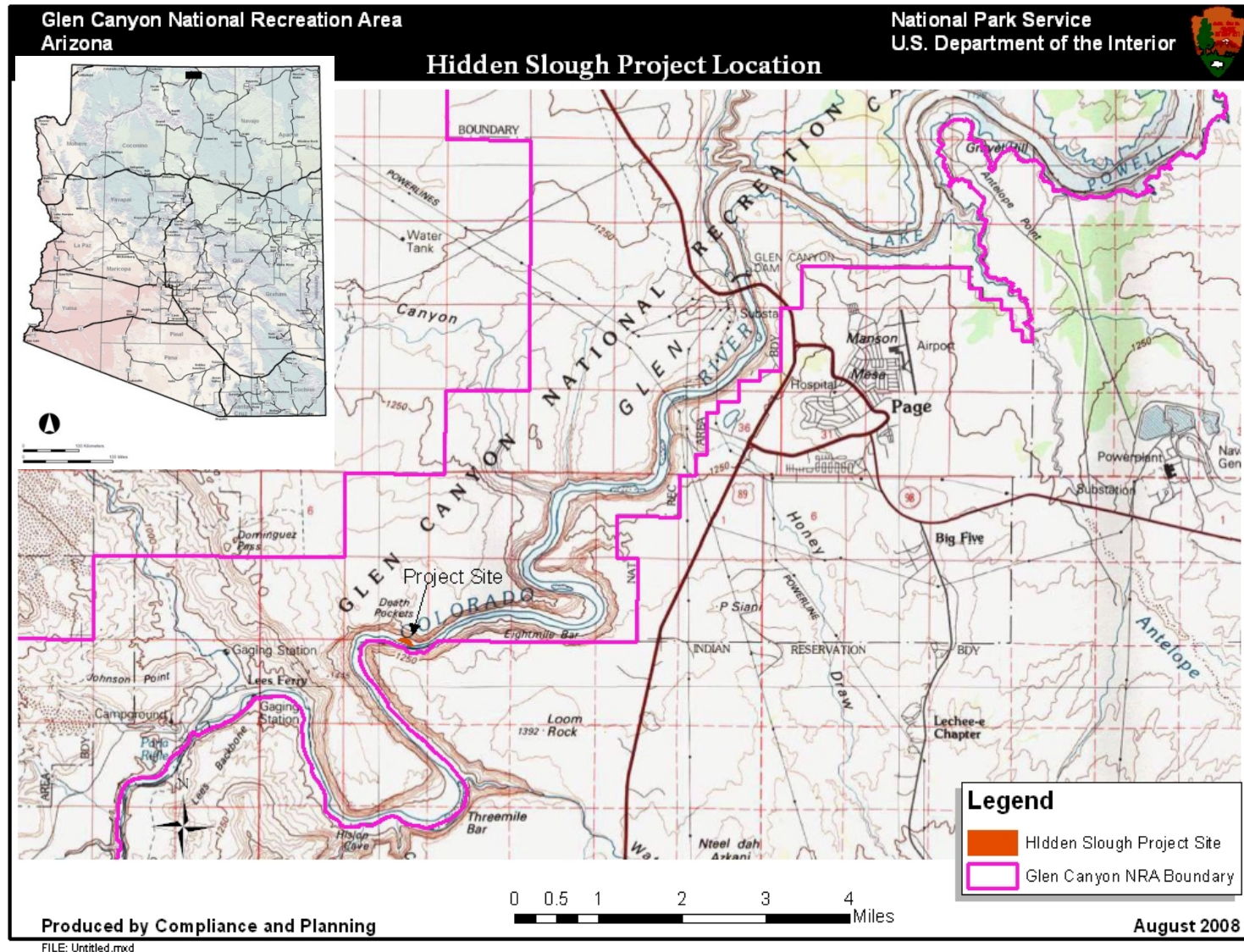
Scoping is a process to identify the resources that may be affected by a project proposal, and to explore possible alternative ways to achieve the goals and objectives of the proposal while minimizing adverse impacts. Glen Canyon NRA staff conducted both internal and external scoping with the public and interested and affected groups and agencies. The NPS identified members of an internal interdisciplinary team that met multiple times between 2005 and 2007 to discuss project objectives, issues, impact topics, possible alternatives, and the results of public scoping. The team consisted of park division managers from Glen Canyon NRA and specialists in cultural resources, natural resources, maintenance, visitor protection and Native American relations. Public Scoping notices were released to the public through letters, press releases and on the NPS Park Planning Website (<http://parkplanning.nps.gov/glca>). All comments received were considered during the development of the alternatives.

During the public scoping period, the park staff determined that there was insufficient data to conduct impact analysis for the entire project corridor; therefore the focus of the EA was narrowed to just the initial pilot site at Hidden Slough.

Concurrently, consultations with the U.S. Fish and Wildlife Service (USFWS), the Arizona State Historic Preservation Officer (SHPO), and Native American tribes were initiated. Based on the responses received and subsequent team communications, the impact topics and action alternatives were refined and finalized prior to analysis.

Additional details concerning public scoping and consultation documented for this project are provided in the *Consultation and Coordination* chapter of this EA and in Appendix A.

Figure 1 – Overview map of Colorado River in Glen Canyon NRA, with inset showing location of Hidden Slough Project Area.



Impact Topics Retained for Further Analysis

Impact topics for this project have been identified on the basis of federal laws, regulations and orders, National Park Service *2006 Management Policies*, and staff knowledge of park resources. Impact topics that are carried forward for further analysis in this EA are listed below along with the reasons why the topic is further analyzed. Further information concerning these topics is located in the *Affected Environment* and *Environmental Consequences* chapter, where the information is used to analyze impacts against the current conditions of the project area.

Vegetation

According to the NPS *2006 Management Policies*, the National Park Service strives to maintain all components and processes of naturally evolving park unit ecosystems, including the natural abundance, diversity, and ecological integrity of plants and animals (U.S. National Park Service 2006). As either alternative will affect the existing vegetation and may affect wildlife habitat quality, this topic has been carried forward for further analysis.

Threatened and Endangered Species and Species of Management Concern

The Endangered Species Act of 1973 (P.L. 93- 205, 87 Stat. 884, 16 U.S.C. 1531- 1544) requires examination of impacts on all federally- listed threatened, endangered, and candidate species. Section 7 of the Endangered Species Act requires all federal agencies to consult with the USFWS (or designated representative) to ensure that any action authorized, funded, or carried out by the agency does not jeopardize the continued existence of listed species or critical habitats. In addition, the 2006 Management Policies and DO- 77 Natural Resources Management Guidelines require the National Park Service to examine the impacts on federal candidate species, as well as state- listed threatened, endangered, candidate, rare, declining, and sensitive species (U.S. National Park Service 2006). As several special status species occur in the project area, this topic has been carried forward for further analysis.

Water Resources

Water resources in the general vicinity of the project site include the Colorado River, several intermittent washes and swales that contribute water from the cliff top, the plunge pool, runoff channels on the project site, and the slough, which is fed by groundwater as well as intermittently by the plunge pool. The flow of the Colorado River at Lees Ferry is controlled by the operation of Glen Canyon Dam. The temperature is relatively constant year- round, averaging 46°F (8°C). The sediment load for which the Colorado River was originally named now drops out of suspension in the upper reaches of Lake Powell; at Lees Ferry the river water is transparent and nutrient levels are low. The water levels, which varied greatly through the year before the dam was constructed, is now fairly constant with the greatest variation occurring seasonally and ranging from 5,000 cfs to about 25,000 cfs. Occasional controlled floods are conducted for natural resource related values. Details of the planned water releases are determined by the Secretary of the Interior through the Bureau of Reclamation based on recommendation of the Glen Canyon Dam Adaptive Management Program.

The project, which is located within the active flood plain of the Colorado River, may locally impact water quality (particularly in the slough area) due to accidental spills of herbicides, gasoline and

lubricants, soil erosion from the cleared area, change in water chemistry due to the ash contribution from burning dried vegetation removed during revegetation efforts, and recycling of water from the river, through the irrigation apparatus and then back into the river as run-off from the irrigation. Due to these possible impacts, this topic has been retained for further analysis.

Wilderness Resources

The Wilderness Act directs agencies responsible for managing wilderness to study wilderness resources and values. NPS *2006 Management Policies* states that “in evaluating environmental impacts, the National Park Service will take into account wilderness characteristics and values, including primeval character and influence of the wilderness; the preservation of natural conditions (including the lack of man-made noise); and assurances that there will be outstanding opportunities for solitude, that the public will be provided with a primitive and unconfined type of recreational experience, and that wilderness will be preserved and used in an unimpaired condition.” NPS policy further requires parks to “take no actions that could adversely affect the wilderness characteristics and values that make them eligible for consideration for inclusion in the National Wilderness Preservation System”.

In keeping with the Wilderness Act requirements, Glen Canyon NRA completed various wilderness studies and incorporated the recommendation into the 1979 Glen Canyon General Management Plan and EIS (U.S. National Park Service 1979). This resulted in Glen Canyon NRA identifying 588,855 acres of recommended wilderness and an additional 48,955 acres of potential wilderness for a total of 637,810 acres that meet the requirements of the Wilderness Act. The project area is located within the acreage identified as eligible for inclusion within this system and this acreage would be impacted by the proposed revegetation activities; therefore this topic has been retained for further analysis.

Wildlife

According to the NPS *2006 Management Policies*, the NPS strives to maintain all components and processes of naturally evolving park unit ecosystems, including the natural abundance, diversity, and ecological integrity of plants and animals. As either alternative could affect wildlife habitat quality, this topic has been carried forward for further analysis.

Impact Topics Dismissed from Further Analysis

Air Quality

The Clean Air Act of 1963 (42 U.S.C. 7401 *et seq.*) was established to promote the public health and welfare by protecting and enhancing the nation’s air quality. The act establishes specific programs that provide special protection for air resources and air quality related values associated with National Park Service units. Section 118 of the Clean Air Act requires a park unit to meet all federal, state, and local air pollution standards. Glen Canyon National Recreation Area is designated as a Class II air quality area under the Clean Air Act. A Class II designation indicates the maximum allowable increase in concentrations of pollutants over baseline concentrations of sulfur dioxide and particulate matter as specified in §163 of the Clean Air Act. Further, the Clean Air Act provides that the federal land manager has an affirmative responsibility to protect air quality related values

(including visibility, plants, animals, soils, water quality, cultural resources, and visitor health) from adverse pollution impacts.

The revegetation project will involve removal of tamarisk and other undesirable vegetation using gasoline- powered chainsaws that may produce small amounts of additional smoke and fumes. Personnel will move and drag cut tamarisk materials into piles, likely creating dusty conditions at the project site only. Dried tamarisk debris piles will be burned, creating brief durations of intense smoke. Planting sites will be bored with a gasoline- powered soil auger, and will create additional fumes. Of these activities, only the burning of tamarisk debris piles would briefly increase concentrations of air pollutants. Because the canyon environment of the project site can cause air stagnation, especially in the heat of the summer, dissipation of the smoke may take several hours. Burning of vegetation debris piles would be managed as prescribed in the Glen Canyon NRA Wildland Fire Management Plan (U.S. National Park Service 2004). Project managers would be required to coordinate with the park's chief ranger before attempting a debris burn and all burns would take place in winter when visitor use of the area is generally low.

Overall, the project could result in a short- term, negligible degradation of local air quality, and such effects would be temporary, lasting only as long as construction. The Class II air quality designation for Glen Canyon National Recreation Area would not be affected by the proposal. Further, because the Class II air quality would not be affected, there would be no unacceptable impacts; the proposed actions are consistent with §1.4.7.1 of NPS 2006 *Management Policies*. Because the proposed actions would not result in any unacceptable impacts, this topic is dismissed from further analysis in this document.

Cultural Resources

According to the National Park Service's DO- 28: *Cultural Resource Management Guideline*, a cultural landscape is a reflection of human adaptation and use of natural resources, and is often expressed in the way land is organized and divided, patterns of settlement, land use, systems of circulation, and the types of structures that are built. A cultural landscape inventory was conducted by the Bureau of Reclamation for a portion of the park occurring below Glen Canyon Dam. Two landscapes were originally identified; these were later merged into one landscape called Lees Ferry/Lonely Dell Ranch Historic District. This landscape is approximately 6.5 river miles west of the down stream end of the project area and would not be impacted by the proposed project. Additionally, the Bureau of Reclamation and the National Park Service conducted an extensive survey of the Colorado River riparian zone from Glen Canyon Dam to Lees Ferry (Balsom 1999). No archeological sites were identified from that research at the proposed re- vegetation site. Due to the possibility of inadvertent finds, an archeological monitor will be on site during re- vegetation activities. Should a new site be found, the archeological monitor will have the authority to stop re- vegetation activities in that location pending determination of eligibility for listing on the National Register of Historic Places by park archeologists. The park archeologist would also be responsible for notifying associated tribes.

The proposed action is consistent with §1.4.7.1 of NPS 2006 *Management Policies*. Because no contributing structures are likely present within the project area and there are no known

archeological sites, there would be no unacceptable impacts to cultural landscapes or individual archeological sites; therefore this topic has been dismissed from further analysis in this document.

Ecologically Critical Areas or Other Unique Natural Resources

Ecologically critical areas are sites with unique combinations of rare species or breeding and maturation habitats for sensitive species. As there are no ecologically critical areas or sites with unique natural resources other than those that have been described under the sensitive species and other habitat issues, this topic is not being carried forward for further analysis.

Environmental Justice

Executive Order 12898, “*General Actions to Address Environmental Justice in Minority Populations and Low Income Populations*,” requires that all federal agencies address the effects of policies on minorities and low-income populations and communities. As there are no inhabitants in this portion of the recreation area, and the proposed project would have no impacts outside the park boundaries, none of the alternatives would have disproportional health or environmental effects on minorities or low-income populations as defined in U.S. Council on Environmental Quality (2007).

Ethnographic Resources

National Park Service’s DO-28 *Cultural Resource Management* defines ethnographic resources as any site, structure, object, landscape, or natural resource feature assigned traditional legendary, religious, subsistence, or other significance in the cultural system of a group traditionally associated with it. According to DO-28 and Executive Order 13007 on sacred sites, the National Park Service shall preserve and protect ethnographic resources.

Ethnographic resources are not known to exist in the proposed project area based on consultation with Native American tribes professing interest in the project area. Native American tribes traditionally associated with the park were apprised of the proposed project in a letter dated December 21, 2007, and one response was received from these tribes. This response confirmed their cultural affiliations with the area, but indicated that no impacts to significant ethnographic resources are expected. As impacts to ethnographic resources is not expected, the proposed action is consistent with §1.4.7.1 of NPS 2006 *Management Policies*. Because the project would not result in any unacceptable impacts, this topic is dismissed from further analysis in this document.

Floodplains

High cliffs of native sandstone dominate the sections of the river where the revegetation project is proposed. Those sections of the river that are not dominated by cliffs often contain terraces of fine alluvial sediments deposited during floods over the recent geologic past. Generally, the higher terraces are older. The lower terraces are often densely vegetated, and many are heavily infested with non-native tamarisk. The Federal Emergency Management Agency has identified the elevation of the 100-year floodplain from Glen Canyon Dam to Lees Ferry at approximately 200,000 cfs, therefore a 100-year flood event would completely inundate the proposed project site. One hundred year events are extremely unlikely as it would require the volume of water of Lake Powell to top the dam. Due to long term drought, water releases from the dam in amounts above 45,000 cfs are very unlikely. In 2007 the Bureau of Reclamation developed management criteria for dam releases that

would likely not exceed flows larger than their planned 45,000 cfs flows during the next decade. This would allow sufficient time for the revegetated area to become well established and therefore provide extra protection for the floodplain. The project would result in short- term negligible adverse impacts due to disruption of floodplain configuration during site preparation, planting, and project maintenance. However, after the first two years, floodplain processes should recover to a near original configuration.

Executive Order 11988 *Floodplain Management* requires all federal agencies to avoid construction within the 100- year floodplain unless no other practicable alternative exists. The National Park Service under 2006 *Management Policies* and DO 77- 2 *Floodplain Management* will strive to preserve floodplain values and minimize hazardous floodplain conditions. According to Director's Order 77- 2 *Floodplain Management*, certain construction within a 100- year floodplain requires preparation of a statement of findings for floodplains. While the revegetation sites are all located within the 100- year floodplain, revegetation projects do not require the preparation of a statement of findings as there would not be a permanent disruption of the floodplain (this assumes no loss of sediments from the project site). Further, there would be no unacceptable impacts to floodplains; the proposed actions are consistent with §1.4.7.1 of NPS 2006 *Management Policies*. Because the project would only result in short- term minor adverse effects to the floodplain, there would be no unacceptable impacts and this topic has been dismissed from further analysis in this document.

Health and Safety

The health and safety of recreation area visitors and staff is of the utmost importance to the NPS. The NPS is always striving to upgrade resources and facilities to ensure they are as safe as possible for visitors and staff alike. The NPS currently provides for recreational visitation along the river upstream from Lees Ferry. Special attention is given to ramps, access trails and the loading dock to ensure that they are in good physical condition without defects that could cause slip and trip injuries to guests and staff alike. These activities would continue to occur regardless of the proposed action. Revegetation activities would include the use of a variety of tools, including chainsaws, as well as the removal of vegetative shade for visitors. Development of construction plans for the proposed project would include the development of health and safety plans for project employees. The health and safety plan would include requirements for management of equipment fuel, and herbicides to be used as part of the project, including special handling requirements. Special attention would be given to make sure that soils and water are not contaminated during the projects.

Given that health and safety plans for employees would be developed before landscaping activities commence, and appropriate public notice warning of site closure would be provided, the proposed actions would result in negligible short- term adverse effects to health and safety. Further, such negligible impacts would not result in any unacceptable impacts; therefore, the proposed actions are consistent with §1.4.7.1 of NPS 2006 *Management Policies*. Because these effects are minor or less in degree and would not result in any unacceptable impacts, this topic is dismissed from further analysis in this document.

Indian Trust Resources

Indian trust assets are owned by Native Americans but held in trust by the United States. Requirements are included in the Secretary of the Interior's Secretarial Order No. 3206, "American Indian Tribal Rites, Federal- Tribal Trust Responsibilities, and the Endangered Species Act," and Secretarial Order No. 3175, "Departmental Responsibilities for Indian Trust Resources." The Bureau of Indian Affairs (BIA) and the National Park Service have formed a joint agency, the National Interagency Fire center (website <http://www.nifc.gov>) to handle wildfire management on Indian trust lands based on fire management plans approved by the Indian landowner. Indian trust assets do not occur within Glen Canyon NRA therefore Indian Trust Resources was dismissed as an impact topic.

Lightscape Management

In accordance with the NPS 2006 *Management Policies*, the National Park Service strives to preserve natural ambient lightscapes, which are natural resources and values that exist in the absence of human caused light. Glen Canyon National Recreation Area strives to limit the use of artificial outdoor lighting to that which is necessary for basic safety requirements. The park also strives to ensure that all outdoor lighting is shielded to the maximum extent possible, to keep light on the intended subject and out of the night sky. Campfires, lanterns and flashlights are the primary sources of light in the project area. The proposed project would only take place during daylight hours and artificial light sources would not be used; therefore the proposed actions are consistent with §1.4.7.1 of NPS 2006 *Management Policies*. Because there are no effects to lightscape management, this topic is dismissed from further analysis in this document.

Museum Collections

According to Director's Order – 24 Museum Collections, the National Park Service requires the consideration of impacts on museum collections (historic artifacts, natural specimens and archival and manuscript materials), and provide further guidance, standards, and requirements for preserving, protection, documenting, and providing access to, and use of, National Park Service museum collections. Because this project would have no impacts on the park's museum collection, which are housed at the park headquarters building (approximately 7 miles northeast of the upstream end of the project area), the proposed action is consistent with Section 1.4.7.1 of NPS 2006 *Management Policies* of and would not result in any unacceptable impacts, this topic is dismissed from further analysis in this document.

Paleontological Resources

According to NPS 2006 *Management Policies*, paleontological resources (fossils), including both organic and mineralized remains in body or trace form, will be protected, preserved, and managed for public education, interpretation, and scientific research. There is no known potential for paleontological resources within the analysis area; therefore, the impact topic of paleontological resources was dismissed.

Prime and unique agricultural lands

The Farmland Protection Policy Act of 1981, as amended, requires federal agencies to consider adverse effects to prime and unique farmlands that would result in the conversion of these lands to non- agricultural uses. Prime or unique farmland is classified by the U.S. Department of Agriculture's

Natural Resources Conservation Service (NRCS), and is defined as soil that particularly produces general crops such as common foods, forage, fiber, and oil seed; unique farmland produces specialty crops such as fruits, vegetables, and nuts. According to the NRCS, none of the land within Glen Canyon NRA meets these requirements; therefore, the topic of prime and unique agricultural lands was dismissed.

Socioeconomics

The proposed action and alternatives take place within a remote area of Glen Canyon NRA and does not have the potential to affect the economic condition of Coconino County, AZ, or any of the communities surrounding this area of the park; therefore, socioeconomics was dismissed as an impact topic.

Soils

According to the NPS *2006 Management Policies*, the National Park Service will preserve and protect geologic resources and features from adverse effects of human activity, while allowing natural processes to continue. These policies also state that the National Park Service will strive to understand and preserve the soil resources of park units and to prevent, to the extent possible, the unnatural erosion, physical removal, or contamination of the soil, or its contamination of other resources. This project would cause a short-term minor adverse disruption of soils during site preparation and planting. In the area where the tamarisk is being cleared, the root systems will be left in place to help hold down the soil while the new plants take root. Further, as there would be no unacceptable impacts to soils; the proposed actions are consistent with §1.4.7.1 of NPS *2006 Management Policies*. Because the project would only result in short-term minor adverse effects to soils and there would be no unacceptable impacts and this topic has been dismissed from further analysis in this document.

Soundscape Management

In accordance with the NPS *2006 Management Policies* and Director's Order- 47 *Sound Preservation and Noise Management*, an important component of the National Park Service's mission is the preservation of natural soundscape associated with national park units (U.S. National Park Service 2006). Natural soundscape exists in the absence of human-caused sound. The natural ambient soundscape is the aggregate of all the natural sounds that occur in park units, together with the physical capacity for transmitting natural sounds. Natural sounds occur within and beyond the range of sounds that humans can perceive and can be transmitted through air, water, or solid materials. The frequencies, magnitudes, and durations of human-caused sound considered acceptable varies among National Park Service units as well as potentially throughout each park unit, being generally greater in developed areas and less in undeveloped areas.

The proposed revegetation activities would occur in what has been identified in the 1979 Glen Canyon National Recreation General Management Plan as part of the natural zone of Glen Canyon National Recreation Area. Noise levels in the project area are periodically dominated by motorized watercraft, the congregation of large tour groups on motorized rafts, and occasional aircraft, which generate noise that is at high level of intensity for short-duration.

The project area already contains man-made noises and the proposed project is not expected to appreciably increase the noise levels above background levels. During construction, human-caused sounds would likely increase for short-durations due to construction activities, equipment, watercraft traffic, and construction crews. Mechanical equipment being used at the site includes chain saws, which produce noise in the range of 110 dBA (decibel adjusted), and motorized augers, which produce noise in the range of 70 – 80 dBA. Normal human conversation in an outdoor setting produces noise in the range of 65- 70 dBA (noise statistics were obtained from the National Institute for Occupational Safety and Health at <http://www.cdc.gov/niosh>). Any sounds generated from construction would be temporary, lasting only as long as the construction activity is generating the sounds, and would have a negligible to minor adverse impact on wildlife, visitors and employees. Further, such negligible to minor impacts would not result in any unacceptable impacts; the proposed actions are consistent with §1.4.7.1 of NPS 2006 *Management Policies*. Because these effects are minor or less in degree and would not result in any unacceptable impacts, this topic is dismissed from further analysis in this document.

Visitor Use and Experience

According to 2006 NPS *Management Policies*, the enjoyment of park resources and values by people is part of the fundamental purpose of all park units. The National Park Service is committed to providing appropriate, high quality opportunities for visitors to enjoy the parks, and will maintain within the parks an atmosphere that is open, inviting, and accessible to every segment of society. Further, the National Park Service will provide opportunities for forms of enjoyment that are uniquely suited and appropriate to the superlative natural and cultural resources found in the parks. The National Park Service 2006 *Management Policies* also state that scenic views and visual resources are considered highly valued associated characteristics that the National Park Service should strive to protect.

While the Colorado River, between Lees Ferry and the Dam is a prized destination of over 50,000 people a year, the proposed project site is only rarely visited by individual recreationist and use is confined to daylight hours. The largest groups of visitors that use the river near the project site are those enjoying a commercial raft tours or contacting with one of the NPS approved fishing guides. There is no camping or restroom facilities at this location and most of these visitor groups do not make use of the project area, itself, but rather enjoy it within the context of the natural surroundings. The project would have both a short-term and long-term minor adverse impact on visitor use and experiences. Removal of the tamarisk and planting of native vegetation would be noticeable to all groups using the river. Additionally, the revegetation site would be visible for several years until the new vegetation becomes mature. Interpretive materials would be made available to all river guides and visitors to help explain the purpose of the revegetation project. Additionally, signs would be placed on the shore of the project area, explaining the purpose of the project as well as a request to stay out of the revegetation zone. As the proposed revegetation project would have no more than an adverse, minor impact to visitors using the area, the proposed action is consistent with §1.4.7.1 of NPS 2006 *Management Policies* and this topic has been dismissed from further analysis in this document.

Wetlands

For regulatory purposes under the Clean Water Act, the term wetlands means "those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs and similar areas."

Executive Order 11990 *Protection of Wetlands* requires federal agencies to avoid, where possible, adversely impacting wetlands. Further, §404 of the Clean Water Act authorizes the U.S. Army Corps of Engineers to prohibit or regulate, through a permitting process, discharge or dredged or fill material or excavation within waters of the United States.

National Park Service defines wetlands as lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water. For purposes of classification, wetlands must have one or more of the following three attributes: (1) at least periodically, the land supports predominantly hydrophytes; (2) the substrate is predominantly undrained hydric soil; or (3) the substrate is non-soil and is saturated with water or covered by shallow water at some time during the growing season of each year (Cowardin et al. 1979). National Park Service policies for wetlands as stated in 2006 *Management Policies* and Procedural Manual #77-1: *Wetland Protection*, strive to prevent the loss or degradation of wetlands and to preserve and enhance the natural and beneficial values of wetlands. In accordance with DO 77-1 *Wetlands Protection*, proposed actions that have the potential to adversely impact wetlands must be addressed in a statement of findings for wetlands.

At the Hidden Slough site (- 6.5 mile), wetlands do occur along the slough and portions of the shoreline. The majority of impacts from the project would be confined to the stand of mature tamarisk, which is located outside the wetland zone. The project does include cutting and treatment with Garlon (an NPS approved herbicide) of scattered tamarisk whips within the wetland zone. Negligible short-term adverse impacts may occur to a very small portion of these wetlands due to inadvertent trampling as personnel and equipment are moved from barge to the revegetation area and as tamarisk whips are removed from the wetland area. A small footbridge would be used as needed to lessen any trampling impacts. As there would be no unacceptable impacts to wetlands; the proposed actions are consistent with §1.4.7.1 of NPS 2006 *Management Policies*. Because there would be no unacceptable impacts, this topic is dismissed from further analysis in this document.

ALTERNATIVES CONSIDERED

Alternatives considered for analysis must be consistent with Glen Canyon NRA enabling legislation as well as the existing GMP and must meet the purpose and need for action as defined in this EA. These considerations, as well as input from interdisciplinary team members and members of the public, formed the basis of the two alternatives that were developed: Alternative A, the No Action Alternative, and Alternative B, the Management Action Alternative. Both alternatives are carried forward for further evaluation in this EA. Table 1 presents alternative components at the end of this section.

Alternative A- No Action

Under this alternative, no removal or replacement of vegetation would occur. The project site would remain dominated by non- native vegetation, including tamarisk.

Alternative B – Revegetation of Hidden Slough

This alternative would implement the design plans for replacement of tamarisk with native vegetation at the Hidden Slough site (mile –6.5R). Tree and shrub willows and Fremont cottonwood will be the focus of revegetation planting at this site. These species are known for their ability to support high biodiversity, including residential and migratory birds, and terrestrial animals.

Figure 2. Hidden Slough Site



The steps as outlined below will be conducted for the Hidden Slough Site as follows:

1. **Conducting a preliminary analysis to assess soil and water conditions** — Soil samples will be collected at 10 paired sample points in order to determine the depth of the water table. At each point a sample will be taken near the soil surface. A second sample will be collected at the top of the water table. For each sample, the soil type, electrical conductivity (salinity), and surface- to- water- table depth will be determined.
2. **Preparing a detailed site plan** — A detailed work plan will be developed for the site. The NPS will approve the plan prior to initiation of work at the site.
3. **Preparing propagules for planting** — approximately 1200 poles, plugs, or rooted cuttings of native plants will be prepared for the Hidden Slough revegetation site. If possible, planting stocks will be collected from the actual Hidden Slough revegetation site, the Lees Ferry area, or the river corridor within Glen Canyon NRA. This will ensure genetic similarity of the plantings with that already established in and around the site. The Glen Canyon reach and Lees Ferry area will provide sufficient stock of plugs or poles of riparian species including Goodding's and coyote willow, Fremont cottonwood, and seepwillow and four- wing saltbrush. If sufficient plant material cannot be collected from these locations, alternative collection sites have been identified as follows (in priority order): 1) Clay Hills Crossing, Glen Canyon NRA; and 2) the Paria River corridor within Glen Canyon NRA. For those species for which rooted cuttings are required, cuttings will be planted in one- gallon pots at an irrigated, upland site at Lees Ferry. Potting material will consist of sandy soil with pre-planting and monthly additions of fertilizer.
4. **Site Clearing** — tamarisk plants will be flush cut at the soil line. Roots will be left in place to provide soil stability. Cut portions of tamarisk will be dismembered using chain saw and hand axes. Small sections will be raked into debris piles, allowed to dry and then subsequently burned. Large pieces would be transported to the opposite cliff facing the project site and sunk. These logs are expected to stay where they are put, as water flows being released from the dam are not strong enough to move them any distance.
5. **Tillage** — riparian soils often require tillage (breaking up, as in plowing) to permit water movement and promote plant growth. Holes will be bored into the soil using a gasoline powered hand auger. The holes will be at least 8 inches in diameter and up to 6 feet deep, to the water table. The boring will till the soil and break up any subsurface barriers to moisture movement in the soil profile. Drip irrigation lines will be established on upper terraces, as needed, to enhance root penetration to the water table. Soil will be bored in the upper terraces where each pole or rooted cutting is to be planted. The existing soil that is tilled will serve as the backfill for the augured holes. The end result will be a planting hole with a tilled path to the water table to assist in root penetration to the water table.
6. **Installing an appropriate irrigation system** — for upland areas, where use of the water table is impractical a gasoline powered generator will be used to pump water to a holding tank. A battery- powered system with automatic timing will be installed to release water from the tank to the irrigation system. This system will feature a ground- level polyethylene main line with polyethylene laterals, fed by two pairs of 2000 gallon storage tanks. Where needed,

planting holes will be serviced by an up to 4 gallons per hour (gph) drip emitter (the exact rate will depend on individual plant needs). Once the native plantings have rooted into the water table (1- 3 years), the irrigation system will be removed. The two gasoline- powered pumps will be used to fill the tanks by drawing water from the Colorado River adjacent the site.

7. **Planting native species** — native plants will be planted according to the site planting design. Species to be used at this site are likely to include Goodding’s willow, sandbar willow, four- wing saltbush, arrowweed, net- leaf hackberry, and other species. Limited amounts of Fremont cottonwood will also be planted at this site.

Goodding’s willow, hackberry, and other large species will be planted about 15 to 20 feet apart. Smaller trees, such as sandbar willows, will be planted about 5 to 10 feet apart, along with patches of shrubs such as four- winged saltbush. The propagules will be about 16 to 24 inches tall when planted; they will be planted at the rate of about 100 per day. A 3- foot- high, 12- gauge, protective hog wire fence will be installed where needed to control browsing by beaver and jackrabbits, and to prevent damage to the young trees.

8. **Irrigating and weeding to maintain the site** — during the first two growing seasons and where appropriate, plantings on the upper terraces will receive up to 4 gallons of water per day for 4 days a week over a period of 28 weeks. This irrigation will continue into the second growing season until plantings are rooted into the water table, a condition that will be assessed on site by the consulting biologists and the Glen Canyon NRA staff. Willow, seepwillow, and cottonwood will not be planted in areas where depth to a permanent water source exceeds 6 feet. The area will be weeded to remove new non- native plants. Any native trees that die during the irrigation period will be replanted once. Weed control will continue into the third growing season, if necessary for successful plant establishment.

9. **Monitoring** — The following variables will be monitored at this site:
 - Plant growth will be monitored at the beginning and end of the growing season on a statistically robust (usually 30), randomly selected individuals of each species, where possible;
 - Plant survival will be monitored for all trees and up to 100 individuals of smaller plants on an annual basis;
 - Overall vegetation cover will be visually estimated on each terrace in four strata: ground cover, shrub cover, mid- canopy cover, and tall canopy cover;

In upland areas, revegetation methods may include broadcasting native seeds (such as four- wing saltbush) on wet soils or planting drought- tolerant species. A native seed mix would be developed for this purpose by the contractor. As native plants grow and regenerate the threat of non- native invasive species will likely decrease. Non- native tamarisk recruitment on upper terraces is unlikely as the lack of availability of water and the non- irrigated soils on the upper terraces are too dry to permit tamarisk recruitment. As native vegetation matures, it provides habitat and structural diversity; as a result, insect, avian, and other wildlife populations are likely to increase in diversity and number.

Mitigation Measures

The following mitigation measures have been developed to minimize the degree and/or severity of all adverse effects, and would be implemented during construction of the action alternative, as needed.

- Revegetation activities will be conducted by the NPS partner for this project, Grand Canyon Wildlands Council. As required by Section 402 of the Clean Water Act, they or their landscaping contractor will be responsible for obtaining an Arizona Pollutant Discharge Elimination System permit from the Arizona Department of Environmental Quality before the start of construction. As part of obtaining this permit, they will have to develop and receive approval from the NPS for a Stormwater Pollution Prevention Plan (SWPPP) that includes erosion control measures. This plan will help ensure that any run-off from the exposed soils of the project area will not reach the slough or the river. It also requires a management plan to insure that all possible water pollutants, including gasoline, pesticides and lubricants do not pollute the project site or adjacent water bodies.
- In cooperation with the Arizona Game and Fish Department, the USFWS has worked with the NPS to establish a set of conservation measures to protect the **California condor** from possible project impacts. These conservation measures would be incorporated into all project documents:
 - If a condor is spotted directly on or over the revegetation site, activities will cease until the bird leaves or is driven off by an USFWS approved biologist.
 - Project workers and supervisors are instructed to avoid interaction with condors and to immediately contact the park Resources Division personnel if and when the condor(s) settle at the site.
 - The revegetation site will be cleaned up at the end of each day (e.g., trash removed, scrap materials picked up) to minimize the likelihood of condors visiting the site.
 - All dead animals found within 500 feet of the revegetation site will be immediately disposed in appropriate containment and removed from the site at the end of each working day.
 - To prevent water contamination and potential poisoning of condors, a Spill Prevention and Cleanup Plan (SPCP) will be developed and implemented for this project. It will include provisions for immediate clean-up of any hazardous substance, and will define how each hazardous substance will be treated in case of leakage or spill.
 - All project personnel will be given a copy of literature regarding condor concerns.
 - Project personnel are strictly prohibited from hazing condors.
- An archeologist that meets all the standards of the Department of the Interior will monitor the project site during tamarisk removal and planting activities. If an archeological site is inadvertently discovered, this archeologist will have the authority to stop project activities pending appropriate notification (including the Navajo Nation) and assessment of eligibility for inclusion on the National Register of Historic Places.
- Wetlands will be protected by the use of several small foot bridges, which will be used to move people and equipment from the shore to the revegetation area. Additionally all crews

will be directed to stay out of the slough area. The silt fencing used to protect the wetlands from run-off will also act as a barrier to this area.

Alternative Summaries

Table 2 summarizes the major components of Alternatives A and B, and compares the ability of these alternatives to meet the project objectives as identified in the Purpose and Need chapter. As shown in the following table, Alternative B meets each of the objectives identified for this project, while the No Action Alternative does not address all of the objectives.

Table 1 – Alternatives Summary and Extent to Which Each Alternative Meets Project Objectives

Alternative A – No Action	Alternative B
Removal of non- native vegetation and replacement with native vegetation would not occur. The riparian zone between Glen Canyon Dam and Lees Ferry would remain dominated by non- native vegetation (primarily tamarisk).	Non- native vegetation would be removed and replaced with native vegetation at the Hidden Slough (mile –6.5R) project site. Successful revegetation with native species would enhance the native biodiversity, ecological functionality and indigenous riparian habitat.
Meets Project Objectives?	Meets Project Objectives?
No. Maintaining existing conditions would result in continued limitation of wildlife habitat quality resulting from the invasion and dominance of the site by non- native tamarisk.	Yes. The Hidden Slough revegetation project will provide data on possible impacts related to the removal of non- native vegetation and re- planting of native vegetation. Implementation of Alternative B would also enhance wildlife habitat and vegetation, enhance the distribution of native species, and provide vegetative cover to protect eroding cut banks that may contain culturally significant materials, improve visitor use satisfaction by enhancing native shoreline habitats, and improve soil conditions.

Identification of the Environmentally Preferred Alternative

The environmentally preferred alternative is the alternative that will promote the policies expressed by the National Environmental Policy Act (NEPA). This includes alternatives that meet the following criteria to the greatest extent possible:

- Fulfill the responsibilities of each generation as trustee of the environment for succeeding generations.
- Ensure for all Americans safe, healthful, productive, and esthetically and culturally pleasing surroundings.

- Attain the widest range of beneficial uses of the environment without degradation, risk of health or safety, or other undesirable and unintended consequences.
- Preserve important historic, cultural, and natural aspects of our national heritage and maintain, wherever possible, an environment that supports diversity and variety of individual choice.
- Achieve a balance between population and resource use that will permit high standards of living and a wide sharing of life's amenities.
- Enhance the quality of renewable resources and approach the maximum attainable recycling of resources that can be depleted.

Environmentally preferable is defined as “the alternative that will promote the national environmental policy as expressed in NEPA §101. Ordinarily, this means the alternative that causes the least damage to the biological and physical environment; it also means the alternative which best protects, preserves, and enhances historic, cultural, and natural resources” (CEQ 1978).

In the NPS, the No Action Alternative must also be considered in identifying the Environmentally Preferred Alternative. Alternative A, the No Action Alternative, represents the current management practices for Glen Canyon NRA. This alternative does not meet the above evaluation factors as it would leave the non- native, invasive tamarisk in place, which would continue to curtail the development of native vegetation at the Hidden Slough Site. The anticipated environmental impacts associated with these two alternatives are summarized in Table 2, and are described in greater detail in the *Affected Environment and Environmental Consequences* chapter.

The environmentally preferable alternative is Alternative B, as it will strive to achieve a future condition in which characteristic native vegetation species dominate the riparian zone of the Hidden Slough Site and by collection data during revegetation activities, provide information for decision making and impact analysis for future revegetation activities. This alternative will enhance native wildlife and vegetation, improve the visitor experience, protect cultural resources and potentially benefit threatened and endangered species. For the remainder of this document, Alternative B will be referred to as the Preferred Alternative.

Table 2 summarizes the anticipated environmental impacts of Alternatives A and B. Only those impact topics that have been carried forward for further analysis are included in this table. The *Affected Environment and Environmental Consequences* chapter provides a more detailed explanation of these impacts.

Table 2 – Environmental Impact Summary by Alternative

Impact Topic	Alternative A – No Action	Alternative B
Vegetation	Continued limitation of wildlife habitat quality resulting from invasion and dominance by non-native tamarisk.	There would be short- term minor, adverse, impacts to vegetation during the removal of the tamarisk. There would also be long- term beneficial impacts to vegetation, by removing the invasive, aggressive tamarisk, which would allow for normal distribution and abundance of native vegetation. Revegetation with native vegetation species would, in time, benefit all native wildlife species.
Threatened and Endangered Species	Continued limitation of threatened and endangered species due to low quality of habitat dominated by non- native vegetation.	The proposed projects would have no adverse impacts to most of the threatened or endangered species or their habitats that known to occur near the project area. There would be negligible impacts to the California condor. Conservation measures approved by the USFWS would mitigate any possible impacts to this species.
Water Resources	The “no action” alternative would not have any impacts on water resources.	The proposed project would have minor short- term impacts to surface water quality due to ash contribution from burning tamarisk debris piles as well as soil erosion and stormwater runoff. Use of a Stormwater Pollution Prevention Plan, with erosion control would help reduce any run- off related impacts.
Wilderness Character	There are no impacts from alternative A to wilderness character or experience.	The project would have a long- term moderate impact due to the very visible removal of tamarisk and the replanting of native vegetation. The project would also have a The project would also have long- term beneficial impacts due to the replacement of non- native tamarisk with a healthy native ecosystem.
Wildlife	The “no action” alternative	The proposed project would have a minor,

Impact Topic	Alternative A – No Action	Alternative B
	would not replace the invasive tamarisk with native habitat for wildlife species.	adverse, short- term impact to wildlife species using the project area. It would have an adverse, minor, long- term impact to species that reuse the same site year after year. The project would have a long- term beneficial impact by providing native habitat to a wide array of wildlife species.

Environmental Consequences

Overview

This chapter analyzes the potential environmental consequences or impacts that would occur as a result of implementing the proposed project. Topics analyzed in this chapter include public health and safety, water resources including wetlands and waters of the US, wildlife and vegetation, special status species, cultural resources, visitor use and experience, soils, floodplains, noise pollution, air quality, and Park operations. Direct, indirect and cumulative effects, as well as impairment are analyzed for each resource topic. Potential impacts are described in terms of type, context, duration and intensity. General definitions are defined as follows, while more specific impact thresholds are given for each resource at the beginning of each resource section.

Type describes the classification of the impact as beneficial or adverse, direct or indirect:

- 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.
- Direct: An effect that is caused by an action and occurs in the same time and place.
- Indirect: An effect that is caused by an action but is later in time or farther removed in distance, but is still reasonably foreseeable.

Context describes the area or location in which the impact will occur. Context addresses the effects that site- specific, local, regional, or those that are more wide ranging?

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 pre- construction conditions for a longer period of time following construction.

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 document.

Impairment Analysis

National Park Service's Management Policies, 2006 require analysis of potential effects to determine whether or not actions would impair park resources (U.S. NATIONAL PARK SERVICE 2006 2006b). The fundamental purpose of the national park system, established by the Organic Act and reaffirmed by the General Authorities Act, as amended, begins with a mandate to conserve park resources and values. National Park Service managers must always seek ways to avoid, or to minimize to the greatest degree practicable, adversely impacting park resources and values. However, the laws do give the National Park Service the management discretion to allow impacts to park resources and values when necessary and appropriate to fulfill the purposes of a park, as long as the impact does not constitute impairment of the affected resources and values.

Although Congress has given the National Park Service the management discretion to allow certain impacts within parks, that discretion is limited by the statutory requirement that the National Park Service must leave park resources and values unimpaired, unless a particular law directly and specifically provides otherwise. The prohibited impairment is an impact that, in the professional judgment of the responsible National Park Service manager, would harm the integrity of park resources or values. An impact to any park resource or value may constitute an impairment, but an impact would be more likely to constitute an impairment to the extent that it has a major or severe adverse effect upon a resource or value whose conservation is:

- necessary to fulfill specific purposes identified in the establishing legislation or proclamation of the park;
- key to the natural or cultural integrity of the park; or
- identified as a goal in the park's general management plan or other relevant National Park Service planning documents.

Impairment may result from National Park Service activities in managing the park, visitor activities, or activities undertaken by concessionaires, contractors, and others operating in the park. A determination on impairment is made in the Conclusion section for each of the resource topics carried forward in this chapter.

Cumulative Effects

The Council on Environmental Quality (CEQ) regulations, which implement the National Environmental Policy Act of 1969 (42 USC 4321 et seq.), require assessment of cumulative impacts in the decision-making process for federal projects. Cumulative impacts are defined as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions" (40 CFR 1508.7). Cumulative impacts are considered for both the no-action and preferred alternative. Cumulative impacts were determined by combining the impacts of the preferred alternative with other past, present, and reasonably foreseeable future actions. Therefore, it was necessary to identify other ongoing or reasonably foreseeable future projects at Glen Canyon National Recreation Area and, if applicable, the surrounding region. The geographic scope for this analysis includes elements mostly within the monument's boundaries,

while the temporal scope includes projects within a range of approximately ten years. Given this, the following projects were identified for the purpose of conducting the cumulative effects analysis, listed from past to future:

1995 Environmental Impact Statement for Operation of Glen Canyon Management Plan and Glen Canyon Dam Adaptive Management Plan:

In November 1989, the Secretary directed an Environmental Impact Statement (EIS) be prepared on the operation of Glen Canyon Dam, and the Secretary designated Reclamation as the lead agency. This Final EIS, completed in March 1995, received broad and intense interest from water and power users, environmental and conservation groups, Federal and State agencies, Indian tribes, and private citizens across the country.

Findings from the EIS indicated that many uncertainties still exist regarding the downstream impact of water releases from Glen Canyon Dam. The EIS team consolidated the issues of public concern, identifying the significant resources and associated issues to be analyzed in detail. These resources include: water, sediment, fish, vegetation, wildlife and habitat, endangered and other special status species, cultural resources, air quality, recreation, hydropower, and non-use value.

In compliance with the Grand Canyon Protection Act (Act) of 1992 (Public Law 102-575), the EIS proposed a process of "adaptive management" whereby the effects of dam operations on downstream resources would be monitored and assessed.

The Act, and the EIS are the guiding documents for development of the Adaptive Management Program. The program meets the purpose and strengthens the intent for which the EIS was prepared, and ensures the primary mandate of the Act is met through future advances in information and resource management.

Colorado River Interim Guidelines for Lower Basin Shortages and Coordinated Operations for Lakes Powell and Mead:

Reclamation, an agency within the US Department of the Interior, operates Glen Canyon Dam as part of the Colorado River Storage Project, which was authorized by Congress in 1956 (43 USC § 620). In 1995 Reclamation finalized an EIS on Glen Canyon Dam operations and in 1996 the Secretary of the Interior decided the dam would be operated using the Modified Low Fluctuating Flow Alternative in the EIS. In 2007 Reclamation completed an EIS that defines interim guidelines for lower basin shortages and the coordinated operations for Lake Powell and Lake Mead (Reclamation 2007a).

Releases from Lake Powell are based largely on the contents of these two reservoirs. Coordinated operations under the 2007 record of decision govern the annual release from Lake Powell, while the 1996 record of decision governs releases from Lake Powell at shorter time increments, primarily daily and hourly releases.

Final Environmental Assessment for Experimental Releases from Glen Canyon Dam, Arizona, 2008 through 2012.

The Department of the Interior, acting through the Bureau of Reclamation (Reclamation), proposes to complete a series of experimental releases of water from Glen Canyon Dam to help native fish, particularly the endangered humpback chub, and conserve fine sediment in the Colorado River corridor in Grand Canyon National Park. Table 3, below identifies the proposed levels of water release from the dam based on the expected amount of inflowing water for any one year from 2008 - 2012. In example, if 2009 is estimated by Reclamation to be a dry year (low inflows), the in December, the release amount would range between 6,800 and 14, 800 cubic feet per second.

Table 3. Projected Glen Canyon Dam releases under dry (7.48 million acre feet (maf), median (8.23 maf), and wet (12.3 maf) conditions, 2009- 2012

	Annual Releases								
	7.48 maf Dry Year			8.23 maf Median Year			12.3 maf Wet Year		
Month	Mean (cfs)	Min (cfs)	Max (cfs)	Mean (cfs)	Min (cfs)	Max (cfs)	Mean (cfs)	Min (cfs)	Max (cfs)
Oct	7,502	7,002	8,002	9,758	9,258	10,258	9,378	8,878	9,878
Nov	7,563	5,900	10,900	10,083	7,100	13,100	9,075	7,100	13,100
Dec	9,378	6,800	12,800	13,011	9,000	17,000	12,503	9,000	17,000
Jan	12,503	9,000	17,000	13,011	9,000	17,000	17,510	14,200	22,200
Feb	8,470	7,800	13,800	10,804	7,800	13,800	13,903	13,700	21,700
Mar	9,378	6,800	14,800	9,758	6,800	12,800	14,776	11,400	19,400
Apr	7,563	5,900	10,900	10,083	7,100	13,100	14,551	12,200	20,200
May	9,378	6,800	12,800	9,758	6,800	12,800	14,880	11,500	19,500
Jun	9,075	7,100	13,100	10,924	7,900	13,900	17,009	14,900	22,900
Jul	12,503	9,000	17,000	13,824	9,800	17,800	19,776	16,600	24,600
Aug	12,503	9,000	17,000	14,637	10,600	18,600	23,883	20,900	25,000
Sep	9,075	8,575	9,575	10,588	10,088	11,088	21,056	20,556	21,556

Introduction of the Tamarisk Beetle (*Diorhabda elongata*) along the Colorado River.

The tamarisk biological control agent, *Diorhabda elongata*, was released is providing an active 670 mile experiment along the Colorado, Green, and Dolores Rivers. *D. elongata*, or the tamarisk leaf beetle, works to control tamarisk by repeatedly defoliating the plant over several years (BLM 2008).

Preliminary evidence of effectiveness shows great potential. If this bio- control project continues to progress, it could be used as one of the main mechanisms for tamarisk control and maintenance. If this is the case advantages over other approaches are significant; i.e., limited use of herbicides and a cost- effective long- term solution (Dudley 2005).

Impact Analysis

Vegetation

Intensity Level Definitions

The thresholds for this impact assessment are as follows:

Negligible: Operations would not cause discernible alteration to vegetation composition, abundance, and diversity.

Minor: **Adverse:** Operations would cause limited alteration to vegetation composition, abundance, and diversity. Mitigation measures, if needed to offset adverse effects, would be simple and successful. Reclamation is readily achievable through natural succession processes.

Beneficial: Benefit to vegetation or species populations would be noticeable, including enhanced survivorship, growth, reproductive output, and/or longevity of individual species as a result of the alternative.

Moderate: **Adverse:** Operations would cause alteration to vegetation composition, abundance, and diversity. Mitigation measures, if needed to offset adverse effects, could be extensive, but would likely be successful. Reclamation is achievable but likely requires additional resources to accomplish goals.

Beneficial: Vegetation or species populations would be moderately beneficially affected: individual plants and assemblages would be positively affected through enhanced survivorship, growth, reproductive output, or longevity as a result of the alternative, and there would be improvement of native species populations, and with no increase, and perhaps a decrease, in the spread of noxious weeds or exotic species.

Major: **Adverse:** Operations would cause substantial alteration to vegetation composition, abundance, and diversity. Extensive mitigation measures would be needed to offset any adverse effects, and their success would not be guaranteed. Reclamation may not be attainable even with substantial efforts.

Beneficial: Vegetation or species populations would be strongly beneficially affected: individual plants and assemblages would be strongly positively affected through enhanced survivorship, growth, reproductive output, or longevity as a result of the alternative, and there would be considerable improvement of native species populations, and with a decrease in the spread of noxious weeds or exotic species.

Existing Conditions

The vegetation at the hidden slough site includes desert and wetland- riparian assemblages. The vegetation at the project site can be separated into three zones: upper desert zone, middle pre- dam sediment terrace zone, and lower or current “new” high water zone.

The upper zone consists of shadscale (*Atriplex confertifolia*) dominated desert scrub assemblages that include Mormon tea (*Ephedra* spp.), *Opuntia* and other cacti, and wire lettuce (*Stephanomeria pauciflora*) as well as other desert shrubs. This zone extends from the canyon wall downslope to the start of the middle zone. The slope is moderate, and soils consist of fine sand with intervening boulders eroded from the cliff side.

The middle zone vegetation corresponds with the zone between ca. 30,000- 100,000 cfs, and is located between the upper zone and lower zone and is dominated by pre- dam tamarisk, with minor amounts of mixed shrubs, forbs and annuals including long- leafed bristlebush (*Brickellia longifolia*), desert olive (*Forestiera pubescens*), live oak (*Quercus turbinella*), and net- leaf hackberry (*Celtis reticulata*). The upper portion of this zone is dry and the distance to the water table precludes the presence of most riparian species. The lower portion is closer to the water table and includes a narrow band of willow and seepwillow and other riparian species. This zone has shallow to moderate slopes and consists of cobble and boulders interspersed sand derived from eroding canyon walls and river silt, contributed before the dam was completed.

The lower zone supports rare Goodding’s willow, and more common coyote willow, arrowweed , and other deep rooted species. Native seepwillows (*Baccharis emoryi* and *B. salicifolia*), common reedgrass (*Phragmites australis*), and various forbs and graminoids are common in this zone as well as minor amounts of new tamarisk whips. Slopes in this zone are shallow and soils of this zone are dominated by silt or cobble. Lower portions of this zone are hydrologically active and commonly support obligate wetland species. The Hidden Slough wetland community is dominated by aquatic sedge (*Carex aquatilis*), wiregrass (*Juncus balticus*), water rush (*Juncus articulatus*), western goldenrod (*Euthamia occidentalis*), cattail (*Typha domingensis*), and other wetland species.

Impacts of Alternative A – No Action

Impact Analysis

The No Action Alternative would result in continued limitation of native habitat resultant from the cyclic invasion and continued dominance of the area by non- native tamarisk; a process that is being sustained by the ongoing operations of Glen Canyon Dam. This process is also contributing to the spread of new tamarisk in the hydrological active portion of the project site; thus resulting in a long- term, adverse negligible to minor impact on the project site. The long- term effects of the potential arrival of the tamarisk leaf beetle remain unknown.

Cumulative Effect

The revegetation project is designed to remove the large block of tamarisk that has been sustained by the long- term flow regulation of the river by Glen Canyon Dam operations and replace it with native vegetation, which would help improve the overall ecological integrity of the river corridor. Under the No Action Alternative, there would be no improvement to the ecological system at the project site or contribution to improvement of the ecosystem along the river corridor. Also, fires that escape

from day use campfires can potentially spread and become destructive due to the presence of tamarisk, and can eliminate native species.

Conclusion

Implementation of the No Action Alternative would result in continued minor to major because of tamarisk fire cycle effects adverse effects on vegetation at the project site. Implementation of this alternative would not result in any unacceptable impacts and is consistent with §1.4.7.1 of NPS Management Policies 2006.

Impacts of Alternative B

Impact Analysis

The preferred alternative would have both adverse and beneficial impacts to vegetation at the project site. There would be short- term adverse minor impacts due the removal of approximately 3 acres of tamarisk habitat, as well as some trampling of vegetation in the lower zone due to moving equipment off the watercraft to the project area and the hand removal of tamarisk whips. The preferred alternative would also result in a long- term beneficial impact by replacing the minimally useful and fire- prone tamarisk habitat with native vegetation, which would contribute to an overall healthier ecosystem along the portion of the Colorado River between Glen Canyon Dam and Lees Ferry. Additionally the project would remove a seed source for new tamarisk starts at Hidden Slough.

Cumulative Effect

The operation of Glen Canyon Dam, in light of the proposed releases associated with the Shortage Criteria EIS and Experimental Releases EA may have an impact on the ability of plants introduced during revegetation activities to reach the ground water within the generally expected two to three year time frame because release levels from the dam directly affect the level of ground water the proposed revegetation site. Dam release levels may also have an effect on the proposed irrigation, as more equipment, including hoses required to pump water for irrigation may be required during low water events. While use of tamarisk beetle as biological control is increasing along the Colorado River, Glen Canyon NRA would not approve of its use until a reasonable amount of data on the pros and cons of its use is available: this information would not be available within the timeframe of this project, therefore the use of tamarisk beetles would not have a cumulative impact when considered with the project and other past, present and foreseeable future projects.

Conclusion

Implementation of the Preferred Alternative could have both a long- term minor adverse impact as well as a long- term beneficial impact to vegetation at the project site. Concerns about water flow levels due to dam operations can be mitigated by incorporating this information into the design process for the project. Implementation of this alternative would not result in any unacceptable impacts and is consistent with §1.4.7.1 of NPS *Management Policies* 2006.

Threatened and Endangered Species and Species of Concern

Intensity Level Definitions

The thresholds for this impact assessment are as follows:

Negligible: Impacts would result in a change to a population or individuals of a species of management concern, but the change would be well within the range of natural fluctuations. Negligible effects equate to a “no effect” determination in USFWS terms.

Minor: Adverse: An action that would affect a few individuals of a species of management concern or have very localized impacts upon their habitat. The change would have barely perceptible consequences to the species or habitat function. Sufficient habitat would remain functional to maintain species viability. Impacts would be outside of critical reproduction periods. Mitigation measures, if needed to offset adverse effects, would be simple and successful. Minor effect would equate with a “may effect, not likely to adversely affect” determination in USFWS terms.

Beneficial: The alternative would beneficially affect one or more individual(s) of a listed species or its critical habitat, but the change would only be noticeable at a local level. It would not be noticeable across the population, at a regional level or across all remaining habitat.

Moderate: Adverse: An action that would cause measurable effects on: (1) a relatively small percentage of the species population, (2) the existing dynamics between multiple species (e.g., predator- prey, herbivore- forage, vegetation structure- wildlife breeding habitat), or (3) a relatively large habitat area or important habitat attributes. A population or habitat might deviate from normal levels under existing conditions, but would remain indefinitely viable within the preserve. Response to disturbance by some individuals could be expected, with some negative impacts to feeding, reproduction, or other factors impacting short- term population levels. Mitigation measures, if needed to offset adverse effects, could be extensive, but would likely be successful. Moderate effect would equate with a “may effect, likely to adversely affect” determination in USFWS terms.

Beneficial: An individual or population of a species of concern or listed species, or its habitat would be detectably beneficially affected. The effect could have long- term consequence to the individual, population, or habitat.

Major: Adverse: An action that would have drastic and permanent consequences for a species population, dynamics between multiple species, or almost all available unique habitat. A population or its habitat would be permanently altered from normal levels under existing conditions, and the species would be at risk of extirpation from the preserve. Frequent responses to disturbance by some individuals would be expected, with negative impacts to feeding, reproduction, or other factors resulting in a decrease in population levels. Extensive mitigation measures would be needed to offset any adverse effects and their success would not be guaranteed. Major effect

would equate with a USFWS determination that the project may “jeopardize the continued existence of a listed species or result in the destruction or adverse modification of designated critical habitat.”

Beneficial: A population of a listed species or species of concern, or its habitat would be noticeably enhanced, with long-term, vitally positive consequences to the population, or habitat.

Existing Conditions

The following species are known to either exist, have critical habitat or could be impacted by the proposed project:

Threatened, Endangered, Proposed Threatened or Proposed Endangered Species

California condor (*Gymnogyps californianus*) – Federal endangered, Arizona species of concern

Mexican Spotted Owl (*Strix occidentalis*) – Federal threatened, Arizona species of concern

Southwestern willow flycatcher (*Empidonax traillii* var. *extimus*) – Federal endangered, Arizona species of concern

Humpback chub (*Gila cypha*) – Federal endangered, Arizona species of concern

Razorback sucker (*Xyrauchen texanus*) – Federal endangered, Arizona species of concern

Candidate Species, Sensitive Species, Species of Concern

Northern Leopard Frog (*Rana pipens*) - Arizona species of concern

Peregrine Falcon (*Falco peregrinus*) – Arizona species of concern

Endangered Species with Designated Critical Habitat

The term “critical habitat” for a threatened or endangered species means: (1) the specific areas within the geographical area occupied by the species, at the time it is listed in accordance with the provisions of section 4 of the Endangered Species Act (ESA), on which are found those physical or biological features (I) essential to the conservation of the species and (II) which may require special management considerations or protection; and (2) specific areas outside the geographical area occupied by the species at the time it is listed in accordance with the provisions of section 4 of the Act, upon a determination by the Secretary that such areas are essential for the conservation of the species.

Critical habitat for the Mexican spotted owl was established in 2004 (69 FR 53181 53298) and includes a wide swatch of the NRA; the nearest occurrence is found about 40 miles to the north of the project area. There is no critical habitat for MESO in or near the study area.

Critical habitat for the Humpback chub and Razorback sucker was established in 1994 (59 FR 13374 13400) and has been designated from the junction of the Paria River with the Colorado River, down to Hoover Dam in Nevada.

There is no designated critical habitat within Glen Canyon NRA for the California condor or the Southwestern willow flycatcher.

Threatened and Endangered Species Information

Humpbacked chub is one of a suite of endangered fishes of the Colorado River Basin. This species lives primarily in canyons with swift currents and white water. The pronounced hump behind its head gives the humpback chub a striking, unusual appearance. Like the Colorado pikeminnow and bonytail, the humpback chub is a member of the minnow family. It has an olive- colored back, silver sides, a white belly, small eyes and a long snout that overhangs its jaw. These fish spawn as young as 2- 3 years and at lengths as small as 5 inches. Their spawning season is between March and July. This fish can grow to nearly 20 inches and may survive more than 30 years in the wild. It is thought to have evolved around 3- 5 million years ago. The humpback chub does not have the swimming speed or strength of species such as the Colorado pikeminnow. Instead, it uses its large fins to "glide" through slow- moving areas, feeding on insects that become trapped in water pockets (<http://www.fws.gov/coloradoriverrecovery/Crhbc.htm>).

Historically, it inhabited canyons of the Colorado River and four of its tributaries: the Green, Yampa, White and Little Colorado rivers. The largest known population is in the Little Colorado River in the Grand Canyon, where there may be up to 10,000 fish. There are no population estimates available for the rest of the upper Colorado River basin including the area upstream from the Little Colorado inflow to the Paria River in Glen Canyon NRA. Designated critical habitat for this species occurs from the inflow of the Paria River downstream to the Hoover Dam. This species was extirpated from the Glen Canyon reach after construction of Glen Canyon Dam, which resulted in a change of habitat from swiftly flowing warm water muddy conditions to highly controlled, cold, clear dam releases. The first true silt contributing water to the Colorado River downstream of Glen Canyon Dam is the Paria River at Lees Ferry.

Razorback sucker is another of a suite of endangered fish that inhabits the Colorado River Basin. This species occur in medium to large rivers with swift turbulent waters, as well as slower flowing backwater areas and impoundments. Historically, they were found throughout the Gila River basin in Arizona and the Colorado River basin in Wyoming, Colorado, Utah, Nevada, Arizona, and New Mexico. Due to severe population declines, razorbacks are presently located above Lake Powell in the upper Colorado River basin and in Lakes Mead, Mohave and Havasu in the lower Colorado River basin. Populations have been established in the lower Colorado River and in several other locations through stocking. (http://www.azgfd.gov/w_c/research_razorback.shtml). One of the largest suckers in North America, the razorback sucker can grow to up to 13 pounds and lengths exceeding 3 feet. The razorback is brownish- green with a yellow to white- colored belly and has an abrupt, bony hump on its back shaped like an upside- down boat keel.

In the upper Colorado River basin, biologists believe the razorback population totals only about 500 adult fish, most of which are thought to be 25 or more years old. Though some of these adult fish reproduce in the wild, few of their young have survived. These fish can spawn as early as age 3 or 4, when they are 14 or more inches long. Depending on water temperature, spawning can take place as early as November or as late as June. In the upper Colorado River basin, razorbacks typically spawn

between mid- April and mid- June. These fish reportedly migrate long distances to spawn, congregating in large numbers in spawning areas. These fish can spawn as early as age 3 or 4, when they are 14 or more inches long. Depending on water temperature, spawning can take place as early as November or as late as June. In the upper Colorado River basin, razorbacks typically spawn between mid- April and mid- June. Razorback suckers Feed on zooplankton and benthic invertebrates and can live to live 40 years or more (<http://www.fws.gov/coloradoriverrecovery/Crrzb.htm>).

Designated critical habitat for this species occurs from the inflow of the Paria River downstream to the Hoover Dam. This species was extirpated from the Glen Canyon reach after construction of Glen Canyon Dam, which resulted in a change of habitat from swiftly flowing warm water muddy conditions to highly controlled, cold, clear dam releases. The first true silt contributing water to the Colorado River downstream of Glen Canyon Dam is the Paria River at Lees Ferry.

California condors were reintroduced to the Grand Canyon and near the Lees Ferry Area of Glen Canyon NRA as a Nonessential Experimental Population and there is no designated critical habitat for this species in Arizona. Condors prefer mountains, gorges, and hillsides, which create updrafts, thus providing favorable soaring conditions. The California condor's diet consists of medium and large- sized dead mammals like cattle, sheep, deer, and horses in any state of decay. Condors may travel several hundred miles in search of food. Condors nest in a cave or cleft among boulders on a cliff or hillside. The female will lay the single egg directly on the floor of the cave. The egg is incubated for 54 - 58 days. The young condor learns to fly in about 6 months, but will stay with its parents for several more months. The extended breeding season prevents condors from breeding yearly. California Condors usually become sexually mature at 6 years of age. Condors have a body length of 43 - 52 inches, a wingspan up to 9 1/2 feet, and weighs 18 - 23 pounds.

Condors are common below Glen Canyon Dam along the Colorado River, particularly in the area of Marble Canyon and Navajo Bridge. California Condors are social birds and they spend a great deal of time feeding and roosting together. They are attracted to human activities and are often seen roosting on the cliffs near the busiest hotel at the Grand Canyon. They are also attracted to construction projects and have been seen roosting on dumpsters and water carriers at construction sites.

Mexican spotted owls occurs from southern Utah and Colorado south through the mountains of Arizona, New Mexico, and west Texas into the mountains of central Mexico. The Mexican spotted owl is widely but patchily distributed throughout its' range in the United States, with distribution reflecting the availability of forested mountains and canyons, and in some cases rocky canyonlands. Consequently, the owl's habitat within the Southwest is naturally fragmented. Critical habitat for this species was designated by the USFWS on August 31, 2004. The nearest designated critical habitat within Glen Canyon NRA is about 40 miles upstream, associated with the Escalante River, a tributary to the Colorado River. The known PACS in this area are located in narrow, cool canyons or alcoves that are shaded much of the day during the breeding season. Most have either ephemeral creeks, springs or water holes as water sources and they all have relict Douglas Fir (*Pseudotsuga menziesii*). The nearest designated critical habitat to the project area is located at on the Grand Staircase Escalante National Monument, about 25 mile north of the project area. The USFWS have suggested that potential habitat for this species occurs within the project area.

In the northern part of the range, including southern Utah, southern Colorado, and far northern Arizona and New Mexico, owls occur primarily in rocky canyons (Rinkevich 1991; Willey 1993). These canyon environments have been described as steep, narrow canyons with cliffs and perennial water sources (Ganey 1989). Canyon habitats usually contain conifers or riparian forests, or clumps of trees, but may also be sparsely vegetated (Rinkevich 1991; Willey 1993).

Several hypotheses have been proposed to explain why spotted owls typically nest in closed-canopy forests or narrow steep canyons. One hypothesis suggests that spotted owls are relatively intolerant of high temperatures, and roost and nest in shady forests or shady canyons because they provide favorable microclimatic conditions (Barrows 1981). This hypothesis could explain why owls typically nest in either closed-canopy forests or deep shady canyons, as both habitat types provide cool microclimates (Ganey 1993) provided support for this hypothesis. During their studies they observed that metabolic rates were higher and rates of evaporative water loss lower in Mexican spotted owls than in sympatric great horned owls, a habitat generalist. Thus, spotted owls appeared to produce more metabolic heat than great horned owls, and were less able to dissipate that heat. This may lead them to seek out cool microclimates during the breeding season (Ganey et al. 1993).

Forsman (1976) described spotted owls as "perch and pounce" predators. Specific prey groups identified from spotted owl pellets included woodrats, mice, voles, rabbits, gophers, bats, birds, reptiles, and arthropods.

Courtship begins in March and eggs are laid in late March or, more typically, early April. Female spotted owls generally incubate for approximately 30 days. The eggs usually hatch in early May (Ganey 1988). Nestling owls fledge from four to five weeks after hatching, from early to mid-June in most cases (Ganey 1988). The young depend on their parents for food during the summer and will eventually disperse out of the natal area in the fall. Spotted owls feed mainly on rodents but also consume rabbits and some other vertebrates, including birds and reptiles, and insects (Birds of North America, No. 179, 1995- this is an inappropriate citation, use the authors names as indicated on the paper). The main causes of mortality for juveniles include exposure, starvation, and predation by Great Horned Owls and forage competition with Great Horned Owls. The main cause of mortality for adults includes predation by Great Horned Owls as well as competition.

Southwestern Willow Flycatcher breeding range includes southern California, Arizona, New Mexico, extreme southern portions of Nevada and Utah, far western Texas, perhaps southwestern Colorado, and extreme northwestern Mexico. It is present in breeding territories by mid-May. It builds nests and lays eggs in late May and early June (average clutch size is 2 to 5 eggs) and fledges young in early to mid-July. Second clutches only occur if the first clutch failed. Between August and September, the southwestern willow flycatcher migrates to wintering grounds in Mexico, Central America, and possibly northern South America. The southwestern willow flycatcher is an insectivore and forages within and above dense riparian vegetation. It catches insects while flying, hovers to glean them from foliage, and occasionally captures insects on the ground.

The southwestern willow flycatcher breeds in relatively dense riparian tree and shrub communities associated with rivers, swamps, and other wetlands including lakes and reservoirs. In most instances, the dense vegetation occurs within the first 10 to 13 feet above ground. Habitat patches must be at least 0.25 ac in size and at least 30 feet wide. Historically the southwestern willow flycatcher nested in native vegetation including willows, seepwillow, boxelder, buttonbush, and cottonwood. Due to changes to riparian ecosystems, this subspecies also uses thickets dominated by non- native tamarisk and Russian olive, or in mixed native non- native stands. The flycatcher builds a small open cup nest, most often 6.5 to 23 feet above ground in a fork or on a horizontal branch of a medium- sized bush or small tree with dense vegetation above and around the nest. Potential habitat for the Southwestern willow flycatcher occurs within the project area as this species is known to nest in large dense tamarisk stands along the Colorado River through Grand Canyon National Park.

Arizona State Listed Species of Concern

Northern Leopard Frog is a slender brown or green frog with large, light- edged dark spots between light- colored dorsolateral ridges (Behler and King, 1995). In the last 20- 30 years frogs of the genus *Rana* have been experiencing serious declines (Drost and Sogge, 1993) across the western United States. This ongoing decline has prompted the Arizona Game and Fish to list *Rana pipiens* as a state species of concern. Once plentiful along slow backwaters and tributaries of the Colorado River, they are now relegated to a few isolated locations. One of these locations is at Leopard Frog Marsh in the Horseshoe Bend area of the Colorado River below Glen Canyon Dam (Drost and Sogge, 1993). In 1992 a small population of Leopard Frogs was discovered in this area at river mile - 8.8L. Subsequently the entire river corridor below Glen Canyon Dam was searched, but no other populations were located. This search included the Hidden Slough project site (Spence pers. comm.).

Species Issues: Glen Canyon Dam has prevented the Horseshoe Bend population from contact with any upstream populations. Given the very cold temperature of the river and the great downstream distance of any other population, they area also blocked from any downstream population interaction (Drost and Sogge 1993). They are also somewhat blocked from expanding beyond their current location due to the presence of large numbers of year around non- native rainbow trout, as well as large numbers of residential and overwintering waterfowl, including great blue herons, of which some species predate leopard frogs. Across their range, the main threats to this species are habitat destruction and pollution. Also they are collected for biological supply houses and fishermen use them for bait (Arizona Game and Fish, Heritage Database)

The population at Horseshoe Bend remained stable from 1993 - 1998. After the spike flow releases from Glen Canyon Dam (30,000 – 40,000 cfs) in 1996 there was a significant population increase. Surveys were not conducted again until 2002, when a downward trend in the population was noted. By 2006 the frogs may have become extirpated from this site and remain absent elsewhere along the Glen Canyon NRA portion of the river below the dam. Park biologists suspect that changes due to erosion and drought degraded habitat while increasing numbers of great blue heron may have heavily predated the existing population. It is also theorized that these frogs are not found at the project site due to the lack of shallow standing water and the fact that the slough opened directly to the river, allowing trout and other predatory species back into the wetland areas.

American Peregrine Falcons are a relatively large and stocky member of the falcon family, with pointed wings and short tail. They can be identified by the dark “mustache” and uniformly patterned underwings (Sibley 2000). Found in Arizona wherever sufficient prey is found near cliffs. Optimum peregrine habitat is generally considered to be steep, sheer cliffs overlooking woodlands, riparian areas or other habitats supporting avian prey species in abundance. As Arizona's population grows, peregrines seem to be breeding in less optimal habitat; either small broken cliffs in ponderosa pine forest or large, sheer cliffs in very xeric areas. The presence of an open expanse is critical (AGFD Heritage Database).

Decline in 1950's and 1960's of peregrines in Arizona and rest of U.S. due to DDT contamination has apparently been reversed. In addition to being found in greater numbers, Arizona's peregrines are being found in areas which would have formerly been considered marginal, suggesting that populations may have reached levels saturating the optimal habitat available, and new breeding pairs forced to breed in sub-optimal areas (AGFD Heritage Database).

Population levels along the rim of the Colorado River, below Glen Canyon Dam have stabilized since about 1996. In 2006, there were five nest starts in the area; four successfully fledged young (Nealon 2006).

Impacts of Alternative A — No Action

Impact Analysis

The No Action Alternative would not remove tamarisk from the Hidden Slough Site and would therefore, not replace the tamarisk with native riparian and upland vegetation. While tamarisk is used by local wildlife, including species of concern and threatened and endangered species, the richness and diversity of species are generally much higher in stands of native vegetation. High quality habitat has the potential of attracting all species, including those protected by the Endangered Species Act. Additionally, the existing tamarisk stand acts as a seed bank for movement of tamarisk into wetter areas of the site and other sites downstream. Tamarisk is a fire dependent community and wildfires in tamarisk stands are not uncommon at Glen Canyon NRA. Wildfire would have a minor, short-term, adverse effect on the wildlife using this area. The effect of not removing the tamarisk would be long-term and have a negligible to minor adverse effect.

Cumulative Effect

The no action alternative would leave the Hidden Slough site in its current state and with the other past, current or foreseeable future actions would not have a cumulative impact to threatened or endangered species and/or species of concern.

Conclusions

Implementation of the No Action Alternative would contribute long-term negligible to minor adverse impacts on endangered species' potential habitat at Hidden Slough site. Because there would be no major, adverse impacts to a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of Glen Canyon National Recreation Area; (2) key to the natural or cultural integrity of the recreation area; or (3) identified as

a goal in the recreation area's general management plan or other relevant National Park Service planning documents, there would be no impairment of the recreation area's resources or values. Implementation of this alternative would not result in any unacceptable impacts and is consistent with §1.4.7.1 of *NPS Management Policies* 2006.

Impacts of Alternative B

Threatened and Endangered Species Determinations.

California condor: Condors can regularly be seen soaring in the Lees Ferry Area, and are attracted to human activities, especially construction projects where they can be physically injured or accidentally poisoned. Condor conservation measures for construction projects have been developed with the help of the USFWS that would help insure no harm comes to these birds. These include the development of mitigation measures, which have been included on page 22 of this document. In accordance with Section 7 of the ESA, Glen Canyon NRA biologists have determined that the proposed project “may affect, but is not likely to adversely affect” this species.

Humpbacked chub: Critical habitat for this species has been designated from the inflow of the Paria River downstream into GCNP. The inflow of the Paria River is located approximately 7 miles downstream from the project site. Additionally, this species has been extirpated from the Lees Ferry to Glen Canyon Dam, which includes the project area; thus the proposed project would not have any direct impacts to this species or its critical habitat. The proposed project includes the placement of larger pieces of tamarisk into deeper sections of the river adjacent to the revegetation sites. The leaves and smaller branches will be collected and burned as debris. While ashes will be left on site, wind, rain and occasional high water events may slowly move the ashes into the river. Due to the size and weight of the larger branches and the controlled amount of water releases from the dam, they are not likely to move down river, but rather stay where they are put. They will provide shelter to a variety of aquatic species and as they break down, provide an additional food source to some of these same species.

Some of the ash may slowly move into the water column, where leaching activities will quickly produce a spike of phosphorus (Spencer and Hauer 1991). As phosphorus is soluble in water it quickly becomes depleted by the presence of large amounts of water and is therefore not likely to above background levels for more than a few moments. Increasing levels of nitrogen and phosphorus can accelerate eutrophication (excessive growth of plants and algae deoxygenate the water) of surface waters and wetlands. As the amount of ash likely to reach the water is very small any chemical effect would be long dissipated before the start of critical habitat or actual location of this species.

Determination: In accordance with Section 7 of the ESA, Glen Canyon NRA biologists have determined that the proposed project “may affect, but is not likely to adversely affect” this species.

Mexican spotted owl: Mexican spotted owls have not been detected along the Colorado River between Glen Canyon Dam and Lees Ferry, though potential habitat may be present. The width of the river canyon at the project site is over 1800 feet. The proposed revegetation site receives over four hours of full sun during the breeding season of this species. While the river canyon is wide enough to allow for full sun penetration, it does inhibit the movement of air, which causes extreme temperature increases during the summer months (see Table 4). Taken together, the extreme width

of the river canyon with the high temperatures and excessive sun exposure at the project site during this species breeding season does not provide the cool canyon environment that is preferred by this species on the Colorado Plateau.

The Glen Canyon NRA reach of the Colorado River has been used extensively by recreationalists since the inception of the park. This section of the river is used by a variety of boaters, including privately owned jet boats, motorboats, canoes and kayaks. Additionally, there has been an active concession providing flat water raft trips (both full and half day) since 1991. There can be up to 20 rafts on the river at any one time and each has a capacity of 22 persons. There are also approximately 15 commercial business permit holders that provide fishing, hunting and sightseeing guided services on the river. While each type of watercraft has specific types of motors, all which contribute to the background noise, the biggest contributor to the noise footprint in the canyon is people. As noted in Table 5, each year from 2000 to 2004, the number of visitors on the river has risen.

Along with the continued presence of humans there is also a population of Great Horned Owls, which predate on Mexican spotted owls. Point count bird surveys, in accordance with appropriate species protocols, were conducted 3 times a year at 15 patch locations along the Colorado River between Glen Canyon Dam and Lees Ferry between 1992 and 1999. During evening camping, surveyors noted significant presences of great horned owls along the survey corridor. The park biologist has also received numerous great horned owl sighting reports from visitors camping along the survey corridor (Spence, pers. comm.).

In reviewing the project area, park biologists have determined the potential habitat for this species only occurs in several side or tributary canyon; waterholes canyon (200 feet across top, 20 feet across bottom) which is located on the Navajo Indian reservation on the southern bank of the river about 2 miles site from the project site, and at nine mile draw (600 feet across top, 60 feet across bottom) at the bottom which is located about 4 miles from the project site. While neither of these sites has been surveyed for the presences of owls, they could potentially be narrow enough to provide the cool canyon habitat required by this species on the Colorado Plateau.

Project related noise is expected to occur during initial land clearing activities and would include the use of gasoline powered soil augers and chain saws. Both these pieces of equipment produce short burst of noise in the range of 90 – 100 dBA. Normal conversation outdoors usually is in the 70 – 80 dBA range. While there is not any known Mexican Spotted Owl nests near the project site, intensive surveys have not been completed, so short bursts of high noise levels can interfere with a variety of breeding period activities (mate selection, hunting, or chick rearing).

Table 4. Average Temperatures for Proposed Project Area.		
	Page, Arizona	Project Area is generally 10 to 15 degrees warmer than Page.

Month	Average Low	Average High	Average Low	Average High
January	26°	43°	36° - 41°	53° - 58°
February	30°	50°	40° - 45°	60° - 65°
March	37°	60°	47° - 52°	70° - 75°
April	44°	69°	54° - 59°	79° - 84°
May	53°	78°	43° - 48°	88° - 93°
June	62°	90°	72° - 77°	100° - 105°
July	68°	95°	78° - 83°	105° - 110°
August	66°	92°	76° - 81°	102° - 107°
September	58°	83°	68° - 73°	93° - 98°
October	47°	70°	57° - 62°	80° - 85°
November	35°	54°	45° - 50°	64° - 69°
December	27°	44°	37° - 42°	54° - 59°

Table 5. Number of Flat Water Raft (FWR) passengers and number of other boats from 2000 to 2004.

	2000		2001		2002		2003		2004	
	OB	FWR	OB	FWR	OB	FWR	OB	FWR	OB	FWR
Jan	676	0	471	0	21	25	272	0	18	0
Feb	769	64	549	9	26	54	20	0	11	33
Mar	714	796	918	904	64	1,148	128	911	61	1,400

Apr	835	3,651	962	3,616	829	2,657	88	3,045	97	3,832
May	574	5,113	687	4,272	634	3,765	121	3,313	54	4,176
June	627	9,375	505	8,711	30	7,546	51	11,170	32	8,431
July	454	7,583	110	7,758	279	6,826	31	7,539	366	6,888
Aug	412	7,688	85	6,746	324	6,153	49	6,821	370	6,576
Sept	420	5,219	52	3,618	84	3,920	73	5,691	558	5,216
Oct	682	3,308	99	2,059	82	3,202	128	2,872	491	2,949
Nov	520	421	64	487	61	502	38	392	301	583
Dec	499	8	352	0	252	7	17	0	164	5
Total	7,182	43,226	4,854	38,180	2,686	35,805	1,016	41,754	2,523	40,089

- Monthly counts taken from National Park Service "Monthly Public Use Report"
- Other boat counts are based on fees paid at entrance stations. Average number of passengers estimated to be 3 per boat.
- Flat water passengers are based on ticket sales.

Determination: Due to the extreme temperatures experienced in the project area during the owls breeding season, the high levels of background noise from the more than 60,000 annual visitors (most using motorized watercraft and the lack of appropriate habitat features (cool canyons with some tree cover), park biologists have determined that the proposed project would have “a may effect, not likely to adversely affect” on this species or its potential habitat. The USFWS has concurred with this determination. A copy of their letter of concurrence can be found in the appendices.

Southwestern willow flycatcher: Potentially suitable habitat for the Southwestern Willow Flycatcher occurs along both sides of the Colorado River below Glen Canyon Dam. While much of the area includes long, thin strands of tamarisk that may not be suitable for this species, there are pockets of tamarisk/willow stands that are large enough and are located on or near standing water, to be suitable for this species. The project area is one of the locations where there is a large mature stand of tamarisk, surrounded by a thin layer of willow with easy access to standing water in the slough area. The proposed project would remove approximately three acres of tamarisk at this site.

Point count surveys for riparian and aquatic birds were completed at the project site between 1992 and 1999 (Spence, 2004). During these surveys there were only two reported sightings of willow flycatchers in 1997. Due to the timing of the sightings and lack of response to taped calls, it has been postulated by the surveyors that these individual were likely a subspecies other than Southwestern willow flycatcher that were migrating through the area. Additionally, protocol level surveys for Southwestern willow flycatcher were conducted at the Hidden Slough site in 2006; findings were negative for the presence of this subspecies.

There is a single breeding record that exists at Lees Ferry from before the dam was built; however, no breeding of this species has been detected for more than 50 years in the project area.

Determination: Because surveys along the whole length of the river from the dam to Lees Ferry (including the project site) have never conclusively documented Southwestern willow flycatcher, in accordance with Section 7 of the ESA, park biologist have determined that the proposed project “will have no effect” on this species. The USFWS has concurred with this determination. A copy of their letter of concurrence can be found in the appendices.

Species of Concern Determinations

Northern Leopard Frog: The project at Hidden slough will not have a direct impact on the wetlands and slough areas. It will remove a very large stand of mature tamarisk, which would allow for the development of ground cover in the understory, a situation that does not currently exist. As leopard frogs tend to wander great distances, this may provide for better cover and foraging should this species become reestablished in the NRA below the dam.

Determination: This project will not have any adverse effects, but rather it would have a long- term minor benefit to this species.

American Peregrine Falcon: Project Impacts: Construction of the project would take place outside the breeding season of this species. Because peregrines are primarily spring- summer breeders with a few birds lingering though the winter, hardly “residential” in the area, there could be short- term adverse indirect impacts as construction might preclude peregrines from foraging and roosting near the project area due to construction related disturbances. This same disturbance may also keep its preferred prey away from the project site.

Determination: The very slight possible adverse effect will be mitigated by the long- term beneficial effect created when tamarisk is replaced by native habitat, which may increase the foraging opportunity for this species in the long run, by increasing small bird numbers in the area.

Cumulative Effect

The preferred alternative when reviewed with the ongoing management of the dam, including the assorted proposed future water releases from the dam would have a cumulative minor, long- term beneficial impact to the threatened and endangered species and species of concern using the project site and river corridor when considered with other past, present, and reasonably foreseeable future actions. The water releases will support the growth of the native vegetation planted as part of this

project. The completion of the project would increase the amount of potential habitat for endangered species occurring along the river corridor. As the tamarisk is replaced by native vegetation, the habitat value will increase for all species including those covered by the Endangered Species Act.

Conclusion: The preferred alternative would have moderate long- term beneficial impacts to all threatened, endangered or species of concern due to the replacement of the block of non- native invasive tamarisk with diverse native vegetation that will promote a healthier ecosystem and may meet the resource needs of a wider array of native species, including those listed by both federal and state agencies. There would be minor, short- term, indirect adverse impacts to the California condor, Mexican spotted owl, Humpback chub and razorback sucker, due to construction activities.

There would be negligible, short- term adverse impacts on the critical habitat of the humpback chub, razorback sucker, if and when ash is makes its way into the river, as well as a negligible, short- term adverse impact to the California condor and its potential habitat. The preferred Alternative would have minor to moderate, adverse impacts on potential habitat for the Southwestern willow flycatcher. The preferred alternative would result in no impacts to potential habitat of the Mexican Spotted Owl. The preferred alternative would result in long- term minor or moderate beneficial impacts as it would improve potential habitat conditions for these species.

Mitigation measures for endangered species are identified on page 22 of this document. Because there would be no major, adverse impacts to a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of Glen Canyon National Recreation Area; (2) key to the natural or cultural integrity of the recreation area; or (3) identified as a goal in the recreation area's general management plan or other relevant National Park Service planning documents, there would be no impairment of the recreation area's resources or values. Implementation of this alternative would not result in any unacceptable impacts and is consistent with §1.4.7.1 of *NPS Management Policies 2006*.

Water Resources

Intensity Level Definitions

The thresholds for this impact assessment are as follows:

Negligible: Impacts are chemical, physical, or biological effects that would not be detectable, would fall well below water quality standards or criteria, and would be within historical or desired water quality conditions.

Minor: Adverse: Impacts (chemical, physical, or biological) that would be detectable at or near the project site, but the affect would not cause water quality parameters to rise above current water quality standards or criteria and would still be within historical or desired water quality conditions.

Beneficial: The alternative would improve one or more water quality parameters in order to help the NPS meet established standards, criteria or historical water quality levels. The effect would be noticeable at a short distance from the project site.

Moderate: Adverse: Impacts (chemical, physical, or biological) that would be detectable within one mile of the project site, but the effect would not cause water quality parameters to rise above current water quality standards or criteria and would still be within historical or desired water quality conditions.

Beneficial: The alternative would improve one or more water quality parameters in order to help the NPS meet established standards, criteria or historical water quality levels. The effect would be noticeable within one mile of the project site.

Major: Adverse: Impacts (chemical, physical, or biological) that would be detectable well beyond one mile of the project site, and the effect may cause water quality parameters to rise above current water quality standards or criteria as well as above historical or desired water quality conditions.

Beneficial: The alternative would improve one or more water quality parameters in order to help the NPS meet established standards, criteria or historical water quality levels. The effects would be noticeable well beyond one mile from the project site.

Existing Conditions

The project area is located on the Colorado River between Lees Ferry and Glen Canyon Dam about 7.5 river miles above and northeast of the Paria River. There are several intermittent swales on the cliff above the project site; these empty into a runoff channel that helped form the slough at the project site. This slough, which does not connect to the main return channel marsh area except during storm flood events, is fed both by groundwater and intermittently by stormwater runoff from the plateau above the project site. The flow of the Colorado River is controlled by the operation of Glen Canyon Dam and the temperature is relatively constant year-round, averaging 46°F (8°C). Due to the construction and operations of the dam the sediment load drops out of suspension in the upper reaches of Lake Powell; at Lee's Ferry the river water is transparent and nutrient levels are low. The flows range from 5,000 cubic feet per second (cfs) to about 25,000 cfs. Occasional controlled floods, limited by dam capability, are conducted by the Bureau of Reclamation for natural resource related values.

Water quality values are closely monitored by the USGS under contract to Reclamation as part of their requirements generated by the 1995 EIS and supplemental 2006 Experimental Flows EA as well as the State of Utah as part of their responsibilities associated with the Clean Water Act.

Currently the water quality in the project area can be qualified as meeting Arizona State standards as a recreational and drinking water source. Parameters monitored include, dissolved oxygen and pH, temperature, salinity, phosphorus, nitrogen, major-ion chemistry composition and biological indicators such as chlorophyll and plankton (USGS Circular 1282).

Impact Analysis

The project, which is located within the active flood plain of the Colorado River, would have a short- term minor impact to local area water quality, including water in the slough, due to accidental spills of herbicides, fuels, lubricants, as well as and soil into the river. Removal of tamarisk, disturbance associated with the project, e.g., bank trampling, etc. will increase compacted bare sand/soil, some of which may run off into the marsh and cause short- term turbidity problems following either dam controlled releases of storm runoff events. There may also be short- term minor impacts to the slough and river in the vicinity of the project area due to increased levels of phosphorus due to the ash contribution from burning dried vegetation debris piles created during the revegetation process.

Cumulative Effect

The preferred alternative in concert with the ongoing management of the dam, including the various water release scenarios would have a cumulative, negligible, short- term, adverse impact to the water quality of the slough and the Colorado River in the vicinity of the project area when considered with other past, present, and reasonably foreseeable future actions.

Conclusion:

The preferred alternative would have minor short- term adverse impact to water quality at the project site. This effect would be lessened to the negligible level by developing and instituting a Stormwater Pollution Prevention Plan with erosion control measures. Mitigation measures for water resources are identified on page 22 of this document. Because there would be no major, adverse impacts to a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of Glen Canyon National Recreation Area; (2) key to the natural or cultural integrity of the recreation area; or (3) identified as a goal in the recreation area's general management plan or other relevant National Park Service planning documents, there would be no impairment of the recreation area's resources or values. Implementation of this alternative would not result in any unacceptable impacts and is consistent with §1.4.7.1 of *NPS Management Policies 2006*.

Wilderness Character

Glen Canyon's wilderness is managed in a means that is consistent with national wilderness policies: they are managed to protect physical wilderness resources as well as wilderness character, consistent with the direction of *NPS Management Policies* and *The Wilderness Act*.

In order to protect and promote wilderness character, project management must consider the purpose of an action and the spirit in which it was carried out. The *Wilderness Act* identifies two key components of wilderness character as:

- Generally appearing to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable; and
- Having outstanding opportunities for solitude or a primitive and unconfined type of recreation.

Providing opportunities for solitude would include managing for visitor experiences with the

following characteristics:

- Freedom from the reminders of society
- Privacy and isolation in natural surroundings
- Absence of distractions such as large groups, mechanization, unnatural noise, signs, and other modern artifacts (*Federal Register*, Vol. 66, No. 10, p. 3713).

However, at its essence wilderness character is unseen and immeasurable; a unique challenge for wilderness managers. Wilderness character includes the natural and scenic condition of the land, natural numbers, cycles, and interactions of wildlife, and the integrity of ecological processes. At its core though, wilderness character, like personal character, is much more than a physical condition. The character of wilderness is an unseen presence capable of refocusing our perception of nature and our relationship to it. It is that quality that lifts our connection to a landscape from the utilitarian, commodity orientation that dominates the major part of our relationship with nature to the symbolic realm serving other human needs [(*Federal Register*, Vol. 66, No. 10, p. 3729- 3730) Isle Royal 2005].

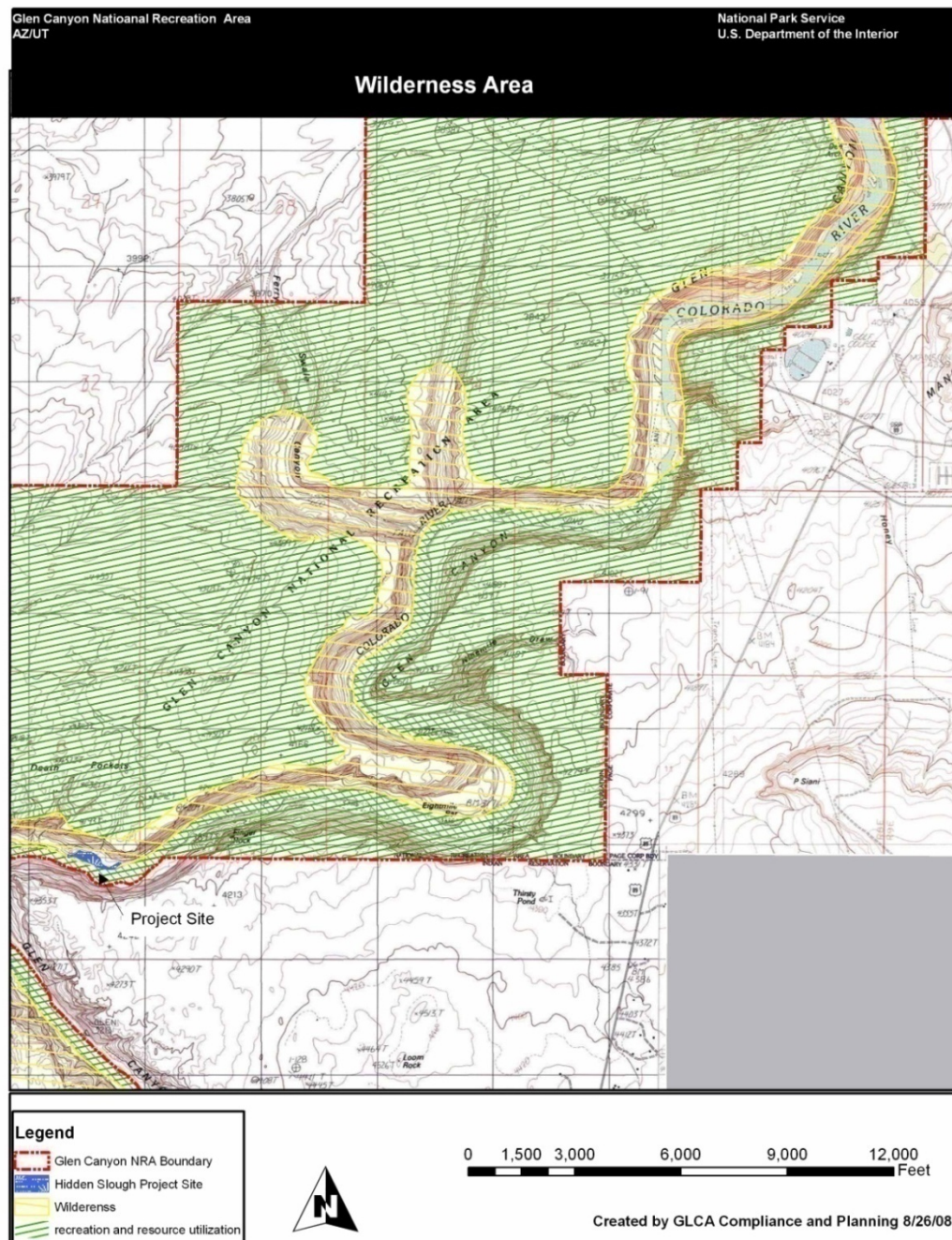
Intensity Level Definitions

- Negligible:** Effects to wilderness character or experience would be slight, and would be very localized in area and very short in duration (a day or less). The action would not cause a fundamental change in the character of Glen Canyon's recommended wilderness.
- Minor:** **Adverse:** Effects to wilderness character or experience would be relatively small, and would be localized in area or short in duration. The action would not cause a fundamental change in the wilderness character of Glen Canyon's recommended wilderness.
- Beneficial:** Effects would make improvements to wilderness character or experience in a localized area or for a short duration.
- Moderate:** **Adverse:** Effects to wilderness character or experience, including the size of the area affected and the duration would be intermediate. The action would not cause a fundamental change in the wilderness character of Glen Canyon's recommended wilderness.
- Beneficial:** Effects would make improvements to wilderness character or experience. Effects would be felt beyond the immediate project location.
- Major:** **Adverse:** Effects to wilderness character or experience, including the size of the area affected and the duration would be substantial. The action would cause a fundamental change in the wilderness character of Glen Canyon's recommended wilderness.
- Beneficial:** Effects would make substantial improvements to wilderness character or experience well beyond the immediate area of the project.

Existing Conditions

The Wilderness Act directs agencies responsible for managing wilderness to study wilderness resources and values. In keeping with the Wilderness Act requirements, Glen Canyon NRA completed various wilderness studies and an associated Environmental Impact Statement for recommended wilderness designation within the park in 1990 (NPS 1980). This resulted in Glen Canyon NRA identifying 588,855 acres of recommended wilderness and an additional 48,955 acres of potential wilderness for a total of 637,810 acres that meet the requirements of the Wilderness Act. The project area as seen in Figure 3 is located within the acreage identified as eligible for inclusion within this system.

Figure 3. Wilderness Area in Relationship to Project Area



Impact Analysis

Impacts of Alternative A - No Action Alternative

There are no impacts from alternative A to wilderness character or experience.

Impacts of Alternative B

Impact Analysis

The project would have long- term, moderate impacts due to the very visible removal of tamarisk and the replanting of native vegetation. This effect, which could be seen by all flat water rafting visitors, as well as many visitors using fishing guides or private vessels, would be most visible during the tamarisk removal stage and during the early growing periods for the new plants. Most of the plants would reach maturity in about 3 to 5 years; during this time the effect would become much less noticeable. The project would also have long- term beneficial impacts due to the replacement of non- native tamarisk with a healthy native ecosystem. Section 4(b) of the Wilderness Act of 1964 states “ except as otherwise provided in this chapter, each agency administering any area designated as wilderness shall be responsible for preserving the wilderness character of the area and shall so administer such area for such other purposes for which it may have been established as also to preserve its wilderness character. Except as otherwise provided in this Act, wilderness areas shall be devoted to the public purposes of recreational, scenic, scientific, educational, conservation, and historical use. This project is being accomplished in order to conserve and enhance the native vegetation at this site on the Colorado River.

Cumulative Impacts

While use of tamarisk beetle as biological control is increasing along the Colorado River, Glen Canyon NRA would not approve of its use until a reasonable amount of data on the pros and cons of its use is available: this information would not be available within the timeframe of this project, therefore the use of tamarisk beetles would not have a cumulative impact when considered with the project and other past, present and foreseeable future projects. There would be no other cumulative impacts associated with the alternative.

Conclusion

Because there would be no major, adverse impacts to a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of Glen Canyon National Recreation Area; (2) key to the natural or cultural integrity of the recreation area; or (3) identified as a goal in the recreation area’s general management plan or other relevant National Park Service planning documents, there would be no impairment of the recreation area’s resources or values. Implementation of this alternative would not result in any unacceptable impacts and is consistent with §1.4.7.1 of *NPS Management Policies* 2006.

Wildlife

Intensity Level Definitions

Negligible: Impacts would result in a change to a population or individuals of a species or a resource, but the change would be well within the range of natural fluctuations.

Minor: **Adverse:** An action that would affect a few individuals of a wildlife species or have very localized impacts upon their habitat. The change would have barely perceptible consequences to the species or habitat function. Sufficient habitat would remain functional to maintain viability of all species. Impacts would be outside of critical reproduction periods for sensitive species. Mitigation measures, if needed to offset adverse effects, would be simple and successful.

Beneficial: An action would improve the habitat of a few individuals of wildlife species in the localized project area.

Moderate: **Adverse:** An action that would cause measurable effects on: (1) a relatively small percentage of the population of a wildlife species, (2) the existing dynamics between multiple species (e.g., predator- prey, herbivore- forage, vegetation structure- wildlife breeding habitat), or (3) a relatively large habitat area or important habitat attributes. A wildlife population or habitat might deviate from normal levels under existing conditions, but would remain indefinitely viable within the preserve. Response to disturbance by some individuals could be expected, with some negative impacts to feeding, reproduction, or other factors impacting short- term population levels. Sufficient habitat would remain functional to maintain variability of all native wildlife species. Some impacts might occur during critical periods of reproduction or in key habitat for sensitive native species. Mitigation measures, if needed to offset adverse effects, could be extensive, but would likely be successful.

Beneficial: An action would measurably improve the living circumstances of a small percentage of a population of wildlife species or bring into balance the existing dynamics between multiple species or a critical portion of their habitat. The effect would be felt well beyond the boundary of the project area.

Major: **Adverse:** An action that would have drastic and permanent consequences for a wildlife species population, dynamics between multiple species, or almost all available unique habitats. A wildlife population or its habitat would be permanently altered from normal levels under existing conditions, and the species would be at risk of extirpation from the preserve. Frequent responses to disturbance by some individuals would be expected, with negative impacts to feeding, reproduction, or other factors resulting in a decrease in population levels. Extensive mitigation measures would be needed to offset any adverse effects and their success would not be guaranteed.

Beneficial: The action would stabilize or increase the population of wildlife species, improve the dynamics between multiple species or improve all available unique habitats for multiple species. The effects would be felt across a large swath of multiple species home ranges.

Existing Condition

The overall project area follows the Colorado River, which supports waterfowl and riparian bird communities, and a modest upland bird assemblage. Avian surveys conducted by Park staff between 1992 and 1999 documented >50 species of riparian birds using the river corridor during migration, breeding and wintering, and 12 species at the project site. These included Black-chinned Hummingbird, Mourning Dove, Ash-throated Flycatcher, willow flycatcher, Bewick's wren, Blue-gray Gnatcatcher, Common Yellowthroat, Yellow-breasted Chat, Blue Grosbeak, Brown-headed Cowbird, Bullock's Oriole and House Finch. Large numbers of waterfowl occupy the Glen Canyon reach between November and March, with concentrations of more than 3,000 birds of 20 or more species in some years. Overwintering waterfowl have been observed using the slough and beach front portion of the project area. They are not generally found within the tamarisk removal area.

Due to changes brought on by construction of the Glen Canyon Dam, the river water at the project site is generally very cold and clear, which perfectly supports a significant population of non-native Rainbow trout (*Oncorhynchus mykiss*) and a few species of other native and non-native fish. Due to the changes in the water quality, native fishes are only rarely found in this stretch of the Colorado. The diet consists mainly of both aquatic and terrestrial insects and other aquatic invertebrates including amphipods. Rainbow trout like cold water temperatures and rarely live in water above about 77°F (25°C) (USGS 2005).

A wide array of mammals can be found living or temporarily visiting the project site: these include coyotes (*Canis latrans*), bobcats (*Felis rufus*), black-tailed jackrabbit (*Lepus californicus*), beaver (*Castor canadensis*), chipmunks and ground squirrels, badger (*Taxidea taxus*), and a variety of bats, mice, rats and the occasional gray fox.

Reptiles and amphibians include a variety of toads, snakes and lizards, including Red-spotted toad (*Bufo punctatus*), Woodhouse's toad (*Bufo woodhousii*), long-nosed lizard (*Gambella wislizenii*), common chuckwalla (*Sauromalus obesus*), desert spiny lizard (*Sceloporus magister*), side-blotched lizard (*Uta stansburiana*), western whiptail (*Cnemidophorus tigris*), common kingsnake (*Lampropeltis getula*), striped whipsnake (*Masticophis taeniatus*), and Western patch-nosed snake (*Salvadora hexalepis*) (NPS 2008).

Invertebrates include both aquatic species including New Zealand mudsnails (*Potamopyrgus antipodarum*) a non-native invasive species, small crustaceans known as scuds or side-swimmers (*Gammarus lacustris*) and a variety of midges (chironomids ssp) and terrestrial species, including a variety of arthropods, including butterfly and moths, and grasshoppers.

Short- term, adverse impacts include noise disturbance and inadvertent trampling of habitat during construction. Long- term, adverse impacts include the permanent removal of habitat that some individuals of a small portion of the above mentioned species use as home. Both short- term and long- term impacts are negligible as the project is only permanently removing 3 acres of tamarisk, and this habitat type and the species that reside or visit this area are very common along the whole length of the Colorado River drainage basin. Most mobile species will likely flee the site and shelter in the surrounding habitat as soon as construction begins.

The majority of wildlife using the Hidden Slough Site is either found within the wetland area or the upland area. The three acres of tamarisk that is being removed provided fairly low habitat value and use is generally confined to a variety of arthropods and birds.

Impact Analysis of Alternative A – The No Action Alternative

Impact Analysis

Without the proposed project the project site would continue to host a lesser diversity and abundance of wildlife species than is found in native habitats in the region. As tamarisk continues to spread, this problem will become more acute over time. Additionally tamarisk catches fire easily and burns hot and fast. The large amount of tamarisk at the project site would kill or maim a variety of wildlife. It would also displace a number of individuals including those that return to the same site to nest year after year.

Cumulative Impacts: None

Conclusion

Alternative A would result in long- term minor adverse impacts due to ongoing degradation of the project area by increasing amounts of invasive tamarisk. There would also be both short- term and long- term negligible impacts due to removal of wildlife habitat by wildfire.

Impacts Analysis for Alternative B

Impact Analysis

The project would benefit the birds and other wildlife once the native species are establish, but before the vegetation becomes established, the project would result in a 3- 5 year drop in diversity.

Cumulative Impacts

There would be no cumulative impacts to wildlife from past, present or foreseeable future project when added to the impacts of Alternative B. The project would be replacing a non- native tamarisk community with a native plant community, neither which occurred at the site before Glen Canyon Dam was built. The regulated water flows from the dam allows for the continued maintenance of the tamarisk as well as the maintenance of the new native plants.

Conclusion

The wildlife community using the project area would likely suffer both a short- term and long- term (depending on site fidelity of individual species of wildlife), adverse, minor impact due to displacement during tamarisk removal and revegetation activities. As there would be no

unacceptable impacts to wildlife; the proposed actions are consistent with §1.4.7.1 of NPS *Management Policies* 2006 this topic is dismissed from further analysis in this document.

CONSULTATION AND COORDINATION

External Scoping

Notification and Comments

Notification of the public scoping period for the preparation of the proposed EA was released December 21, 2007. The public scoping period ran for 30 consecutive days. Letters and postcards providing notification of public scoping were sent out to a variety of individuals, tribes and agencies. Notice was also posted on the NPS Planning, Environment, and Public Comment System web site at <http://parkplanning.nps.gov/>. Public notices were also released to local news organizations.

Comments were received from one individual and one organization.

U.S. Fish and Wildlife Service

The USFWS was provided with a letter requesting species information during the public scoping period. On January 17, 2006 they responded with a list of concerns. An informal consultation meeting was held at Lees Ferry on May 25, 2006 between Mr. Bill Austin of the USFWS and park staff. A biological assessment of the impacts to threatened and endangered species was forwarded to the Southwestern Ecological Services Office of the USFWS in December, 2007. After several meetings, site visits and exchanges of requested information, the USFWS provided concurrence with the project on June 19, 2008. Their concurrence included conservation and mitigation measures have been included in this EA and are available for review in the appendices.

Arizona State Historic Preservation Office

Informal consultation was conducted with staff from the Arizona State Historic Preservation office and park staff between September 12 and September 29, 2007. Subsequently Glen Canyon NRA requested in writing concurrence on the park's determination of "No Effect" to properties eligible for listing on the National Register of Historic Places (see appendices).

Tribes/Nations

Federal legislation and NPS policy require personnel within the NPS to consult with Native Americans if any federal action may affect areas of cultural importance to them. Identification of such resources was made through direct mailing of a scoping letter to the Tribes with cultural affinity to the area. On July 12, 2007, we received a letter from the Historic Preservation Department of the Navajo Nation. In their letter they found that the proposed undertaking would not impact any Navajo traditional cultural properties. They did request that certain protective measure be put in place in the case of inadvertent discoveries. These included immediate cessation of work and that they be given telephone notification with 24 hours and a formal letter within 72 hours and that work not continue until approved (by the Navajo Nation) mitigation measures are developed. These requests have been incorporated into the Revegetation Plan.

Tribal governments for each of the following Native American communities were provided information about the project through the Native American Liaison of Glen Canyon NRA regarding

the nature of the project. Comments, questions, and concerns were sought to determine their interest, use, and impacts on those resources important to them.

- Kaibab Paiute Tribe
- Kanosh Band of Paiute Indian Tribe of Utah
- Koosharem Band of the Paiute Indian Tribe of Utah
- Navajo Nation
 - Oljato Chapter
 - Coppermine Chapter
 - Inscription House Chapter
 - Gap/Bodaway Chapter
 - Navajo Mountain Chapter
 - LeChee Chapter
 - Shonto Chapter
 - Kaibeto Chapter
- San Juan Southern Paiute Tribe
- Shivwits Band of Southern Paiute
- White Mesa Ute Band of the Ute Mountain Tribe

Internal Scoping

The NPS identified members of an internal interdisciplinary team that met several times in 2006, 2007 and 2008 to discuss project objectives, issues, impact topics, possible alternatives, and the results of public scoping. The team consisted of park division managers from Glen Canyon NRA and GCNP as well as specialists in cultural resources, natural resources, maintenance, visitor protection and Native American relations. The objectives, issues, potential impacts assessment, and alternatives described in this document were identified by the team and described for a public scoping newsletter that was issued in December 2006 (see appendices). Concurrently, consultations with the USFWS, the SHPO, and Native American tribes were initiated. Based on the responses received and subsequent ID team communications, the Environmental Assessment was narrowed to revegetation of the Hidden Slough Site. Impact topics and action alternatives were then refined and finalized prior to analysis. Additional details concerning public scoping and consultation documented for this project are provided in the *Public Scoping* portion of this EA.

Environmental Assessment List of Recipients

The following agencies, tribes, and organizations have been notified of the release of this EA with information on how to obtain copies. Landowners adjacent to the Glen Canyon NRA and other interested parties have also been sent notification of the availability of the document with information on how to obtain copies.

Bureau of Land Management
Grand Staircase Escalante National Monument
National Park Service
Grand Canyon National Park
U.S. Bureau of Reclamation

U.S. Environmental Protection Agency, Region VIII
U.S. Fish and Wildlife Service
U.S. Geological Survey, Grand Canyon Monitoring and Research Center
Arizona State Office
U.S. House of Representatives
U.S. Senate
U.S. Army Corps of Engineers, Los Angeles Division

State Agencies

Arizona Department of Environmental Quality
Arizona Game and Fish Department
Arizona Historic Preservation Office

Tribes and Native American Interests

Hopi Tribe
Kaibab Paiute Tribe
Kanoosh Band of Paiute Indian Tribe of Utah
Koosharem Band of the Paiute Indian Tribe of Utah
Navajo Nation
Oljato Chapter Coppermine Chapter
Inscription House Chapter Gap/Bodaway Chapter
Navajo Mountain Chapter LeChee Chapter
Shonto Chapter Kaibeto Chapter
San Juan Southern Paiute Tribe
Shivwits Band of Southern Paiute
White Mesa Ute Band of the Ute Mountain Tribe

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Mr. Chris Brod – Project Designer – Grand Canyon Wildlands Council – Flagstaff, AZ

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Appendix A - Public Scoping Brochure



National Park Service
U.S. Department of the Interior

FOR IMMEDIATE RELEASE
December 21, 2006 06-36

Glen Canyon National
Recreation Area

691 Scenic View Dr.
PO Box 1507
Page, AZ 86040-1507

CONTACT: Kevin Schneider
928-608-6208

Glen Canyon News Release

Scoping Begins for Project to Restore Native Vegetation along Colorado River

Page, Ariz. – Glen Canyon National Recreation Area is initiating an environmental assessment to restore native vegetation to the Colorado River between Lees Ferry and the Glen Canyon Dam. This spectacular 15- mile stretch of river has been invaded by non- native tamarisk, a highly aggressive weed found throughout the Southwest. Tamarisk, also called salt cedar, chokes out other native species by increasing the salinity of the soil.

The project is intended to develop a 20- year master plan to restore native vegetation to this stretch of the river. Initially, a six- acre site at Hidden Springs, located 6.5 miles upriver from Lees Ferry will be restored. The plan proposes to remove tamarisk while planting native upland and riparian species. Irrigation systems would be used as necessary to insure that native species become established.

The National Park Service is currently seeking public comments on the scope of the environmental assessment to help identify issues and alternatives for the analysis. The environmental assessment, expected to be completed in spring 2007, will analyze the potential impacts to the natural, cultural, and human environment associated with the proposal.

Comments may be submitted online at: <http://parkplanning.nps.gov/glca> or by mailing them to: Colorado River Vegetation Restoration EA, P.O. Box 1507, Page, AZ 86040. All public scoping comments must be received by January 26, 2007. Additional information about the project is also available at parkplanning.nps.gov/glca.

– www.nps.gov/glca –

Appendix B - USFWS Consultation Letter--



United States Department of the Interior

U.S. Fish and Wildlife Service

Arizona Ecological Services Field Office

2321 West Royal Palm Road, Suite 103

Phoenix, Arizona 85021-4951

Telephone: (602) 242-0210 Fax: (602) 242-2513



In Reply Refer to:

AESO/SE

22410-2008-I-0346

June 19, 2008

Memorandum

To: Superintendent, Glen Canyon National Recreation Area, Page, Arizona

From: Field Supervisor

Subject: Concurrence for the Colorado River Riparian Revegetation Plan at the Hidden Slough Site (-6.5 Mile)

Thank you for your correspondence of June 6, 2008. This memorandum documents our review of the proposed project titled Colorado River Riparian Revegetation Plan at the Hidden Slough Site (-6.5 Mile) on the Colorado River within Glen Canyon National Recreation Area (GLCA) in Coconino County, Arizona, in compliance with section 7 of the Endangered Species Act of 1973 (ESA) as amended (16 U.S.C. 1531 et seq.). Your correspondence included determinations that the proposed project may affect, but is not likely to adversely affect, the California condor (*Gymnogyps californianus*), humpback chub (*Gila cypha*) and its critical habitat, Mexican spotted owl (MSO) (*Strix occidentalis lucida*), southwestern willow flycatcher (*Empidonax traillii extimus*), and razorback sucker (*Xyrauchen texanus*) and its critical habitat. We concur with your determinations and provide our rationales below.

PROPOSED ACTION

A complete description of the proposed action is in your biological assessment. That document is incorporated herein by reference. The proposed action is a six-acre riparian revegetation project at the Hidden Slough Site at mile -6.5R (6.5 miles upstream from Lees Ferry on the right side of the river looking downstream). The information gained from the project will be used to implement a 20-year Colorado River Riparian Revegetation Plan for Glen Canyon NRA along the 15.5-mile reach of the Colorado River between Glen Canyon Dam and Lees Ferry. The results from this first site will be used to refine approaches, methods, and cost effectiveness in the further removal of non-native vegetation and planting of native vegetation. Due to the long-term nature of the plan, consultation begins with this initial restoration site, with consultation on the remaining plan to occur at a later date. A detailed site plan for the Hidden Slough site will be developed for approval by the National Park Service prior to initiation of work at the site.

Three acres of established tamarisk will be cleared with minimal disturbance of existing native vegetation. Tamarisk will be flush-cut at the trunk using chainsaws or hand tools and immediately painted with Garlon-4, an herbicide approved by the National Park Service for tamarisk control. Existing native vegetation on the site will not be affected, to the extent possible. Any new sprouting of tamarisk from Garlon-4 treated stumps will be cut and the stumps re-treated with the herbicide. Tamarisk will be removed from mid-August to September 2008, and removal will take from two to five days depending on the crew size.

Large trunks and limbs of the cleared tamarisk will be placed and sunk into the Colorado River across from the project site. Due to the size and weight of the larger branches and the controlled amount of water releases from the dam, the sunken material is likely to remain in place and not move down river.

All remaining woody material removed will be burned in September and October 2008 depending on dryness of the materials and weather. Weather and river-level events may slowly move the ash into the river and may produce a spike of phosphorus. The amount of ash produced will be relatively small and is likely to be quickly diluted and dissipated by the volume of water in the river.

Approximately 1,200 poles, plugs, or rooted cuttings of native plants will be prepared for the Hidden Slough site. If possible, planting stock will be collected from the actual Hidden Slough site, the Lees Ferry area, or the river corridor within GLCA. Such sites should provide sufficient stock of plugs or poles of riparian species including Goodding's and coyote willow, Fremont cottonwood, and seep willow. If sufficient plant material cannot be collected from those locations, Clay Hills Crossing and the Paria River in GLCA have been identified as alternative collection sites. For those species for which rooted cuttings are required, cuttings will be planted in one-gallon pots at an irrigated site behind the Lees Ferry Ranger Station. The local cuttings may consist of Goodding's willow, coyote willow, Fremont cottonwood and four-wing saltbush.

Native plants will be planted according to a site planting design. Species may include Goodding's willow, sandbar willow, four-wing saltbush, arrow weed, Turbinella oak, net leaf hackberry, and other species. Limited amounts of Fremont cottonwood will be planted at the site. Large trees (Goodding's willow, hackberry, and others) will be planted approximately 15 to 20 feet apart. Smaller trees, such as sandbar willows, will be planted approximately 5 to 10 feet apart, along with patches of shrubs such as four-winged saltbush. The trees will be about 16 to 24 inches tall when planted. Approximately 100 per day will be planted. A four-foot-high, 12-gauge, protective welded wire fence will be installed where needed to prevent damage from browsers.

Pole planting will occur in October and November 2008. Soil will be augered where each propagule is to be planted. Augered holes will be at least eight inches in diameter and up to six feet deep to the water table or to refusal. The auguring will till the soil and break up any subsurface aquacludes (barriers to moisture movement) in the soil profile. The augered soil will serve as the backfill for the augured holes.

Drip irrigation lines will be established to enhance root penetration to the water table. A battery-powered or solar-operated automatic irrigation timing system will be installed. The system will feature a ground-level polyethylene main line with polyethylene laterals. Where needed, planting holes will be serviced by an up to four gallons per hour (gph) drip emitter (the exact rate will depend on individual plant needs). Once the native plantings have rooted into the water table in two to three years, the irrigation system will be removed. The irrigation system requires a minimum of one gas-powered water pump to fill a minimum of two tanks in separate locations. Pump(s) may run approximately 30 minutes to less than an hour depending on the size, number, and type of portable water storage tank(s). The maximum running time one pump would need to operate in one day for 1,200 plants at four gallons per plant would be 30 minutes. Larger tanks would require more time of operation but at a lower frequency. For example, two 4,000-gallon tanks would require 48 minutes of pump operation, but would only require filling every 1.67 days. Initially, the plants may need watering every day for two to three weeks, but the rate of watering will decrease as plants become established.

During the first two growing seasons (mid-March through mid-October) and where appropriate, plantings will receive up to four gallons of water per day for four days a week over a period of 28 weeks. This irrigation will continue into the second growing season until plantings are rooted into the water table, a condition that will be assessed on site by the consulting biologist and GLCA staff. Willow will not be planted in areas where depth to a permanent water source exceeds six feet. The area will be weeded to remove non-native plants. Any native trees that die during the irrigation period will be replanted. Weed control will continue into the third growing season if necessary for successful plant establishment.

In upland areas, revegetation methods may include broadcasting native seeds on wet soils or planting drought-tolerant species (such as four-wing saltbush). A native seed mix will be developed for this purpose.

CONSERVATION MEASURES

The following conservation measures from your biological assessment of the project are part of the proposed action:

California Condor

- If a condor is spotted directly on or over the construction site, activities will cease until the bird leaves or is driven off by a GLCA biologist.
- Construction workers and supervisors are instructed to avoid interaction with condors and to immediately contact the appropriate Park personnel (Mr. John Spence, at 928-608-6267) if and when condor(s) settle at the construction site.
- The construction site will be cleaned up at the end of each day (e.g., trash removed, scrap materials picked up) to minimize the likelihood of condors visiting the site.

- All dead animals found within 500 feet of the construction zone will be immediately disposed of by placing the carcass in the nearest available dumpster.
- To prevent water contamination and potential poisoning of condors, a spill prevention and clean-up plan will be developed and implemented for the project. It will include provisions for immediate clean-up of any hazardous substance and will define how each hazardous substance will be treated in case of leakage or spill.
- All construction personnel will be given a copy of literature regarding condor concerns.
- Project personnel are strictly prohibited from hazing condors.

DETERMINATION OF EFFECTS

We concur with your determinations that the proposed project may affect, but is not likely to adversely affect, the California condor, humpback chub and its critical habitat, Mexican spotted owl, southwestern willow flycatcher, and razorback sucker and its critical habitat for the following reasons:

California Condor

- Conservation measures that are part of the proposed action will eliminate or minimize potential effects to condors.

Humpback Chub and Critical Habitat

- Large pieces of tamarisk placed in the river at the project site are likely to remain in place and not reach critical habitat that begins at the confluence with Nautiloid Canyon.
- Any ash from tamarisk burned at the site that may enter the river will be sufficiently diluted and dissipated by the volume of the water in the river to avoid any adverse impacts to humpback chub and its critical habitat.

Mexican Spotted Owl

- Effects to key habitat components of Mexican spotted owl habitat will be insignificant and discountable.
- Tamarisk removal will begin in mid-August but will be completed in no more than five days. Operation of gas-powered water pumps will occur from mid-March through mid-October for up to three years. However, operation of the pumps will occur no more than approximately 30-50 minutes per day, and noise from the pumps is expected to be minimal. Tamarisk burning and pole planting will occur outside of the MSO breeding season. Thus, project-generated noise will be insignificant and discountable to breeding Mexican spotted owls that may be present in the area.

Southwestern Willow Flycatcher

- The project site does not contain habitat for breeding flycatchers.
- A 2006 survey did not detect breeding flycatchers.

Razorback Sucker and Critical Habitat

- Large pieces of tamarisk placed in the river at the project site are likely to remain in place and not reach critical habitat that begins at the confluence with the Paria River.
- Any ash from tamarisk burned at the site that may enter the river will be sufficiently diluted and dissipated by the volume of the water in the river to avoid any adverse impacts to razorback sucker and its critical habitat.

Thank you for your continued coordination. No further section 7 consultation is required for this project at this time. Should project plans change, or if information on the distribution or abundance of listed species or critical habitat becomes available, these determinations may need to be reconsidered. We also encourage you to coordinate the review of this project with the Arizona Game and Fish Department. In all future correspondence on this project, please refer to the consultation number 22410-2008-I-0346. Should you require further assistance, or if you have any questions, please contact Bill Austin at (928) 226-0614 (x102) or Brenda Smith (x101).

Brenda H. Smith

for Steven L. Spangle

cc: Barbara Wilson, Environmental Specialist, Glen Canyon National Recreation Area, Page, AZ
Shaula Hedwall, Fish and Wildlife Service, Flagstaff, AZ
Chief, Habitat Branch, Arizona Game and Fish Department, Phoenix, AZ

W:\Bill Austin\HIDSLOUCONC.346 for brendas sig:cgg

Appendix C

Consultation with the State Historic Preservation Office



United States Department of the Interior

NATIONAL PARK SERVICE
Glen Canyon National Recreation Area
P.O. Box 1507
Page, Arizona 86040



IN REPLY REFER TO:

H4217

AUG 29 2008

Ms. Ann Howard
State Historic Preservation Office
Arizona State Parks
1300 West Washington Street
Phoenix, Arizona 85007

Subject: §106 Compliance; Glen Canyon National Recreation Area (NRA); Environmental Assessment (EA) for Hidden Slough Pilot Site

Dear Ms. Howard:

With this letter we are submitting for your review a copy of the above referenced EA in order to fulfill our requirements under Section 106 of the National Historic Preservation Act. Also enclosed is an Assessment of Effect form describing the proposed undertaking and its area of potential effects.

The area of potential effect (APE) was intensively surveyed with negative results (Fairley et al. 1994; a .pdf version of this document can be downloaded at <http://www.gcmrc.gov/library/reports/GrandCanyon/Fairley1994.pdf>). The survey meets the Secretary of Interior's Standards and Guidelines for Archeology and Historic Preservation. In addition, Native American tribes traditionally associated with the lands of Glen Canyon NRA were notified of the proposed action, and no known properties of religious or cultural significance were identified in the APE.

In accordance with 36 CFR 800.4(d)(1), Glen Canyon NRA determined that there would be no historic properties affected by the proposed action. However, it is our opinion that there is a potential for impacts to as yet unidentified buried resources if they exist in the APE. Accordingly, included in the EA is a requirement for the use of a cultural resource professional, who will ensure that protective measures are implemented.

A qualified archaeologist will monitor all disturbance activities (e.g., tamarisk cutting and using an auger to dig holes) in the event that previously unidentified cultural resources are exposed or brought to the surface. If during any phase of the undertaking unknown historic properties are discovered, ground disturbing activities will halt and consultation to establish and implement proper mitigating procedures will begin. In the event of inadvertent discoveries, Glen Canyon

NRA will operate under the *Memorandum of Agreement Regarding Intentional Excavation and/or the*

Inadvertent Discovery of Native American Remains and Associated Funerary Objects at Glen Canyon NRA and Rainbow Bridge National Monument.

These mitigation measures are included in the revegetation plan and in the EA. The determination of no historic properties affected is documented on the enclosed Assessment of Effect form. If you concur with the Assessment of Effect, please sign in the space provided below and return this letter to us.

If you would like to discuss this recommendation or have any questions concerning this project, please call Archaeological Technician Nathaniel Baker at (928) 608-6263.

Thank you for your consideration.

Sincerely,


for Stan Austin
Superintendent

Enclosure

_____ I concur with the Assessment of Effect

_____ I do not concur with the Assessment of Effect

Signed: _____ Date: _____
Arizona State Historic Preservation Officer

Appendix D

Wilderness Minimum Tool



ARTHUR CARHART NATIONAL WILDERNESS TRAINING CENTER

MINIMUM REQUIREMENTS DECISION GUIDE

WORKSHEETS

“... except as necessary to meet minimum requirements for the administration of the area for the purpose of this Act...”

– The Wilderness Act, 1964

Please refer to the accompanying *MRDG Instructions* [click here](#) for filling out this guide. The spaces in the worksheets will expand as necessary as you enter your response.

Step 1: Determine if it is necessary to take action.

Description: Briefly describe the situation that may prompt action.

Executive Order 13112 (1999) on Invasive Species requires all federal agencies to:

- ✓ identify actions that may affect the status of invasive species,
- ✓ prevent the introduction of invasive species,
- ✓ detect and respond rapidly to and control populations of such species in a cost- effective and environmentally sound manner,
- ✓ monitor invasive species populations accurately and reliably,
- ✓ provide for restoration of native species and habitat conditions in ecosystems that have been invaded,
- ✓ conduct research on invasive species and develop technologies to prevent introduction and provide for environmentally sound control of invasive species, and
- ✓ promote public education on invasive species and the means to address them.

NPS Management Policies (2006) states that “exotic species will not be allowed to displace native species if displacement can be prevented”. It further stipulates “all exotic plant and animal species

that are not maintained to meet an identified park purpose will be managed . . . if control is prudent and feasible, and the exotic species interferes with natural processes and the perpetuation of natural features, native species or natural habitats”

The General Management Plan for Glen Canyon National Recreation Area (1979) states that the recreation area was established “to provide for public outdoor recreation use and enjoyment of Lake Powell and lands adjacent thereto. . . and to preserve scenic, scientific, and historic features contributing to public enjoyment of the area” (Public Law 92- 593, 92nd Congress, S. 27, October 27, 1972). Invasive plants threaten the ecological integrity of the riverine environment, a key resource for this unit of the National Park system.

The park is proposing to remove approximately 3 acres of invasive tamarisk and replacing it with a variety of native vegetation. As the project site is not accessible from overland, it must be accessed via the Colorado River. Additionally, tools needed to complete the project include hand tools, such a saws, rakes, shovels, etc and power equipment including chain saws, motorized augers and gasoline powered generators, needed to pump water from the river into the storage tanks. Additionally, an herbicide; Garlon will be used to treat the stumps after the trunks are cut near the ground. This will stop re- growth from occurring. Revegetation activities will be noticeable to all using the river. The project area is located in an area identified as having character that would make it eligible for inclusion in the National Wilderness Preservation System (1980 Glen Canyon NRA Wilderness Recommendation).

A. Describe Valid Existing Rights or Special Provisions of Wilderness Legislation

Are there valid existing rights or is there a special provision in wilderness legislation (the Wilderness Act of 1964 or subsequent wilderness laws) that allows consideration of action involving Section 4(c) uses? Cite law and section.

Yes: x

No: ☐

Not Applicable: ☐

Explain:

Section 4(b) of the Wilderness Act of 1964:

(b) Except as otherwise provided in this chapter, each agency administering any area designated as wilderness shall be responsible for preserving the wilderness character of the area and shall so administer such area for such other purposes for which it may have been established as also to preserve its wilderness character. Except as otherwise provided in this Act, wilderness areas shall be devoted to the public purposes of recreational, scenic, scientific, educational, conservation, and historical use.

This project is being accomplished in order to conserve and enhance the native vegetation at this site on the Colorado River.

B. Describe Requirements of Other Legislation
Do other laws require action?

Yes: X

No: ☐

Not Applicable: ☐

Explain:

NPS Organic Act (16 USC, Chapter 1, Subchapter I, Section 1):

"The service thus established shall promote and regulate the use of the Federal areas known as national parks, monuments, and reservations . . . by such means and measures as conform to the fundamental purpose of the said parks, monuments, and reservations, which purpose is to conserve the scenery and the natural and historic objects and the wildlife therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations."

NPS Organic Act (16 USC, Chapter 1, Subchapter I, Section 1a- 1):

"The authorization of activities shall be construed and the protection, management, and administration of these areas shall be conducted in light of the high public value and integrity of the National Park System and shall not be exercised in derogation of the values and purposes for which these various areas have been established, except as may have been or shall be directly and specifically provided by Congress."

C. Describe Other Guidance

Does taking action conform to and implement relevant standards and guidelines and direction contained in agency policy, unit and wilderness management plans, species recovery

Yes: x

No: ☐

Not Applicable: ☐

Explain:

Executive Order 13112 (1999) on Invasive Species requires all federal agencies to:

- ✓ identify actions that may affect the status of invasive species,
- ✓ prevent the introduction of invasive species,
- ✓ detect and respond rapidly to and control populations of such species in a cost- effective and environmentally sound manner,
- ✓ monitor invasive species populations accurately and reliably,
- ✓ provide for restoration of native species and habitat conditions in ecosystems that have been invaded,
- ✓ conduct research on invasive species and develop technologies to prevent introduction and provide for environmentally sound control of invasive species, and
- ✓ promote public education on invasive species and the means to address them.

NPS Management Policies 4.4.4 (2006):

Exotic species will not be allowed to displace native species if displacement can be prevented.

NPS Management Policies 4.4.4.2 (2006):

All exotic plant and animal species that are not maintained to meet an identified park purpose will be managed . . . if control is prudent and feasible, and the exotic species interferes with natural processes and the perpetuation of natural features, native species or natural habitats . . .

High priority will be given to managing exotic species that have, or potentially could have, a substantial impact on park resources, and that can reasonably be expected to be successfully controlled. Lower priority will be given to exotic species that have almost no impact on park resources or that probably cannot be successfully controlled. Where an exotic species cannot be successfully eliminated, managers will seek to contain the exotic species to prevent further spread or resource damage.

NPS Management Policies 4.4.5.4 (2006):

The application or release of any bio- control agent or bioengineered product relating to pest management activities must be reviewed by designated Integrated Pest Management specialists in accordance with Director's Order #77- 7 and conform to the exotic species policies in section 4.4.4.

NPS Management Policies 6.3.7 (2006):

The National Park Service recognizes that wilderness is a composite resource with interrelated parts. Without natural resources, especially indigenous and endemic species, a wilderness experience would not be possible. Natural resources are critical, defining elements of the wilderness resource, but they need to be managed within the context of the whole ecosystem. Natural resource management plans will be integrated with and cross- reference wilderness management plans. Pursuing a series of independent component projects in wilderness, such as single- species management, will not necessarily accomplish the over- arching goal of wilderness management. Natural resources management in wilderness will include and be guided by a coordinated program of scientific inventory, monitoring, and research.

The principle of non- degradation will be applied to wilderness management, and each wilderness area's condition will be measured and assessed against its own unimpaired standard. Natural processes will be allowed, insofar as possible, to shape and control wilderness ecosystems. Management should seek to sustain the natural distribution, numbers, population composition, and interaction of indigenous species. Management intervention should only be undertaken to the extent necessary to correct past mistakes, the impacts of human use, and influences originating outside of wilderness boundaries.

Management actions, including the restoration of extirpated native species, the alteration of natural fire regimes, the control of invasive alien species, the management of endangered species, and the protection of air and water quality, should be attempted only when the knowledge and tools exist to accomplish clearly articulated goals.

D. Describe Options Outside of Wilderness

Can this situation be resolved by action outside of wilderness?

Yes: x

☐ No:

Not Applicable: ☐

Explain:

The specific resource values involved and the invasive species threatening those values occur within the Recommended Wilderness boundaries in Glen Canyon National Recreation Area.

E. Wilderness Character

Is it necessary to take administrative action to preserve wilderness character, as described by the qualities listed below?

Untrammelled:

The primary visitors in the river corridor near the project area are recreational boaters. They do not remain, but simply pass by the project site that is a component of the park's recommended wilderness. If left unmanaged, tamarisk will continue to change the character of the project site environment, including the wildlife they now support.

Undeveloped:

The project area is currently in an undeveloped condition and this project would not change that condition.

Natural:

Invasive tamarisk is slowly changing the project site by overtaking and displacing native vegetation species. This project would remove this invasive species and replacing them with native species that would help return the site to a more natural setting.

Outstanding opportunities for solitude or a primitive and unconfined type of recreation:

The project area is located within recommended Wilderness along the Colorado River on river- right 6.5 miles above Lees Ferry and therefore is subjected to the visitors using the river corridor for recreational reasons. The site does provide some opportunities for solitude if a visitor hikes up toward the back of the project area near the cliff walls, as they are somewhat protected from the river traffic by topography and the tamarisk, which provides a partial screen. Once the revegetation has had time to grow, the screening effect will be even more effective, as the cottonwoods and Gooding's willows grow much taller than tamarisk.

Other unique components that reflect the character of this wilderness:

F. Describe Effects to the Public Purposes of Wilderness

How would action support the public purposes for wilderness (as stated in Section 4(b) of the Wilderness Act) of recreation, scenic, scientific, education, conservation, and historical use?

Explain:

A unique recreational experience awaits the calm water rafters and other recreational boaters visiting Glen Canyon between Lees Ferry and Glen Canyon Dam. The beautiful scenery within the unique high cliff walls has provided life- changing experiences for thousands of visitors. Managing invasive plants preserves or improves that experience (long term), as described above.

Some management activities interfere with wilderness recreation. NPS and cooperator staff, including volunteers involved in the revegetation project would constitute a (short- term, temporary) human presence in the river corridor. Evidence of tamarisk removal and subsequent planting of native species will be easily visible from the river for at least two years. Revegetation activities would require (short- term) use of motorized tools (chainsaws for managing large quantities of large woody debris, gas- powered soil auger used during planting and a gas- powered generator that runs the water pump to fill the irrigation tank.

Step 1 Decision: Is it necessary to take action?

Yes: X

No: ☐

Not Applicable: ☐

Explain:

Proposed action would remove an invasive spreading species with native species, which will improve one of the defining characteristics of wilderness in the area.

If action is necessary, proceed to Step 2 to determine the minimum tool for action.

Step 2: Determine the minimum tool.

Description of Alternative Actions

For each alternative, describe what methods and techniques will be used, when the action will take place, where the action will take place, what mitigation measures are necessary, and the general effects to wilderness character.

Description:

The original Revegetation design required the use of heavy construction equipment, which would be barged upriver from the launch ramp at Lees Ferry. Heavy equipment included the use of a bobcat and skip loader with power auger arm attachment. Hand held equipment includes

chain saws, rakes, shovels, etc. Heavy equipment would be driven off the barge and up to the revegetation site via a temporary road created by the bobcat. This road would have changed the slope of the middle terrace, removed a large swatch of wetlands and churned the sandy beach soil.

In consideration of the wilderness ethics as well as visual obtrusion to the visitors, the project design was changed by eliminating the heavy construction equipment and barge. Project workers (both paid and volunteer staff) will be transported upriver in a boat with a hull designed to inflict as little damage to the beach as possible. Hand held motorized equipment will be limited to chain saws and power augers. Tree roots will be left in place to help prevent erosion of the project site soils. All woody debris will be dragged to a location outside the wetlands and will be left to dry; larger pieces will be floated downriver to provide fish habitat – when materials becomes detritus, it provide food source for the food chain.

Effects: The proposed design would have the least damaging effect to biological and physical resources at the project site. Wetlands, the slough and the Colorado River would be protected by placing small foot bridges over wetlands, installing silt fencing along side of project adjoining slough area and decreasing motorized equipment to the minimum needed to complete the job (chain saws, gasoline powered hand held soil augers and gasoline generator to run pump to fill irrigation tanks. Chain saws and soil augers will only be used for a very short time (about 3 days). Gasoline powered generator will be turned on once a day for about 30 minutes to fill tank.

Social and Experiential Resource: As the project would be visible to the public until plants have reached a survivable age without irrigation, the NPS will be providing information to the public by way of signs on beach, information at the launch ramp and newsletters to entities providing boat trips on the river.

Heritage and Cultural Resource: Heritage and cultural resources will be evaluated and protected through implementation of management actions.

Maintaining Contrast and Unimpaired Character

Crews will be instructed to minimize impacts to area of project site not included in revegetation activities.

Special Provisions

Crews will be provided with instructions and a pamphlet outlining conservation methods for the California condor a species protected by the Endangered Species Act that is known to occur in this area.

Safety of Visitors, Personnel, and Contractors and Work Methods

See above.

Economic and Time Constraints

NA

Additional Wilderness- specific Comparison Criteria

NA

Step 2 Decision: What is the Minimum Tool?

Complete revegetation activities using hand tools, chain saws, powered hand augers, gasoline generator, cooperator staff and volunteers.

Describe the rationale for selecting this alternative:

Rational is described above.

Describe any monitoring and reporting requirements:

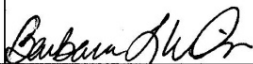
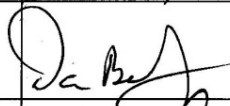

An archeologist will be on site to monitor tree removal and planting activities. Should a previously unknown site be found, this monitor would have the authority to stop construction activities pending determination of eligibility of the site for listing on the Register of Historic Places.

Both pre- and post vegetation monitoring is planned: this monitoring will include diversity, abundance, and survivability of new plants. Additionally, annual monitoring of the bird use of the area will continue after planting has occurred.

Please check any Wilderness Act Section 4(c) uses approved in this alternative:

- | | |
|-----------------------------------------------|----------------------------------------------------------------------------------------|
| <input type="checkbox"/> mechanical transport | <input type="checkbox"/> landing of aircraft |
| X motorized equipment | <input type="checkbox"/> temporary road |
| <input type="checkbox"/> motor vehicles | X structure or installation - irrigation equipment will be left on site for two years. |
| X motorboats | |

Be sure to record and report any authorizations of Wilderness Act Section 4(c) uses according to agency procedures.

Approvals	Signature	Name	Position	Date
Prepared by:		Barbara Wilson	Environmental Specialist	9-2-08
Recommended:		Dan Bishop	Chief of Maintenance and Facilities	9/2/08
Approved by:		Stan Austin	Superintendent	9/3/08

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