

National Park Service  
U.S. Department of the Interior



Glen Canyon National Recreation Area  
Warmwater Nonnative Fish Management at the -12-Mile Slough /  
Environmental Assessment – FONSI

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**FINDING OF NO SIGNIFICANT IMPACT**

**January 2025**

**Warmwater Nonnative Fish Management  
at the -12-Mile Slough / Environmental Assessment  
Glen Canyon National Recreation Area**

**NPS-123839**

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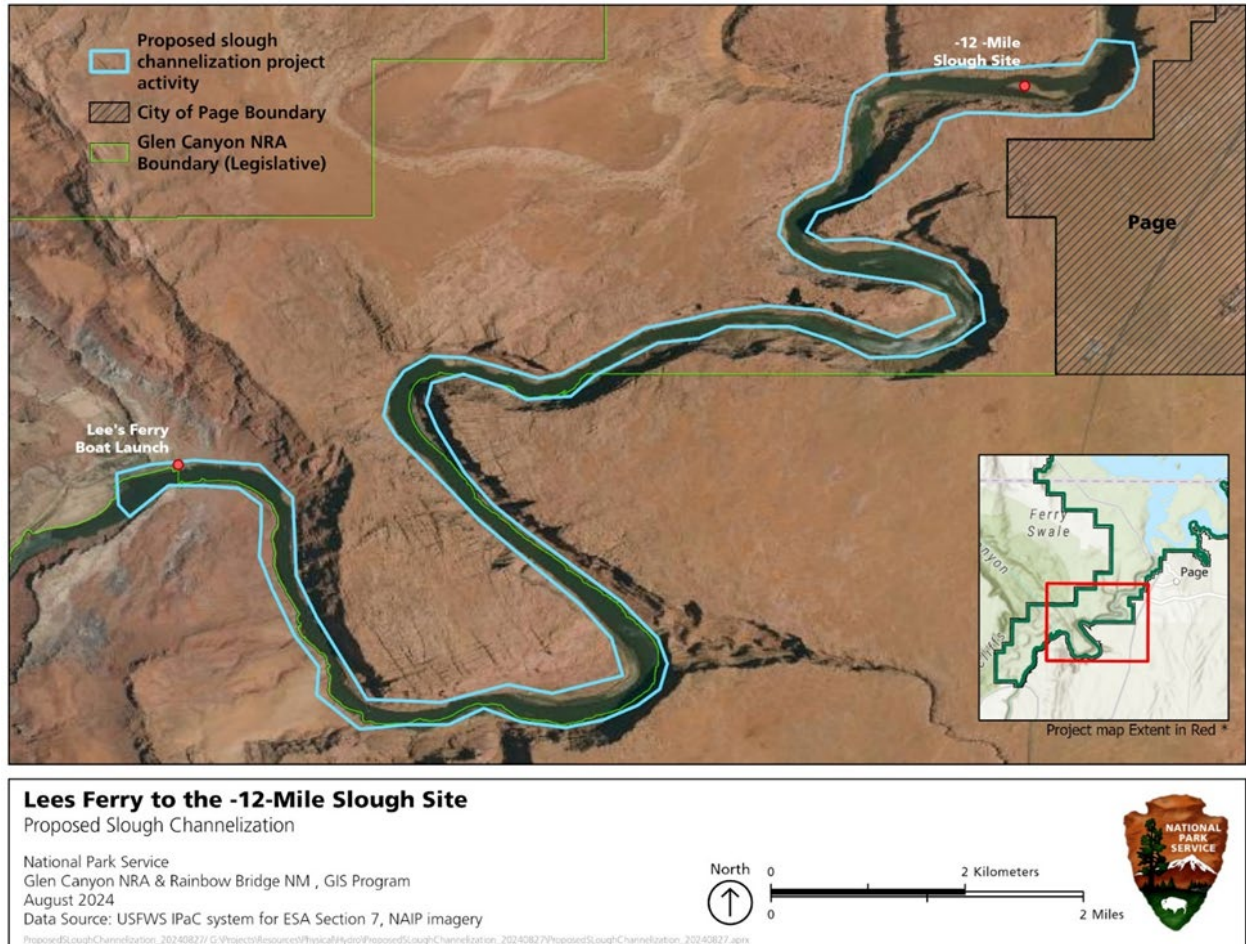
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# FINDING OF NO SIGNIFICANT IMPACT

## 1. INTRODUCTION

In compliance with the National Environmental Policy Act (NEPA), the National Park Service (NPS) prepared an environmental assessment (EA) to examine alternative actions and environmental impacts associated with physical modifications of a backwater slough complex (slough) in Glen Canyon National Recreation Area (Glen Canyon NRA). The slough is located at the -12-mile marker on the Colorado River (figure 1), 3 miles below Glen Canyon Dam and 12 miles upriver from Lees Ferry.



**FIGURE 1. LOCATION OF LEES FERRY AND -12-MILE SLOUGH IN RELATION TO PAGE, ARIZONA\***

\*Note: The oblong blue polygon shows the action area affected by the proposed slough channelization project activity and, hence, is the core area considered for compliance consultations.

Predatory nonnative warmwater fish threaten current populations of native fish in the Colorado River in Glen, Marble, and Grand Canyons. These threats are of great concern regarding the long-term survival of the federally listed humpback chub (*Gila cypha*, threatened) and razorback sucker (*Xyrauchen texanus*, endangered), two federally listed species under the Endangered Species Act (ESA) of 1973 (Public Law 93-205; 87 Stat 884), as amended. The purpose of the

proposed action at the slough site is to help prevent the reproduction of high-risk (predatory) warmwater nonnative fish, particularly smallmouth bass and green sunfish. Action at the slough site will complement collaborative, interagency management strategies implemented in the Colorado River mainstem against warmwater nonnative fish.

Need for the proposed action is driven by increased levels of the entrainment of high-risk warmwater nonnative fish passing through Glen Canyon Dam when Lake Powell elevations are low. These fish often survive their journey through the dam into the Colorado River below, and they are poised to breed when water temperatures rise above 16°C (61°F). Low lake levels result in warmer water passing into the river, and in both 2022 and 2023, river water temperatures became warm enough for warmwater nonnative fish to produce young. Conditions involving low lake levels and higher water temperatures are expected to persist in the river and slough site in future years. Action is therefore needed to disrupt or prevent the establishment of high-risk (predatory) warmwater nonnative fish in the proposed project area by limiting their spawning in 2025 and beyond.

The proposed action at the slough site is an effort to reduce predatory warmwater nonnative fish while restoring an historic river side channel. Reducing warmwater nonnative fish reproduction at the slough site will help reduce the likelihood of their downstream expansion and reduce their establishment in Glen, Marble, and Grand Canyons. Efforts will be made to avoid or minimize impacts on native species, though some native species will experience direct impacts from habitat alteration. Mitigation measures will be implemented to help restore balance regarding losses from project impacts.

A summary of concern statements developed from public comments received is provided in attachment B of this finding of no significant impact (FONSI), along with responses from the National Park Service. Minor modifications, or errata to the EA, are provided in attachment C. A determination of non-impairment is provided in attachment D.

## **2. BACKGROUND**

The Humpback chub is an imperiled fish species that was downlisted on November 17, 2021, from federally endangered to federally threatened under the Endangered Species Act. Though currently present in five populations in the Colorado River Basin, the largest population (approximately 95% of all humpback chub) exist in the Grand Canyon. One of the reasons for downlisting this species was the absence of warmwater nonnative predatory fish in the vicinity of chub populations. Warmwater nonnative fish threaten not only the humpback chub and razorback sucker but also other native fish, amphibians, and invertebrates in Glen Canyon, Marble Canyon, and Grand Canyon. As analyzed in the 2018 *Expanded Non-Native Aquatic Species Management Plan/Environmental Assessment* (NPS 2018), smallmouth bass are the most concerning of these nonnative species due to their impacts on native fish populations across the desert southwest. In 2022, smallmouth bass reproduced in the Colorado River below Glen Canyon Dam for the first time since the completion of the dam in 1963. These bass spawned again in 2023 and moved farther downstream to the vicinity of Lees Ferry, 12 to 20 miles downstream of the -12-mile slough site.

While smallmouth bass may spawn throughout the Colorado River, the -12-mile slough is problematic because, compared to the river mainstem, slough water temperatures warm more quickly, warm to higher temperatures, and stay warmer for longer periods of time. The warmer, calmer waters at the slough site attract bass seeking to nest and spawn. During 2024, cool-mix flows from the base of Glen Canyon Dam cooled both the river and the lower slough, helping to prevent bass spawning in the lower sloughs. The cool-mix flows did not cool the upper slough.

### **3. SELECTED ACTION AND RATIONALE FOR THE DECISION**

The National Park Service has decided to implement the preferred alternative in the EA as the selected action, with minor modifications. The selected action summarized in this FONSI is consistent with the action described on pages 13–27 of the EA, which is incorporated by reference consistent with the 2023 Council on Environmental Quality (CEQ) NEPA regulations, which were in effect when the National Park Service initiated this EA (40 CFR 1501.6(c)).<sup>1</sup> The EA is available at <https://parkplanning.nps.gov/GLCASloughEA>.

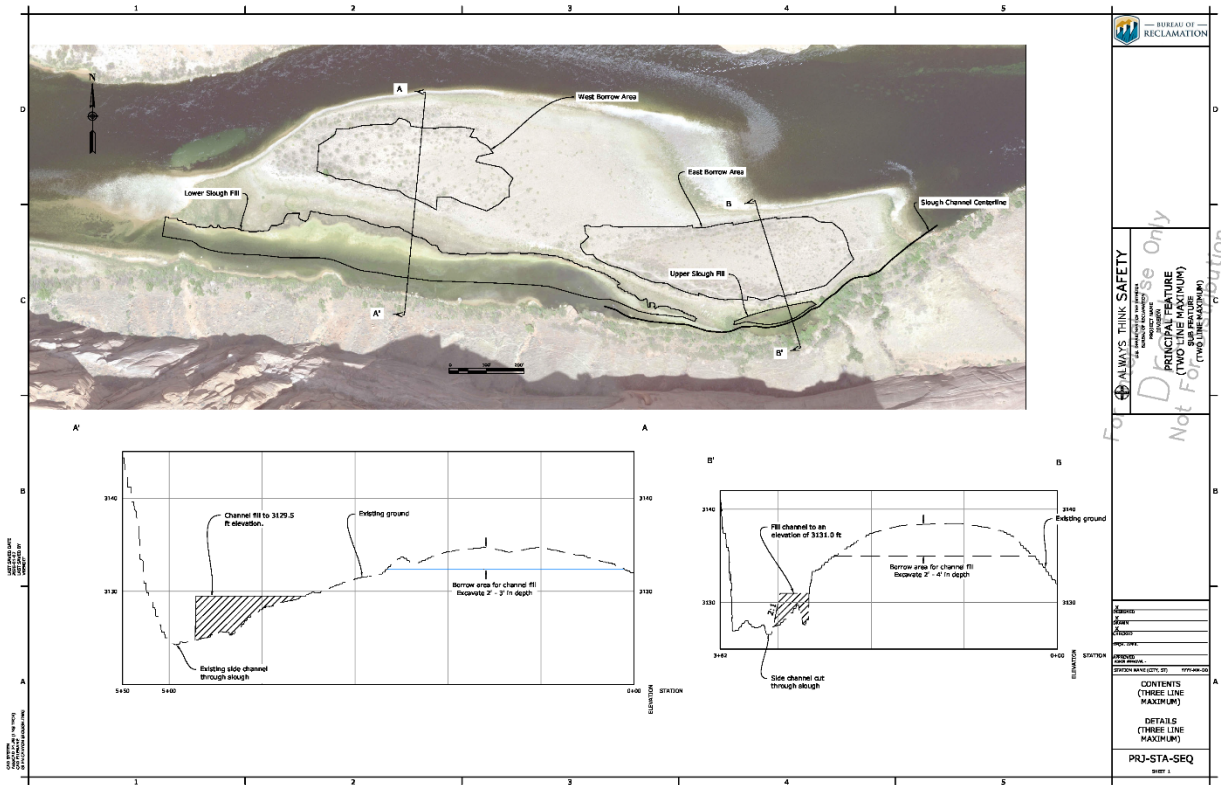
#### **3.1 Changes to the Action as Described in EA**

The selected action described in this FONSI varies slightly from the action proposed in the draft EA. In working through the public and stakeholder engagement process, the National Park Service identified environmental concerns with the proposed action related to potential impacts on sensitive species and a spring in the upper slough. The selected action has been refined to adjust the channel alignment and reduce the channel cut depth in sensitive areas, reducing impacts on spring upwelling sites and retaining some habitat that could be used by affected species to the extent possible. The specifics of these potential impacts are fully described in the “Degree and Effects of the Action section” below.

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1. The National Park Service is aware of the November 12, 2024, decision in *Marin Audubon Society v. Federal Aviation Administration*, No. 23-1067 (D.C. Cir. Nov. 12, 2024). To the extent that a court may conclude that the CEQ regulations implementing NEPA are not judicially enforceable or binding on this bureau action, the National Park Service has nonetheless elected to follow those regulations at 40 CFR. Parts 1500–1508, in addition to the Department of the Interior’s procedures/regulations implementing NEPA at 43 CFR Part 46 and Part 516 of the Departmental Manual, to meet the bureau’s obligations under NEPA, 42 USC §§ 4321 et seq.

### 3.2 Selected Action



**FIGURE 2. PROJECT DETAILS MAP WITH ELEVATIONS**

The selected action is a habitat conversion that restores an historic river side channel while eliminating the upper slough and narrowing the lower slough. The selected action will cut a 1,000-foot-long channel at a variable depth, approximately similar to current depths of the upper and lower slough. On average, the channel will be 6 feet wide at the bottom and 30 feet wide at the top, though narrower through the upper slough to preserve the existing left bank (figure 2). This action reduces the likelihood of smallmouth bass spawning in the constructed channel by increasing water velocity and lowering water temperatures to be like temperatures in the river mainstem. Success of the constructed channel against nonnative fish spawning depends largely on water temperatures in Lake Powell and in the Colorado River during this challenging time of climate change. Success also includes how well Reclamation can ensure cool water in the Colorado River during warm seasons using cool-mix or other methods at appropriate times. A full description of other alternatives considered, including those dismissed from further analysis, are described in the EA.

The project is composed of the following elements:

- Mobilizing and transporting a mini-excavator, two skid steers loaders, and other support equipment to the slough via a barge from Lees Ferry
- Supporting construction activities daily, including transporting fuel and crew by boat to and from the slough for approximately two months

- Storing construction supplies and equipment at Lees Ferry and at the slough site during the construction phase, including a small fuel tank, a small boat for crew and fuel transportation, and some other vehicles
- Cutting a wider, deeper channel to match the approximate depth of the upper slough (using mechanized equipment) from the upstream edge of the sand/cobble bar through the upper slough and into the upstream end of the lower slough
- Converting the upper slough into a flowing channel by cutting through the upper slough and barrier separating the upper and lower sloughs; cutting the channel to a depth of the current upper slough floor, which sits at an average 2.5 feet depth; using fill material composed of excavated gravel, cobble, sand, and soil to eliminate the upper slough contour and strengthen the channel banks running through the upper slough site
- Narrowing the width of the lower slough (using small, mechanized equipment) by placing gravel, cobble, and sand from the channel and from upland portions of the gravel bar to form a shallow bank, reducing the 6-acre aquatic lower slough into a 2-acre channel with 4 acres of adjacent land
- Demobilizing and transporting equipment via barge back to Lees Ferry

### **3.3 Rationale for Decision**

The National Park Service has selected the preferred alternative because it best meets the purpose and need for action against warmwater nonnative predatory fish. In contrast to the no-action alternative, the selected alternative will be more effective in reducing the likelihood of warmwater nonnative predatory fish reproducing in the new channel restored at the slough site. The selected action will restore an historic river side channel and allow the National Park Service to avoid using the chemical Rotenone at the slough to control nonnative fish, helping to address concerns by Tribes regarding the taking of fish life through chemical methods. Overall, the selected alternative will proactively assist in native fish conservation and recovery, including for the federally threatened humpback chub, by reducing predation, competition, and downriver movements by warmwater nonnative predatory fish.

The US Fish and Wildlife Service concurs with the NPS determination that the selected alternative will have no effect on federally listed species in the project activity area extending from Lees Ferry upriver to the slough channel construction site. The US Fish and Wildlife Service agrees the selected alternative will benefit native and federally listed fish downriver in Grand Canyon, including for the humpback chub and razorback sucker. The US Fish and Wildlife Service also concurs with precautions described on page 62 of the EA in which the National Park Service, Reclamation, and construction crews will practice ensuring safety for condors in the unlikely event a condor appears in the project activity area during construction or equipment transport.

In accordance with its obligation under section 106 of the National Historic Preservation Act, park staff consulted with all relevant parties to reach a final determination of no adverse effect

on historic properties for the project. Consultation with the Arizona State Historic Preservation Office (SHPO) and Tribes will continue, as necessary, as project implementation proceeds.

Although the project will involve work in the river channel, the National Park Service has determined that this project falls under the list of excepted actions in NPS Procedural Manual 77-2, which states, “This procedure does not apply to certain park functions that are often located near water for the enjoyment of visitors but require little physical development and do not involve overnight occupation. Examples include isolated backcountry sites, natural or undeveloped sites along trails or roads, survey and study sites, or other similar activities . . .” Based on this language and the fact that the project will return the geomorphology to a restored river side channel, the selected alternative is considered a restoration excepted action and does not require a wetland statement of findings nor a floodplain statement of findings.

#### **4. MITIGATION MEASURES**

The National Park Service strongly emphasizes avoiding, minimizing, and mitigating potentially adverse environmental impacts. Therefore, the National Park Service will require mitigation measures and best management practices to protect environmental and cultural resources potentially affected by implementing the selected alternative. The selected alternative incorporates the mitigation measures and best management practices listed in attachment A.

The authority for mitigation for the proposed project comes from laws and policies, including the following:

- Council on Environmental Quality NEPA regulations (40 CFR 1500-1508)
- Department of the Interior NEPA regulations (43 CFR 46.10-46.450)
- Endangered Species Act, as amended (16 USC § 1531 et seq.)
- Migratory Bird Treaty Act of 1918 (16 USC § 703-712)
- National Environmental Policy Act (42 USC 4321 et seq.)
- National Historic Preservation Act of 1966, as amended (54 USC 300101 et seq.)
- NPS *Management Policies 2006* (chapters 4, 5, and 9)
- NPS Organic Act of 1916 (16 USC § 1)

After channelization is complete, mitigation measures will be implemented on-site and off-site to help offset losses to the extent feasible. Some losses in need of gains through mitigation include the following concerns:

- Loss of 0.14 acre of jurisdictional wetland habitat, which sustains plants, amphibians, and invertebrates, and the elimination of some riparian vegetation
- Loss of 4 acres of submerged riverine lower slough habitat, which will be converted into a land bank using fill, leaving a narrower 2-acre lower slough with faster-flowing water

Post-project mitigation measures will include monitoring the project site for nonnative plants, then restoring native plants to the site over approximately five years. Limited amounts of wetland topsoil and native vegetation will be collected during construction and reestablished where possible. Roots and seeds from native plants at the site will be collected before project construction and maintained at Glen Canyon NRA's greenhouse to help restore native plants to the slough project site when post-project conditions allow.

Additional mitigation measures will be implemented off-site. These may include mitigation measures identified and agreed to with Tribes or other partners. These also include potential improvements at alternate sites within Glen Canyon, such as evaluations and management actions related to enhancements at spring locations, restoring salamanders to viable habitat, or enhancing small amounts of wetlands to benefit native plants or avian species.

## **5. POTENTIALLY AFFECTED ENVIRONMENT**

Consistent with the 2023 CEQ regulations in effect at the time the National Park Service initiated the EA (40 CFR 1501.3(b)(1)), in assessing whether the effects of the selected action are significant, the National Park Service analyzed the potentially affected environment considering the setting of the affected area and its resources.

The selected alternative has the potential to impact several resources that were retained for further analysis and discussed in detail in chapter 3 of the EA. These resources are water quality; aquatic resources; terrestrial resources; Tribal and cultural resources; and recreation, visitor use, and experience. Impacts on other resources were so small and insignificant that they were not carried forward for analysis and are not discussed in this FONSI.

The project activity area includes the Colorado River from the upstream end of the -12-mile slough, downstream to the Lees Ferry boat launch. This reach of the river is bounded by a 0.25-mile buffer to include consideration of the land and other resources on either side of the river. Where appropriate, impacts on resources downriver of the project area, such as for federally listed species like humpback chub or razorback sucker, are also addressed to include considerations for Glen, Marble, and Grand Canyons.

### **5.1 Water Quality**

Glen Canyon Dam water releases from Lake Powell affect the water quality of the Colorado River and in the slough project area. Water temperatures in the Colorado River fluctuate annually, reflecting seasonal variations in the temperature of Lake Powell water at the depth of the large pipes (penstocks), which bring water to power turbines located inside Glen Canyon Dam (DOI 2016). Along the Colorado River, tributaries, backwaters, and off-channel areas tend to have higher water temperatures than the river mainstem. The turbidity of the Colorado River has been reduced by the presence of Glen Canyon Dam because it reduces the supply of river-borne sediment (DOI 2016). Tributaries, especially the Paria River and Little Colorado River, carry large amounts of fine sediments and organic matter to the river mainstem during flood events.

## 5.2 Aquatic Resources

Aquatic resources at the -12-mile slough include a spring, fish, amphibians, macroinvertebrates, plants, and the habitat in which they occur.

**Aquatic habitat:** The upper slough is disconnected from the mainstem at the upstream end, and it drains through a small channel approximately 10 feet long and 2 feet wide into the lower slough. The upper slough is less than 2.5 feet deep, on average, except for a groundwater inflow through a spring at the bottom of the upper slough that is 4–6 feet deep or more. The lower slough averages 6 feet deep, and it is 9 feet deep or more at its downstream end near where it joins the river mainstem. The existing aquatic habitat in the slough site is generally slow-moving water with aquatic algae and macrophytes. Slow-water habitat is typically found in backwaters and off-channel ponds along the Colorado River, and these habitats are relatively rare in Glen Canyon when compared to river mainstem habitat.

**A spring in the upper slough:** Based on 2024 analysis of six parameters (specific conductance, comparative water levels, specific conductance, major ions, nutrients, and stable isotopes), the water source feeding the upper slough is a spring and not from the Colorado River mainstem. The spring helps the upper slough maintain a relatively constant water level that is independent of fluctuations in the level of the nearby river mainstem. The estimated inflow into the upper slough is up to 12 gallons per minute, which enters from multiple upwelling sites. Most water enters the slough from the left bank and along the northeast corner. Together, the spring and upper slough maintain habitat important to the life cycles of amphibians and invertebrates at the slough site.

**Amphibians:** Three native amphibian species were detected in or near the -12-mile slough: the Woodhouse's toad (*Anaxyrus woodhousii*), the red-spotted toad (*Anaxyrus punctatus*), and the Arizona tiger salamander (*Ambystoma mavortium nebulosum*). The upper slough is the only currently documented location along the Colorado River corridor, across Glen Canyon NRA (NPS unpublished data) and Grand Canyon National Park (personal communication with Brandon Holton, NPS regional wildlife biologist, May 9, 2024), where Arizona tiger salamanders have been detected along the river in recent surveys since around 2020.

**Macroinvertebrates:** The Colorado River immediately downstream of Glen Canyon Dam generally has low numbers and low diversity of aquatic invertebrate species. The Glen Canyon reach is dominated by non-insect taxa, including New Zealand mudsnails (*Potamopyrgus antipodarum*), scuds (*Gammarus lacustris*), flat worms (planarians, sub-phylum Turbellaria), sludge worms (family Tubificidae), earthworms (Lumbricidae), and bladder snails (Physidae) (Cross et al. 2011; Carothers and Brown 1991). The two most common aquatic insect taxa in the mainstem Colorado River in Glen Canyon are generalist taxa, including non-biting midges in the family Chironomidae and black flies in the family Simuliidae, while sensitive mayflies (Order Ephemeroptera), stoneflies (Order Plecoptera), and caddisflies (Order Trichoptera) are absent from the tailwater (Kennedy et al. 2016; Abernethy et al. 2021). Glen Canyon NRA employees observe an abundance of odonates at the slough each year, comprising multiple species representing 10 families. There are no rare aquatic invertebrates known to be present in the sloughs. Invasive nonnative aquatic invertebrate species that are known to occur in the project

area include the northern crayfish (*Orconectes virilis*), the New Zealand mudsnail, and the quagga mussel (Benson et al. 2018).

**Native fish:** Eight species of native fish have historically occurred in the project area. The flannelmouth sucker (*Catostomus latipinnis*) occurs in the area and is frequently captured in the lower slough in recent years. The bonytail (*Gila elegans*, endangered) is considered extirpated from Glen and Grand Canyons but occurs in Lake Powell due to hatchery stocking. The humpback chub (*Gila cypha*, federally threatened), razorback sucker (*Xyrauchen texanus*, federally endangered), bluehead sucker (*Catostomus discobolus*), and speckled dace (*Rhinichthys osculus*) occur in most of the 277 miles of river downstream in Grand Canyon but are absent in Glen Canyon. The Colorado pikeminnow (*Ptychocheilus lucius*, federally endangered) is extirpated from the mainstem between Glen Canyon Dam and Hoover Dam. Of all these native fish, only the flannelmouth sucker normally occurs in the slough project area.

**Nonnative fish:** Two nonnative trout species currently occur in the 15 miles of the Colorado River below Glen Canyon Dam. Rainbow trout (*Oncorhynchus mykiss*) were introduced in 1964 and are supported by multiple agencies as a sport fish for anglers. Brown trout (*Salmo trutta*) are invasive and grew in numbers in Glen Canyon from 2014 to 2016, raising concerns regarding potential impacts on native fish such as flannelmouth suckers and the federally listed humpback chub (Runge et al. 2018).

Prior to 2015, warmwater nonnative fish species were mostly contained behind Glen Canyon Dam in Lake Powell, though they were collected in low numbers below the dam from sporadic entries through the dam into the Colorado River below. With the water in Lake Powell warming and falling to lower levels during drought and aridification, warmer lake water was released through the dam into the river below. In July 2015, a reproducing population of green sunfish was discovered in the upper slough.

Smallmouth bass were initially found breeding in the lower slough on June 30, 2022. Smallmouth bass have since continued to pass through the dam, and they have shown nesting behavior at the base of the dam. With warmer water temperatures in the river and sloughs in 2022 and 2023, smallmouth bass spawned in the lower slough in both years, and immature juveniles were found in the upper slough in 2023. Smallmouth bass numbers grew within the first 20 miles of the river below the dam in 2022 and 2023 (Shollenberger 2024). Smallmouth bass have a much larger adult body size, larger gape, are generally much more piscivorous (i.e., predatory fish eaters) than green sunfish, and are known to reduce or eliminate native fish populations (Marks et al. 2010; Johnson et al. 2008; Bestgen and Hill 2016).

### 5.3 Terrestrial Resources

**Wetland vegetation:** The overall slough complex contains approximately 7 acres of wetlands, which provide habitat for wetland vegetation that occurs along the edge of each slough, between the sloughs, and in the original channel upstream of the upper slough. The vegetation overstory (large tree) component is very limited on the bank formation and mainly occurs at slightly higher elevations above and adjacent to the wetland and riparian area boundary at the sloughs. Tree species observed in this overstory fringe and noted adjacent to the sloughs include a few large common hackberry trees (*Celtis occidentalis*), a Siberian elm (*Ulmus pumila*), and one red

mulberry (*Ulmus pumila*). Additionally, Glen Canyon NRA employees and partners completed cottonwood (*Populus deltoides*) plantings for restoration in several areas on the bank formation. The midstory component primarily comprises coyote willow (*Salix exigua*), with a few salt cedar (*Tamarix ramosissima*) and Emory's baccharis (*Baccharis salicina*) present. Emory's sedge (*Carex emoryi*), tall fescue (*Schedonorus arundinaceus*), Ferriss' horsetail (*Equisetum X ferrissii*), and other various grasses, sedges, and rushes are located throughout the project site. No plant species protected under the Endangered Species Act, as amended, occurs near the sloughs within the proposed project boundary. Wetland indicators, including hydric soils, hydrophytic vegetation, and wetland hydrology, were found at three out of four sampling points.

**Wildlife:** A wide variety of wildlife species are associated with terrestrial and riparian habitat along the Colorado River. Beavers, ringtail cats, racoons, badgers, coyotes and squirrels occur at or near the slough site, with bighorn sheep and a mountain lion recently cited approximately 6 to 8 miles downriver. A badger is currently living within the slough project boundary, including recent dens dug by the badger into the sand/cobble bar along the sloughs. Beavers may have dens at both the upper and lower sloughs since they have been observed entering each slough from the adjacent left bank.

The river mainstem, calm water side habitats, riparian habitat, rock piles, and canyon walls provide a variety of habitat used by migratory birds, waterfowl, and shorebirds in the 15-mile Colorado River corridor below Glen Canyon Dam. The lower slough serves as important winter resting and feeding habitat for waterfowl and shorebirds.

The Bald and Golden Eagle Protection Act of 1940 protects two eagle species across the United States. Bald eagles winter in Marble Canyon and in the upper half of Grand Canyon, where wintering individuals occur at tributary confluences (DOI 2016). Golden eagles prefer rugged terrain with cliffs and mesas and nest on cliff ledges. Migrant eagles use the sheer cliffs of the Glen Canyon NRA to hunt (DOI 2016). Both bald eagles and golden eagles occur across Glen Canyon NRA, but these two eagle species do not nest within or near the proposed slough channelization project boundary.

The California Condor (*Gymnogyps californianus*) prefers mountains, gorges, canyons, and hillsides, which create updrafts, thus providing favorable soaring conditions (USFWS 2024). Condors are often seen downriver of Lees Ferry in the vicinity of Marble Canyon, where they roost during spring season on or near Navajo Bridge (river mile marker +4.5). Inspection of Peregrine Fund telemetry tracking data to date clearly show that condors soar above or rest on the rim of Glen Canyon as far upriver as the -7-mile mark. To date, there are no known data or observations showing condors down at river level at the base of Glen Canyon walls. For these reasons, the site of proposed channelization (i.e., the slough complex upriver at the -12-mile river mark) does not experience condor presence.

#### **5.4 Tribal and Cultural Resources**

The Colorado River is a Traditional Cultural Property (TCP) of interest to more than 30 Tribal Nations, including the 9 Tribes consulting with Glen Canyon NRA regarding -12-mile slough channelization. The Colorado River, as it flows through Glen Canyon, Marble Canyon, and Grand Canyon, has a prominent place in the history and worldview of the Indigenous peoples of

the Southwest, and it continues to have an important place in the lifeways of contemporary Native American cultures, religions, and economies. Many Tribes regard the canyons as sacred space, the origin and home of their ancestors, and the residence of the spirits of their dead. Tribes also regard the canyons as the source of culturally important resources, including plants, animals, mineral sources, and other resources naturally occurring in the environment.

The canyons and all areas within are important to the creation stories, passed down from generations, of the Tribes who continue their contemporary ways of life rooted in those oral traditions. Ancestrally connected Tribes have stated that they regard the Colorado River ecosystem, including the river and the land base from rim to rim in Glen Canyon NRA below Glen Canyon Dam and in Grand Canyon National Park, as a TCP. The Arizona State Historic Preservation Office concurred with this determination.

There are no known archeological sites in the proposed slough channelization project boundary at the -12-mile marker on the Colorado River. The slough site, including the sand/cobble bar, slough shoreline, and river side channel, were previously surveyed by Glen Canyon NRA and were confirmed to not contain archeological sites. The slough site has a history of being underwater at times during higher flows.

## **5.5 Recreation, Visitor Use, and Experience**

The Glen Canyon 15-mile reach includes the -12-mile slough project site and is heavily visited for multiple recreational purposes. Visitor use is highest from March through October, with up to 176, 000 visitors per month in 2023. Visitor use is lowest during winter months, with 2023 visitors numbering 64,000 in December compared to 33,000 in January and 87,000 in February.

The Glen Canyon reach includes Lees Ferry boat launch facilities with restrooms, a shade pavilion, and interpretive facilities. River rafting trips through Grand Canyon begin in Glen Canyon NRA at Lees Ferry. The reach also includes commercial and private boating and rafting operations, along with six designated campsites accessed only by boat and which are located on sediment terraces and beaches along the river (DOI 2016). Visitors engage in trout fishing from boats or the shoreline, private and commercial boating and rafting trips, or nonmotorized activities such as kayaking, canoeing, and paddleboarding. Visitors also view wildlife, camp, hike, climb, bow hunt for carp, hunt for waterfowl, visit cultural sites, sightsee, and create arts such as painting. Navajo Nation land extends along much of the southeast side of the Colorado River, adjacent to the Glen Canyon NRA boundary. Hiking and canyoneering access is very limited due to high, steep canyon walls.

## **6. THE DEGREE AND EFFECTS OF THE ACTION**

As described in the EA and below, the selected action has the potential for adverse impacts on water quality, aquatic resources, terrestrial resources, Tribal and cultural resources, recreation, visitor use, and experience. The National Park Service considered the following in evaluating the degree of the effects (40 CFR 1501.3(b)(2), 2023) of the selected action:

- short- and long-term effects
- beneficial and adverse effects

- effects on public health and safety
- effects that would violate federal, state, Tribal, or local law protecting the environment

## 6.1 Water Quality

Sediment disturbance in the river water may be noticeable during channel construction but are minor and will subside after construction is complete. Sediment disturbance during or shortly after construction will produce a localized turbidity plume in the immediate area and downstream from the slough. This disturbance includes channel excavation in the upper and lower sloughs, channel excavation between the river mainstem and upper slough, and the addition of excavated material to the upper and lower sloughs. This plume will be episodic, localized, and occur periodically during the action itself, depending on where equipment is working. The plume could potentially continue for a few days after project completion, but it will not be significant because overall turbidity conditions will not increase in receiving waters downstream of Lees Ferry, some of which are normally turbid, especially during high flow events.

Changes in water temperature and dissolved oxygen are expected to be positive results from channel construction. Connecting the sloughs to the mainstem river above will cool water in the sloughs and side channel to match river mainstem water temperatures. The overall thermal regime in the slough/channel is expected to be generally cooler. This will result in less warmwater influence on the channel, less rapid warming during spring season, and less rapid cooling during fall season. Dissolved oxygen levels in the river and slough depend upon water quality passing through Glen Canyon Dam, but faster-moving water through the new channel could raise dissolved oxygen levels slightly.

Only during construction, equipment could possibly release small amounts of grease or oil at the slough/channel work site. Heavy equipment is lubricated with grease, which might create a sheen on the water's surface at times. Best practice measures will help avoid or minimize this possibility. Reclamation intends to use fluids and grease more friendly to the environment to better address this potential challenge. Therefore, impacts from grease or oil will be avoided or small enough to be insignificant.

Additionally, although adverse cumulative impacts on water quality will occur under the selected action, they will be largely driven by other past, present, and reasonably foreseeable future actions. The selected action will have some localized adverse impacts during implementation and overall benefits after completion that will not contribute significantly to these overall cumulative effects.

## 6.2 Aquatic Resources

**Aquatic habitat:** The proposed action will convert two low-velocity pool habitats (the upper slough and lower slough) into a higher-velocity restored river side channel reflective of historic conditions with water temperatures more like the river mainstem. This action will convert the upper slough pond into a channel and will narrow the lower slough by two-thirds, eliminating the largest potential breeding habitat for warmwater nonnative fish in the 15-mile Glen Canyon reach.

The historic side channel will be restored by reconnecting it to the river mainstem above the upper slough and channelizing through the upper slough into the lower slough to help cool the water and increase water velocity. The fill area eliminating the upper slough outside the channel is approximately 0.33 acres, and the fill area of the lower slough is 4.66 acres. The lower slough width will be reduced from about 200 feet into a 50-foot-wide channel. The fill area in the lower slough will be dry at water flows below 11,000 cubic feet per second and thus will no longer be aquatic habitat for portions of each day due to hydropower fluctuations.

This habitat conversion will not be significant since the river side channel habitat is being restored to its historic conditions and aquatic habitat will be retained on-site to the extent possible. Further, mitigation measures will restore some of the lost wetland and riparian habitat both on-site and off-site. While the selected action will have some localized adverse impacts, much of that will be offset, and it will not contribute in any significant way to the cumulative impacts of other past, present, or reasonably foreseeable future actions or to the availability of aquatic habitat more broadly.

**A spring in the upper slough:** Under the selected action, a channel will be cut through the middle of the upper slough and barrier separating the upper and lower sloughs. The channel will be cut to a depth of the current upper slough floor, which sits an average 2.5 feet depth. However, this not expected to have significant adverse impacts on the spring as the project will be designed to allow water to continue to flow into the newly constructed channel and onward into the mainstem of the Colorado River. In efforts to not impede the flow of the spring water, Reclamation will avoid disturbing the left bank to the extent feasible, where the greatest water inflow occurs, and will not add fill to these locations.

Project-related mitigation measures recognize physical, biological, and spiritual considerations for the spring and its location and function in the upper slough, including impacts on associated species life such as plants, amphibians, and invertebrates. Mitigation also considers cultural views of Tribes, who speak of springs and the life they support as special entities Tribes tend to and manage, which includes pilgrimages where Tribes express prayers and ceremonies at springs. Project-related mitigation may include off-site efforts to conserve and enhance alternate spring sites in Glen Canyon. These mitigation measures will further reduce the potential for significant adverse impacts.

**Amphibians and macroinvertebrates:** Because the slough channelization project will result in an overall reduction of breeding by warmwater nonnative predatory fish at the slough site, completing the project also provides overall long-term benefits for conserving amphibians and macroinvertebrates further downriver in Glen, Marble, and Grand Canyons. Fewer smallmouth bass and green sunfish means less predation pressure further downriver over time, enhancing the long-term survival of amphibians and macroinvertebrates along the river and its tributaries in the canyons. Habitat that supports these species will be retained in the project area to the extent feasible, and post-project mitigation actions on-site and off-site will also help to restore some of the losses of amphibians and calm water macroinvertebrates caused by the project locally at the slough site.

Conversion in habitat conditions from a calm-water spring-supported upper slough pond into a faster-flowing river side channel will directly impact local assemblages of amphibians and

macroinvertebrates, specifically salamanders, toads, dragonflies, damselflies, and other macroinvertebrates. The bank of rock, mud, and vegetation that separates the upper and lower sloughs will be breached, but some habitat for these species will be retained along the left bank. While there may be direct loss of some burrow sites used by these species, they may continue to use others in habitat that will be retained. Aquatic portions of life cycles of these species that rely on calm water may be negatively impacted, and many of these species may not survive in the new side channel. However, impacts are not expected to be significant because habitat will be retained on-site. Further, impacts on toad and macroinvertebrate species will be localized to individuals using the slough, and other macroinvertebrate species more adapted to faster-moving water may move into the newly constructed channel over time.

Project impacts will cause site-specific declines in two toad species at the slough site, but the impacts will not be significant, as populations of these species will remain widely distributed in the canyons, helping to buffer each toad species from further causes of population declines. Managing impacts on the local native salamander population is more difficult since they are currently the only known salamander population identified in surveys along the Colorado River mainstem in Glen, Marble, and Grand Canyons in recent years. However, as described, the project will seek to retain some habitat that supports this salamander population, which will reduce the potential for adverse impacts. While mitigation actions could further reduce this potential, options are limited for the loss of salamanders at the slough site. Finding a new source salamander population in the canyons could be helpful in restoring salamanders to alternate locations in Glen Canyon NRA with viable habitat, though chances of survival at the new locations can be low. Mitigation can also include habitat improvements at alternate sites for toads and salamanders.

A cooperative study is underway to compare invertebrate assemblages at the pre-project slough site versus the river mainstem, both before and after channel construction. This approach will inform potential mitigation to improve habitat at alternate sites in Glen Canyon for invertebrates, including for dragonflies and damselflies. Mitigation may potentially include improving habitat at alternate sites for invertebrates.

**Native fish:** Substantial gains in conservation and the recovery of native fish downriver are achieved by restoring the historic river side channel in Glen Canyon, resulting in an overall reduction of breeding by warmwater nonnative predatory fish at the slough site. Reducing smallmouth bass and green sunfish means less pressure from predation and competition on native fish, enhancing native fish survival. Fewer nonnative fish will be moving downriver into Marble Canyon and Grand Canyon. Reducing warmwater nonnative predatory fish helps native populations of flannelmouth sucker, bluehead sucker, speckled dace, humpback chub, and razorback sucker living in the 277 miles of river through Marble and Grand Canyons. Because the proposed action is expected to result in cooler and faster-flowing water in the new channel, flannelmouth suckers will use the new channel less than before the project, but this will not be a significant impact because viable populations of flannelmouth sucker species will still be present.

**Nonnative fish:** Rainbow trout and brown trout might use the new channel more often due to cooler water and better aeration. However, changes to the population levels of these trout species will be based on the small increase in trout using the new channel. The increased water

velocity and cooler water in the new channel will make the channel habitat less suitable for warmwater nonnative fish spawning and less suitable for the survival of larval and juvenile warmwater nonnative predatory fish. This change will reduce the number of nonnative fish overall by reducing reproduction, which means fewer nonnative fish to remove from the river mainstem. Reducing nonnative fish helps to reduce the taking of fish life overall, which better addresses the concerns of Tribes about life balance in the canyons.

Although adverse cumulative impacts on aquatic resources will occur under the selected action, these overall cumulative effects will be largely driven by other past, present, and reasonably foreseeable future actions, and the adverse impacts will not contribute significantly to the overall cumulative effects. Rather, the long-term benefits of the selected action are expected to decrease the magnitude of cumulative impacts by reducing the potential population growth of extremely harmful nonnative species.

### **6.3 Terrestrial Resources**

**Wetland vegetation:** The proposed action will cause a loss of 0.14 acres of jurisdictional wetlands of the approximately 7 acres in the project area and then allow the revegetation of at least 0.04 acres of wetland or riparian vegetation along the new channel banks.

Approximately 4.66 acres of submerged riverine habitat will be converted to terrestrial channel bank that will not be permanently submerged in waters of the lower slough. The channel bank will also be planted with native vegetation using wetland or riparian substrate containing hydric soils, roots, or seeds saved by park or construction crews.

These adverse impacts on wetland vegetation will not be significant because the effects will be localized and relatively small (0.1 to 0.14 acres), and project design and mitigation measures will help to balance or exceed the loss of jurisdictional wetlands caused by the project.

Although adverse cumulative impacts on wetland vegetation will occur under the selected action, the impacts will be largely driven by other past, present, and reasonably foreseeable future actions. The localized adverse impacts of the selected action will not contribute significantly to these overall cumulative effects.

**Wildlife:** Mammals, including a badger, and birds living in the project area will be adversely affected by noise, human disturbance, and abrupt habitat conversion during construction. However, these impacts will only occur during the three-month construction period, and larger, mobile mammal and bird species will temporarily avoid the area during construction and return once construction is complete. Population-level effects are not expected to occur. As a result, these temporary impacts will not be significant. If the badger is found in the project area, the National Park Service will attempt to move it to an alternate location outside of the project area, which will reduce the potential for adverse impacts.

During the winter months after implementation, waterfowl, shorebirds and marsh birds will find their traditional lower slough winter resting and feeding habitat is altered and reduced, causing them to spend extra energy to find another suitable location in the canyons for resting and feeding each winter. Because smaller versions of such habitat are available for these birds at select sites downriver in Glen, Marble, and Grand Canyons, these birds may simply not visit the

slough site anymore in favor of finding more suitable habitat elsewhere that will continue to support their needs. The selected alternative is not expected to have population-level impacts on these species, and as a result, these impacts will not be significant.

**Condors:** Impacts on condors are not anticipated, but park employees and construction workers will be briefed on condor conservation measures and actions to take if they encounter a condor. Activities involving heavy construction equipment will take place in the form of staging and storage near the Lees Ferry boat ramps, along with equipment transport via barge 12 miles up the Colorado River to the slough channel construction site.

Condor conservation measures will be in place to protect condors in the unlikely event a condor visits the construction site or otherwise is near construction or barge equipment. These measures will be included in all pertinent documents and will be discussed during morning safety briefings before a day's construction activity. The following condor conservation measures will be implemented:

- If a condor is spotted directly on or in proximity (150 feet or less) over the construction site, activities will cease until the condor leaves or is encouraged to leave by an approved biologist appointed by the National Park Service and US Fish and Wildlife Service.
- Project workers and supervisors will be instructed to avoid interaction with condors and immediately contact park resources division personnel if a condor settles at the site.
- The construction site will be cleaned 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 site will be immediately disposed in appropriate containment and removed from the site at the end of each working day. Park employees will be contacted for assistance.
- To prevent water contamination and potential poisoning of condors, a spill prevention and cleanup plan will be developed and implemented for this project. The plan will include provisions for immediate cleanup of any hazardous substance and define how each hazardous substance will be treated in the event of leakage or spill.
- All project personnel will be provided with a copy of literature about condors.
- Project personnel will be strictly prohibited from hazing or harassing condors.

If condors or other federally listed species enter the proposed project site, the species may be disturbed by human presence, noise, heavy equipment activity, and construction-related visual cues. Construction-related impacts, including noise, will be temporary, lasting for the duration of the activity (the hours of equipment operation on a given day). Human presence may occur at the Lees Ferry staging area, depending on security needs during the project. The staging and construction period is expected to last 2.5 months. Equipment transport is expected to be using a barge only. As a result, population-level effects on condors or other listed species are not expected to occur, and therefore, effects will not be significant.

Although adverse cumulative impacts on wildlife will occur under the selected action, these will be largely driven by other past, present, and reasonably foreseeable future actions. The localized adverse impacts of the selected action will not contribute significantly to these overall cumulative effects.

#### **6.4 Tribal and Cultural Resources**

While the Colorado River and the canyons are a TCP, it is important to recognize that numerous resources in the TCP will see effects from the selected slough channelization action. One positive effect is that channelization will reduce breeding by nonnative fish at the slough site, resulting in fewer warmwater nonnative predatory fish in the new channel and in the Colorado River mainstem. Another positive effect at the slough site is that channelization better addresses life balance concerns of Tribes by allowing the National Park Service to reduce the lethal removal of nonnative fish in the newly constructed channel. The National Park Service will no longer need to use chemical Rotenone at the slough site to remove nonnative fish. The amount of netting and electrofishing to remove nonnative fish from the new channel will also be reduced. Channelization will thus result in long-term gains in improved environmental conditions and gains in savings in costs and employee time, allowing more effort to continue in managing nonnative fish in the river mainstem and at other locations within Glen Canyon.

The selected channelization project will also affect resources in the river and canyons within the TCP in the following ways. As shown in figure 2 above, the newly constructed, 1,000-foot-long channel will extend from the river mainstem above the sloughs, cut down through the historic river side channel, cut across the middle of the upper slough, and cut through a riparian barrier down into the lower slough. Water will travel through the new channel before it rejoins the river mainstem below. The upper slough pond, substrate, and vegetation will be directly altered, causing the loss of salamanders, toads, invertebrates, plants, some wetlands (0.14 acres) and up to 4.66 acres of riverine submerged aquatic vegetation. The composition of invertebrate species in the new channel will decline at first, then change into a low level of invertebrates more adapted to a flowing stream channel. Some riparian habitat to support these species will be retained, and disturbance to the spring will be minimized to the extent possible.

Because there are multiple upwelling sites, water from the spring will very likely continue to flow into the newly constructed channel and onward into the mainstem of the Colorado River after project completion. Direct impacts on the left bank, which contains the highest concentration of upwelling sites, will be avoided, and Reclamation will not add fill on top of the precise upwelling locations. As a result, impacts on the spring will not be significant.

Project-related mitigation measures recognize physical, biological, and spiritual considerations concerning the spring and its location and function in the upper slough. This includes impacts on associated species life such as plants, amphibians, and invertebrates. Mitigation also considers the cultural views of Tribes, who speak of springs and the life they support as special features Tribes tend to and manage, and this includes pilgrimages where Tribes express prayers and ceremonies at springs. Project-related mitigation may include off-site efforts to conserve and enhance alternate spring sites in Glen Canyon.

Mitigation actions are described above and in attachment A. After project completion, these actions will help restore some of the wetland, riparian, vegetation, and life balance values lost during or after channel construction. Mitigation actions may include off-site work to enhance known alternate locations in Glen Canyon that have a spring, wetland, or riparian vegetation. Habitat locations improved through mitigation may help restore some of the wildlife or invertebrate species lost, though the loss of salamanders at the slough site may never be fully recovered.

As part of addressing impacts in the Colorado River ecosystem and canyons in the TCP, the National Park Service will continue to work with and engage Tribes of intended management actions and consult on appropriate measures for mitigation based on each management action. Examples of continuing mitigations include the beneficial use of removed nonnative fish, such as collecting fish during management actions and transporting them to Tribes for fertilizer, human consumption, or as food in eagle aviaries. Although beneficial use has been used in the past (BOR 2011; NPS 2018), what is considered beneficial use may not be the same for all Tribes and is considered only a partial mitigation by most Tribes. What a specific Tribe considers beneficial use may also change over time as communities become more aware of evolving community needs and specific management actions, including a beneficial use option to use removed fish in scientific research.

While there are minor, localized adverse impacts on resources that contribute to the TCP, as described, the National Park Service has determined in consultation with Tribes that the project will have no adverse effect on the TCP as a historic property, and the impacts on the TCP overall will not be significant. Although adverse cumulative impacts on Tribal cultural resources will occur under the selected action, these will be driven by other past, present, and reasonably foreseeable future actions, including Glen Canyon Dam operations. The localized adverse impacts will not contribute significantly to the overall cumulative effects. In addition, the benefits after completion of the project will help reduce some of the adverse cumulative effects by reducing the taking of fish life and protecting native fish.

## **6.5 Recreation, Visitor Use, and Experience**

The selected action will temporarily affect visitor recreation in the Glen Canyon reach. To reduce these impacts, the proposed project work will occur from January through March, when public use is at its lowest level. Visitors seeking an isolated winter experience will be disturbed by the noise and visual disturbance from the construction work at the slough site. Boating traffic at Lees Ferry and along the Glen Canyon reach may be delayed by the barge moving heavy equipment up and down the river at the beginning and end of the project; however, the majority of boating opportunities will remain unaffected.

Lees Ferry will experience impacts during the mobilization and demobilization periods, which are expected to last approximately one week or less. Barge assembly and loading will likely require closing part or all of the boat ramps at Lees Ferry for a short time (estimated to be one or two days). The purpose of this closure is to protect human health and safety by preventing the public from entering the location and interacting with the crane that will be loading barges into the water. A partial or potential full closure at the Lees Ferry boat ramps could result in the delay or cancellation of guide service launches for (fishing or kayak back hauls) in the Glen Canyon

reach and for Grand Canyon river raft trips scheduled to travel downriver from Lees Ferry in early January and mid-March. Glen Canyon NRA and Grand Canyon National Park staff will work together to notify permit holders and the fishing and boating communities so they may reschedule trip launches as needed. Although there could be delays and closures that affect visitor use and experience, the impacts will not be significant because these closures will only last one or two days at the beginning and end of the project during a period of lesser visitation. In addition, permit holders and the fishing and boating community will still have ample opportunities to access the river.

Visitors will not be permitted to access the slough site during construction for safety reasons. While this will reduce recreational opportunities and diminish the overall visitor experience in the Glen Canyon reach, these impacts will be short in duration (during the construction period) and not significant because they are localized to the slough area itself, which provides limited recreational opportunity to visitors as compared to other locations throughout the corridor.

Both duck hunting and bow hunting for carp will be directly impacted by the selected action in both the short and long term because these species may not be present nor accessible during or after channel construction. However, because these species are expected to find similar habitat elsewhere, there will not be significant adverse impacts on hunting opportunities, even if it is more difficult for hunters to finish their hunts successfully. Rainbow trout fishing in the side channel may improve due to flowing water and increased dissolved oxygen. Rainbow trout fishing in the Glen Canyon reach may improve slightly due to fewer smallmouth bass and fewer green sunfish problems from competition and predation.

The overall cumulative impacts on visitor use and experience in the Glen Canyon reach will continue to be generally beneficial to visitors and recreation as a result of past, present, and reasonably foreseeable future actions. The limited adverse and beneficial effects of the selected action will not contribute significantly to these overall cumulative effects.

## **7. DEGREE TO WHICH THE PROPOSED ACTION AFFECTS PUBLIC HEALTH AND SAFETY**

Under the selected action, there will be no significant impacts on public health, public safety, or unique characteristics of the region. No highly uncertain or controversial impacts, unknown risks, significant cumulative effects, or elements of precedence were identified. Implementation of the NPS selected alternative will not violate any federal, state, or local environmental protection law, providing mitigation is implemented effectively.

## **8. EFFECTS THAT WILL VIOLATE FEDERAL, STATE, TRIBAL, OR LOCAL LAW PROTECTING THE ENVIRONMENT**

The selected action does not threaten or violate applicable federal, state, Tribal, or local environmental laws or requirements imposed for the protection of the environment. The selected alternative will not violate any provision or requirement identified under legislation addressing Glen Canyon NRA, the NPS Organic Act, the Grand Canyon Protection Act, or any other subsequent legislation.

## **9. PUBLIC INVOLVEMENT AND AGENCY CONSULTATION**

### **9.1 Public Scoping**

The National Park Service sent letters to stakeholders and submitted a press release and public notice as part of the scoping period from July 22, 2024, through August 5, 2024. During this time, the National Park Service also hosted two in-person public meetings, the first on July 23, 2024, at the Glen Canyon NRA headquarters and the second on July 25, 2024, in Marble Canyon. Public notices were distributed via the following sources:

- a press release posted on the park website, in local newspapers, and on media accounts (Facebook, Instagram, and X)
- a news release sent electronically (via e-mail) to stakeholders, agencies, and media groups

The park received verbal comments and questions from 18 people attending the July scoping sessions and written correspondence during the scoping period from one private company, one private stewardship organization, one federal agency, and five state agencies. The scoping comments contributed to the development of the EA.

### **9.2 Environmental Assessment Public Comment Period**

The draft EA was made available for public review and comment during a 14-day period from September 30 through October 14, 2024. During the review period, 23 correspondences were submitted to the National Park Service through the Planning, Environment and Public Comment (PEPC) website or e-mail. National Park Service responses to the comments received are summarized and included in attachment B. All comments received are incorporated into the project record. Public notices of the comment period were distributed through the same sources as public scoping, as mentioned above.

### **9.3 Arizona State Historic Preservation Office and Section 106 Consultation**

Glen Canyon NRA staff consulted directly with Tribes and with the Arizona State Historic Preservation Office in 2024 about the proposed slough channelization project. Contacts include formal letters to Tribes in April, July, August, and October, along with Teams video calls, multiple phone calls, and in-person meetings. Glen Canyon NRA staff sent formal letters to the Arizona State Historic Preservation Office in August and October and completed several virtual calls. Park staff also spoke with nine Tribes, seven of which are directly affiliated with the Glen Canyon portion of the Colorado River. Consultation with the Tribes is summarized below. Tribes asked for more time to consider the slough project before it is constructed. Tribes asked the National Park Service to consider a third alternative in the EA. Tribes also asked for more information about the spring in the upper slough.

In their August 30, 2024, letter to Glen Canyon NRA, the Arizona State Historic Preservation Office recommended the development of a programmatic agreement or memorandum of agreement based on the following concerns:

- the complexity of the undertaking (slough channelization)
- the presence of the National Register of Historic Places-eligible Colorado River TCP
- the river’s relationship to the broader unevaluated cultural landscape
- the potential for a finding of adverse effect

The Arizona State Historic Preservation Office recommended a collaborative approach. Glen Canyon NRA staff opted to engage Tribes in further discussions to better identify if agreement can be reached on “no adverse effect” as opposed to an “adverse effect” determination. From September 2024 to January 2025, additional consultation discussions occurred with Tribes. As a result of those conversations, the National Park Service adjusted project design to help conserve spring upwelling sites and assist in the initial survival of local salamanders. With project concurrence from all nine Tribes by January 15, 2025, the Arizona State Historic Preservation Officer sent written concurrence to the National Park Service indicating their concurrence with a finding of no adverse effect.

#### **9.4 Tribal Consultation**

Glen Canyon NRA and Grand Canyon National Park staff sent initial consultation letters to the park’s seven consulting Tribes on April 25, 2024, describing the proposed action and issues of potential Tribal interests and inviting them into consultation about not only the project but also for input on the proposed area of potential effects.

Park staff engaged with Tribal representatives as they requested, including follow-up e-mails and phone calls made to seven Tribes on May 13 and May 14, 2024. A second letter was sent to seven Tribes on July 22, 2024, as well as a second e-mail inviting Tribes to the draft EA open house. On August 16, seven Tribes were again contacted inviting them to visit the project site on September 5. Three Tribes attended. Two additional Tribes were added to consultation on the project at this point, when the park became aware of their interest.

On September 23, all Tribes were sent a preview of the draft EA to review. On December 2, 2024, a letter was sent to nine Tribes confirming the park’s no adverse effect determination, with an explanation as to how this determination was reached. More consultation took place, including additional phone calls with some Tribes, and three visits by park staff to a Tribal Nation, which ultimately led to a modification to the design by engineers to adjust the project design where possible to better address specific Tribal concerns. All nine Tribes have either expressed concurrence or identified no concerns with the modified project design as of January 13, 2025.

On January 14, 2025, Glen Canyon NRA staff sent the letter of concurrence for the last Tribal consultation, and on January 15, 2025, the Arizona State Historic Preservation Officer sent written concurrence to the National Park Service with the finding of no adverse effect.

All nine Tribes were sent final correspondence, including the modifications to design and updates on areas where they had previously expressed concern, during the week of January 20, 2025. Two Tribal visits to the project site are scheduled starting February 1, 2025, and more will be scheduled as requested by Tribes.

## 9.5 US Fish and Wildlife Service

Regarding section 7 consultation under the Endangered Species Act, as amended, Glen Canyon NRA staff worked with the US Fish and Wildlife Service to develop a biological assessment using the service’s IPaC software during a pre-consultation period from May to October in 2024. Glen Canyon NRA staff submitted the biological assessment on October 10, 2024, to the service. Informal consultation was completed in November 2024. The biological assessment concluded that the selected alternative has no effect on federally listed species within the project activity area. The biological assessment and service letter recognize the selected alternative will benefit native and federally listed fish species in Grand Canyon, especially the flannelmouth sucker, razorback sucker, and humpback chub.

## 9.6 US Army Corps of Engineers

Because the selected action will involve work below the ordinary high-water mark of the Colorado River, which is a jurisdictional water of the United States, Reclamation will obtain permit authorization on behalf of the National Park Service under section 404 of the Clean Water Act from the US Army Corps of Engineers.

## 9.7 Other Stakeholders

Glen Canyon NRA staff met with key stakeholders early in the planning process to discuss impacts and concerns (see chapter 4 of the EA). For the scoping and public comment periods, park staff submitted a news release, which was distributed to various stakeholders, government agencies, and media groups.

## 10. FINDING OF NO SIGNIFICANT IMPACT

Based on the information in the EA, analysis in this FONSI, and proposed mitigations, the National Park Service has determined that the selected action does not constitute a major federal action having a significant effect on the human environment. Therefore, an environmental impact statement will not be required.

This finding is based on consideration of CEQ criteria for significance (40 CFR 1501.3(b), 2023) regarding the potentially affected environment and degrees of effects of the impacts described in the EA.

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## **ATTACHMENT A: MITIGATION AND RESTORATION AFTER CHANNELIZING THE -12 MILE SLOUGH**

Restoring a river side channel at the slough site converts still-water slough riparian/wetland habitat into a faster-flowing restored river side channel with riparian habitat. This habitat conversion brings positive change in managing nonnative warmwater fish but impacts a spring, the upper slough it supports, and the associated habitat upon which amphibians and invertebrates depend during their life cycle. For these reasons, post-project mitigation, restoration, and monitoring are important to help restore balance in the Glen Canyon portion of the Colorado River. This includes ecological, resource, and life balance that are important to the creation stories, heritage, and well-being of many Tribes in these canyons.

### **PROPOSED APPROACH IN MITIGATION**

Mitigation may include some longtime concerns expressed to Glen Canyon NRA managers by some Tribes. For example, Tribes have asked Glen Canyon NRA staff to move portable toilets along the river away from canyon wall petroglyph panels as a way of achieving better balance and respect for cultural values. Glen Canyon NRA staff will consider this and other actions as discussions with Tribes continue.

Native vegetation will be restored both on-site at the slough and off-site at one or more other locations within the Glen Canyon reach of the Colorado River. Potential off-site mitigation locations will be assessed in 2025, with off-site mitigation actions implemented from 2026 through 2029. Off-site mitigation will include actions to restore balance regarding resource values impacted by slough channelization. Hence, potential mitigation sites will be evaluated for benefits to native vegetation, spring, wetland, and riparian values while also considering benefits to salamanders, toads, invertebrates, waterfowl, and shorebirds. More than one mitigation site may be selected, and actions will tap a resource toolbox that includes possible prescribed fire and clearing with hand tools to improve both wetland and terrestrial habitat. The amount of post-project wetland and riparian habitat restored will depend on multiple factors, including site condition, species presence, water movements, and the level of disturbance by the visiting public.

One potential mitigation site suggested to Glen Canyon NRA staff is the location near Horseshoe bend, often called Leopard Frog Marsh (on river left, mile marker -9.12). For this reason, this 2024 draft EA incorporated by reference the Glen Canyon NRA 2008 *Environmental Assessment for Hidden Slough Pilot Site* (NPS 2008b) with its considerations, consultations, and pilot actions. This 2008 EA informs additional potential mitigation actions at Leopard Frog Marsh and elsewhere in the Glen Canyon reach. This site currently has the potential for enhancements to its spring site for thinning nonnative vegetation and improving its habitat for salamanders, toads, frogs and native fish.

A second potential mitigation location is also called Hidden Slough, but is located on the right riverbank at the -6.3 mile marker. This site contains turbid water, which can be helpful in protecting toad and salamander eggs and larvae and other life stages from predation by

nonnative fish. This site will be evaluated for both aquatic and terrestrial habitat improvement potential, including vegetation restoration.

If feasible, mitigation may include the additional monitoring of fish, salamanders, toads, and invertebrates in the riparian channel of the post-project slough site from 2026 through 2029. The schedule for native plant monitoring and restoration is provided below.

While all these mitigation actions are intended to span five years, roughly 2025–2029, adjustments in timing and years in mitigation may become necessary pending various factors such as funding, available personnel, site condition, competition from nonnative plants, and the ability and pace of restored species to generate and thrive.

## **PROPOSED SCHEDULE FOR NATIVE PLANTS OF VALUE TO TRIBES**

### **Summer 2024**

Glen Canyon NRA employees will collect native seeds from the slough site and along the river from Lees Ferry to the dam for the following species, most of which are culturally important to local Tribes. Other plant species may be added to the list.

*Artemisia ludoviciana*

*Aristida purpurea*

*Sporobolus flexuosus*

*Euthamia occidentalis*

*Apocynum cannabinum*

*Carex emoryi*

*Equisetum xferissii*

*Thymophylla pentachaeta*

*Stanleya pinnata*

### **November 2024**

Glen Canyon NRA employees will take cuttings from *Salix exigua* and remove native *Carex* clumps to overwinter in the greenhouse. *Juncus articulatus* and *Juncus arcticus* will also be collected as rhizomes or full plants.

### **Winter 2024**

The proposed slough channelization project will occur from January 1 to March 15 in 2025.

### **Summer 2025**

Glen Canyon NRA employees will observe soil and plant dynamics at the slough site, both at the sand/cobble bar and alongside the newly constructed channel. Pending monitoring and

observations, park staff will treat or remove nonnative vegetation. Subsequently, staff will establish native plants using seeds, cuttings, and other stored native plants and plant materials.

### **Fall 2025**

Glen Canyon NRA employees will plant native vegetation and seeds as needed.

### **Years 2026–2029**

Glen Canyon NRA employees will remove nonnative vegetation and plant native vegetation as the site(s) becomes ready. This work will occur both on-site at the slough and off-site at one or more mitigation locations in the Glen Canyon segment of the Colorado River corridor.

# ATTACHMENT B: PUBLIC COMMENT SUMMARY REPORT

## BACKGROUND

The proposed action is intended to disrupt warmwater nonnative fish reproduction overall, with a particular focus on reducing numbers of high risk (predatory) nonnative warmwater fish. Predatory nonnative warmwater fish threaten current populations of native fish in the Colorado River in Glen, Marble, and Grand Canyons. These threats are of great concern regarding long-term survival of the federally listed humpback chub (*Gila cypha*, threatened) and razorback sucker (*Xyrauchen texanus*, endangered) under the Endangered Species Act of 1973 (Public Law 93-205; 87 Stat 884), as amended.

The National Park Service released the draft “Warmwater Nonnative Fish Management at the -12 River Mile Slough Environmental Assessment” for public comment from September 20 to October 14, 2024, to seek feedback from the public on the draft plan. Comments were collected through the NPS PEPC website at <https://parkplanning.nps.gov/GLCASloughEA>, as well as via mail and e-mail.

All comments received were considered and included in the overall project record and are summarized here. A total of 23 pieces of correspondence were received during the public comment period.

This report summarizes the concerns and ideas expressed during the public comment period.

## CORRESPONDENCE ANALYSIS

The following table was produced by the NPS PEPC database and provides information about the numbers of correspondences received by state.

**Table FONSI B-1. Correspondence Distribution by State**

State	# of Correspondences
Arizona	11
California	1
Colorado	3
New Mexico	1
Nevada	1
Utah	5
Wyoming	1

## DEFINITION OF TERMS

The following definitions are used for the associated terms in this document.

**Correspondence:** A correspondence is the entire document received from a commenter. It can be in the form of a letter, written comment form, note card, or other written communication on the plan to the park.

**Comment:** A comment is a portion of the text in a correspondence that addresses a single subject or issue. It could include information such as an expression of support or opposition to the use of draft strategy, a suggestion for a potential management strategy, or additional data regarding existing conditions or key issues.

**Concern Statement:** A concern statement is a description of a group of comments that are focused on a common subject. Comment summaries combine similar comments.

## CONCERN STATEMENTS

The following concern statements are grouped into overarching themes.

### Effectiveness of Proposed Action

Many commenters express concern with the continued presence of invasive fish species in the slough, despite implementing several tiers of actions outlined in previous planning for the site. In addition, commenters express general support for enacting the plan to stop smallmouth bass and other warmwater nonnative fish from spawning. One commenter notes that carp are continuing to spawn, which indicates that current temporary and experimental bypass releases being undertaken by Reclamation has not adequately reduced temperatures and that further action is needed. Another commenter suggests that park staff should move quickly to modify the slough to ensure that nonnative fish species are not able to reproduce and disperse this upcoming spawning season. Other commenters are more critical of the proposal, with some indicating that active management has not been adequate to maintain desired fisheries.

**NPS Response:** As described in the EA, the National Park Service finds that the proposed action will be the most effective to manage fish populations, as required under applicable law and policy, including the NPS Organic Act, *NPS Management Policies 2006*, and the Grand Canyon Protection Act. Channelization will increase flow velocities and cool the water to effectively discourage nesting and spawning by nonnative species, and the use of rock, cobble, and sand fill in the upper slough will eliminate ponding. It is also likely that this action will reduce the need for active management through removal activities in the new channel, such as chemical treatments (Rotenone), electrofishing, Fyke netting, and block netting. This action is consistent with the progressive suite of control measures that were identified in the 2018 EA to manage nonnative fish populations below the Glen Canyon Dam.

## Project Costs

Commenters remark on the overall costs of the proposed action, with one indicating that permanent channelization will likely be effective and less costly than other annual management actions for warmwater, nonnative species control, such as piscicide (Rotenone) application in the -12 Mile Slough; repeated electroshocking of the Colorado River to remove warm water nonnative species; and operational flow changes at Glen Canyon Dam. One commenter mentioned that decisions under the *Long-Term Experimental Management Plan Supplemental Environmental Impact Statement* were costing an estimated \$12 million for this year. The commenter supports the plan's modifications of the slough since this effort will likely help prevent the need for such extensive and costly bypass flows in upcoming years and help preserve the basin fund for its original purposes.

Others feel that the costs were excessive to achieve the stated goals of the plan. One commenter opposes spending money and resources on an issue that they believe citizens are not seriously concerned with.

**NPS Response:** While this project will not necessarily replace actions being undertaken by other agencies, the National Park Service does find that this project will reduce the costs associated with its recurring activities to manage the nonnative fish population in the upper and lower sloughs. In particular, the staff time required to conduct activities like chemical treatment, electrofishing, and netting will be reduced in the newly constructed side channel, though regular monitoring will continue to occur. The bureau acknowledges comments received from individuals regarding lack of public concern over the issue but finds that it has an obligation to engage in nonnative fish management activities as directed by various applicable laws and policies and seeks to do so in a fiscally responsible manner. The strategies identified in this plan are cost-effective in meeting the stated purpose and need and may result in an overall reduction in costs associated with nonnative species management at the slough site.

## Fisheries Management

One commenter mentions that supporting native fish populations destroys the recreational sport fishery and is a waste of money. The commenter sees no reason to destroy the fishery that was created to preserve native fish species that they believe a large majority of canyon visitors do not know exist. Another commenter indicates that there is no appropriate way to balance a sustainable ecosystem where native fish thrive and accommodate the "world-famous" recreational trout fishery in this stretch of the river. On the other hand, some feel that the bureau is focusing too much on recreational fishing, specifically as it relates to the broader mandates of the 1992 Grand Canyon Protection Act, and that other important projects under this act have not moved forward. They do not believe there is an appropriate way to balance a sustainable ecosystem for native fish to thrive while also accommodating the recreational rainbow trout fishery.

**NPS Response:** While not the primary intent of the project, the bureau anticipates that the proposed action will indirectly benefit the recreational sport fishery. This project reduces threats by nonnative fish populations, which compromise the sport fishery

because of predation, by competing with desirable species and reducing spawning habitat. As stated in the EA, the project will likely have a generally positive effect on the recreational trout fisheries in this way. At the slough site, the new channel will be cooler and contain more dissolved oxygen, making the new side channel more appealing to trout. Additionally, it is important to note that this project is not taking away funding or support from any other projects needed or being undertaken to carry out other habitat management activities or to more broadly meet the mandates of the Grand Canyon Protection Act.

## **Wildlife and Wildlife Habitat**

Commenters express concerns regarding other affected species, including salamanders and peregrine falcons. One commenter recommends moving salamanders if they are found to be a native species. Another commenter notes the presence of peregrine falcon nesting territory in the cliff above the slough. They believe that the planned use of heavy equipment for slough channelization could have a negative effect on this population and that it could cause an active nest to fail, premature fledging and predation of young, and possible complete abandonment of the breeding territory. For these reasons, the commenter believes that slough channelization should be done at a time of year outside the peregrine nesting season.

**NPS Response:** The overall project has been developed with close consideration of impacts on the entire range of sensitive species present in the project area. To help manage potential impacts on nesting species, such as peregrine falcons, construction is planned to occur in the winter. Peregrine falcons are not nesting during this period.

Regarding salamanders, direct DNA testing shows the salamanders are the native Arizona salamander. Environmental DNA testing shows an absence of this species of salamander in the rest of Glen Canyon below the dam. Further, scientists indicate that the slough population of salamanders is the only native population detected in recent years along the Colorado River between Lake Powell and Lake Mead. The slough salamanders persist from year to year despite high-flow events and predation pressure from green sunfish in the upper slough. Because of the relatively rare presence of this native salamander population in this area, the National Park Service has adjusted the selected action to preserve potential habitat and burrows along the left bank of the upper slough to the extent possible. While some salamanders may not survive construction of the channel or the resulting conversion of ponded habitat into side channel streamflow habitat, some individuals may survive with habitat preserved under this refined action. Additional mitigation measures will also be considered, such as capturing and relocating the salamanders to an alternative location with suitable habitat or restoring new salamanders to a suitable location.

During the consultation process, Tribes discussed issues of special concern, including potential impacts on a spring that may be feeding the upper slough and treatment options that result in loss of life. Correspondence from one Tribal Nation during the EA comment period notes that springs are sensitive and culturally significant to their Tribe and that they do not support channelizing the slough with a spring present. Another Tribal Nation notes that the modification of the slough will likely decrease the need for

other, more invasive management actions, such as piscicide (Rotenone) applications and electroshocking, which result in loss of fish life, which is of concern to some Tribes.

### **Issues of Special Concern to Tribes**

A couple of commenters specifically discussed issues of special concern to Tribes, including potential impacts on a spring that may be feeding the upper slough and treatment options that result in loss of life. Correspondence from one Tribal Nation during the draft EA comment period noted that springs are sensitive and culturally significant to their Tribe and do not support channelizing the slough with a spring present. A couple of commenters mentioned that the modification of the slough would likely decrease the need for other, more invasive management actions, such as piscicide (Rotenone) applications and electroshocking, which result in loss of fish life of concern to some Tribes.

**NPS Response:** Park staff have worked closely with Tribes throughout the project development process and through a separate section 106 process to better understand and respond to potential impacts on historic resources in the project area, including the Colorado River TCP. Through close coordination with affiliated Tribes, the bureau has determined a “finding of no adverse effect” for the action under section 106. The Arizona State Historic Preservation Office has concurred with this finding. Park staff will continue to consult with affected Tribes throughout project implementation process to ensure issues of Tribal concern are effectively addressed. Engineers have revised the project design based on Tribal input, providing for the protection of the spring and its flow, and seeking to preserve the left bank to the extent possible to minimize impacts on salamander burrows and habitat. All Tribes with which the National Park Service consulted have expressed positive support for this project because it protects the native fish population without the use of lethal management options.

### **Tribal Consultation Process**

One Tribal Nation comments that Reclamation and the National Park Service did not formally consult one-on-one with their Tribe before seeking action to channelize the slough and further requests that their Tribe receive government-to-government consultation, with no other Tribe present, before Reclamation and the National Park Service take further action on channelizing the slough. They recommend that the National Park Service continue to monitor the slough and harvest nonnative fish until an appropriate solution is developed in consultation with Tribes.

**NPS Response:** Park staff began conversations with the Tribes when the project began in early in 2024. Glen Canyon NRA first initiated consultation with seven affiliated Tribes traditionally associated with the Glen Canyon portion of the Colorado River Basin. When Glen Canyon NRA staff learned that two Tribes traditionally associated with the Grand Canyon portion of the basin consider the canyons as a whole, park staff invited these two additional Tribes into the consultation process for the proposed slough channelization project.

For these reasons, Glen Canyon NRA staff are consulting with a total of nine Tribes regarding channelization of the slough site. Tribal consultation letters and invitational

correspondence about the slough project were sent to Tribes from April through December in 2024. Multiple visits to the slough were facilitated for all Tribes interested, including at least two more visits that are scheduled for 2025. In-person government-to-government consultation has taken place on-site at the park, as well as with multiple visits made to individual Tribal Nations. Park staff have continued to engage with its Tribal partners as part of the section 106 consultation process for this effort, which is occurring parallel to the NEPA process. In working with consulting parties, including Tribes, park staff have better defined the nature of the action and have moved forward with a “finding of no adverse effect,” which was concurred by the Arizona State Historic Preservation Office. Tribal perspectives have been critical to our decision-making process, such that engineers have now revised the project design based on Tribal input, providing for the protection of the spring and its flow and seeking to preserve the left bank to the extent possible to minimize impacts on salamander burrows and habitat. Park staff will continue to engage with Tribal partners as the proposed action is refined and carried out.

### **Recreational Impacts**

One commenter notes that boat ramps may need to be temporarily closed during staging and loading periods for public safety, and they suggest that partial closures be considered, when feasible, to maintain access for recreational boaters. The commenter also emphasizes the importance of adequate advanced notice of closures so that recreationalists are aware and able to adjust their plans for boating, angling, and wildlife-related recreation.

**NPS Response:** Park staff have developed a construction plan that seeks to avoid or minimize impacts on recreational users at Lees Ferry and throughout the Glen Canyon Reach. Specifically, as described in the EA, park staff have identified a work zone location that separates construction activities from visitors to the extent feasible, and staging at Lees Ferry is oriented to avoid conflicts with areas of visitor use. Further, all construction activities are occurring at the conclusion of the rafting season to avoid potential impacts on commercial operators and rafting operations at the park. Park staff will issue a press release detailing the anticipated construction activities in advance to further reduce the likelihood of any potential conflicts with park visitors.

### **Mitigation Measures**

One commenter noted that the National Park Service is noncommittal in its description of mitigation as a component of the proposed action by using phrases like “potential mitigation,” “summary of potential mitigation actions is in Appendix B,” “examples of potential mitigations include,” “mitigation actions may include,” and “Mitigation may include.” They believe the National Park Service should revise the EA to sharply define the mitigation actions that will be taken as part of the proposed action. They believe this clarity might provide greater confidence for the bureau to determine, based on the EA, that NEPA does not require the preparation of an environmental impact statement because the proposed action will not have significant effects due to mitigation.

**NPS Response:** The details of the selected action has been refined in the FONSI to the extent that mitigation measures are not critical to the overall project in terms of significance of effects. The selected action has a relatively low potential for adverse impact, as described in the FONSI, though mitigation measures are included in attachment A that will further reduce impacts throughout project implementation and after it is completed.

### **Range of Reasonable Alternatives**

A commenter mentions that NEPA requires an agency to consider reasonable alternatives to a proposed project as part of its assessment of the project's environmental impacts. The commenter notes that agencies may not eliminate alternatives simply because they do not provide a complete solution to the problem. The commenter believes that in appendix A, the reasoning for dismissing alternatives 3 and 4 are not suitable, and instead, the National Park Service should briefly discuss the reasons that alternatives 3 and 4 do not achieve the purpose and need for the action.

One commenter notes that each of the nonflow actions, whether from the 2018 EA or otherwise, represent a specific tool available to adaptively manage the resources listed in the *Long-Term Experimental and Management Plan (LTEMP)*, *Final Supplemental Environmental Impact Statement*. However, they further note that new tools, particularly those that support the stated purpose and need and not at the expense of other LTEMP resources, should be analyzed independently for implementation in a programmatic manner.

**NPS Response:** The National Park Service considered a full range alternatives as part of its planning process, and based on guidance in the NPS NEPA Handbook, only the proposed action alternative was considered reasonable and therefore carried forward for detailed analysis EA. Other alternatives considered, including alternatives 3 and 4, were not considered reasonable because they are only partial solutions to the problem, and the additional-effort needed to manage nonnative fish and prevent spawning will be infeasible and impractical long term given park staffing and funding constraints. The EA has been revised in the errata to expand on the reasons for dismissing less suitable alternatives, including alternatives 3 and 4, because they will not fully meet the purpose and need described in the EA.

With regard to other management tools, park staff have focused this decision on a tool put forward in the adaptive management framework in the 2013 and 2018 EAs, which called for channelization of the slough site. While channelization is the preferred action for the management of nonnative fish populations at the -12 river mile slough, a complete solution to manage invasive fish populations below the Glen Canyon Dam *must* rely on innovative management solutions carried out by a number of federal partners, including Reclamation and Grand Canyon National Park. Further, other tools described in the 2018 EA and 2013 *Comprehensive Fish Management Plan* are still available to use today. Glen Canyon NRA staff will continue to work with partners to ensure that long-term management can be effective.

## Historic Presence of the Slough

Commenters express a range of opinions on the historic presence of the upper and lower sloughs—specifically whether they are historic features or whether they are artificial products from dam operations or flooding in the 1980s. One commenter believes that the body of available science clearly demonstrates that the current slough is a post-dam feature and that the modification proposed in the EA should be characterized as restoring the historical nature of the feature to its pre-dam condition. They note that NPS staff explained “that the slough, its side channels, and adjacent sand/cobble bar have at times been completely under water, depending on river flows” and that the “NPS does not have complete information regarding the age of wetland characteristics at the slough site.” The commenter believes this statement is contradictory to the published paper, as well as to the photographic analysis provided by Dr. Paul Grams. They believe it is important to transparently share the USGS analysis with the Tribal Nations. They further note that if the National Park Service is aware of other scientific evidence or traditional ecological knowledge that counters the evidence published by Dr. Grams and colleagues, and shared in the photographic analysis, then that information should be included and appropriately cited in the EA as well.

**NPS Response:** The origin and persistence of the -12-mile slough site is heavily debated, with largely differing opinions among agency officials and various stakeholders. Some officials readily state the slough site, especially the upper slough, are artificial products of the dam, implying the upper slough and general slough site are only 40 years old. Other resource managers believe the slough site in general is much older than the dam, implying the original slough site is natural and predated the dam, but has experienced influences from dam operations since the 1960s. In assessing pre- or post-dam presence of the slough, the National Park Service considered the work done by Dr. Grams, as well as the best professional judgment of NPS resource managers. As a result of these considerations, the National Park Service feels the acknowledgement in the EA that we are restoring an historic side channel that was present and flowed more frequently earlier in history is an appropriate characterization. And for the purposes of this EA, additional changes are not necessary, as they do not have bearing on the impacts analysis.

## Presence of a Spring at the Slough

One commenter indicates that section 3.3.1.2 of the EA provides preliminary results from an unreferenced study on water inputs to the upper slough and concludes that the upper slough is maintained by spring water. The EA states that “similar fluctuations” to the 1.5 feet of stage change observed at Lees Ferry will be expected at the -12 mile slough; however, the commenter does not agree with the conclusion that an isolated side channel pool will exhibit similar stage changes as the mainstem, even if it was the sole water source. They note that the diel patterns observed in the stage measurements for the upper slough, shown in figure 3-6, suggest that the water levels are being influenced by mainstem discharge. They further mention that hyporheic flows through the sediment below and alongside a river can extend several meters. They note there are significant interactions between hyporheic flows, groundwater and defining or classifying these water sources can be a matter of scale. They comment that even though the EA

attempts to differentiate the waters based on specific conductance, water chemistry can rapidly transition in the hyporheic zone through natural filtering and biochemical processes.

**NPS Response:** The spring information shared in this section of the EA is based on the best available information at the time the EA was prepared. Since the slough EA was released for public review, results from three additional parameters (major ions, nutrients, and stable isotopes) also support the presence of a spring in the upper slough. Of seven parameters, data results from all seven parameters indicate it is a spring in the upper slough. Further investigations undertaken by park staff have confirmed the presence of multiple seeps that feed the spring at the slough, the majority of which exist along the left bank of the upper slough. The draft EA has been updated by errata to reflect these findings, though these new findings do not change the analysis in the EA, which already assumed the presence of a spring. The selected action has been revised in the project design to avoid direct impacts on the spring upwelling sites along the left bank, which has greatly reduced the potential for impacts on the spring. While the spring will no longer feed a pond in the upper slough, spring water will continue to seep into the river at this location.

# ATTACHMENT C: ERRATA INDICATING TEXT CHANGES TO THE ENVIRONMENTAL ASSESSMENT ENTITLED WARMWATER NONNATIVE FISH MANAGEMENT AT THE -12-MILE SLOUGH

## INTRODUCTION

This errata documents changes to the text of the EA in response to comments received on the EA during the public review process, as well as other corrections. Original text from the EA is included to provide context and allow for comparison to the text change. Additions to text are underlined, and deleted text is shown by strikeout.

## ERRATA FOR THE PLAN/ENVIRONMENTAL ASSESSMENT

### Front Matter

#### Title Page: Revised Text

Warmwater Nonnative Fish Management ~~Plan at the -12 River Mile Slough~~ / Environmental Assessment

### Chapter 1: Overview, Purpose, and Need

#### Page 1: Revised Text

Purpose: The purpose of taking action is to compliment collaborative, interagency management strategies being implemented to prevent the successful reproduction of high-risk (predatory) warmwater nonnative fish, particularly smallmouth bass and green sunfish, in the Colorado River through the management of ~~in~~ the upper and lower sloughs at river mile -12, which has conditions favorable for nonnative fish spawning. The approach would seek to minimize negative effects on native species, restore natural functions or dynamics, and mitigate impacts, as necessary.

#### Page 1: Revised Text

Need: The need is driven by increased levels of entrainment of high-risk nonnative warmwater species surviving passage through the Glen Canyon Dam due to recent lower Lake Powell elevations, the increased dam outflow temperatures in 2022 and 2023, the expectation that these conditions will likely occur in the future, and the resulting reproduction of predatory smallmouth bass and green sunfish, including in the river mile -12 upper and lower slough.

#### Page 6: Revised Text

Table 1-1 ~~also~~ notes scouring flows (1950 to 1963) and flooding (1983 and 1984), which may have contributed large cobble to armoring of the slough sandbar surface. The table also indicates much lower flows during the period from 2000 to the present, which is known as the Millennial Drought, and is partly a result of climate change. The slough during this period had the fewest incidents of overwash, effectively reducing flows that would have been seen in the side channel historically.

### Page 8: Revised Text

Their projections anticipate river temperatures below Glen Canyon Dam to exceed 15.5°C often in the future, which is an important threshold as the lowest temperature at which smallmouth bass typically spawn. Other actions must be taken ~~unless other actions are taken~~ to avoid this, such as a cool-mix of water from bypass tubes at the base of the dam (BOR 2024a).

### Page 8: Added Text

In 2022 and 2023, elevated river temperatures (>15.5°C) resulted in warmwater nonnative predatory fish spawning and growing in numbers within approximately the first 20 miles of the river below the dam.

### Page 9: Revised Text

During 2024, Glen Canyon NRA fish crews were highly successful in using netting and other methods to prevent smallmouth bass from entering both the upper and lower sloughs, thus preventing breeding by ~~these bass in the sloughs~~ warmwater nonnative predatory fish from April to the time of the writing of this 2024 EA in September.

### Page 9: Revised Text

The Reclamation's cool-mix flows into the river from Glen Canyon Dam started on July 9, 2024 (BOR 2024a), and the cool-mix strategy so far has been highly successful in lowering water temperatures in both the river and in the lower slough to below the 15.5°C breeding threshold for nonnative warmwater fish. However, Reclamation has identified concerns with the extended use of bypass tubes, and infrastructure has not been evaluated for impacts of the 2024 cool-mix.

Despite the use of cool-mix flows, ~~the~~ the upper slough water continues to remain warmer compared to the river and lower slough. Larval stages of green sunfish were also found in the upper slough and in Hidden Slough at river mile -6, which indicates that green sunfish successfully reproduce outside of the river mile -12 slough site. Green sunfish were found in both the upper and lower sloughs during 2024, though in numbers lower than in the prior two years.

## Chapter 2: Alternatives

### Page 13: Revised Text

The proposed action in this 2024 EA builds upon slough modification potential actions identified in the prior 2018 EA, which analyzed several tools that include channelizing and dewatering of the upper slough. The methods outlined in the 2018 EA were designed in response to the threat from green sunfish, but it was found that they would not likely be successful at preventing warmwater invasive fish spawning more broadly. The more extensive designaction in this 2024 EA differs from what was proposed in the 2018 EA widening the proposed channel, extending the length of the channel into the lower slough, and connecting the upper end of the historic side channel to the river mainstem, which was determined to be more effective in reducing nesting and spawning by both smallmouth bass and green sunfish.

### Page 13: Added Text

Accordingly, consistent with sections 1802(a), (b), and (c) of the Grand Canyon Protection Act...

### Page 15: Revised Text

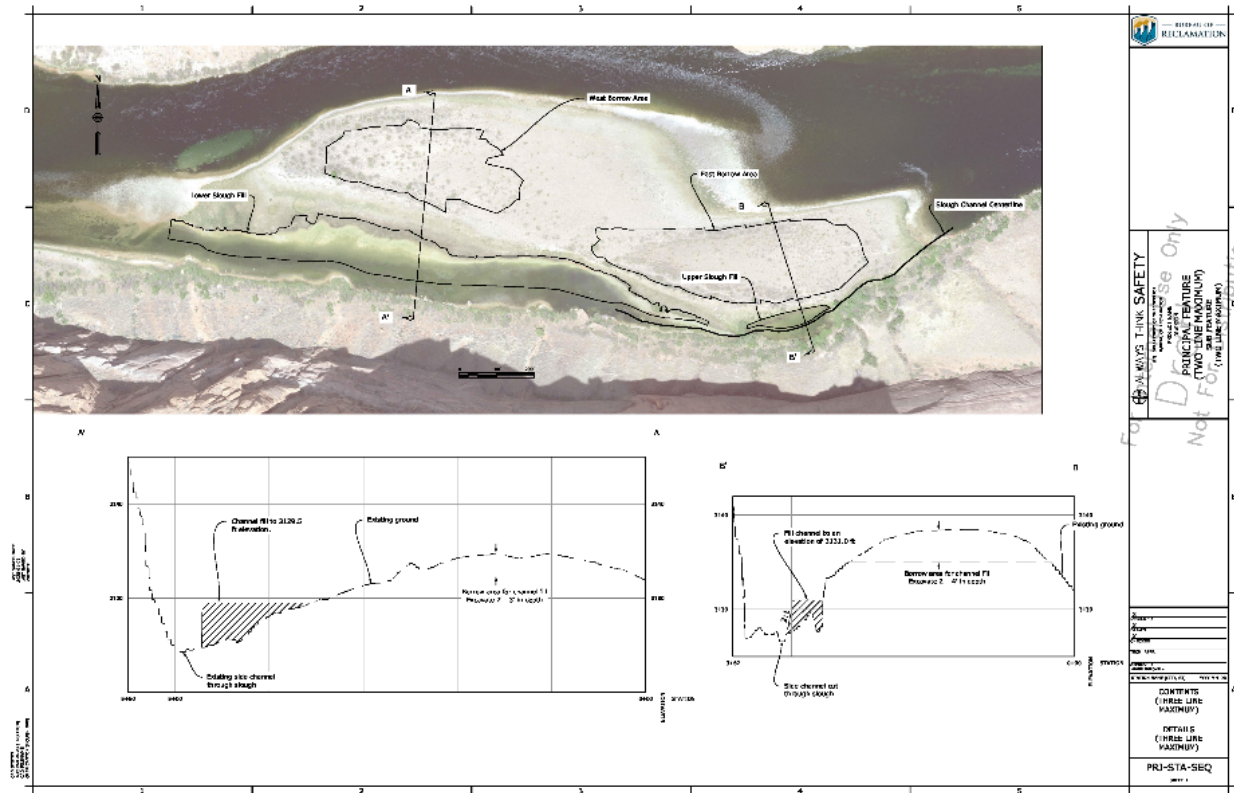
Current cooling of river mainstem water from Glen Canyon Dam cool-mix flows in summer 2024 are cooling the lower slough water below the 16°C nonnative fish spawning threshold via tidal action tied to dam water releases. That said, the slough can and does reach the temperature of 16°C before the mainstem, and there could be years where the slough would support bass and other warmwater nonnative fish reproduction before and without triggering any potential smallmouth bass flows. However, the 2024 Reclamation LTEMP SEIS extends consideration of this cool-mix action only to 2027, since it was intended as a short-term action to prevent nonnative fish breeding until a longer-term solution is identified and used. The decision to implement cool-mix flows is made annually, and the SEIS does not guarantee that cool-mix or any other smallmouth bass flow would be implemented. Failure to keep river flows below 16°C via natural flows, cool-mix, or other Glen Canyon Dam operations would result in additional breeding by warmwater nonnative predatory fish and additional threats to native fish like the federally threatened humpback chub.

### Page 15: Revised Text

~~The channel is proposed to be constructed from the river above, through the historic side channel, through the middle of the spring and upper slough, and into the lower slough (figures 2-1 below). The upper slough would be filled with rock, cobble, and sand, eliminating the existing pond. Rock, cobble and sand would also be used to partially fill the lower slough to increase the velocity and flow rate of water to discourage nesting and spawning by smallmouth bass and other predatory nonnative species.~~

The project would convert the upper slough into a flowing channel by cutting through the upper slough and barrier separating the upper and lower sloughs. The channel would be cut to a depth of the current upper slough floor, which sits at an average 2.5-foot depth. Fill material composed of excavated gravel, cobble, sand, and soil would be used to eliminate the upper slough contour and strengthen the channel banks running through the upper slough site. The width of the lower slough would be narrowed with fill to form a shallow bank, reducing the 6-acre aquatic lower slough into a 2-acre channel with 4 acres of adjacent land. Reclamation would avoid disturbing the left bank to the extent feasible, where the greatest inflow of spring water occurs, and would not add fill to these locations.

## Page 16: Replace Figure



## Page 16: Added Text

Work would start with channel construction in the upper and lower slough, filling portions of the upper and lower sloughs, and filling a portion of the lower slough (figure 2-1 above). Reclamation would avoid disturbing the left bank to the extent possible, where the greatest inflow of spring water occurs, and would not add fill to these locations.

## Page 20: Added Text

Fill in the upper slough would be at approximately the level of the existing water's edge and would be placed on both sides the right side of the new channel bank, completely filling the upper slough with sand, mud, and cobble while avoiding disturbing the left bank to the extent possible, where the greatest inflow of spring water occurs.

## Chapter 3: Affected Environment and Environmental Consequences

### Page 30: Revised Text

Connecting the slough to the mainstem river above would cool water in the slough and side channel to match river mainstem water temperatures and restore the functional flow of the historic side channel.

## Page 32 to 35: Revised Text

A study in 2024 initially indicates the upper slough is fed by a spring. Spring data analyses will continue for six parameters through the remainder of 2024. Initial findings are reported in this EA based on two initial comparative parameters, specific conductance, and water levels. Figure 3-5 below shows the upper slough sample site located in between the lower slough and river mainstem.

Glen Canyon NRA and the US Geological Survey (USGS) Arizona Water Science Center initiated a 2024 study to evaluate the water chemistry of collected water samples from three locations. These locations are the upper slough at the -12-mile mark, the Colorado River at Lees Ferry, Arizona (USGS site ID 09380000), and a spring located in Leopard Frog Marsh, near Horseshoe Bend, that is known to be a regional spring source. The set of six parameters undergoing analyses are as follows:

- Comparative water levels (figure 3-6a)
- Specific conductance
- Major ions
- Nutrients
- Stable isotopes
- Tritium

Figure 3-5. Upper slough (top middle), lower slough (lower right), and river mainstem (left)

Figure 3-6a. The upper plot shows a brief snapshot in time (30 minutes, top diagram) illustrating how water levels in the upper slough remain relatively steady while water levels in the river mainstem change more rapidly. The lower plot shows water levels in the upper slough compared to water levels in the Colorado River mainstem at Lees Ferry between June 25, 2024 and August 8, 2024.

The initial evaluation of transducer data suggests there is minimal fluctuation in the water level of the upper slough from June 25 to August 8 in 2024 (figure 3-6a). During the same period, the water level of the Colorado River fluctuated daily by approximately 1.5 feet at the Lees Ferry gage with similar fluctuations expected at the -12-mile slough location. Transducer data thus support daily and weekly field observations of Glen Canyon NRA employees who observe the upper slough maintaining itself at relatively steady levels despite fluctuations in levels of the adjacent river mainstem.

Based on 2024 specific conductance results alone, the water source feeding the upper slough is most likely from a spring and not from the Colorado River mainstem. Measured in microsiemens per centimeter ( $\mu\text{s}/\text{cm}$ ), specific conductance was 222.7 at the upper slough inflow, compared to 222.4 at the Leopard Frog Marsh seep spring, and compared to 767.6 at the Lees Ferry river mainstem. The specific conductance measured at the upper slough indicates its bottom-groundwater inflow is likely a spring or seep located at the deepest point in the pond.

During the remainder of calendar year 2024 (October through December), spring data results became available for three additional spring parameters: (1) major Ions, (2) nutrients, and (3) stable isotopes. These parameters also support the conclusion that the water source is most likely a spring. The final (sixth) parameter in the upper slough spring study is the data result for tritium, which can indicate the age of the spring water flowing into the upper slough. As of January 2025, the lab results for tritium are not yet available.

Further on-site investigations undertaken by NPS staff confirm the presence of multiple spring water entry points that feed the upper slough, the majority of which exist along the northeast corner and left bank of the upper slough. The spring water upwelling sites are indicated by yellow arrows and blue circles on the diagram in figure 3-6b.

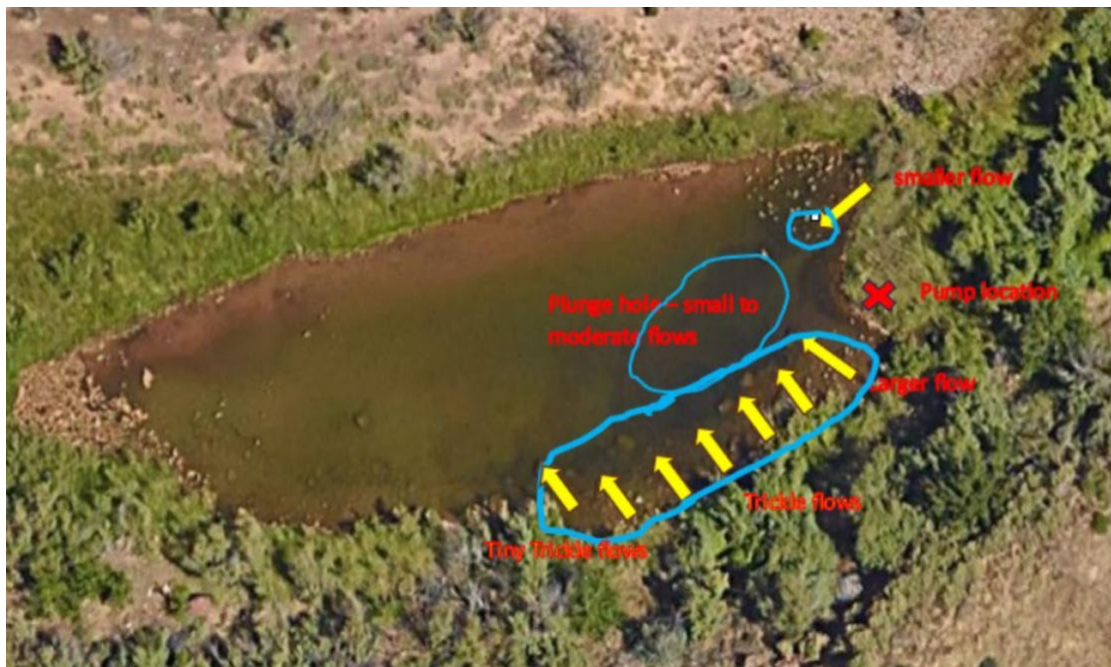


Figure 3-6b. The upper slough. Yellow arrows show multiple spring inflows. Blue circles show groupings of spring upwelling sites. Red text indicates degree of spring inflows, ranging from smaller to moderate to larger inflows, along with smaller or tiny trickle flows. Most of the spring inflows occur in the northeast corner and left bank of the upper slough.

#### **Page 36: Revised Text**

In 2015, at Leopard Frog Marsh, and in 2016, near the upper slough, one native Arizona salamander was found at each Glen Canyon location by an NPS employee, which was identified as a native Arizona salamander by the Arizona Game and Fish Department (NPS unpublished data). Current surveys and eDNA work in Glen Canyon NRA confirm salamanders are no longer detected at Leopard Frog Marsh nor in its vicinity.

#### **Page 40: Revised Text**

Whereas the Colorado River between Glen Canyon Dam and Hoover Dam was relatively free contained lower levels of nonnative fish during earlier decades, the presence of nonnative fish

species ~~became introduced~~ has increased over time into Lake Powell, Lake Mead, and tributaries of Glen and Grand Canyons.

**Page 40: Revised Text**

The National Park Service concluded that smallmouth bass and brown trout ~~are~~ were a very high risk to native species at that time, while green sunfish ~~are~~ were identified as a medium-high risk (figure 3-11). However, with changing water conditions below the Glen Canyon Dam, there is reason to believe that risks from green sunfish are higher than were previously rated given the warmer water temperature.

**Page 41: Added Text**

In response to the detection of smallmouth bass amid a growing number of green sunfish in Glen Canyon, a larger multiagency effort was initiated in 2022 using multiple fund sources for the National Park Service to target and remove high-risk nonnative fish in Glen and Grand Canyons.

**Page 47: Revised Text**

The implementation of cool-mix flows would complement the ~~Success of the proposed action~~ and increase the chance of success is highly dependent on cool-mix flows occurring each year.

**Page 49: Added Text**

The upper slough would be partially filled with sand, cobble, and larger rock, leaving a channel 6 feet wide at the bottom and 30 feet wide at the top. Reclamation would avoid disturbing the left bank to the extent possible, where the greatest inflow of spring water occurs, and would not add fill to these locations.

**Page 49: Added Text**

The bank of rock, mud, and vegetation that separates the upper and lower sloughs would be breached, possibly causing the direct loss of burrow sites and the loss of the amphibians and invertebrates within or near those sites, though disturbing the left bank, where some burrows occur, would be avoided to the extent possible.

**Page 50: Revised Text**

The proposed action could cause the salamanders population at the slough to become ~~locally~~ lost, causing a broader extirpation in Glen and Grand Canyons, which is important because as this is the only currently known population of Arizona tiger salamander identified in recent surveys ~~location~~ along the Colorado River corridor, in both Glen Canyon NRA and Grand Canyon National Park (B. Holton, pers. comm.), ~~where tiger salamanders were detected in recent surveys.~~ Moving salamanders to a new location before project construction is very difficult, and their rate of survival at a new location might be low to none. However, the project would retain some habitat that supports this salamander population along the left bank to the extent possible.

#### **Page 50: Revised Text**

However, warmwater nonnative predatory fish would persist in the river mainstem and river side habitats in Glen and Marble Canyons, so cool-mix flows remain an important management tool each year, along with efforts to remove nonnative fish from the river mainstem when cool-mix flows are not occurring.

#### **Page 51: Added Text**

The rainbow trout sport fishery would remain vulnerable to decline due to nonnative fish predation and competition in the mainstem, but the completed slough project and cool-mix flows might help rainbow trout survival longer term by reducing the abundance and reproduction of nonnative predatory fish. The presence of cooler water and dissolved oxygen would also support the survival and reproductive success of rainbow trout.

#### **Page 56: Added Text**

A variety of waterfowl and shorebirds occur in the Glen Canyon corridor, and they visit the slough site for feeding and resting during winter. The lower slough is the largest and most active winter feeding and resting area in the 15-mile reach in Glen Canyon below the dam. However, some winter feeding and resting activity is seen in much smaller numbers at or just upriver from Lees Ferry, in the vicinity of Hidden Slough around the -6 river mile marker, and at the dam slough (3 miles upriver).

#### **Page 61: Revised Text**

The upper slough would be ~~eliminated~~ converted to a channel by excavating and partly filling it with rock, mud, sand, and cobble from the side channel and sand/cobble bar

#### **Page 62: Added Text**

As a result, these birds may simply not visit the slough site anymore in favor of finding more suitable habitat elsewhere that would continue to support their needs, such as at loafing habitat just upriver from Lees Ferry, in the vicinity of Hidden Slough around the -6 river mile marker, or at the dam slough (3 miles upriver).

#### **Page 62: Added Text**

This plan retains the California condor for further EA analysis below since it occurs near the proposed slough project vicinity. Glen Canyon and Lake Mead National Recreation Areas and Grand Canyon National Park are located within the experimental population area for the California condor. These areas are administered by the secretary of the interior and are included in the national park system (see 16 USC § 1c(a)) and are subject to the 1916 Organic Act and other laws applicable to national parks and monuments. Condors located in national recreation areas and national parks within the experimental population area should be treated as a threatened species for purposes of section 7 consultation.

#### **Page 70: Revised Text**

Under the 2024 proposed action alternative, a much deeper and wider 1,000-foot-long channel would be cut from the river mainstem down through the historic river side channel, across the

middle of the ~~spring and~~ upper slough, and down into the lower slough. The ~~spring and~~ upper slough habitat would be directly impacted causing the loss of salamanders, toads, invertebrates, some plant life, some wetlands (0.14 acres), and up to 4.66 acres of riverine submerged aquatic vegetation, though disturbing the left bank would be avoided to the extent possible, potentially retaining some habitat that supports the salamander population.

#### **Page 79: Added Text**

Waterfowl would have to use an alternate site located elsewhere, and this would make it more difficult for duck hunters to finish their hunts successfully. The -12 river mile slough is the largest location offering the greatest number of waterfowl, marsh birds, and shorebirds for winter feeding and resting, which makes it the best opportunity in the Glen Canyon 15-mile reach for waterfowl hunting. However, smaller numbers of waterfowl and smaller opportunities for duck hunting could be found at loafing habitat at the dam slough (3 miles upriver) or near the -6-mile marker in the vicinity of Hidden Slough.

### **Chapter 4: Consultation and Coordination**

#### **Page 87: Revised Text**

The humpback chub is federally listed as threatened under the Endangered Species Act of 1973, and it was recently downlisted from endangered, largely because ~~of the abundance of humpback chub in Grand Canyon~~ there are not established nonnative warmwater fish below Glen Canyon Dam threatening the reproducing populations in the Little Colorado River and western Grand Canyon. The establishment of smallmouth bass below Glen Canyon Dam would be a consistent and a significant new threat to this species.

#### **Page 87: Revised Text**

The nearest Mexican spotted owl critical habitat is located 40 miles from the proposed project site, though it is possible that the owl is present or nesting closer. If that is the case, it is reasonable to assume that the owl would use the Glen Canyon corridor to travel between habitat components used for foraging, dispersal, nesting, or other functions.

### **Appendix A: Decisions on Impact Topics and Project Alternatives**

#### **Page A-1: Revised Text**

Alternatives 3 and 4 below were considered by the National Park Service but were dismissed from detailed EA analyses because the National Park Service and partner agencies believe alternatives 3 and 4 would not meet the purpose and need of the plan. These alternatives present only partial solutions to the problem, and the additional effort needed to manage nonnative fish and prevent spawning would be infeasible and impractical long term given park staffing and funding constraints to be less effective for reducing spawning by warmwater nonnative predatory fish when compared to the proposed alternative described in chapter 2.

## ATTACHMENT D: DETERMINATION OF NON-IMPAIRMENT

The NPS Organic Act of 1916 directs the National Park Service to “conserve the scenery, natural, and historic objects, and wildlife in the System units and to provide for the enjoyment of the scenery, natural and historic objects, and wildlife in such manner and by such means as will leave them unimpaired for the enjoyment of future generations” (54 USC 100101). National Park Service *Management Policies 2006*, section 1.4.4, explains the prohibition on impairment of park resources and values:

*While Congress has given the Service the management discretion to allow impacts within parks, that discretion is limited by the statutory requirement (generally enforceable by the federal courts) that the Park Service must leave park resources and values unimpaired unless a particular law directly and specifically provides otherwise. This, the cornerstone of the Organic Act, establishes the primary responsibility of the National Park Service. It ensures that park resources and values will continue to exist in a condition that will allow the American people to have present and future opportunities for enjoyment of them.*

An action constitutes impairment when its impacts “harm the integrity of park resources or values, including the opportunities that otherwise will be present for the enjoyment of those resources or values” (NPS 2006, section 1.4.5). To determine impairment, the National Park Service must evaluate the “particular resources and values that will be affected; the severity, duration, and timing of the impact; the direct and indirect effects of the impact; and the cumulative effects of the impact in question and other impacts. An impact on any park resource or value may constitute impairment, but an impact would be more likely to constitute an impairment to the extent that it affects a resource or value whose conservation is

- necessary to fulfill specific purposes identified in the establishing legislation or proclamation of the park;
- key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park; or
- identified in the park’s general management plan or other relevant NPS planning documents as being of significance” (NPS 2006, section 1.4.5).

The purpose of Glen Canyon NRA, along with park significance statements and a description of the park’s fundamental resources and values, are described in the *Foundation Document for Glen Canyon National Recreation Area and Rainbow Bridge National Monument* (NPS 2014). The park’s purpose is as follows:

*Glen Canyon National Recreation Area, located at the center of the Colorado Plateau, provides for public enjoyment through diverse land- and water-based recreational opportunities, and protects scenic, scientific, natural, and cultural resources on Lake Powell, the Colorado River, its tributaries, and surrounding lands. (NPS 2014, 5)*

The park's significance statements and fundamental resources and values highlight resources that may be impacted by visitor day uses and related access to the park. The park's fundamental resources and values include the following (NPS 2014, 8):

- Heritage resources
- Lake Powell
- Landscape
- Paleontology
- Water

Resources that were carried forward for detailed analysis in the EA and for which a non-impairment determination has been made include water quality, aquatic resources, terrestrial resources, wildlife resources, and Tribal and cultural resources. A non-impairment determination is not necessary for recreation, visitor use, and experience because these impact topics are not generally considered a park resource or value subject to the non-impairment standard (NPS 2006, section 1.4.6). Any impacts on other resources that will be subject to a non-impairment determination (NPS 2006, section 1.4.6) are so minor that they were not carried forward for analysis in the EA (see appendix A in the EA) and will not result in impairment.

## **Water Quality**

Water quality is directly linked to the purpose of Glen Canyon NRA and as such, is identified as a part of the park fundamental resource and value of water. Water is essential for public outdoor recreation use and for sustaining terrestrial and aquatic life in the high desert, and the quality of water in the project area is linked to actions taken upstream at the Glen Canyon Dam, such as water releases from Lake Powell. Sediment disturbance as a result of the project will produce a localized turbidity plume in the immediate area and downstream from the slough; however, the effects will be episodic, localized, and occur primarily during the action itself. While the plume could continue for a few days, after project completion, the effects will be relatively short-lived, and water quality will not be impaired in any meaningful way. The selected action is anticipated to have an overall beneficial impact on water quality in the project area over the long term. Connecting the slough to the main stem will cool water in the slough and side channel to match temperatures in the Colorado River, which will reduce spawning habitat for warmwater nonnative predatory fish. This action will also slightly increase dissolved oxygen levels in the slough, which will support greater biodiversity and aquatic life.

As described in the EA, long-term cumulative impacts are expected to be adverse, largely attributed to external processes outside of the control of the National Park Service. Past and present actions have reduced flow and resulted in alterations of water temperature, declines in dissolved oxygen, changes in sediment patterns, and increases in salinity in the Colorado River. These effects will continue from future actions at Glen Canyon Dam and along the Colorado River. Climate change will continue to have the most substantial effect on future conditions in water volume, temperature, and quality. Further, future decisions by the Reclamation regarding releases from Glen Canyon Dam could have a direct effect on water quality. The beneficial

impacts of this action will improve water quality in the project area and help to reduce cumulative impacts.

In conclusion, the selected action will not result in impairment of water quality since the selected action will likely result in cooler, more oxygenated water, causing an overall long-term benefit to park resources, including the water fundamental resource and value, which will remain unimpaired for the enjoyment of future generations as a result of the project.

## **Aquatic Resources**

The diverse array of aquatic resources in Glen Canyon NRA are similarly critical to the park purpose, and in the context of this selected action, are broadly encompassed within the water and landscape fundamental resources and values. These fundamental resources and values speak specifically to the importance of water to maintaining aquatic life in the park and diverse habitats that sustain endemic, rare, and relict plant and animal communities. The resources retained for analysis in the plan include a spring in the upper slough, fish, amphibians, macroinvertebrates, plants, and the habitat in which they occur. The selected action is anticipated to have a mix of potential impacts on these resources. In general, beneficial impacts are anticipated on fish, particularly native fish and special status fish species in the project area and points downriver. Other identified aquatic resources will experience adverse effects but not to the level of impairment.

The project location will be modified to eliminate spawning habitat for warmwater nonnative invasive fish species, which is anticipated to have a broadly positive impact on native fish species. Channelization will increase water velocity and reduce temperatures in a way that will deter warmwater nonnative species and benefit native fish species. The action, however, will greatly alter the habitat at the slough and will eliminate the upper slough pond. Amphibians, macroinvertebrates, and plants that depend on the wetland, riparian, and submerged habitats in the project area will be adversely affected, though altering the left bank will be avoided to the extent feasible. Avoiding the left bank will reduce the potential impact of the project on the native salamander population identified at the site. By avoiding the left bank, it is also likely that the spring will continue to flow into the new channel and onto the river mainstem. Mitigation measures will serve to offset adverse impacts and restore ecological and life balance to the 15 miles of Colorado River reach below the Glen Canyon Dam.

Adverse cumulative impacts may also occur to aquatic resources in the project area, primarily resulting from changes in seasonal and annual water flow patterns that drive dam release volumes and temperatures. Past, present, and reasonably foreseeable future actions and trends have or are expected to produce increased water demand (resulting from population growth and development), decreased water supply (resulting from drought and increased water temperature attributed to climate change), and other foreseeable actions. Decreases in runoff, reservoir volume, and river flow caused by drought and increased demand will result in lower reservoir elevations and warmer release temperatures, which could benefit native aquatic species but could also make conditions more favorable for warmwater nonnative aquatic species that prey on or compete with native species. The selected action is expected to benefit aquatic resources overall and decrease the magnitude of cumulative impacts by reducing the potential population growth of extremely harmful nonnative species.

Overall, the selected alternative will improve conditions for native fish and special status fish species, with minor adverse impacts on amphibians, macroinvertebrates, plants, and aquatic habitat. The selected action will minimize impacts on the spring and wildlife to the extent feasible, and impacts will be offset through mitigation on- and off-site. The impacts on aquatic resources will not seriously affect the overall condition of park resources, including the water and landscape fundamental resources and values, which will remain unimpaired for the enjoyment of future generations as a result of the project.

## **Terrestrial Resources**

The wide array of habitats present in Glen Canyon NRA support terrestrial resources that are important to maintaining the park purpose. These resources are included within the water and landscape fundamental resources and values as well. These fundamental resources and values speak to the importance of water in sustaining terrestrial life in the high desert and the vast landscape and diverse habitats that sustain endemic, rare, and relict plant and animal communities. The specific resource type retained for analysis in this plan include terrestrial and wetland vegetation. The project area provides habitat for wetland vegetation along the edge of the upper and lower sloughs, between the sloughs, and in the original channel upstream. The vegetation overstory is limited on the bank formation and mainly occurs at slightly higher elevations above and adjacent to the wetland and riparian area boundary. A range of overstory species are present.

The selected action converts two low-velocity sloughs into a higher-velocity channel with water temperatures more like the river mainstem. The proposed action causes the loss of 0.14 acres of jurisdictional wetlands and eliminates up to 4.66 acres of riverine submerged aquatic vegetation in the lower slough. Submerged aquatic vegetation in the lower slough will be eliminated in favor of upland sand/cobble fill. Some wetland or riparian substrate containing hydric soils or portions of root or seed banks could be saved by construction crews to add on top of a small portion of the sand/cobble fill. To offset potential impacts, the National Park Service will evaluate the restoration potential and initiate a five-year revegetation plan to restore native vegetation in the project footprint and possibly at one or more mitigation sites located outside of the slough project boundary. Riparian vegetation will be replanted, as needed, along the channel edge to restore a portion of the lost wetland habitat.

The slough site will continue to be subject to other external influences that will result in adverse cumulative impacts, but at a relatively small scale. As described in the EA, ongoing cumulative influences relate to changes in riparian vegetation resulting from the construction of Glen Canyon Dam. Future increased water demand and lower flows downstream of Glen Canyon Dam, which are expected with climate change, could stress and reduce riparian and wetland vegetation. Warmer discharges of water through the dam (attributed to climate change) could increase algae, causing both positive and negative food chain effects. If cool-mix flows continue from the dam, it is possible that algae response and food chain effects may calm.

In general, within the range of external influences, the impact of the project is minor, with a relatively small loss of terrestrial habitat. Mitigation measures undertaken on- and off-site will

seek to offset this impact to the extent feasible. The impacts on terrestrial resources will not substantially affect the overall condition of park resources, including the water and landscape fundamental resources and values, which will remain unimpaired for the enjoyment of future generations as a result of the project.

## **Wildlife Resources**

Glen Canyon NRA Wildlife resources have been retained as an impact topic in the EA, which are again directly related to the purpose of Glen Canyon NRA and linked to multiple fundamental resources and values—specifically water and landscape. Similar to the terrestrial resources, relevant language in these fundamental resources and value speaks to the importance of water in sustaining terrestrial life in the high desert and the vast landscape and diverse habitats that sustain endemic, rare, and relict plant and animal communities. A wide variety of wildlife species are associated with terrestrial and riparian habitat along the Colorado River. Many of these species are habitat generalists, occurring in ecosystems from both the riparian zones and upland communities. Some species require specific vegetation composition and structural components and may only occur in specific habitats in the river corridor. The wildlife resources discussed in the EA include common mammals, migratory birds, and species with federal status. Mammals that occur at or near the slough site include beavers, ringtail cats, badgers, and squirrels. The slough serves as an important winter resting and feeding habitat for waterfowl and shorebirds. Other migratory birds (e.g., raptors), migrate, stop to rest, and build nests along the river in the Glen Canyon reach or high above the project area along the cliff faces or on the rims.

Adverse impacts on wildlife from slough channelization in the selected action will result from noise, human disturbance, and abrupt habitat conversion from slough habitat to restored riverside channel habitat. Riparian habitat vegetation will be retained on the left bank of the channel and sloughs. The upper slough will be eliminated by filling it with rock, mud, sand, and cobble from the side channel and sand/cobble bar. The lower slough will be narrowed by two-thirds using similar fill material. Larger, mobile wildlife species are expected to temporarily avoid the area during construction. Loss of small amounts of wetland (0.1 acres net loss) and riparian habitat will result in less wildlife using the new channel. However, some wildlife may return after vegetation is restored to disturbed surfaces by mitigation measures described in the EA. Overall, the selected action is not expected to result in population-level impacts on wildlife. Additionally, while federally protected California condors do occur near the project area, they do not rely on the habitat at the slough. Long-term adverse impacts on the species are not anticipated.

Cumulative impacts on wildlife in the project area primarily relate to the changes in riparian vegetation resulting from the construction of Glen Canyon Dam. Future increased water demand and lower flows downstream of Glen Canyon Dam, which are expected under climate change, could stress riparian and wetland vegetation, resulting in adverse impacts on wildlife habitats and the wildlife food base. Warmer discharges of water through the dam (attributed to climate change) could increase algae and invertebrates, increasing the food base for some wildlife species. If cool-mix flows continue from the dam, it is possible some of these stresses on wildlife habitat and food base may calm. The selected action is not anticipated to contribute in

any major way to the external cumulative effects already experienced by wildlife resources in the corridor.

In conclusion, impacts on wildlife will be relatively minor, especially when considering the cumulative effects occurring because of other external influences. As stated, the selected action will not result in population-level impacts on wildlife, and impacts on federally protected species will be avoided. The impacts on wildlife resources will not substantially affect the overall condition of park resources, including the water and landscape fundamental resources and values, which will remain unimpaired for the enjoyment of future generations as a result of the project.

### **Tribal and Cultural Resources**

Tribal and cultural resources have also been retained as an impact topic in the EA. The range of cultural resources in Glen Canyon NRA are critical to the park purpose and represented in a fundamental resource and value focused on heritage resources. This fundamental resource and value speaks to the archeological and historic sites, cultural landscapes, and traditional cultural properties in the park that illustrate the connection of people with the landscape. Specific to the project area, the Colorado River is a Traditional Cultural Property (TCP) of interest to more than 30 Tribal Nations, including the seven affiliated with the Glen Canyon portion of the river. Associated Tribes have stated that they regard the Colorado River ecosystem, inclusive of the river and the land base from rim to rim in both Glen Canyon NRA below Glen Canyon Dam and in Grand Canyon National Park, as a TCP. Other cultural resources, including archeology, cultural landscapes, and historic districts, are not found in the project area, and no impacts are anticipated.

Under the selected action, a much deeper and wider 1,000-foot-long channel will be cut from the river mainstem down through the historic riverside channel, across the middle of the upper slough and into the lower slough. The upper slough habitat will be directly impacted, causing the likely loss of some salamanders, toads, invertebrates, plant life, some wetlands (0.14 acres) and up to 4.66 acres of riverine submerged aquatic vegetation. However, the selected action will avoid impacts on the left bank to the extent feasible, which will reduce impacts on affected species and may retain some habitat. The composition of invertebrate species in the new channel will decline and then change to a lower level of invertebrates more adapted to a stream channel. Impacts on the spring upwelling sites will be avoided to the extent possible, and it will likely continue to flow into the newly constructed channel and onward into the Colorado River. Tribes regard these natural resources as culturally important, as is the balance of life at the -12-mile slough and downriver in Marble and Grand Canyons. Consequently, the project may have minor adverse impacts on Tribal resources; however, these adverse impacts must be considered with broader positive impacts on native fish species. Further, Tribes have generally indicated support for the project and have concurred with a finding of no adverse effect on the Colorado River TCP. Mitigation actions after project completion will restore some of the wetlands, riparian habitat, and plant life to the slough site and could enhance a known spring downriver. Mitigation may not be fully successful in restoring lost amphibians, such as salamanders and toads, or in restoring slough-like riverine waterfowl resting and feeding habitat.

Also important to several Tribes is the taking of life associated with resource management activities, including the Hopi Tribe, the Pueblo of Zuni, and the Paiute Tribe. These Tribes generally object to bureau actions that use mechanical and chemical field methods to remove (take the life of) nonnative fish because these actions are not consistent with the Tribe's cultural and spiritual values associated with the Colorado River and Glen and Grand Canyons. To help create balance in life, the National Park Service has already implemented several mitigation measures to reduce taking of life or else provide "beneficial uses" of removed fish to help sustain life in other ways. The selected action is anticipated to reduce the need for taking of life activities at the slough, such as electrofishing or Rotenone treatments, which will result in an overall beneficial impact on Tribal resources.

As described, overall impacts on Tribal resources are anticipated to be minor, with impacts on the TCP avoided and impacts on the spring and amphibians minimized to the extent feasible. Mitigation measures will also seek to offset some of these impacts. Also, by reducing the need for taking of life activities, the selected action will have a beneficial impact for certain Tribes. The impacts on Tribal and cultural resources, including the heritage resources fundamental resource and value, which will remain unimpaired for the enjoyment of future generations as a result of the project.

## **Summary**

The National Park Service has determined that the implementation of the selected action will not constitute an impairment of the resources of the park. This conclusion is based on consideration of the park's purpose, significance, fundamental resources and values, and a thorough analysis of the environmental impacts described in the EA, comments provided by the public and others, and the professional judgment of the decision-maker guided by the direction in *NPS Management Policies 2006*.