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

Finding of No Significant Impact
Comprehensive Fisheries Management Plan

Background

In compliance with the National Environmental Policy Act (NEPA), the National Park Service (NPS) prepared an Environmental Assessment (EA) to examine various alternatives and environmental impacts associated with comprehensive fisheries management in all fish-bearing waters in Grand Canyon National Park (GCNP) and Glen Canyon National Recreation Area (GCNRA) below Glen Canyon Dam (GCD).

Prior to the completion of Glen Canyon Dam (GCD) in 1963, the Colorado River and its tributaries were home to eight native fish species. The river carried high sediment loads, and river flows and water temperatures varied tremendously by season. Since dam completion, released water has been clear and cold with flow variations based on watershed precipitation cycles (tributary inflows) and water storage and delivery and electrical generation needs. Non-native fish introduction, water diversions, and other factors also altered native fish habitats. Effects of these impacts have resulted in extirpation of three native fish species from GCNP and GCNRA including two listed under the Endangered Species Act (ESA), the Colorado pikeminnow and bonytail, and one candidate species, the roundtail chub. Two other native fish species, the humpback chub (HBC) and razorback sucker, are currently present in GCNP but listed as federally endangered. Only speckled dace, flannelmouth sucker, and bluehead sucker still maintain healthy populations, mainly in GCNP. The tailwater immediately below GCD in GCNRA does not provide suitable habitat for native fish populations. A non-native rainbow trout fishery was established in the Glen Canyon Reach in the 1960s[1]. This fishery has become important to both anglers and local businesses that cater to anglers. For more information on GCNRA's Rainbow Trout Fishery, see Chapter 3 of the EA, Affected Environment, Fisheries, Historical Status 1964-1998.

Selected Action

Alternative 2, Moderate Intensity Fisheries Management, is the preferred alternative and NPS's selected action because it best meets the purpose and need for the project and project goals.

GCNP Fisheries Management Goals for the Colorado River and its Tributaries

1. Meet or exceed population and demographic goals for the appropriate recovery unit applicable to GCNP for existing ESA-listed fish species, maintain self-sustaining populations, and restore distribution of those species to the extent practicable
2. Maintain or enhance viable populations of existing native fish, and restore native fish communities and native fish habitat to the extent practicable
3. Restore self-sustaining populations of extirpated fish species including Colorado pikeminnow, razorback sucker, bonytail, and roundtail chub as appropriate and to the extent feasible (if feasibility studies determine each species can be reasonably restored without impacting existing ESA-listed species)
4. Foster meaningful tribal relations and integrate tribal knowledge and perspectives into park management decisions and practices

[1] http://www.gcmrc.gov/research_areas/rainbow_trout/rainbow_trout_default.aspx

5. Prevent further introductions of non-native (exotic) aquatic species, and remove, when possible, or otherwise contain individuals or populations of non-native species already established in GCNP

GCNRA Fisheries Management Goals for the Colorado and Paria Rivers

1. Maintain a highly valued recreational rainbow trout fishery with minimal emigration of rainbow trout downstream to GCNP
2. Restore and maintain healthy, self-sustaining native fish communities, native fish habitat, and the important ecological role of native fish to the extent possible
3. Foster meaningful tribal relations and integrate tribal knowledge and perspectives into park management decisions and practices
4. Prevent further introductions of non-native (exotic) aquatic species

Preferred Alternative - Alternative 2

Adaptive Management

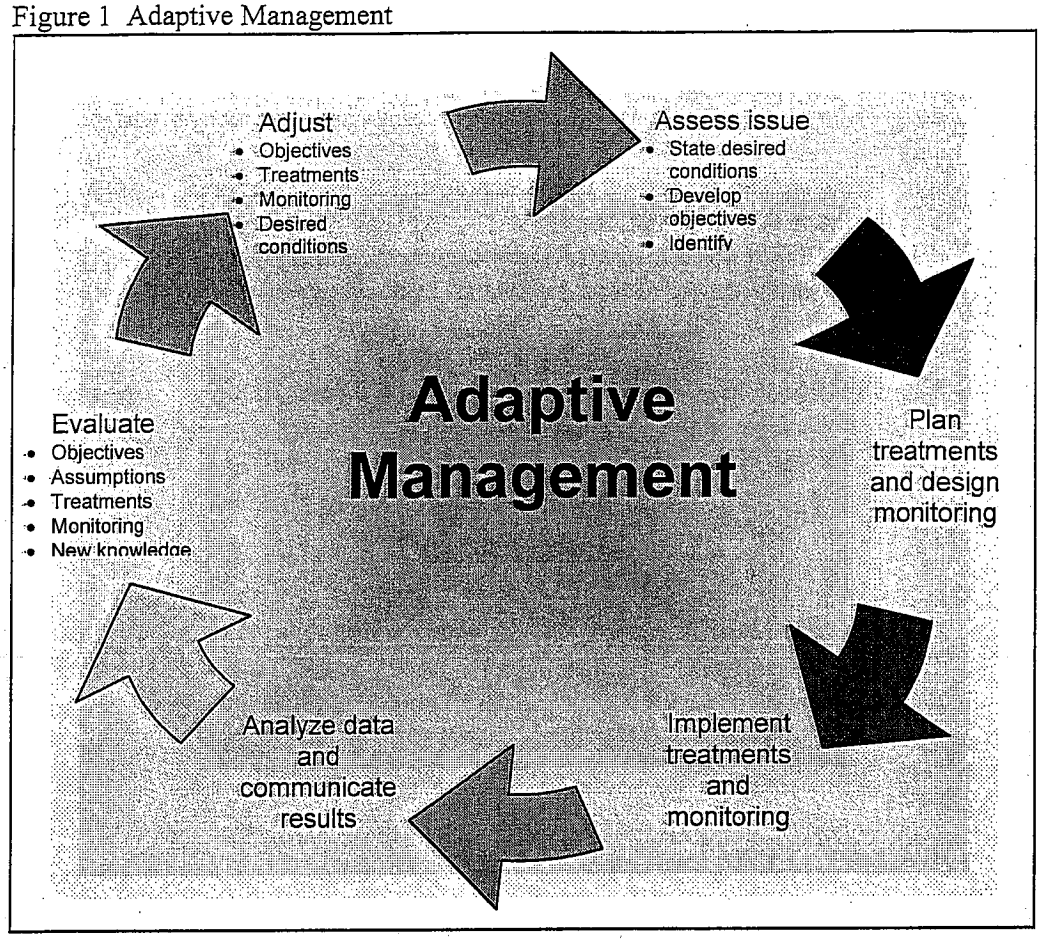
Implementation of the CFMP relies on adaptive management to achieve goals and objectives. Adaptive management is based on clearly identified, measurable objectives and monitoring to determine if proposed actions are achieving the desired result, and implementing changes if they are not (Walters and Holling 1990; Williams, Szaro, and Shapiro 2009). Critical to successful adaptive management is a rigorous monitoring program. Adaptive management advantages include: accounting for uncertainty and allowing for applied learning through development of a suite of predicated outcomes (i.e., alternate hypotheses), providing clear performance metrics or indicators, and providing for well-informed fisheries and aquatic habitat monitoring programs prior to action initiation. Monitoring success of initial actions can be adjusted based on defined triggers to meet goals and objectives (see Figure 1).

CFMP Adaptive Management Strategies

Objectives for fisheries in the project area, as described in Chapter 1 of the EA, are defined by Fisheries Management Zones (FMZ) including Colorado River mainstem areas, tributary, and tributary inflow areas. Managers will strive to meet objectives for each FMZ using management actions described in the preferred Alternative. The response of fish communities to each proposed action is uncertain. For example, while the best available science and expert opinion (Kennedy 2013) indicates removal of predatory brown trout would benefit native fish species, the effort needed to effectively control and maintain brown trout at low abundances, and how native fish respond to, or are affected by these activities, is uncertain. These types of uncertainties would be addressed through monitoring and adaptive management when defined triggers are met. Key questions and uncertainties addressed through management and monitoring in this EA include

- Will translocated humpback chub and other native fish remain and reproduce? The long-term (ten or more years) response of humpback chub and other native fish to translocation to new streams or mainstem areas is relatively uncertain
- How will populations of native and non-native fish respond to potential physical (capture and handling stress) and biological (reduced competition and predation) effects of non-native fish control activities over the long term (five or more years)?
- Is habitat sufficient to maintain razorback sucker in Lower Grand Canyon?
- Can Glen Canyon rainbow trout growth, condition, and size be improved, and can emigration downstream be reduced through active management?

Figure 1 Adaptive Management



The CFMP describes a hierarchal series of outcomes developed to address these questions for individual FMZs in each Action Alternative. Different outcomes represent circumstances that would trigger adaptive management. These outcomes were developed based on results of past fisheries management actions and monitoring in GCNP or GCNRA, quantitative predictive models including the humpback chub population viability model (Pine et al. 2013); brown trout harvest model (unpublished NPS, GCMRC and AZGFD 2012); review of published scientific literature (best available science); and expert opinion (Kennedy 2013).

Assumptions

- Non-native fish abundance can be reduced short term (i.e., during the sampling event) using electro-fishing techniques in tributaries
- Actions, such as non-native fish control, implemented to recover or conserve endangered fish would benefit other native fish in GCNP
- Humpback chub translocated to other GCNP areas may prey on other native fish in receiving streams, but historically, these species evolved together in the Colorado River basin. There have been shifts from historical physical and biological conditions in the river that could affect inter-species relationships. However, monitoring has not revealed substantial adverse effects of HBC on other native species, and thus, minimal population-scale impacts to other native fish populations would be expected as a result of HBC translocation
- Currently, humpback chub primarily reproduce in the Little Colorado River and disperse downstream, but habitat is sufficient in some tributaries for all or most life stages, and

downstream mainstem areas may occasionally support reproduction now or in the future (i.e., temperatures are occasionally sufficient farther downstream from GCD)

- Due to the high adult survival and longevity of humpback chub, annual recruitment may not be necessary to establish and maintain HBC in the Colorado River. Occasional recruitment may be sufficient to maintain populations long term
- Flannelmouth and bluehead sucker population trends can be effectively monitored through existing programs in the mainstem Colorado River
- If a severe decline in the GCNRA rainbow trout fishery occurs, the fishery could be effectively maintained by stocking of sterile triploid (non-reproducing) rainbow trout

Monitoring
Adaptive management strategies will be based on existing collaborative fisheries monitoring programs established in the Colorado and Little Colorado Rivers through the USGS-Grand Canyon Monitoring and Research Center (GCMRC) in support of Glen Canyon Dam Adaptive Management Program (GCDAMP). These programs are conducted in cooperation with U.S. Fish and Wildlife Service (USFWS), Arizona Game and Fish Department (AZGFD), and NPS.

Evaluation of Outcomes
Evaluation periods will be prescribed for each project where an adaptive strategy is taken. During that time, outcomes for each project or program will be assessed to determine if objectives are being met, and responses, that may include adaptation of current methods, implemented. Evaluation periods include annual consultation among management agencies, sharing of results and future plans with stakeholders and Traditionally Associated American Indian Tribes, and outreach to the public.

Emergency Rapid Response to Detected Expansion or New Non-native Species Introduction
Consistent with NPS Director's Order-12, for emergencies including

- expansion in distribution or abundance of existing high-risk non-native species, particularly in sensitive areas for native fish (e.g., Havasu Creek or Little Colorado River Inflow areas) or
- new detection of a rapidly spreading aquatic invasive species or non-native fish species
- The Superintendent could approve a temporary, short-term, targeted removal effort to treat known occurrences of the new threat using mechanical methods including angling, electro-fishing, and passive (i.e., trap nets) or active (e.g., seining) netting. Simultaneously, additional planning and compliance would be completed as necessary.

Humpback Chub Translocations

Humpback chub translocations were included among conservation measures in the most recent Biological Opinion for GCD operation (USFWS 2011). This Alternative element includes collection of larval or juvenile HBC from the Little Colorado River, rearing in a hatchery facility until large enough to mark with individually identifiable tags, and release to tributaries or downstream areas of the Colorado River in GCNP.

If abundance of other native fish, such as bluehead or flannelmouth sucker, declines, suckers may be translocated, or collected as larvae from tributaries and reared in a hatchery prior to release following development of a translocation and augmentation plan. The release plan would incorporate methods described for humpback chub relocations and NPS 2006 Management Policies direction for genetics management (Section 4.4.1.2, NPS 2006a). Additional interagency and tribal consultation and planning and compliance may be necessary prior to these activities.

Collection and Rearing of Fish

Humpback chub will be collected from the Little Colorado River during summer prior to monsoon onset (early to mid-July) or, if summer collecting trips are cancelled or ineffective due to flooding, a secondary collecting period would occur in fall (October or November). Trips would last approximately five days, and consist of six to eight biologists and volunteers. Equipment and staff will be flown into and out of previously established camps and landing areas via helicopter[2] (up to four flights to/from camps from Salt Helipad near the head of Salt Canyon). Collections will target young-of-the-year fish using netting methods.

Young-of-the-year humpback chub collected from the Little Colorado River will be flown from collection areas and transferred to a hatchery truck for delivery to a USFWS-approved hatchery facility. Fish will be quarantined and treated for parasites and diseases, following standard hatchery procedures, and held until approximately four inches (five to ten months), then tagged and released the following spring or summer. The number of individuals collected per year would depend on population viability modeling (Pine et al. 2013), genetic augmentation needs, and hatchery rearing capacity. Initially (the first five years, due to initial hatchery capacity), approximately 500 individuals will be collected for translocations per year, however a higher or lower number of fish may be collected in the future.

Translocation/Release of Fish

In late spring or early summer (the year after collection), tagged humpback chub will be flown from the NPS South Rim helibase in aerated coolers to release sites. Initially (the first five years), Havasu, Bright Angel, and Shinumo Creeks will be targeted for translocations; however, other tributaries, or areas of the mainstem Colorado River where sufficient habitat is determined to exist, may be considered for future translocations. Mainstem HBC aggregations (Valdez and Ryel 1995) may be targeted for translocations. Translocations in Shinumo Creek will be expanded to include another 0.6 mile (1 km) of stream below White Creek to increase the existing population size. Humpback chub translocation to Bright Angel Creek would only occur if brown trout were reduced from 2010 baseline estimates by greater than 80%. Brown trout will be monitored and maintained at or below 20% of the baseline population size by additional removals as needed. Following USFWS guidance (USFWS/ DNFHTC 2010), initial translocations of at least 200 fish would occur to each release area for a minimum of five years, and up to ten years (one generation, minimum 1,000 fish), depending on fish availability for translocation.

Adaptive Strategies for Management, Outcomes, and Triggers

Various Outcomes from humpback chub translocation into tributaries or mainstem areas are anticipated. For humpback chub, three potential HBC Outcomes are expected (see Table 1).

Table 1. Humpback Chub, Possible Outcomes from Translocations

Outcome	
HBC 1	Establishment of a second spawning and recruiting population in the mainstem or tributary
HBC 2	Sufficient survival and growth to provide a rearing ("grow-out") opportunity to augment the local mainstem aggregation
HBC 3	Failure of at least 20% of HBC to survive in the creek or adjacent mainstem aggregation for at least one year

The NPS and its cooperators will strive to meet HBC Outcome 1, which contributes the most toward humpback chub recovery goals; however, HBC Outcome 2 would result in benefits to humpback chub. HBC Outcomes 2 and 3 will be evaluated five years following initial translocations. However, it may require ten years or more (Pine et al. 2013) to determine whether HBC Outcome 1 has been observed.

Indicators for evaluation of potential humpback chub Outcomes are listed in Table 2.

[2] Determined by GCNP's Minimum Requirement Analysis

Table 2. Humpback Chub, Indicators for HBC Outcomes

Indicator	
A	Retention of translocated humpback chub over the first year
B	Similar or increased juvenile survival relative to the Little Colorado River and mainstem Colorado River near the Little Colorado River inflow
C	Similar or increased growth rates relative to the Little Colorado River and mainstem Colorado River near the Little Colorado River inflow
D	Contribution to and retention of translocated fish to an adjacent mainstem aggregation
E	Evidence of successful reproduction (presence of larval or young-of-year fish)
F	Evidence of recruitment to mature size

HBC Outcome 1 would be achieved if monitoring detected conditions described in HBC Indicators E or F. HBC Outcome 1 will trigger additional humpback chub translocations to maintain genetic integrity, consistent with genetics management principles found in DNFHTC (USFWS 2010) and Mills and Allendorf (1996). In summary, a minimum adult population of 200 fish will be maintained, with at least ten migrants per generation or it will be necessary to introduce ten additional adult fish into the population to maintain genetic integrity (Mills and Allendorf 1996). Based on observations made during translocations at Shinumo and Havasu Creeks (unpublished NPS data 2009-2012; Spurgeon 2012), and the number of fish remaining and surviving to adult size, between approximately 45 and 1,000 total fish may need to be released in translocation sites over a generation (a humpback chub generation is approximately ten years, R. Valdez, SWCA consultations, personal communication to B. Healy/NPS, August 3, 2012) to meet augmentation needs

HBC Outcome 2 will be achieved if monitoring detected conditions described in HBC Indicators A, B, C, or D for translocated populations. HBC Outcome 2 may be considered intermediate and expected to lead to HBC Outcome 1, which will be determined through continued monitoring. Alternatively, the particular translocation project for which HBC Outcome 2 will be observed for ten years may be considered a humpback chub rearing opportunity, in which case a minimum 200 adult fish would be maintained.

HBC Outcome 3 would signify translocation failure to partially or fully meet FMZ objectives, and translocations to a particular tributary or other mainstem area would cease. If at least HBC Indicator A is not achieved consistently after five years of translocations, and no other HBC Indicators are observed, then translocations to a particular area will be considered a failure (HBC Outcome 3), the translocation project would be re-evaluated and discontinued, as appropriate, following additional interagency and tribal consultation.

Monitoring

A key component of this project element and adaptive management is monitoring translocated humpback chub populations' survival, individual fish growth, and reproduction and recruitment. Further, monitoring and augmentation of translocated populations may be necessary to maintain genetic integrity (USFWS/DNFHTC 2010).

Access to monitoring sites, ideally up to three times per year, will follow GCNP's Minimum Requirement Analysis (MRA) process to minimize impacts to Proposed Wilderness. For tributary translocations, netting and/or electro-fishing may be necessary in both tributary and adjacent mainstem areas to determine humpback chub survival. Monitoring and continued control of non-native rainbow trout will also be employed during monitoring efforts at Shinumo Creek at least twice per year including a winter, one-week, raft-supported electro-fishing trip (February). No multiple-pass electro-fishing will occur in tributaries containing resident or transient populations of bluehead or flannelmouth sucker or humpback

chub during April, May, or June to coincide with spawning periods. A temporary, previously installed fish detection system will be maintained for three more years to test release methods on humpback chub retention, and monitor movements of translocated fish at Shinumo Creek.

Lower Colorado River FMZ Razorback Sucker Augmentation and Adaptive Management

Uncertainty exists as to whether GCNP habitat is suitable to maintain a self-sustaining razorback sucker population. Recent GCNP detections of razorback sucker tagged and released in Lake Mead, and their return to the lake suggests razorback sucker may use project area habitat at least occasionally. Further, as razorback sucker spawn and recruit in Lake Mead's Colorado River Inflow area, it is also possible populations will expand on their own into the Lower Colorado River FMZ (RM 179.2 Lava Falls downstream to Lake Mead).

A three-year study, begun in 2010, in Lake Mead's Colorado River Inflow confirmed wild razorback suckers were spawning and recruiting into the Lake Mead fish population (Kegerries and Albrecht 2011). Recent data confirms razorback sucker sonic-tagged in Lake Mead have moved into the Lower Colorado River FMZ at Quartermaster Canyon (R. Keggeries et al., Bio-West Inc, unpublished data). In addition, an untagged, ripe male was captured in the Lower Colorado River FMZ in October 2012 (A. Bunch, AZGFD, personal communication). In consultation with the Lake Mead Razorback Sucker Workgroup, a razorback sucker management strategy was developed (Valdez et al. 2012). The release of sonic-telemetry-tagged razorback sucker is planned, along with additional inventories to determine whether the Lower Colorado River FMZ habitat is suitable for razorback sucker.

Potential Outcomes related to razorback sucker suitability studies in the Lower Colorado River FMZ over the life of the plan are summarized in Table 3.

Table 3. Razorback Sucker (RBS), Potential Outcomes from Suitability Studies in the Lower Colorado River FMZ

Outcome	
RBS 1	Razorback sucker are present and reproducing in Lower Colorado River FMZ
RBS 2	Razorback sucker are present in substantial numbers in Lower Colorado River FMZ, but are not reproducing or recruiting in the Colorado River
RBS 3	Suitable razorback sucker habitat is available, but few individuals are present and no reproduction occurs

Depending on RBS Outcomes, elements of the phased adaptive management strategy described in Table 4 will be implemented.

Table 4. Razorback Sucker, Phased Adaptive Management Strategy

Phase	Year	Action
I	1-3	Conduct fish community survey of Lower Colorado River FMZ including larval fish, large-bodied fish, and sonic-tagged razorback sucker to describe/quantify fish community and identify potential spawning sites
II	End of Year 3	Evaluate data collected years 1-3 to identify • whether sonic-tagged fish remained in the area • razorback sucker presence/absence • whether the Lake Mead population is expanding into Grand Canyon
III	4	If Phase II results show substantial numbers (25%) of sonic-tagged razorback sucker remain, or razorback sucker presence (larvae or other unmarked adults), or evidence of Lake Mead's

Phase	Year	Action
		population expanding into Grand Canyon, then establish a long-term monitoring program for razorback sucker in Lower Colorado River FMZ, and • Suspend plans to augment razorback sucker in Lower Colorado River FMZ if evidence of increasing abundance of razorback sucker or expansion of Lake Mead population into the Lower Colorado River FMZ (RBS Outcome 1) or • Convene established workgroups (see Valdez et al. 2012a) to recommend continuing augmentation plan and implementation when there is a continued presence of Lake Mead razorback sucker but no evidence of expansion into Grand Canyon (RBS Outcome 2)

Non-native Fish and Aquatic Invasive Species (AIS) - Introduction Prevention, Detection, and Control

Outreach

Outreach via development and placement of signs at likely public access points, website development, interpretive talks, and other materials or practices will be expanded to prevent accidental or purposeful introduction of new non-native aquatic species in the project area. Outreach efforts will also encourage harvest of all non-native fish species by anglers when appropriate.

Detection Monitoring

Current fish and invertebrate monitoring conducted by cooperating agencies will continue at likely introduction areas in the Glen Canyon Reach, the Little Colorado River, and in the mainstem Colorado River upstream of Lake Mead. However, detection programs will be added or expanded to include other geographical areas considered high-risk pathways for non-native species introductions. Monitoring programs in tributary watersheds that include lands beyond the NPS boundary, and thus may be sources for new introductions including Havasu Creek and Kanab Creek will be added, with monitoring taking place on NPS-managed lands. Havasu Creek will be monitored using multiple fish-sampling gear types up to twice per year in conjunction with humpback chub monitoring (no additional trips), and Kanab Creek's lower sections will be monitored early summer and fall to detect non-native species in conjunction with river trips supporting monitoring efforts at Shinumo Creek or other tributaries. Fish monitoring efforts will be expanded in Lower Colorado River FMZ to detect invading or expanding populations of non-native fish from Lake Mead in conjunction with efforts to monitor for razorback sucker (see Table 4).

When new introductions of non-native fish species are encountered, depending on level of threat and magnitude of response needed, control measures may take place through Emergency Response procedures (see Chapter 2 of the EA, Emergency Rapid Response, Non-native Fish and AIS, Alternative 2).

To the extent possible, NPS will coordinate with other management agencies, tribes, and/or land owners in watersheds that extend beyond GCNP or GCNRA to evaluate risk of new introductions from those areas and develop cooperative efforts to deter future invasions.

Removal of Incidental Captures

Unless specific research objectives warrant tagging and release, all high-risk non-native predatory fish species captured during monitoring efforts project-wide will be euthanized and put to beneficial use, when possible, according to consultation with Traditionally Associated American Indian Tribes. These species include brown trout (*Salmo trutta*), catfish species (including bullheads), bass and sunfish (*Centrarchidae*), striped bass (*Moronidae*), cichlids (*Cichlidae*), perch and walleye (*Percidae*), and other

rare non-native species not previously detected in GCNP or the Glen Canyon Reach (e.g., burbot, *Lota lota*).

Source Identification
Tissues or bony parts of high-risk non-native fish removed incidental to monitoring efforts will be analyzed to determine source when possible and when funding is available. For example, the microchemistry of humpback chub otolith bones has been used to determine natal origin in Grand Canyon (Hayden et al. 2012). Additionally, the NPS would engage resource managers (AZGFD, USFWS, Tribes) or landowners in the watersheds immediately adjacent to GCNP and GCNRA to prevent future introductions of non-native species. Information sharing will assist managers in targeting areas if/when expanded or emergency control efforts are needed.

Targeted Angling, Non-native Fish Removal Trips
Non-native fish removal excursions may be implemented through a non-commercial administrative permit[3], when necessary, to remove cold-water non-native fish, primarily rainbow trout using angling equipment, primarily in Marble Canyon and downstream (Paria Riffle to approximately RM 60). Other rare non-native species may be captured and removed as well.

Emergency Rapid Response to Detected Expansions of New Non-native Species Introduction
As consistent with NPS Director's Order-12 (2001, Section 2.14, Emergency Actions), for emergencies including

a) discovery of expansion in distribution or abundance of an existing high-risk non-native species, particularly in sensitive areas for native fish (e.g., Havasu Creek or Little Colorado River Inflow areas); or
b) new detection of a rapidly spreading aquatic invasive species or non-native fish species

The Superintendent could approve a temporary, short-term, targeted removal effort to treat known occurrences of the new threat using mechanical methods including angling, electro-fishing, and passive (i.e., trap nets) or active (e.g., seining) netting. Simultaneously, additional planning and compliance would occur if a long-term response or control method is considered that would result in potential effects to resources that are not adequately addressed in the CFMP EA.

Comprehensive Brown Trout Control
NPS fisheries biologists will expand past trout reduction activities (weir and tributary electro-fishing, NPS 2006b) in Bright Angel Creek to the Bright Angel Creek Inflow area of the Colorado River. Both brown and rainbow trout and other non-native fish encountered will be removed during these efforts to meet goals and objectives identified in Chapter 1 of the CFMP EA. Experimental mechanical control methods will be implemented for five consecutive years and then re-evaluated to determine whether reduction targets and native species objectives had been achieved. Integrated project activities include:

- Multiple-pass electro-fishing using two motorized electro-fishing boats for up to 20 nights, sufficient to reduce trout by at least 80% between Zoroaster and Horn Creek rapids (approximately five miles of the Colorado River). A single trip is proposed during fall
- Weir (fish trap) installation downstream of Phantom Ranch during spawning seasons for rainbow (fall/winter/spring) and brown trout (fall) to capture mature adults entering Bright Angel Creek to spawn. The weir may be installed in late summer or early fall and extend into spring months (April) depending on ability of equipment to withstand higher spring snowmelt runoff flows
- Backpack electro-fishing by an eight-person crew in all fish-bearing waters in the Bright Angel Creek watershed (approximately 13 miles of stream) for between approximately 70 and 100

[3] NPS 2006 Management Policies, Section 8.2.2.5, "Commercial fishing will be allowed only when specifically authorized by federal law or treaty right."

continuous days over fall and winter. One remote camp and helicopter transport[4] of gear may be necessary near Bright Angel Canyon and in Bright Angel Creek headwaters

- Removing brown trout incidentally captured throughout the project area during monitoring and encouraging harvest of brown trout by anglers. Through adaptive management, anglers will be encouraged to harvest brown trout via public outreach activities, changes in harvest regulations, or other means. Additional consultation may be necessary
- Mechanical removal (electro-fishing, angling, netting, etc.) of brown trout may be employed in other tributaries or mainstem areas if natal origin studies conducted during the first five years indicate other areas are sources of brown trout in Grand Canyon, and project-wide declines in brown trout are not observed initially. Efforts would be focused where individuals are aggregating and populations can be feasibly controlled and suppressed using mechanical removal methods (additional planning and compliance may be necessary)

Monitoring will occur annually to determine project success during and following the initial five-year effort. Monitoring metrics include abundance, size structure, and recruitment of native and non-native species, as well as apparent survival of bluehead sucker (may require additional sampling occasions). Depletion monitoring using electro-fishing gear will be the initial focus for both the tributary and Colorado River; however, additional netting may be conducted in both areas in coordination and consultation with the AZGFD, USFWS, and GCMRC to improve native fish survival or abundance estimates.

Adaptive Management, Outcomes, and Triggers

Non-native fish control will be conducted to benefit GCNP native fish species (see CFMP EA Chapter 1 GCNP Goal 2); however, the response of native fish to non-native control actions, and the level of control necessary to elicit a positive response in native populations is difficult to predict and often variable (reviewed by M. Trammell, unpublished report 2005). While measures are taken to reduce likelihood of injury to individual native fish during electro-fishing, fish injuries or deaths can and do occur on occasion. The uncertainty relates to whether benefits to native fish populations of removal of non-native predators outweigh potential effects of injury to individual fish through electro-fishing and subsequent handling prior to release. Additionally, environmental factors (e.g., climate, flooding, drought, fire, etc.) not influenced by active management may have an overriding influence in driving native fish population dynamics in project area waters. Potential outcomes for non-native fish removal activities for both existing native and non-native fish in tributaries are summarized in Table 5.

Table 5. Potential Outcomes for Non-native Fish (NNF) Removal for Existing Native and Non-native Fish

NNF 1	Native fish survival, abundance, and recruitment is maintained or increases as non-native fish species abundance is reduced in tributaries
NNF 2	Native fish survival, abundance, and recruitment declines as non-native fish species abundance is reduced in tributaries
NNF 3	Non-native fish abundance does not decline in tributaries with control method implementation

Non-native fish and native bluehead sucker and speckled dace population dynamics will be monitored in all tributaries where non-native fish control actions are implemented. A monitoring program is currently in place (see CFMP EA Alternative 1) for these species in Havasu, Shinumo, and Bright Angel Creeks. Flannelmouth sucker are not generally found as residents in tributaries outside the Little Colorado River, and thus, monitoring efforts in tributaries may be focused on other native species (speckled dace and bluehead sucker). Flannelmouth sucker trends in GCNP and the Glen Canyon Reach are monitored during

[4] Determined by GCNP's MRA

AZGFD's and USGS-GCMRC's mainstem electro-fishing trips on the Colorado River between Lees Ferry and Lake Mead, and during Glen Canyon electro-fishing monitoring efforts. Only abundance indicators (Table 6) are proposed for monitoring speckled dace due to lack of feasible methods to assess individual survival for the species. Outcomes for each non-native control project will be assessed after a maximum of five years, using indicators described in Table 6.

Table 6. Non-native Fish, Indicators for NNF Outcomes

Indicator	
A	Measures of abundance or density (e.g., relative abundance: number of fish/unit area) or trend in catch rates (i.e., catch-per-unit-effort)
B	Survival (estimated via mark-recapture)
C	Recruitment (either number of new fish tagged or percent of population less than 100 or 150 mm)
D	Size structure (i.e., numbers of fish at each size class)

Fisheries managers will strive for NNF Outcome 1 for each project, and if achieved, non-native control projects may proceed at an appropriate level of maintenance control effort, which could include continued or reduced effort.

If after five years, monitoring indicates that NNF Outcome 2 or 3 has occurred, non-native fish control projects will cease and be re-evaluated for at least one year. Data and trends from previous years and newly emerging science and technologies would be reviewed, and methods may be adapted for the future to achieve NNF Outcome 1. Translocations of other native species may be considered if it is determined species declines are severe, and augmentation is needed. Following review, and depending on the most appropriate course of action proposed, additional planning and compliance may be necessary.

During the evaluation phase of non-native fish control projects, NPS will share data, results, and future plans with collaborating agencies, Traditionally Associated American Indian Tribes, stakeholders, and interested public.

Feasibility Study for Use of Chemical Fish Control Methods

Data to assess use of chemical fish control methods were not available during preparation of the CFMP EA. Aside from stream dewatering, chemical piscicides (fish poisons) may be the only means to ensure complete removal of non-native fish species from streams (Moore et al. 2008). During implementation of initial five-year mechanical non-native fish removal efforts for brown trout, additional data will be collected to determine chemical use feasibility, and possibly barrier installation for trout control in Bright Angel Creek and other tributary streams. Data collection for invertebrates, water quality, distribution of native and non-native fish species and non-target organisms, and physical habitat will be informed by published NPS guidance for the use of chemical piscicides (see Moore et al. 2008). Future potential use of chemical fish control methods will also be informed through interagency and tribal consultation. Additional NEPA documentation, planning, and accompanying compliance would be necessary if chemical means for controlling non-native fish in GCNP or GCNRA are considered in the future.

Beneficial Use of Non-native Fish Removed

The NPS will employ a beneficial use policy for all non-native fish removed from the project area, consistent with the outcome of consultation with Traditionally Associated American Indian Tribes. Beneficial use policies will be employed to reduce disease-transfer risk from one location to another, consistent with state and federal laws and statutes. Non-native fish euthanized during non-native control efforts will be put to a beneficial use, to the extent possible, and within limits of health and safety for human consumption, fed to captive wildlife at wildlife rehabilitation centers, or recycled into the ecosystem through returning fish into the water following euthanization.

Glen Canyon Rainbow Trout Management

Sterile Trout Experimental Stocking

NPS 2006 Management Policies (NPS 2006a, Section 4.4.3) allow for exotic species stocking for recreational fishing in altered water bodies when allowed by law, such as in GCNRA's enabling legislation, when the activities will not result in unacceptable impact to park natural resources or processes. Sterile trout would not reproduce, and could be stocked in an experimental context to maintain GCNRA fishing opportunities in the tailwater of the Glen Canyon Dam. Experimental stocking of sterile, triploid rainbow trout (stocking plan to be determined) could be initiated, specifically if one or more elements in Table 7 are met.

Table 7. Glen Canyon Reach Rainbow Trout Experimental Stocking Criteria

• Recruitment (wild young fish) is low for multiple years: rainbow trout recruits (fish less than six inches) comprise less than 20% of the fish community during AZGFD fall monitoring events for more than three consecutive years; or
• AZGFD electro-fishing estimates of relative abundance (including all sizes of fish) are less than one fish/minute for two consecutive years of fall sampling; or
• If angler catch rates in Glen Canyon Reach decline to less than 0.5 rainbow trout/hour and average size is less than 14 inches for two consecutive years.

Sterile rainbow trout stocking will be limited to the Glen Canyon Reach. If triggers are met, stocking would likely continue until electro-fishing relative abundance estimates and/or angler catch rate criteria in Table 7 are met. Relative abundance of all fish caught of any size would be greater than one fish/minute or angler catch rates exceeded 0.5 fish/hour for two consecutive years. Depending on conditions that may lead to a potential decline in the fishery in the future, sterile trout may be stocked for a number of years until the fishery objectives are met, at which time stocking would potentially cease until triggers are met, and stocking would be re-initiated. Stocking could be reinitiated as appropriate, following GCNRA's rainbow trout adaptive management strategy described in the next paragraph.

Adaptive Management

A stocking and monitoring plan including number and size of sterile trout stocked will be developed before sterile trout stocking is implemented. At a minimum, sterile fish released would be marked to assess their performance. Short- and long-term outcomes, monitoring metrics, and an adaptive management framework will be defined and determined. Depending on the final stocking and monitoring plan, additional planning and compliance may be necessary. For example, experimental stocking of triploid rainbow trout will include marking of hatchery fish to monitor multiple metrics including, but not limited to, return to anglers, movement, growth, and survival. If marked fish are not returned/captured by anglers as intended or are found moving out of the stocking-approved area (i.e., into Marble Canyon/Little Colorado River area), stocking will be reassessed. Reassessment could include altering location of stocking, size of fish stocked, timing of stocking, and number of fish stocked. If stocking was deemed sustainable at a given level (i.e., acceptable catch rates, minimal impacts outside the fishery), it would continue. Essentially, the experiment will be considered a success if, through triploid trout stocking, fisheries objectives are maintained and an adequate control of the rainbow trout population is achieved while minimizing impacts on resources outside the fishery. If, through monitoring of stocked fish, there is minimal return to anglers or unacceptable levels of impact on resources outside the fishery, stocking would cease.

Extirpated Species Reintroduction Feasibility Studies

Feasibility studies for extirpated fish species reintroduction will be conducted over the life of the plan, and if potential exists, additional NEPA, ESA, NHPA and associated planning and compliance would be

initiated prior to reintroduction plan development. Prior to summer 2012, razorback sucker had not been detected in the project area since the 1990s, and was considered extirpated. However, since 2012, five tagged razorback sucker were found upstream of Pearce Ferry Rapid (River Mile 280) including four detected in GCNP upstream of River Mile 277.4 (B. Albrecht, BIO-West, Inc., personal communication), and another individual captured in October 2012 near Spencer Canyon (RM 246) (A. Bunch, AZGFD, personal communication). Thus, razorback sucker is no longer considered extirpated (see CFMP EA Chapter 3).

At this time, only Colorado pikeminnow is prioritized for reintroduction feasibility studies. Potential hybridization between roundtail chub, bonytail, and humpback chub preclude introduction of additional chub species (*Gila* sp.) in humpback chub habitat. Pikeminnow reintroduction feasibility studies will primarily rely on expert opinion, literature reviews of habitat requirements, and evaluation of existing biological and physical data (e.g., food base, fish community). However, a field survey may also be required to assess physical habitat or collect biological data.

Best Management Practices

Interagency Coordination:

- All sampling activities would be coordinated with AZGFD (consistent with 43 CFR part 24 and enabling legislation for both NPS units) and the USFWS Arizona Fish and Wildlife Conservation Office, USGS-GCMRC, as well as other agencies performing fish monitoring in the project area.
- Annual reports documenting NPS CFMP implementation and monitoring will be provided to USFWS, AZGFD, USBR, USGS, Tribes, and other interested parties.
- Monthly, or at least bimonthly, conference calls (or written status updates in lieu of a call) will continue to be held by the NPS Fisheries Program to update interested parties on ongoing or new NPS fisheries management activities.

Wilderness and Visitor Experience:

- An outreach strategy will be developed for projects to inform park visitors of NPS fisheries management activities.
- A Minimum Requirement Analysis (MRA) will be conducted for all fisheries management activities occurring in proposed Wilderness Areas.
- Quiet technology equipment, including for helicopters and outboard motors, will be used whenever possible for fisheries management projects.

Mitigation Measures

Mitigation measures are actions that will be taken to reduce or minimize impacts to resources as a result of the implementation of the selected action.

National Historic Preservation Act - Ethnographic Resources:

- Actions will comply with all stipulations included within the Memorandum of Agreement (MOA) between the NPS and the Arizona State Historic Preservation Officer (SHPO), and tribal signatories regarding the CFMP EA for GCNP and GCNRA in accordance with the National Historic Preservation Act (NHPA).

Conservation Measures – Endangered Species Act

The preferred alternative contains a number of conservation measures to reduce the potential for adverse effects to humpback chub and razorback sucker from capture events (electrofishing and netting), and

subsequent handling and tagging prior to their return to the water. These conservation measures were developed through Endangered Species Act, Section 7 consultation with the USFWS, and are included in the Biological Opinion issued by the USFWS (USFWS 2013). The capture and handling protocols described below are common to all agencies engaged in fisheries work in the GCNP and GCNRA (Persons et al. 2013).

Electrofishing:

- Electro-fishing gear will be set to avoid injury to native fish, and crews will be appropriately trained on the use of the equipment.
- In tributaries where humpback chub have been released, electrofishing equipment will be minimized in large-volume, deep pools where this gear is less effective in capturing fish, and where humpback chub tend to congregate.
- Block nets will be used during multiple-pass depletion electrofishing where native fish are present to minimize applying electrical current to individual fish multiple times. Fish will be released downstream of block nets and outside the sampling area between passes.
- The least-intensive electrofishing settings that effectively sample fish will be used in all cases. For example, during tributary electrofishing in Grand Canyon, a pulsed-DC at a frequency of 30-40 Hz (300-350 volts) has proven to be sufficient.
- Fish captured using electrofishing will be monitored in buckets, and gear settings would be adjusted if sufficient recovery is not observed.
- Netters and electrodes will be positioned so that fish can be removed from electrical fields as quickly as possible.
- During sampling efforts, all native fish will be processed first and handling time on captured humpback chub will be minimized whenever possible.

General Fish Handling:

- Trammel net use will be minimized when possible, and will not be used if water temperatures exceed 16°C (60°F). Trammel nets would be checked every 2 hours or less.
- The feasibility of the use of experimental mobile PIT tag antenna probes, where no handling of fish is necessary, will be determined, and considered for future sampling in lieu of handling PIT tagged humpback chub.
- During sampling efforts, all native fish will be processed first and handling time on captured humpback chub will be minimized whenever possible.
- If incidental mortality occurs, humpback chub otoliths will be extracted and preserved (if feasible) and preserved in 100% ethanol, otherwise the entire fish will be preserved as above and deposited into GCNP's museum.
- PIT tagging of listed species will be performed by personnel trained in tagging methods and follow the guidelines for handling fish in GCNP (Persons et al. 2013).
- "General Guidelines for Handling Fish" published by the USGS-GCMRC to minimize injury to fish would be followed during all field projects (see Persons et al. 2013).
- No bait, or an artificial or natural substance that attracts fish by scent and/or flavor (i.e., live or dead minnows/small fish, fish eggs, roe, or human food), would be used by anglers participating in non-native fish control efforts. Barbless hooks would be used for trout removal activities.
- During lower Grand Canyon larval and small-bodied fish surveys, fish large enough to be identified in the field (> about 20 mm [> 0.75 in]) will be examined for the presence of humpback chub. Larval/young-of-year humpback chub would be released alive to the extent possible.
- In the Little Colorado River, hoopnets will not use bait to attract fish with the exception that baited hoopnets can be used to collect larval and juvenile fish for translocations under the direction of USFWS personnel.

Aquatic Nuisance Species

- Standard quarantine/hatchery pathogen and disease testing and treatment procedures will be followed to prevent the transfer of ANS from one water to another during humpback chub (or other native fish) translocations.
- To prevent inadvertent movement of disease or parasitic organisms among fish sites, research and management activities shall conform to the Declining Amphibians Population Task Force Field work Code of Practice (www.nrri.umn.edu/NPSProtocol/pdfs/Amphibians/Appendix%20B.pdf), with the exception that 10% bleach solution or 1% quarternary ammonia should be used to clean equipment rather than 70% ethanol. Abiding by this code will effectively limit the potential spread of pathogens via fish sampling equipment.

Other Reasonable and Prudent Measures (USFWS 2013) to be implemented related to electro-fishing are:

1. Electrofishing would be restricted for at least six months following translocations to allow translocated fish to fully acclimate to the new environment.
2. Electrofishing would not occur in the spring/early summer months to avoid interfering with native fish spawning periods.
3. Electrofishing to monitor and remove trout populations would occur no more than once per year in translocation streams.
4. Electrofishing will cease for that sampling event if more than 10 percent of the captured humpback chub are injured or die while being held for processing post-capture.

The action also contains a set of conservation measures to reduce the potential for effects to species listed under the Endangered Species Act in both GCNP and GCNRA, including California condor, Mexican Spotted Owl, Southwestern willow flycatcher, and Yuma clapper rail. All actions will be consistent with the Biological Opinion issued for this project.

Conservation Measures for California Condor:

- Keep areas free of trash and other materials
- Provide all personnel with educational information about condors before field work commences. This educational information will emphasize appropriate interactions with condors
- Record and report immediately any condor presence in the project area to the GCNP Wildlife Department
- Avoid any condors that arrive at any area of human activity associated with fish management activities. Notify GCNP Wildlife Department, and only permitted personnel will haze the birds from the area
- Minimize aircraft use along the rim to the greatest extent possible
- Keep aircraft at least 400 meters (437 yards) from condors in the air or on the ground unless safety concerns override this restriction.
- Aircraft will give up airspace to the extent possible, if airborne condors approach aircraft, as long as this action does not jeopardize safety
- Planned fisheries projects involving mechanized equipment will not occur within 0.5 miles of active condor nesting sites during the breeding season (February 1 – September 30)
- Crews will stop activity on projects if condors arrive on site
- GCNP will continue to work closely with The Peregrine Fund, USFWS, and AZGFD to determine condor use patterns and breeding sites
- Any crew access necessary within .25 miles of an active nest site during the breeding season will be limited to established roads and trails. If access off designated roads or trails or camping is necessary during the breeding season, only activities that occur greater than .25 miles from any known or suspected nest area may be conducted. Such situations will be coordinated with GCNP's Wildlife Department.

Conservation Measures for Mexican Spotted Owls:

- To the maximum extent possible, aircraft will remain at least 1,200 feet (400 meters) from the boundary of any designated PAC
- Locate areas associated with fisheries management activities, at least 400 meters (437 yards) from the boundary of any designated PAC
- Notify GCNP Wildlife Department if MSO are discovered during any projects
- As resources allow, GCNP will continue to survey MSO predicted habitat and known PACs for owl presence and breeding activity
- Inform all field personnel who implement any portion of the proposed action about MSO regulations and protective measures
- Consult GCNP Wildlife Department prior to conducting planned fisheries management activities
- Most fisheries management activities would take place outside of the MSO breeding season (March 1- August 31). In instances when fisheries activities are scheduled during MSO breeding season and/or within a designated PAC or unsurveyed habitat, GCNP's Wildlife Department will be contacted before activities commence
- Integrate data from reports to USFWS on fisheries management activities into adaptive management processes
- If camping is necessary in a designated PAC or within unsurveyed predicted habitat during the breeding season, only those activities greater than .25 miles from any known or suspected nest/roost/core area may be conducted. Such situations will be coordinated with the park Wildlife Department
- Prior to the start of any fisheries management activities for the year, GCNP's Wildilfe Department will be contacted for any new information related to MSO or their status near the project area. MSO location and habitat maps will be updated annually with any new information to ensure consistency with the above measures and will be referenced when annual work plans are developed.

Conservation Measures for Southwestern Willow Flycatcher:

- Occupied southwestern willow flycatcher habitat would be avoided during the breeding season (May 1-August 31)
- Prior to the start of any fisheries management activities, the park's wildlife department would be contacted for any new information related to flycatchers, flycatcher habitat, and their status near the project area. Southwestern willow flycatcher location and survey maps will be updated annually with any new information to ensure consistency with the above measures and will be referenced when annual work plans are developed
- Contingent upon availability of funding, GCNP will strive to conduct annual southwestern willow flycatcher –presence/absence, nest monitoring surveys, and on-the-ground monitoring of habitat throughout the action area that may be affected by fisheries management activities.
- No camping or sustained activities would occur, except at already established campsites, within occupied or unsurveyed flycatcher habitat (suitable or potential) unless it is outside the breeding season (May 1 – August 31)
- Travel to project sites would not occur in occupied flycatcher habitat

Conservation Measures for the Yuma clapper rail:

- As funding allows, GCNP will conduct surveys for the Yuma clapper rail in the lower gorge (RM 234 – RM 277). Such surveys may be combined with surveys for breeding birds and/or southwestern willow flycatchers. Surveys should be conducted once every 3 years for the life of the CFMP.

- If Yuma clapper rails are found in GCNP during the breeding season or if nests are located, GCNP will establish a closure of suitable breeding habitat in the area, with an appropriate buffer, during the length of the breeding season (March 1-July 1).
- Occupied clapper rail habitat would be avoided during the breeding season
- Prior to the start of any fisheries management activities, the park's wildlife department would be contacted for any new information related to clapper rails, clapper rail habitat, and their status near the project area
- Fisheries management crews would avoid walking through and/or disturbing dense riparian vegetation, especially where cattails and/or bulrush are present

Conservation Measures for the Western Yellow-Billed Cuckoo:

- Occupied western yellow-billed cuckoo habitat would be avoided during the breeding season (June to August)
- Prior to the start of any fisheries management activities, GCNP's wildlife department would be contacted for any new information related to cuckoos, cuckoo habitat, and their status near the project area.
- As funding allows, GCNP would conduct surveys for the western yellow-billed cuckoo in the lower gorge (RM 234 – RM 277). Such surveys may be combined with surveys for breeding birds and/or southwestern willow flycatchers. Surveys should be conducted once every 3 years for the life of the CFMP.
- Habitat modification of riparian areas would not occur as part of fisheries management activities.

Alternatives Considered

Three alternatives were evaluated in the EA including the no action alternative and two action alternatives. Under Alternative 1, No Action, current management actions would continue, unless previous compliance had expired, and does not meet goals and objects described in this EA. Alternative 2, is the Moderate Intensity Fisheries Management alternative, and is the selected action described in the previous section. Alternative 3 was the Intensive Fisheries Management Alternative. This Alternative also includes implementation of conservation measures, but emphasizes a proactive approach to control of non-native species in GCNP to limit risk of impacts to native species, including endangered fish species. Alternative 3 differs from the other Alternatives in that it included a proactive approach to removing warmwater non-native species such as catfish and carp, at areas such as the Little Colorado River, in and near Havasu Creek, the Lower Colorado River FMZ, and also included a second electro-fishing trip to remove trout from the Bright Angel Creek Inflow FMZ.

Environmentally Preferable Alternative

According to Council on Environmental Quality (CEQ) regulations implementing NEPA (43 CFR 46.30), the environmentally preferable alternative is the alternative "that causes the least damage to the biological and physical environment and best protects, preserves, and enhances historical, cultural, and natural resources. The environmentally preferable alternative is identified on consideration and weighing by the Responsible Official of long-term environmental impacts against short-term impacts in evaluating what is the best protection of these resources. In some situations, such as when different alternatives impact different resources to different degrees, there may be more than one environmentally preferable alternative."

Alternative 2 (Moderate Intensity Fisheries Management) is the environmentally preferable alternative for several reasons: 1) Alternative 2 would promote active protection and restoration of native fish

populations in GCNP. 2) This alternative would also promote protection and enhancement of the highly valued recreational rainbow trout fishery in GCNRA's Glen Canyon Reach. 3) It would also address concerns from Traditionally Associated American Indian Tribes by limiting the number of fish killed and using as many fish as possible for human consumption. This would allow attainment of the widest beneficial uses of the environment, and preserve cultural and natural aspects of our national heritage.

By contrast, Alternative 1 (No Action) is not the environmentally preferable alternative because it would result in inadequate control of non-native fish and prevention thereby jeopardizing the quality of the park's natural and cultural resources and visitor experience.

Alternative 3 (Intensive Fisheries Management) is not the environmentally preferable alternative because although it would employ a more aggressive approach to fisheries management and increase protection and restoration of native fish in GCNP, it would have greater impacts to ethnographic resources and visitor experience. Specifically, this alternative would result in a higher number of fish killed and therefore would not address concerns brought forward by Traditionally Associated American Indian Tribes.

Why the Selected Action Will Not Have a Significant Effect on the Human Environment

As defined in 40 CFR §1508.27, significance is determined by examining the following criteria:

Impacts that may be both beneficial and adverse. A significant effect may exist even if the Federal agency believes that on balance the effect will be beneficial.

Implementation of the preferred (selected) alternative will result in some adverse impacts; however, the overall benefit of the project, particularly to native and endangered fish populations, outweighs these negative effects. The effects are summarized as follows. For ethnographic resources, effects of the selected alternative will result in moderate, adverse, regional, long-term effects, due to the manipulation and removal of fish, which are a contributing element to the Traditional Cultural Property (TCP) for Traditionally Associated Tribes. Mitigating measures, such as using non-native trout removed from GCNP for human consumption will be implemented to attempt to lessen the impact of the selected alternative upon ethnographic resources. However, restoration of natural processes through translocation of native fish and non-native fish control may be perceived as beneficial to ethnographic resources by some tribes.

Beneficial impacts to Visitor Experience are expected as a result of the selected alternative, including from avoidance of potential decline in the quality of the Glen Canyon Reach rainbow trout fishery through sterile trout stocking. The effects of the actions (sterile trout stocking) included in the selected alternative on the rainbow trout fishery within GCNRA depend on the extent of a fishery decline, if it occurs, and assuming other factors such as food base or water quality deterioration did not preclude survival and growth of stocked fish. The effects on the Glen Canyon rainbow trout fishery would be minor to moderate, beneficial, local, and short to long term. Sterile trout have not been released into the Glen Canyon Reach in the past, and thus, intensity and duration of beneficial effect to the rainbow trout fishery would be minor to moderate (depending on stocked trout performance) beneficial, local, and short to long term.

Beneficial, short to long term, moderate, impacts would also result due to actions meant to restore native aquatic ecosystems to GCNP. Adverse impacts to the angling experience and backcountry and river users are expected to result due to encounters, use of motorized equipment, and presence of scientific structures and equipment in GCNP backcountry and Wilderness. The quality of trout angling will also decline as a result of non-native fish control in and around Bright Angel Creek. Adverse impacts will be short to long term, moderate, especially during the non-motorized use period when nighttime management activities occur.

Minor adverse impacts to the untrammeled quality of Wilderness Character will result from electro-fishing and CFMP monitoring activities. Moderate, adverse impacts to the undeveloped quality are expected to result from the presence of scientific equipment in the backcountry and the continued use of motorized/mechanized transportation and equipment, especially during the non-motorized period. A Minimum Requirement Analysis (MRA) would be conducted for fisheries management operations, but nevertheless, moderate adverse impacts to Wilderness Character are expected from encounters with science crews and noise associated with motorized/mechanized equipment operations including night operations in the Bright Angel FMZ, and helicopter transport of equipment and fish. Actions taken to improve native fish populations may result in long-term minor beneficial impacts to the natural quality of Wilderness Character.

Translocations of HBC will have minor to moderate, beneficial, local, short- to long-term impacts to HBC by achieving a wider distribution and higher abundance in downstream aggregations, potentially leading to a second spawning aggregation in GCNP. While non-native rainbow trout populations in Glen Canyon may continue to fluctuate depending on dam discharge, whirling disease and other factors, triploid sterile rainbow trout stocking is expected to have minor, short-term, site-specific adverse impacts to native fish. Comprehensive control of non-native trout around Bright Angel Creek will result in indirect, moderate, beneficial, local, long-term impacts to HBC and native fish. Emergency non-native fish control actions would allow managers to react quickly to emerging threats, which may become particularly important with warmer GCD discharge. However, reactive rather than pro-active control of newly invading or expanded populations of warm-water non-native predators may be less effective. Overall, the selected alternative will have minor to moderate, beneficial, local, long-term impacts on native fish communities in GCNP.

The degree to which the proposed action affects public health or safety

The preferred alternative involves electro-fishing, the use of helicopters, and river rafts to conduct work and transport crews in the backcountry within GCNP, which do have the potential to result in harm to crew or park visitors. However, with the implementation of appropriate safety protocols and procedures, no impacts to health or safety of crews or park visitors are expected.

Unique characteristics of the geographic area such as proximity to historic or cultural resources, park lands, prime farmlands, wetlands, wild and scenic rivers, or ecologically critical areas

The Preferred Alternative will not measurably affect soundscapes, environmental justice, prime and unique farmland, socioeconomic environment or Indian trust resources. No wild and scenic rivers are designated in the parks and none will be affected by implementing the selected action. No ecologically critical areas are known within the project areas. Mitigation measures minimize potential for adverse impacts to natural and cultural resources. Mitigation measures to minimize adverse impacts to ethnographic resources are incorporated into the MOA between the NPS, SHPO, and invited tribal signatories.

The degree to which the effects on the quality of the human environment are likely to be highly controversial

As displayed in the Errata Sheets/Response to Comments section, there was disagreement related to whether the CFMP should be incorporated into the Long Term Experimental and Management Plan (LTEMP) for the GCD, or whether the CFMP should be delayed until after the completion of the LTEMP. While generally supportive of the preferred alternative as described in the EA, additional concerns were raised by Traditionally Associated Indian Tribes and some anglers related to the removal of non-native trout from GCNP. However, the adaptive strategy for the actions within the CFMP was developed to respond to future conditions that may result following the development of the LTEMP and any operational changes to GCD that may be established through the separate LTEMP planning process,

or as a result of other unforeseen factors. Scientific evidence supports the projects as described in the selected alternative, and mitigations will be implemented to attempt to lessen the effect on ethnographic resources. Thus, the effect on the quality of the human environment that would result from implementing the selected action is not highly controversial.

The degree to which the possible effects on the quality on the human environment are highly uncertain or involve unique or unknown risks

While uncertainties related to the impacts of the actions on fisheries resources do exist, such as, the long-term response of native fishes to translocations, the response of native and non-native fish to potential effects of non-native fish control activities, and habitat sufficiency to maintain razorback sucker in Lower Grand Canyon, an adaptive management strategy, which includes a rigorous monitoring program with defined outcomes and triggers, has been developed to address each uncertainty. Should negative outcomes be observed, this management strategy will allow for the appropriate adjustment of activities. Adaptive strategies for management, outcomes, and triggers are described for each activity within this FONSI (pages 5-12). Implementation of the adaptive management strategy will ensure the magnitude of the impacts over the life of the plan will not be significant. Thus, the anticipated effects on the human environment, as analyzed in the EA, are not highly uncertain or unique, nor were any unknown risks identified.

The degree to which the action may establish a precedent for future actions with significant effects or represents a decision in principle about a future consideration

Implementation of the Comprehensive Fisheries Management Plan will not result in significant adverse effects to the natural environment, cultural resources, or visitor experience because the project was designed to minimize resource and visitor impacts and resource protection measures were incorporated into the project to further reduce identified adverse effects. In addition, the preferred alternative will provide for the long term protection of resources and will not set a precedent for future actions that could have significant effects.

Whether the action is related to other actions with individually insignificant but cumulatively significant impacts. Significance exists if it is reasonable to anticipate a cumulatively significant impact on the environment. Significance cannot be avoided by terming an action temporary or by breaking it down into small component parts.

The EA concluded that past, present, and future activities, when coupled with the management of fish in the park units will have local, long-term, minor to moderate, beneficial cumulative impacts on native fish communities in GCNP, and local, short- to long-term, minor to moderate, beneficial cumulative impacts on the recreational fishery in GCNRA. The contribution to ethnographic resource cumulative impacts from fish management, specifically euthanizing, will be regional, long-term, minor to moderate and adverse. Cumulative impacts to visitor use and experience will be short and long-term, moderate and adverse. Increased education around the fish management projects will have beneficial impact on visitor experience. The relative adverse contributions of the preferred alternative to the overall cumulative impacts are predicted to have no significant cumulative effects.

The degree to which the action may adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places or may cause loss or destruction of significant scientific, cultural, or historical resources.

Moderate adverse, regional, and long-term effects are expected to ethnographic resources as a result of non-native fish control within the CFMP, and thus an adverse effect is expected under Section 106 of the NHPA. The NPS has developed an MOA with the SHPO and Tribes, with stipulations designed to mitigate the adverse impacts of the CFMP upon ethnographic resources to the extent possible.

The degree to which the action may adversely affect an endangered or threatened species or its habitat that has been determined to be critical under the Endangered Species Act of 1973.

For purposes of Section 7 consultation under the Endangered Species Act, Preferred Alternative implementation "may affect, is not likely to adversely affect" California condor, Mexican spotted owl, southwestern willow flycatcher, Yuma clapper rail, and western yellow-billed cuckoo. The Preferred Alternative "may affect, and is likely to adversely affect" the humpback chub and its critical habitat, and the razorback sucker and its critical habitat. Concurrence on these determinations was received from the U.S. Fish and Wildlife Service on August 20, 2013.

Whether the action threatens a violation of Federal, State, or local law or requirements imposed for the protection of the environment

The action will not violate any federal, state, or local environmental protection laws.

Public Involvement

The EA was made available for public review and comment during a 30-day period ending June 10, 2013. To notify the public of this review period, an e-mail was sent to stakeholders, Native American tribes, interested parties, and newspapers. Copies of the document were sent to tribes and posted on the NPS PEPC website at http://parkplanning.nps.gov/. Twenty-five comments were received during this review period. Twelve comments were received from those affiliated with angling groups, seven comments were received from state or federal agencies or others representing water and power conservation or distribution groups, the AGFD, the USGS-GCMRC, and the Bureau of Reclamation also submitted comment letters. One comment letter was received from a Native American tribe. A majority of comments were generally supportive of the plan. Substantive comments focused on the desire for the NPS to delay the completion of the CFMP until after the completion of the LTEMP EIS or integrate the CFMP into the LTEMP, develop or clarify objectives and actions for the Glen Canyon FMZ for larger trout and augmented aquatic foodbase, avoid considering the reintroduction of extirpated species, and others expressed concerns related to the killing of non-native fish species. These comments are addressed in the Errata Sheets attached to this FONSI. The FONSI and Errata Sheets will be sent to all commenters.

Agency Consultation

In addition to public scoping, Federal agencies are required to consult with American Indian tribes and federal, state and local agencies with jurisdiction or special expertise applicable to the proposed action.

The AZGFD has been participating and assisting GCNRA and GCNP in development of fisheries management strategies for this planning effort beginning in 2010. This participation includes site visits, meetings, emails, and phone conversations. NPS fisheries management goals and objectives were developed in consultation with AZGFD.

National Historic Preservation Act

Under Section106 of the National Historic Preservation Act (NHPA) of 1966 and its implementing regulations, federal agencies must consider the effects of their undertakings on historic properties (resources that have been determined eligible or are listed on the National Register of Historic Places (National Register). Agencies are required to consult with the State Historic Preservation Officer and any Native American Tribe that attaches religious or cultural significance to identified properties. Consultation with the Advisory Council on Historic Preservation may also be required.

There are four historic properties in the area of potential effect. There is one National Register-eligible archaeological site, but it would not be affected by the proposed actions. There is one National Register-eligible historic district, the Cross-Canyon Corridor Historic District, in GCNP, and the proposed actions would have no adverse effect on the historic district. There is one National Register eligible historic district, the Lees Ferry and Lonely Dell Ranch Historic District, in GCNRA, and the proposed actions would have no effect on the historic district.

The Colorado River and its associated elements is a traditional cultural property and is eligible for listing in the National Register. The NPS consulted with traditionally associated tribes during the development of the EA. The GCNP and GCNRA tribes are the Hopi Tribe, Havasupai Tribe, Hualapai Tribe, the Kaibab Band of the Paiute Indians, the Navajo Nation, the Hualapai Tribe, the San Juan Southern Paiute Tribe, the Pueblo of Zuni, the Paiute Indian Tribe of Utah, Las Vegas Paiute Tribe of Paiute Indians, Moapa Band of Paiute Indians, and the Yavapai/Apache Nation. The Ute Mountain Ute are also a traditionally associated tribe for GCNRA. The proposed actions have the potential to adversely affect the traditional cultural property (TCP), the Colorado River and its associated elements.

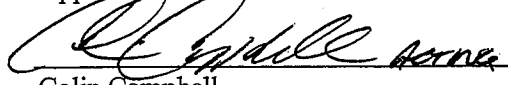
The NPS consulted with the SHPO and the traditionally associated tribes on the proposed actions, identification and description of historic properties, description of potential effects to historic properties, the finding of adverse effect, and ways to avoid, minimize, or mitigate adverse effects on historic properties. A Memorandum of Agreement (MOA) was developed to record the terms and conditions agreed upon to resolve the adverse effects on historic properties. The EA, Section 106 letter, and draft MOA were sent to the State Historic Preservation Officer (SHPO) in a letter dated 5/21/2013, and sent to traditionally associated tribes in a letter dated 5/29/2013. The Hopi Tribe provided comments on the EA and the MOA. The Zuni Tribe and SHPO provided comments on the MOA. No other tribal comments were received on the EA or MOA. The MOA was finalized on 11/12/13, after taking into account the tribal and SHPO comments. The NPS and SHPO are signatories to the MOA and the traditionally associated tribes are invited signatories. The Advisory Council on Historic Preservation was notified of the adverse effect finding in a letter dated 5/21/2013, and declined to participate in the adverse effect consultation.

Conclusions

As described above, the preferred alternative does not constitute an action meeting the criteria that normally requires preparation of an environmental impact statement (EIS). The preferred alternative will not have a significant effect on the human environment. Environmental impacts that could occur are limited in context and intensity, with generally adverse impacts that range from localized to widespread, short- to long-term, and negligible to moderate. There are no unmitigated adverse effects on public health, public safety, threatened or endangered species, sites or districts listed in or eligible for listing in the National Register of Historic Places, or other unique characteristics of the region. No highly uncertain or controversial impacts, unique or unknown risks, significant cumulative effects, or elements of precedence were identified. Implementation of the action will not violate any federal, state, or local environmental protection law.

Based on the foregoing, NPS has determined that an EIS is not required for this project and thus will not be prepared.

Approved:



12/3/13

Colin Campbell — Date

Regional Director, Intermountain Region, National Park Service

Appendix – Non-Impairment Finding

National Park Service's *Management Policies, 2006* require analysis of potential effects to determine whether or not actions will impair park resources. The fundamental purpose of the national park system, established by the Organic Act and reaffirmed by the General Authorities Act, as amended, begins with a mandate to conserve park resources and values. National Park Service managers must always seek ways to avoid, or to minimize to the greatest degree practicable, adversely impacting park resources and values.

However, the laws do give the National Park Service the management discretion to allow impacts to park resources and values when necessary and appropriate to fulfill the purposes of a park, as long as the impact does not constitute impairment of the affected resources and values. Although Congress has given the National Park Service the management discretion to allow certain impacts within park, that discretion is limited by the statutory requirement that the National Park Service must leave park resources and values unimpaired, unless a particular law directly and specifically provides otherwise. The prohibited impairment is an impact that, in the professional judgment of the responsible National Park Service manager, would harm the integrity of park resources or values, including the opportunities that otherwise would be present for the enjoyment of those resources or values. An impact to any park resource or value may, but does not necessarily, constitute an impairment. 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
- identified as a goal in the park's general management plan or other relevant NPS planning documents.

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

The park resources and values that are subject to the no-impairment standard include:

- the park's scenery, natural and historic objects, and wildlife, and the processes and conditions that sustain them, including, to the extent present in the park: the ecological, biological, and physical processes that created the park and continue to act upon it; scenic features; natural visibility, both in daytime and at night; natural landscapes; natural soundscapes and smells; water and air resources; soils; geological resources; paleontological resources; archeological resources; cultural landscapes; ethnographic resources; historic and prehistoric sites, structures, and objects; museum collections; and native plants and animals;
- appropriate opportunities to experience enjoyment of the above resources, to the extent that can be done without impairing them;
- the park's role in contributing to the national dignity, the high public value and integrity, and the superlative environmental quality of the national park system, and the benefit and inspiration provided to the American people by the national park system; and
- any additional attributes encompassed by the specific values and purposes for which the park was established.

Impairment may result from National Park Service activities in managing the park, visitor activities, or activities undertaken by concessioners, contractors, and others operating in the park. The NPS's threshold for considering whether there could be an impairment is based on whether an action will have significant effects.

Impairment findings are not necessary for visitor use and experience, socioeconomics, public health and safety, environmental justice, land use, and park operations, because impairment findings relates back to park resources and values, and these impact areas are not generally considered park resources or values according to the Organic Act, and cannot be impaired in the same way that an action can impair park resources and values. After dismissing the above topics, topics remaining to be evaluated for impairment include Special Status Species, and Ethnographic Resources.

Fundamental resources and values for GCNP are identified in the General Management Plan and Foundation Statement. According to these documents, of the impact topics carried forward in this EA, only Fisheries, and Non-Fish Special Status Wildlife Species, Ethnographic Resources are considered necessary to fulfill specific purposes identified in the establishing legislation or proclamation of the park; are key to the natural or cultural integrity of the park; and/or are identified as a goal in the park's General Management Plan or other relevant NPS planning document.

- **Special Status Species (as discussed in EA under the impact topics: Fisheries and Non-fish Special Status Wildlife Species)** – GCNP possesses outstanding biological diversity and protects large, relatively undeveloped tracts of land, including habitat for two fish, five birds, an invertebrate, one plant, an amphibian and a reptile protected under the Endangered Species Act. The preferred alternative may result in minor, adverse, regional, and long-term impacts to non-fish special status species. While individual native fish may be injured or harmed during the implementation of the preferred alternative, overall, minor-to moderate, beneficial, local, and short- to long-term impacts to humpback chub and razorback sucker would result. Based on these impacts and because they will not exceed moderate, the Preferred Alternative will not result in impairment to special status species.
- **Ethnographic Resources** – GCNP protects an important cultural history, including 12,000 years of human occupation. Eleven American Indian tribes have known ties to Grand Canyon, and some consider the canyon their original homeland or place of origin. Moderate, adverse, regional and long-term impacts are expected to ethnographic resources. Mitigations, including human consumption of fish, were developed to address tribal concerns and minimize the impacts to ethnographic resources. Based on these impacts and because they will not exceed moderate, the Preferred Alternative will not result in impairment to ethnographic resources.

Fundamental resources and values for GCNRA are identified in the park's enabling legislation and 1979 General Management Plan. GCNRA was established to provide for public outdoor recreation use and enjoyment of Lake Powell and lands adjacent thereto in the States of Arizona and Utah and to preserve scenic, scientific, and historic features contributing to public enjoyment of the area. Of the impact topics carried forward in the EA, Fisheries, Ethnographic Resources, and Non-fish Special Status Wildlife Species are considered necessary to fulfill specific purposes identified in the enabling legislation of the park; are key to the natural or cultural integrity of the park; and/or are identified as a goal in the park's General Management Plan or other relevant NPS planning document.

- **Fisheries (as discussed in EA under the impact topics: Fisheries and Visitor Use and Experience)** –The preferred alternative would result in the potential for beneficial effects to the recreational rainbow trout fishery within the Glen Canyon reach below the dam by supplementing the fishery with stocked sterile trout in the event that the existing reproductive population of rainbow trout is degraded by dam operations, disease, or other external factors. Maintenance of a recreational rainbow trout fishery within the GCNRA would be consistent with the park's enabling legislation which states that hunting, fishing, and trapping on lands and waters within the boundaries of the recreation area shall be permitted in accordance with applicable laws of the United States and the States of Utah and Arizona. As such, the selected action will not result in impairment fisheries resources within GCNRA.

- **Ethnographic Resources** – Glen Canyon National Recreation Area preserves a record of more than 10,000 years of human presence, adaptation and exploration. This place remains significant for many descendant communities, providing opportunities for people to connect with cultural values and associations that are both ancient and contemporary. Tribal consultation and the implementation of mitigation measures associated with the selected action will minimize impacts in GCNRA and will not result in impairment to ethnographic resources.

- **Non-fish Special Status Wildlife Species**– The Glen Canyon reach within GCNRA provides habitat that is used by non-fish special status wildlife species that include the California condor and southwestern willow flycatcher. The implementation of conservation measures identified in the CFMP will minimize the potential for adverse effects to these species and their habitat. The selected action will not result in impairment to non-fish special status species or their habitat in GCNRA.

In conclusion, as guided by this analysis, good science and scholarship, advice from subject matter experts and others who have relevant knowledge and experience, and the results of public involvement activities, it is the Superintendents' professional judgment that there will be no impairment of park resources and values from implementation of the preferred alternative.

Errata Sheets

Comprehensive Fisheries Management Plan
Grand Canyon National Park
Glen Canyon National Recreation Area

According to NPS policy, substantive comments are those that 1) question the accuracy of the information in the EA, 2) question the adequacy of the environmental analysis, 3) present reasonable alternatives that were not presented in the EA, or 4) cause changes or revisions in the proposal. All comments are reviewed, and if major substantive issues not covered adequately in the EA are raised, or new alternatives the NPS wishes to consider are suggested, the EA would be rewritten to incorporate them and the EA would be reissued for a second 30-day public review period.

Some substantive comments may result in changes to the text of the EA, in which case, they are addressed in the *Text Changes* section of the Errata Sheets. Other substantive comments may require a more thorough explanatory response and are addressed in the *Response to Comments* section. NPS responds to all substantive comments in either or both of these sections.

Of the 25 comments that were received during public review of the EA, most of them contained substantive comments, however no major substantive issues were raised that would have required the EA to be rewritten. Substantive comments centered on the connection between the NPS CFMP and the Long Term Experimental and Management Plan currently under development by the Bureau of Reclamation and the National Park Service and the on-going Glen Canyon Dam Adaptive Management Program. Other substantive comments suggested augmenting the foodbase, establishing goals for large trout, and a general concern for recreational fishing interests in GCNRA. These concerns resulted in minor changes to the text of the EA and are also explained more thoroughly in the *Response to Comments* section.

Text Changes

Page 1, *Introduction* – Change Discrete Population Segment to *Distinct* Population Segment.

Page 7, *Need* – change "GCNP conservation measures include" to "*The Conservation Measures covered in this CFMP consist of:*"

Page 10, *Glen Canyon Reach FMZ Objectives* – the first objective: "Maintain angler catch rates of at least 10 fish per day greater than 14 inches with an angler catch rate above one fish per hour,' is changed to "*Maintain overall angler catch rates greater than 1.0 fish per hour of any size, or an angler catch rate of at least 0.5 fish per hour, with an average size of greater than 20 inches.*"

Page 11, second bullet at the top of the page – "take" is changed to "*harvest*"

Page 14, Arizona Game and Fish Department – change "*yarrowki*" to "*yarrowi*"

Page 14, *Final Environmental Impact Statement and Record of Decision on the Operation of GCD* – The reference to GLC in the first sentence of the first bullet should be *GCD* which stands for Glen Canyon Dam.

Page 15, *GCD Long-Term Experimental and Management Plan EIS* – The reference to GLC in the first sentence should be *GCD*.

Page 15, *GCD Long-Term Experimental and Management Plan EIS* – In addition to the reference to the Grand Canyon Protection act, "and the law of the River" is added after the words "Grand Canyon Protection Act."

Page 14-15, Bureau of Reclamation, Other Plans and Documents – "*Development and Implementation of a Protocol for High-flow Experimental Releases from Glen Canyon Dam, Arizona through 2020 EA*" is added to this section. In addition, the following text is added below the heading referencing the HFE

EA: "*The EA recognized that two previous spring HFEs, in 1996 and 2008, resulted in increased rainbow trout production in the Colorado River, particularly in the first 16-miles downstream of the Dam. The potential for impacts as a result of future HFEs is considered in the CFMP EA cumulative effects section.*

Page 29, Collection and Rearing of Fish, second paragraph, second sentence – change "...held until approximately four inches....." to: "held until approximately four inches *in length*....."

Page 30, first paragraph below Table 2.1, first sentence – the phrase "recovery goals" is changed to "*CFMP goals*"

Page 30, first paragraph below Table 2.2, first sentence – "HBC Outcome 1 would be achieved if monitoring detected conditions described in HBC Indicators E or F." is changed to read "HBC Outcome 1 would be achieved if monitoring detected conditions described in HBC Indicators E *and* F."

Page 31, first sentence – "HBC Outcome 2 would be achieved if monitoring detected conditions described in HBC Indicators A, B, C, or D for translocated populations" is changed to read: "HBC Outcome 2 would be achieved if monitoring detected conditions described in HBC Indicators A, B, C, *and/or* D for translocated populations."

Page 31-32, including tables 2.3, 2.4, pertaining to razorback sucker augmentation and adaptive management – the FMZ the activity would occur is listed as "Colorado River FMZ," which is changed to "*Lower* Colorado River FMZ."

Page 37, *Table 2.7 Glen Canyon Reach Rainbow Trout Experimental Stocking Criteria* – The third bullet in the table, stating: " If angler catch rates in Glen Canyon Reach decline to less than or equal to 0.5 rainbow trout/hour, and average size less than 14 inches for two consecutive years; in other words, if trout density and angler catch rates are very low, but average fish size is very large, then goals for the fishery would have been met and no sterile triploid trout stocking would be necessary" is changed to "*If angler catch rates in the Glen Canyon Reach decline to less than or equal to 0.5 rainbow trout/hour, and the average size is less than 14 inches, for two consecutive years.*"

Page 40, *Chemical Removal of Non-Native Fish and Fish Passage Barrier Construction, second paragraph, second to the last sentence* – "*(see page 36 for further detail)*" is added to the end of the sentence.

Page 40, *Flow Modification and Tributary Dewatering* – the reference to the Colorado River Storage Project Act of 1956 is incorporated.

Page 42 – the first sentence reference is changed to "*Table 2.8*" instead of Table 2.7.

Page 43, *Humpback Chub translocation to aggregations* – Change 2011 and 2013 USFWS conservation measures implemented to *2007 and 2011 USFWS conservation measures implemented.*

Page 53, last sentence – the citation "Persons and Haverbeke", is changed to read "*Persons and Van Haverbeke...*"

Response to Comments

Comment	Response
Foodbase/Aquatic Invertebrates	
"We believe one of the most promising opportunities would be to conduct experimental actions to enhance the abundance and/or diversity of the aquatic food through habitat improvements, nutrient supplementation, or flow and temperature modifications." This comment included an attachment suggesting that the NPS consider large boulder placement and large woody debris	Section 4.4.3 of NPS Management Policies state that habitat manipulation will not include the artificial manipulation of habitat to increase the numbers of a harvested species above its natural range in population levels. This would preclude artificially modifying the "food base" through nutrient or wood additions to attempt to increase the abundance of invertebrates and

additions to restore and support high biomass of invertebrates. A similar comment to this, related to augmenting or enhancing the foodbase to enhance the humpback chub population, was also received. Aquatic Food Base Enhancement: When the gates of Glen Canyon dam closed, the aquatic environment of the river was radically altered. Many of the aquatic insects that previously inhabited the river were extirpated and due to the lack of transport through Lake Powell, most of these native insects have not and will not reestablish without a comprehensive reintroduction. An abundant insect population is also important to improving the quality of the Lees Ferry trout fishery and supplies food for native fishes and migratory birds. An aggressive plan should be developed to reestablish a thriving population of aquatic insects into the Colorado River, below Glen Canyon dam.	trout. The introduction of additional insects was considered for inclusion in the CFMP, but dismissed from detailed analysis, as explained on page 41 of the EA. In addition, the introduction of many species of insects and other invertebrates was attempted early in the history of the Lees Ferry fishery, after the GCD was completed. Due to consistently cold temperatures below the Dam, only a few species survived, and the aquatic food base is now dominated by introduced aquatic organisms (McKinney and Persons 1999). The NPS recognizes that habitat components, including flow and temperature regimes that may strongly influence aquatic insect communities, have been altered as a result of the construction of Glen Canyon Dam. The NPS does not have discretion to determine dam infrastructure changes that may allow for temperature control, nor to dictate changes in dam operations. Flow regimes and options for modifying the temperature of waters discharged from Glen Canyon Dam may or may not be evaluated as part of the Glen Canyon Dam LTEMP planning process, of which the NPS is a co-lead with the U.S. Bureau of Reclamation. The effects of proposed changes on the food base or trout size will be evaluated during that process.
A group of respondents provided a summary of food base research, and urged the NPS to begin applied research to enhance the food base to benefit aggregations (of fish), reduce density limitations, and establish colonies of invertebrates for re-colonization following disturbance events.	The NPS appreciates the summary of food web information related to river fish communities. The habitat alterations and limitations related to the construction and operation of Glen Canyon Dam including the loss or reduction in driftwood inputs and transport, flow regime changes, changes in sediment regime, the dam acting as a barrier to potential sources of colonizing insects upstream of the dam, are recognized by NPS specialists. The CFMP does not prohibit or exclude future research related to aquatic invertebrates within the project area, and each new research application would be evaluated, and appropriate NPS planning and compliance processes would be determined at the receipt of an application and proposal.
Trout Fishery	
Develop a goal or objective, and management options for larger trout in Glen Canyon, including at least one trout per day over 20 inches, rather than just "maintain" a high quality fishery.	The scope of this plan is to maintain a recreational rainbow trout fishery which has been identified as a management goal/objective for Glen Canyon NRA in the Lees Ferry reach of the Colorado River. Angler catch rates and the condition of the fishery will be monitored and if objectives are not being met, a stocking plan may be developed for sterile rainbow trout. Sterile trout may

	grow larger than naturally produced trout in Glen Canyon. The CFMP also recognizes that there is uncertainty related to the extent to which active fisheries management actions can improve the growth, condition, and size of rainbow trout in the Glen Canyon reach because the influence of the operation of GCD would likely exceed the influence of other fishery management actions. A management objective of at least one trout per day over 20 inches would likely be unattainable using feasible management actions under the discretion of the NPS. Monitoring and adaptive management are meant to resolve these questions to meet goals and objectives for the fishery.
Comment suggesting selective harvest of smaller fish to obtain larger average size of trout.	It was recognized that angler harvest of small fish could result in improvements in size structure or growth objectives for trout in Glen Canyon, however the level of harvest required would be extensive, and unlikely to be achieved by angler harvest alone. It was also recognized by fish biologists that the influence of the operation of the dam would likely exceed the effects of angler harvest or electro-fishing removal (see CFMP EA page 40) of small fish from the area.
Treatments should include the consideration of mechanical removal in the Lees Ferry reach in order to better manage the trout fishery and to conserve native fish downstream.	The removal of small rainbow trout (through electro-fishing) was considered but dismissed from detailed analysis, as described on page 40 of the CFMP. It was recognized that the removal of small fish may result in size structure or growth objectives being met for trout in Glen Canyon, however the intensive level of harvest required would be financially and logistically infeasible, and it was recognized by fish biologists that the influence of the operation of the dam would likely exceed the effects of angler harvest or electro-fishing removal of small fish from the area.
Develop a goal or objective to enhance the abundance and diversity of the "aquatic food base" of the Colorado River below Glen Canyon Dam.	The NPS recognizes the ecosystem below Glen Canyon Dam has been altered (see discussion beginning on page 2 of the CFMP EA), compared to pre-dam conditions, which includes alterations of the physical processes that would have maintained a different aquatic insect community. Habitat existing in the Colorado River below Glen Canyon Dam supports very few native aquatic insect species/taxa, and a goal and management objectives for restoration of the diversity and abundance of the aquatic insect community, which constitutes a portion of the food base for fish, would be consistent with NPS Management Policies. Nevertheless, the NPS has no discretion to determine dam operations or infrastructure modifications that would allow for restoration of aquatic habitats and insect communities. Management objectives would therefore be unattainable using feasible management actions under the discretion of the NPS.
Consider stocking different strains of rainbow trout, or other trout species, that may grow larger in Glen	As explained on page 41 of the EA, the stocking of Apache trout, a native trout species to Arizona (outside

Canyon, or experiment with different strains of rainbow trout or with eggs collected from the Less Ferry reach, to determine the potential for larger size of different strains. Another commenter suggested considering the use of a strain of fish that is not piscivorous for stocking in the Glen Canyon FMZ to meet recreational fishing goals and objectives.	of the project-area) listed as threatened under the Endangered Species Act, in the Glen Canyon Reach was suggested during the scoping period to provide both a conservation opportunity for Apache trout, as well as an additional sport fishing opportunity. However, NPS Management Policy 4.4.4.1 (NPS 2006a) dictates that in general, new exotic species will not be introduced into parks, unless the exotic species is introduced to meet a specific, identified management need and all feasible and prudent measures to minimize the risk of harm have been taken, and the action meets several other criteria (e.g., stocking is directed by law). The effects of such an introduction on the native fauna are difficult to predict, including the potential for impact upon the endangered humpback chub in connected waters within Grand Canyon and downstream. If a stocking plan is developed, only sterile triploid trout will be used. No reproductive trout will be stocked in this plan, including those collected as eggs from the Glen Canyon FMZ/Lees Ferry reach and reared in a hatcher, however triploid trout may grow to larger sizes because they are unable to reproduce. Triploid trout are not readily available in multiple strains, thus the potential stocking plan development will consider only the available triploid strains. The CFMP does not preclude or prohibit experimentation with various strains of diploid and triploid rainbow trout to determine growth potential in a hatchery or laboratory setting. We know of no strain of rainbow trout that is not piscivorous that could be available and considered for stocking to meet recreational fishery objectives.
The performance (growth, survival, etc.) of triploid trout in Lees Ferry is uncertain, and stocking triploid trout is an unproven management action that should not be relied upon to meet trout fishery objectives.	Triploid (sterile) trout stocking has been conducted in other areas with varying performance, as reviewed in the CFMP EA (page 72). Nevertheless, the NPS believes the adaptive management approach for sterile trout stocking described in the CFMP will allow for adjustments in management strategies to enable objectives to be achieved, and few feasible options, in addition to stocking triploid trout, are available to meet fisheries objectives for the rainbow trout fishery.
Develop mitigation for triploid trout stocking	Mitigation planning will necessarily be part of the stocking plan that would be developed between NPS and AZGFD at specific trigger points described in Chapter 2 of the EA.
Additional clarity/discussion is needed for the triploid stocking plan, including such details as, whether the stocking would continue indefinitely, how monitoring would be conducted, the strain of trout that would be stocked, among others.	A detailed stocking plan would be developed at specific trigger points outlined in the CFMP EA (see Chapter 2). The CFMP uses an adaptive management approach to respond to the condition of the fishery, and additional fishery condition information would be available at that point to be incorporated into the stocking plan. Stocking could occur throughout the life of the plan, as described

	in the CFMP, to meet fishery objectives for the Glen Canyon FMZ.
A comment was received urging the NPS to manage for a naturally reproducing population of rainbow trout in both Glen Canyon within Glen Canyon NRA, and Marble Canyon within Grand Canyon NP.	Actions within the CFMP do not attempt to limit natural reproduction of rainbow trout in Glen Canyon, but instead, establish an adaptive management strategy for maintaining the highly valued recreational fishery for rainbow trout in the event that unforeseen and uncontrollable factors cause a decline in the fishery. The rationale for removing non-native rainbow trout from GCNP, which includes Marble Canyon, was described on page 39 of the CFMP. In summary, NPS Management Policies (Section 4.4.4, NPS 2006a)) mandate that exotic species be removed from National Parks.
Respondents questioned why the majority of the CFMP focused on endangered or native species, rather than a focus on trout management, when the river is not natural due to the dam.	The preparers of the CFMP incorporated what was thought to be all feasible and effective options for managing the trout fishery in the Glen Canyon FMZ, outside of dam operations or modifications to the Glen Canyon Dam that are outside the authority of the NPS to determine. The CFMP goals, objectives, and actions are meant to maintain a balance between recreational angling in the Glen Canyon FMZ, values of the Traditionally Associated Tribes, and native fish conservation across the entire project area, while maintaining consistency with NPS Management Polices and legislated mandates (Endangered Species Act, National Historic Preservation Act, etc.).
A respondent suggested saving endangered species in refugia in the canyon, or another river elsewhere, such as the Los Angeles River.	It is unclear what was meant by "refugia in the canyon", but translocations of the endangered humpback chub, as described in the CFMP, are intended to serve as new protected areas within GCNP. However, developing refuges for endangered species in the Los Angeles River, or another river elsewhere, would not meet the purpose and need for conserving endangered species within GCNP.
Monitoring/Implementation	
Authority questions/comments- the EA needs to clarify who is responsible for management and monitoring, and who will implement the various components of the CFMP, or take the lead on various projects (NPS, AZGFD, USGS-GCMRC, USFWS, USBR, GCD Adaptive Management Program). A description of how actions in the CFMP and actions in the GCD AMP interact is needed. An explanation of the roles and responsibilities of the NPS, AZGFD, USGS-GCMRC, USFWS, USBR, GCD Adaptive Management Program in regards to fisheries management is also needed.	The authority and responsibility for managing fisheries within both GCNRA and GCNP is explained on page 2 of the CFMP EA: "In GCNP and GCNRA state law applies to fish management, but only to the extent not preempted by federal statute, regulation, or lawful administrative action. In accordance with CFR part 24, and the GCNRA enabling legislation, NPS must consult with AZGFD before taking certain administrative actions to manage fish in park units." Further, all fisheries research and monitoring activities within GCNP and GCNRA require NPS Scientific Research and Collecting permits, under the discretion of the NPS. Thus, as in the past, all fisheries-related activities conducted by the state and federal agencies mentioned in the comments would continue to be coordinated through the NPS permitting process.

Other commenters questioned whether the "core monitoring" protocols implemented through the GCD AMP and GCMRC are sufficient to monitor the effects of implementation of the CFMP. The NPS should avoid duplication of effort. A revision to the CFMP EA was suggested to identify what activities will be monitored and who would conduct the monitoring.	As in the past, the NPS will continue coordination of its activities with the other state and federal agencies and researchers during the implementation of the CFMP to avoid duplication of efforts, and to ensure appropriate monitoring data are collected to assess the outcomes of management activities included within the CFMP.
CMFP Page 33, in the Detection Monitoring section, last paragraph: A good place to start evaluating the risk of new introductions and plan cooperative efforts would be to obtain the AZGFD fish management plan for the LCR watershed.	Thank you for the suggestion. If available, the LCR watershed plan will be consulted during the implementation stage of the CFMP.
Authorities, Laws	
The respondent was unaware of any legal authority the Service (NPS) has to use the CFMP to affect water release decisions at Glen Canyon Dam. Another comment received: "It is imperative that the EA/Plan not be used to govern or dictate flow regimes from Glen Canyon Dam and that the EA/Plan be entirely clear as to its relationship to the Law of the River."	None of the Alternatives analyzed in the CFMP EA propose modifications to GCD or its operations because NPS does not have discretion to determine dam operations. The NPS is a co-lead with the USBR for the LTEMP EIS, and will address potential operational considerations through that process.
The text in paragraph 2 on this page is incomplete and misleading in that it cites only a portion of section 1802 of the Grand Canyon Protection Act and not section 1802 (b), which requires the Secretary to comply with existing law in the operation of Glen Canyon Dam.	NPS is aware of all mandates contained within the Grand Canyon Protection Act (GCPA) and has ensured that the CFMP complies will the GCPA, the Law of the River and all other applicable Federal statutes and regulations. In addition, none of the Alternatives analyzed in the CFMP EA propose modifications to GCD or its operations because NPS does not have discretion to determine dam operations.
Reference to the LTEMP authority should also include specific reference to the Law of the River, not just the Grand Canyon Protection Act	Thank you for your comment. "and the Law of the River" has been added after "Grand Canyon Protection Act" if the paragraph you have referenced.
P. 40: Reference in the last paragraph should also refer to the Colorado River Storage Project Act of 1956.	Thank you for the comment, the change has been made.
P. 78: The first two sentences of the second full paragraph referring to "low summer flows" should be deleted. The issue of flows is under the purview of the Bureau of Reclamation and the language could be construed as pre-decisional under the LTEMP EIS.	We wrote that "discharge options that may modify Colorado River temperatures *may* be evaluated" and "Water temperatures *could* be achieved." (emphasis added) The sentences are neither absolute nor pre-decisional. Therefore, no change will be made.
Activities proposed within the CFMP would result in impacts to endangered humpback chub, and consultation with the U.S. Fish and Wildlife Service according to the Endangered Species Act is required.	The NPS is aware of the requirement and has engaged in formal consultation with the U.S. Fish and Wildlife Service regarding the potential impacts to humpback chub and other species listed under the Endangered Species Act. The planning process was not completed until a Biological Opinion on the CFMP by the U.S. Fish and Wildlife Service was received by the NPS.
A biological assessment was not included for review within or along with the EA/Plan, and thus the CFMP is a draft, and that the biological assessment needs to be included for public review prior to finalization.	A biological assessment of impacts to endangered species was embedded into Chapter 3 of the CFMP EA for public review. Changes to the CFMP as a result of public review and comment are included in the FONSI and accompanying errata sheet.
Delay completion until after the Glen Canyon Dam Long Term Experimental and Management Plan (LTEMP) Environmental Impact Statement (EIS) is	Thank you for your comment(s). This was a common concern during scoping for the CFMP EA. The NPS will not be delaying publication and implementation of

complete, or integrate the CFMP into the LTEMP.	the CFMP because the GCD LTEMP EIS, which is currently being developed and written, is considered in the Cumulative Effects sections of the CFMP EA. As a co-lead agency, NPS is well aware of all aspects of the GCD LTEMP EIS and will ensure that the CFMP is compatible and consistent with the GCD LTEMP EIS to the maximum extent practicable. The CFMP and LTEMP address many similar issues, but they are separate Federal actions. NPS is not legally required to delay the CFMP until after the LTEMP EIS is completed. After publication of the LTEMP, NPS will consider whether changes to the CFMP are necessary and will evaluate those changes pursuant to NEPA at that time. It is also important to recognize that many of the actions identified in the CFMP related to NPS management actions for conserving native species in tributaries to the Colorado River, not in the river itself. Further, the NPS is mandated to manage natural resources within GCNP and GCNRA, as directed by congress.
It was recommended that the NPS add a section within the CFMP that addresses the relationship and management implications associated with the proposed CFMP and implementation of the proposed LTEMP, DFCs, current biological opinion associated with Glen Canyon Dam Operations, and the revised Colorado River Basin Native Fish Recovery Goals developed by the U.S. Fish and Wildlife Service (USFWS).	The recommended section is not required by the National Environmental Policy Act (NEPA). Therefore, no change will be made. However, NPS has considered the "proposed LTEMP, DFCs, current biological opinion associated with Glen Canyon Dam Operations, and the revised Colorado River Basin endangered fish Recovery Goals developed by the U.S. Fish and Wildlife Service (USFWS)" in the course of preparing this EA.
There is an underlying lack of administrative integration between the CFMP and activities occurring within the AMP and being developed under the Long Term Experimental Management Plan EIS. The overlap in these programs is not defined in the CFMP EA.	The CFMP and LTEMP address many similar issues, but they are separate Federal actions. After publication of the LTEMP, NPS will consider whether changes to the CFMP are necessary and will evaluate those changes pursuant to NEPA at that time. It is also important to recognize that many of the actions identified in the CFMP related to NPS management actions for conserving native species in tributaries to the Colorado River, not in the river itself. Further, the NPS is mandated to manage natural resources within GCNP and GCNRA, as directed by congress. The authority and responsibility for managing fisheries within both GCNRA and GCNP is explained on page 2 of the CFMP EA: "In GCNP and GCNRA state law applies to fish management, but only to the extent not preempted by federal statute, regulation, or lawful administrative action. In accordance with CFR part 24, NPS must consult with AZGFD before taking certain administrative actions to manage fish in park units." Further, all fisheries research and monitoring activities under the AMP, or that will be conducted following the completion of the LTEMP, and that would occur within GCNP and GCNRA require NPS Scientific Research

	and Collecting permits, under the discretion of the NPS. Thus, as in the past, all fisheries-related activities would continue to be coordinated through the through the NPS permitting process. As in the past, the NPS will continue coordination of its activities with the other state and federal agencies and researchers during the implementation of the CFMP to avoid duplication of efforts, and to ensure appropriate monitoring data are collected to assess the outcomes of management activities included within the CFMP.
Goals, Objectives, Desired Conditions	
The GCD AMP has identified Desired Future Conditions ("DFCs") which overlap with the Fisheries Plan. It is not clear whether the Fisheries Plan exceeds the goals of the DFCs, and if so, why those additional measures are necessary. Until this EA analyzes its relationship to the GCD AMP, DFCs, and any potential conflicts, the analysis for the Fisheries Plan is not complete. If the Fisheries Plan is not incorporated into the LTEMP EIS, the EA should be revised and reissued to address the Fisheries Plan's relationship to the GCD AMP and analyze whether the DFCs adequately address the goals of the Fisheries Plan.	NEPA does not require NPS to conduct the analysis mentioned in this comment. NPS acknowledges that GCD AMP DFCs do overlap with desired outcomes in the CFMP. However, the LTEMP and CFMP are different plans in multiple aspects. Therefore, there may be differences in the desired outcomes between the two plans. NPS is well aware of all aspects of the GCD LTEMP and will ensure that the CFMP is compatible and consistent with the GCD LTEMP to the maximum extent practicable.
The goals of the CFMP are related to flow and implementation may result in pressure on other federal agencies to change the Glen Canyon Dam discharge and downstream flow regime. The EA should provide a detailed description of how implementation of the Fisheries Plan is consistent with the GCD EIS, 2007 Interim Guidelines, and Section 1802(b) of the Grand Canyon Protection Act. Furthermore, the EA should clearly state that the Fisheries Plan does not affect the Bureau of Reclamation's ("Reclamation") operations of the Glen Canyon Dam under its water delivery obligations and legal requirements.	None of the goals listed in the CFMP mention dam discharge, however it is recognized in the CFMP that habitat in the Colorado River within the project area is affected by the Glen Canyon Dam. This recommended revision is not required by NEPA and is beyond the scope of this EA. None of the Alternatives analyzed in the CFMP EA propose modifications to GCD or its operations because NPS does not have discretion to determine dam operations. The NPS is a co-lead with the USBR for the LTEMP EIS, and will address potential operational considerations in that process.
The relationship between the EA's Desired Conditions and the Desired Future Conditions (DFCs) developed by the Glen Canyon Dam Adaptive Management Program (AMP) and recognized by the Secretary of the Interior is not clear. Given that there is overlap between the resources and geographic scope used in the EA/Plan and the AMP, the EA's Desired Conditions should be compatible with the DFCs, or the AMP DFCs should be considered for use within the NPS CFMP.	We recognize the efforts of the AMP stakeholders in the development of DFC's for the AMP program and the Secretary of the Interior's acceptance of the document. We have attempted to incorporate as much of the AMP DFC concepts as is reasonable into the approach outlined in our CFMP. The desired conditions within GCNP and GCNRA relative to fisheries management requires more specific conditions than are articulated in the AMP DFC document and we believe the desired conditions identified compliment the broad DFC's identified by the AMP.
Clarification and rationale is needed for how and why humpback chub translocation outcome 3 (CFMP page 30, table 2.1) was established. The outcome states that the failure of at least 20% of [translocated] humpback chub to survive in the creek or adjacent mainstem aggregation for at least one year, would signify the failure of that particular translocation to meet objectives.	Based on monitoring of past translocation projects, at least 20% apparent survival of humpback chub resulted in increases in mainstem aggregation populations, and in general, this result was perceived as successful by agency cooperators and stakeholders. Additional interagency consultation and consultation with Traditionally Associated Indian Tribes would occur prior to cancelling or continuing a particular

	translocation project if this outcome was observed (CFMP page 31).
The scientific basis and background for the GCNRA trout management objectives: "....maintain proportion of rainbow trout (in Glen Canyon) less than six inches at 20-80% of the population...." is unclear.	Data provided by AZGFD indicated that from 1991 to present, the proportion of trout <150 mm TL (6") remained between 20 and 80% of the total electrofishing catch with the exception of two years. Since angling success was acceptable to during this time period, maintaining the proportion of near-recruits at similar levels is determined to be appropriate by NPS and AZGFD fisheries specialists.
CFMP EA Page 10, GCNRA objectives: First bullet: does "maintain" imply that this is where the fishery variables are currently at? Second bullet: are there target condition levels (other than "moderate"), and which condition index is being used? Also, just curious, is there a rationale why 12+ inch fish need to be of a certain condition (this bullet) and 14+ inch fish need to be of a certain abundance (first bullet)?	'Maintain' does partly refer to current fishery conditions. According to data provided by AGFD, angler catch rates of fish of all sizes have averaged just under 1 fish per hour (0.91±0.16) from 1991-2012. Lowest catch rates were observed in 1992 (0.39 fish/hour) while highest catch rates were observed in 2011 and 2012 (1.47 and 1.90 fish/hour respectively). Angler catch rates of 1 fish per hour of fish >14" are desired, and current catch rates are greater than 1 fish per hour for fish of all sizes (Mike Anderson, AGFD, personal comm.). To clarify that a range of conditions is possible, we have changed the objective on page 10 to read: "Maintain overall angler catch rates greater than 1.0 fish per hour of any size, or an angler catch rate of at least 0.5 fish per hour with an average size of greater than 20 inches." Relative condition (Kn) data were reported in Makinster et al. 2011, using the standard relative condition formula Kn =(W/W1)x100, where Kn is expressed as a percentage, W is the weight (grams) of the fish, and W1 is the standard length-weight relationship for fish captured in Lees Ferry 1991 to 2012. Kn was reported for fish in several size classes including 'catchable' size fish, defined as fish >12". Kn for fish over 12" has varied from 70 to 95%. 'Moderate' is considered to be ≥80% for this objective, since condition has been above 80% in most years. Objectives for abundance and condition were based on slightly different fish sizes in response to input from AZGFD.
Table 2.7: Second bullet: is this relative abundance of all sizes of fish? Third bullet: This needs to be simplified. The first sentence seems to make sense as a trigger to stock fish, but the second sentence is confusing because if this situation were attained, the objectives set out earlier in the document on page 10 would in fact *not* be met (i.e., fish may be greater than 14", but they would be caught at a rate of less than 1 fish/hour, in fact less than 0.5 fish/hour). Is there a reason why the threshold here is 0.5 fish/hour and 1.0 fish/hour in the objectives? Suggest dropping the second sentence and emphasize that these are triggers to stock fish with the hope that objectives on page 10	The relative abundance referred to in the second bullet is for all sizes of fish, and is based on the AZGFD electrofishing catch rates. We agree that the third bullet needs to be simplified. The intent is that triploid trout would only be stocked if there were very few, small, fish. We will change it to read: "If angler catch rates in Glen Canyon Reach decline to less than 0.5 rainbow trout/hour, and average size is less than 14 inches for two consecutive years." In addition, we have changed the associated objective on page 10 to read:

would eventually be met (but not necessarily objectives themselves)? It also seems like criteria in the first and second bullet would be met before the unusual set of circumstances put forth in the third bullet. Is the third bullet necessary?	"Maintain overall angler catch rates greater than 1.0 fish per hour of any size, or an angler catch rate of at least 0.5 fish per hour with an average size of greater than 20 inches."
GCNP Fisheries Desired Conditions (first two bullets on CFMP EA page 11): Conceptual goals for the Little Colorado River (LCR) humpback chub aggregation and other aggregations to be stable or increasing, at carrying capacity, and above minimum viable population (MVP; term not defined in the CFMP), demonstrates a simplistic look at species conservation. It is unlikely that humpback chub will continue to increase, or be stable, or be at an undefined (and nearly impossible to describe) carrying capacity for any period of time (undefined in the CFMP). A more realistic approach would utilize goals that place the long term trajectory for humpback chub at or above a defined MVP, with a defined likelihood of remaining above a biologically significant population level based on important life history characteristics.	The first bullet statement under the GCNP Fisheries Desired Conditions recognizes the need to meet or exceed the USFWS recovery criteria for humpback chub at the Little Colorado River, and the second simply recognizes the need to maintain genetic integrity in any translocated populations in tributaries. The use of the Minimum Viable Population (MVP) concept for humpback chub desired conditions, as recommended in this comment, is included in the third bullet under GCNP Fisheries Desired Conditions on page 11. The NPS defers to the USFWS to establish a specific MVP for humpback chub. The development of an MVP is based on important life history characteristics.
How was the goal for brown trout control established? The goal of 80% removal of brown trout appears arbitrary. Commenters suggested using fish population models to inform trout reduction goals, or questioned whether there was a scientific literature citation to support the 80% trout removal objective. It is unclear how an 80% reduction in brown trout would ensure a successful translocation of humpback chub.	As with all goals and objectives in the CFMP, adaptive management principles will be applied. In the description of the adaptive management strategy, the CFMP EA recognizes that the level of mechanical control needed to effectively reduce brown trout, and the level of brown trout control necessary to benefit native species is uncertain (see CFMP EA page 26). Nevertheless, we used an unpublished brown trout exploitation model developed cooperatively by NPS, USGS-GCMRC, and AZGFD biologists to estimate the level of removal effort needed and to establish removal objectives in the CFMP. The model incorporates published stock-recruit relationships and brown trout life history data and electro-fishing capture probability information from Bright Angel Creek. Targets were also reviewed and discussed among multiple agency biologists (BOR, GCMRC, NPS), during the development of the CFMP. The following citation was reviewed during the development of objectives, in addition to others reviewed by Trammell (unpublished 2005 report), as described in the CFMP text (page 35): Mueller, G. A. 2005. Predatory fish removal and native fish recovery in the Colorado River mainstem: what have we learned? Fisheries 30 (9): 10-19. The paper recommends at least 80% removal of non-native fish. The interim goal of an 80% reduction in brown trout would be maintained prior to an attempt to translocate humpback chub to Bright Angel Creek, an survival of translocated humpback chub would be monitored to determine if adjustments in management actions are necessary. Depending on changes in management

	strategies, additional planning and compliance may be necessary.
Why was the target population size for humpback chub set at 6,000 to 10,000 fish?	While unpublished draft USGS-GCMRC data indicate the humpback chub population may be between 9,000 and 12,000 fish, the estimate remained under review at the time of the completion of the CFMP, and thus, we opted to defer back to the latest peer-reviewed, published population estimate, which was 6,000 – 10,000 fish (Coggins and Walters 2009).
Should a target for reduction of rainbow trout be included in the objectives for Shinumo Creek?	Thank you for noticing the oversight. The objective has been added to the Shinumo Creek/Inflow FMZ Objectives (see Errata sheet text changes above).
In reference to page 30, in the adaptive management section for humpback chub translocations, the first sentence below table 2.1 reads "The NPS and its cooperators would strive to meet HBC Outcome 1, which would contribute the most toward humpback chub recovery goals...." The outcome 1 is an element of the reasonable and prudent alternative in the 1995 EIS for operations of Glen Canyon Dam, not the USFWS recovery goals for humpback chub.	In reference to "recovery goals" in this sentence, the intention was to state that HBC Outcome 1 would contribute most towards meeting goals for humpback chub outlined in the CFMP, not necessarily specific USFWS recovery goals or reasonable and prudent elements of the 1995 EIS. The change will be made in the errata sheets.
In reference to the razorback sucker adaptive management: should there be indicators to go with the potential outcomes? Is table 2.4 meant to fulfill that need?	The razorback sucker augmentation and adaptive management strategy was adapted directly from the "Management Strategy for the Razorback Sucker in the Lower Grand Canyon and Lake Mead Inflow" by R. A. Valdez, et al. (2012), which includes indicators of outcomes. Indicators include whether sonic-tagged fish remain in the area, presence/absence, etc.
Compliance Process-related Comments	
Missing from the CFMP "Relationship to Other Plans and Programs" section (Page 12-15), is the recognition of the "Law of the River." Perhaps this would be the appropriate section to discuss the relationship between the CFMP and the Law of the River.	This discussion is not required by NEPA or its applicable regulations. NPS has ensured that all actions contemplated in the CFMP are in compliance with the "Law of the River." The actions considered in the CFMP do not alter water rights or water delivery in any way, and as such do not have the potential to conflict with the Law of the River. From the BOR website: *The Colorado River is managed and operated under numerous compacts, federal laws, court decisions and decrees, contracts, and regulatory guidelines collectively known as the "Law of the River." This collection of documents apportions the water and regulates the use and management of the Colorado River among the seven basin states and Mexico.* As described above, the actions described in the CFMP in no way alter or affect the implementation of the Law of the River.
Comments suggested that the alternatives, particularly alternatives 2 and 3 were too similar to detect a difference in impacts of the actions upon Park resources.	Alternative 2 was developed to address concerns raised by Traditionally Associated Tribes related to the sanctity of life in the Colorado River and non-native trout control. Differences exist between the alternatives in effects to Visitor Use and Experience, as well as in the relative amount of non-native fish control and number of non-native fish that would be removed. Alternative 3

	includes more intensive fisheries management than the other alternatives, with additional non-native fish control.
There is bias in the analysis of the "No Action" Alternative, as the outcome described in the EA for the No Action would be much worse than the outcome for Alternatives 2 and 3 for fish. Some of the objectives are currently being met because they were identified as being important through the GCD AMP, without the CFMP.	Under NEPA, the purpose of evaluating a No Action alternative is to provide for a baseline for comparison of the other alternatives. Some of the actions (e.g., non-native fish control, humpback chub translocations) have occurred prior to the development of the CFMP, however separate planning and compliance processes were completed for each project prior to the initiation of the projects. Compliance has expired for many of these actions, and thus, they would not continue into the future until new planning and compliance processes were completed, which is why objectives would not be met in many cases under the No Action alternative. Under the preferred alternative, fisheries management activities would be implemented into the future, meeting objectives for fisheries, and the CFMP displays the impacts of the actions in a comprehensive context.
Alternative 1 conclusion statement, page 68: It is somewhat misleading to say that impacts are negligible because experimental high flows are thought to stimulate production of age-0 rainbow trout in GCNRA.	We agree that high flows may increase production of age-0 rainbow trout in the Glen Canyon FMZ. However, the conclusion that negligible beneficial impacts to the trout fishery may occur under the No Action Alternative must be considered in the context of the goals and objectives for the fishery. In which case, extremely high numbers of small rainbow trout is not ideal, and fisheries managers would have limited ability to implement management changes, such as stocking triploid trout, as considered in Alternative 2 and 3. In addition, the outcome of the No Action Alternative would be minor to moderate, adverse, localized, and long-term impacts if whirling disease or other natural or anthropogenic factors occurred.
Aquatic Invasive Invertebrates	
The CFMP should address the effects of quagga mussel to the Lees Ferry fishery.	Glen Canyon NRA is initiating an Invasive Mussel Comprehensive Resource Stewardship Plan for Glen Canyon National Recreation Area to identify and prioritize strategies in response to the recent detection of adult quagga mussels. The plan will provide direction to the park's effort to meet the desired condition of avoiding the introduction, establishment, or spread of invasive non-native mussels. The plan will include a threat assessment to identify where aquatic resources are vulnerable to invasive mussels, and to consider potential visitor use management strategies through an adaptive management framework that would protect visitor experience, key infrastructure, and park resources. This may include changes to where, when, and how visitor uses that may contribute to the introduction of invasive mussels occur. The plan may also consider infrastructure changes to support invasive mussel prevention and management. The plan will be developed through a public process that complies with the National Environmental Policy Act (NEPA).
The CFMP EA should specifically consider quagga mussels, New Zealand mudsnails, or other invasive	Actions to control these aquatic invasive invertebrate species are generally beyond the scope of this CFMP.

species, including crayfish, because the presence of these species may inhibit the ability of the NPS to meet objectives for native species.	However, the species listed are present within the project area, or in waters connected to the project area as in the case of quagga mussel, and are perceived as a threat to aquatic ecosystems. As explained above, GCNRA is initiating an invasive mussel management plan. If feasible control methods are identified for the other invasive invertebrate species in GCNP or GCNRA, the NPS may consider initiating a planning and compliance effort to develop an invasive aquatic invertebrate control plan. Invasions or introductions of new aquatic invasive species would also be addressed through outreach efforts or emergency response actions, as explained in CFMP Chapter 2.
Habitat	
Comments related to a lack of options considered in the CFMP to identify activities to restore natural aquatic (fish) habitats that were historically present in the Canyon, or monitor and maintain existing habitat.	The NPS recognizes its responsibility to restore natural ecosystems and processes, including aquatic habitats, when impairment exists. The aquatic habitat, particularly related to temperature, flow, and sediment, in the Colorado River below Glen Canyon Dam is very different than its pre-dam condition. However, the NPS has no discretion to determine dam operations that may result in restored and natural flow, sediment, or temperature regimes in the Colorado River. NPS staff monitor aspects of aquatic habitat in tributaries. There are limited opportunities to restore or improve minimally-impacted physical habitat in the tributaries that may have population-scale effects on native fish, and thus, no habitat improvements were considered in the EA.
Integrate temperature and flow management into the CFMP, and develop a multi-agency fishery management plan for the Glen Canyon FMZ once the LTEMP EIS is completed.	While it is recognized temperature and flow regimes have changed considerably with the construction and operation of Glen Canyon Dam, none of the Alternatives analyzed in the CFMP EA propose modifications to Glen Canyon Dam or its operations because NPS does not have discretion to determine dam operations. The NPS is a co-lead with the USBR for the LTEMP EIS, and will address potential operational considerations in that process. The CFMP was designed to enable managers to adapt management activities to meet objectives for fisheries within the project area, including the Glen Canyon FMZ, in the face of changing and unpredictable conditions. The agencies with the authority to manage fisheries, described on page 2 of the CFMP (NPS, AZGFD, and USFWS), were involved in the development of the CFMP, and the NPS does not see a need to duplicate the effort; however it may be considered if new and unforeseen information becomes available.
Geographical Scope	
The CFMP should discuss and address major threats to the fishery from inside (quagga mussel invasion) and outside the project area/NPS unit boundaries (LCR water withdrawals, mining, spills, climate change, etc.).	Future cumulative impacts to fisheries within the CFMP project area related to reasonably foreseeable future actions by other federal, state, tribal, and local or private entities were discussed in Chapter 3 of the CFMP EA, and climate change affects were considered but dismissed from detailed analysis in the CFMP (see

	CFMP page 21). Further, The CFMP was designed to enable managers to adapt management activities to meet objectives for fisheries within the project area, including the Glen Canyon FMZ, in the face of changing and unpredictable conditions. The potential impacts of quagga mussel, recently found in Lake Powell Reservoir upstream of the Glen Canyon FMZ, to the rainbow trout fishery, is outside the scope of the CFMP. The quagga mussel invasion will be addressed by Glen Canyon NRA in a separate Invasive Mussel Comprehensive Resource Stewardship Plan planning process (see response above). The NPS actively seeks the cooperation of other state and federal agencies and other entities in minimizing the impacts of outside threats to resources within GCNP and GCNRA when they arise. For example, the NPS engaged with the Bureau of Land Management, the USDA Forest Service, and the USGS, to conduct studies to inform the recent Northern Arizona Mineral Withdrawal Final Environmental Impact Statement, signed on January 9, 2012. The purpose of withdrawing lands from mining was to protect the Grand Canyon watershed from adverse effects of uranium exploration and mining. The CFMP identified and discussed currently known threats to fisheries and other natural resources within the project area, and the NPS will continue to actively engage in outside threats when NPS becomes aware of outside activities in the future. The level of planning and compliance needed for future outside threats would be identified when proposals arise, subject to the jurisdictional authority of the NPS.
A suggestion was made, related to the geographical scope of the plan, to clearly establish the downstream boundary for the NPS CFMP as Pearce Ferry, to avoid the perception by anglers in Lake Mead that the NPS is somehow planning to affect sport fish populations in Lake Mead.	No actions are proposed or approved in the CFMP to affect sport fish within Lake Mead. To clarify the boundary and scope of the plan, the CFMP includes all waters within GCNP, and the waters within GCNRA downstream of Glen Canyon Dam. The official boundary between GCNP and Lake Mead National Recreation Area on the Colorado River is upstream of Pearce Ferry at approximately River Mile 277.
Non-native Fish Control Implementation	
The EA does not address a long-term non-native fish control action or set of actions in the case that a non-native species gets "out of control," and that if a long-term control program becomes necessary, additional NEPA compliance would be necessary, unless the EA is revised to include this analysis, or the fisheries plan is integrated or delayed until after the LTEMP is completed.	We concur that additional compliance would be necessary in the event that a longer-term response is needed for a new or expanded non-native fish invasion, and this is stated on page 28 of the CFMP EA. The NPS is not legally required to delay the CFMP until after the LTEMP EIS is completed.
The EA should be revised to include a non-native fish control program focused on backwaters to protect young, endangered razorback sucker, in the case that razorback sucker spawning occurs above Pearce Ferry.	Young razorback sucker have not been found inhabiting backwaters within the project area as of the completion of the CFMP, although native flannelmouth and bluehead suckers have been observed in backwaters in the lower gorge (NPS unpublished data). However, the Lower Colorado River FMZ razorback sucker

	augmentation and adaptive management action included in the selected Alternative (2), recognizes the uncertainty related to whether habitat in GCNP can support razorback sucker reproduction. Depending on the results of Phase I-II (see CFMP page 32), including whether razorback sucker spawning occurs in GCNP, a non-native fish control program focused on backwaters could be considered for implementation, if necessary, however additional planning and compliance activity may be necessary.
The CFMP is too prescriptive, and thus restrictive, with respect to the types of fishing gear that would be used during the implementation of the CFMP, and the NPS should make it clear that fish chemical attractants (pheromones), chemical piscicides (fish toxins), or new and yet unknown gears or techniques could be used without additional NEPA analysis and compliance.	The impact of over-handling of humpback chub by researchers and direct impacts of fisheries sampling gear on humpback chub and other native species was a concern addressed in Chapter 3 of the CFMP EA as well as during ESA-related consultation with the USFWS. Because there is the potential to injure or cause mortality in individual fish during sampling, and the potential to harm fish varies by gear type, additional impact analysis would be necessary for new or unknown gear types. The use of chemical piscicides (fish toxins), was considered but dismissed from detailed analysis in the EA due to a lack of data that would enable the NPS to analyze the impacts to park resources. Chemical piscicides, and other new gear types may be considered in the future, and additional planning and compliance would be necessary prior to their use.
It is unclear how trout removal will be conducted using angling as a trout removal tool. It is unlikely that angling can be used effectively to control trout densities or movements in the mainstem or in the tributaries, and more explanation is needed.	Angling was suggested as a means to remove non-native trout, during the public scoping and preparation of the CFMP EA. We agree that as a stand-alone trout removal strategy, angling is unlikely to result in large reductions in non-native trout populations in the mainstem. However, based on past experience, angling may be effectively used as a tool to control trout in tributaries, and may be implemented during monitoring excursions in combination with additional electro-fishing events at least once per year to assess trends in trout populations, and remove additional trout.
Respondents supported the non-native fish source identification (otolith microchemistry) actions included in the CFMP, but suggest the provisions for the action and the protocol should be incorporated into the CFMP.	To clarify, provisions of the non-native fish source identification program are incorporated into the CFMP, to the extent necessary to implement the actions. On CFMP page 33, actions are discussed that would support source identification work, including the removal of incidental captures of high-risk predatory species and other rare non-natives, and methodology is cited in the paragraph below (e.g., Hayden et al. 2012).
Continued monitoring of non-native trout control efforts near and within Bright Angel Creek, and the response of native fish populations to those efforts is needed, and if desired outcomes for native fish are not achieved, removal efforts should be re-assessed. A native fish habitat assessment should be included in this case.	Non-native trout control will follow an adaptive management strategy, including monitoring, as described in the CFMP. Native fish habitat will continue to be considered during assessments of the project.
The objectives for preventing further introductions of non-native species are inadequate. Establish an objective that includes collaborating with other jurisdictions within the watershed to develop a response plan to detection of non-native species.	The NPS feels the specific objectives and management actions in Alternative 2 of the CFMP EA will promote active protection and restoration of native fish populations in GCNP, promote protection and enhancement of the highly valued recreational rainbow

	trout fishery in GCNRA's Glen Canyon Reach, and addresses concerns from Traditionally Associated American Indian Tribes by limiting the number of fish killed and using as many fish as possible for human consumption. This would allow attainment of the widest beneficial uses of the environment, and preserve cultural and natural aspects of our national heritage. Further, the collaboration with other management agencies, tribes, and/or land owners in watersheds that extend beyond GCNP or GCNRA to evaluate risk of new introductions from those areas and develop cooperative efforts to deter future invasions, is included within Alternative 2 of the CFMP (see EA page 33).
Table 2.5: NNF outcome 1 includes the possibility that there will be no response ("is maintained") on the part of native fish parameters. Would NNF control still proceed if this is the outcome? Also see p. 36, first sentence: we think NNF control (or the ability to detect effects) would have to be reassessed if there was no discernible response.	As stated on page 35, if Outcome 1 is achieved, non-native control may continue, but the level of effort may change. Under the CFMP adaptive management strategy, non-native fish control methodology, as well as monitoring methodology, may be reassessed and adjusted periodically if needed, including if monitoring methods are not sensitive to changes in native fish populations.
Extirpated Species	
The reintroduction of extirpated species, such as Colorado pikeminnow, may jeopardize the continued survival of humpback chub, and the analysis of these impacts in the CFMP EA is insufficient.	The CFMP does not propose to reintroduce Colorado pikeminnow, and additional impact analysis would be conducted, including related ESA, NEPA, and NHPA compliance, if future studies indicated extirpated species reintroductions were feasible. The commenter is referred to Chapter 2 for further discussion.
Remove the concept of extirpated species reintroductions, including Colorado pikeminnow, from the CFMP goals.	The NPS is obligated under the NPS Organic Act and the ESA to proactively conserve listed species, including cooperating with the USFWS to reestablish extirpated populations as necessary, so the extirpated species goal will not be removed from the CFMP.
There is insufficient detail in the CFMP EA describing how the reintroduction of extirpated species would be conducted, or how extirpated species objectives would be accomplished.	The feasibility studies, as described in Chapter 2 (Alternatives), would be conducted to evaluate whether and how extirpated species reintroductions may occur, and then additional planning and compliance would be conducted prior to the development of specific reintroduction plans.
The reintroduction of extirpated fish species could result in additional predation and food competition that could impact the humpback chub. The EA provides almost no discussion of impacts to protected species that may result for the reintroduction of extirpated species.	Thank you for the mentioning the concern related to the potential for impacts to the humpback chub in GCNP. The CFMP does not currently propose to reintroduce any extirpated species, but does propose to conduct additional feasibility studies to assess whether a reintroduction may be feasible and practicable. Additional planning and compliance (including, but not limited to ESA compliance) would be conducted if feasibility studies suggested reintroduction may be possible. The potential for impacts to humpback chub, razorback sucker, and other fish and wildlife species, as well as impacts to other resources (e.g., ethnographic and cultural resources, Visitor experience, Wilderness Character, etc.) would be considered at that time. Any and all future plans and activities would continue to be coordinated with the USFWS, to ensure consistency with recovery goals and plans for ESA-listed species.

Cultural/Tribal Concerns	
One caveat to supporting the selection of Alternative 2, is that unnecessary killing of non-native fish has the potential to occur under the CFMP, even in situations where there may be little or no evidence that the species poses a threat to native species. The term "high-risk species" is used when referring to non-native fish species that would be targeted for removal by the NPS, but no specific list of these species is provided.	Alternative 2 was developed with the concerns related to killing non-native fish in mind. The list of "high-risk" non-native species that would be removed if captured is under the project element heading "Removal of Incidental Captures" on page 33 of the CFMP EA, but admittedly, some are listed as fish "families," such as "bass and sunfish (*Centrarchidae*)," rather than specific species, such as brown trout or burbot. In addition to specific species listed, the groups of species listed as families of fish that would be targeted for removal, such as *Centrarchidae* or catfish, are those groups that contain multiple species that have been implicated in native fish declines in the Colorado River basin, or elsewhere, or are highly predatory (e.g., smallmouth bass, green sunfish, striped bass, burbot, brown trout), and are considered to pose serious threats to native species within the project area.
Concerns have been consistently expressed for the sanctity of all life in the Canyon (not only native species), and we do not support the eradication of non-native fish from tributaries for the purpose of stocking (translocating) "native" fish, unless there is evidence that the given native species previously occupied those tributaries. If a species never existed in the tributary, it is really introducing another "non-native" species if translocations occur.	The concerns related to the taking of life in the Canyon are taken seriously. The removal of non-native species from tributaries is included within the CFMP to meet objectives related to improvement or enhancement of existing native fish, meet the intent of conservation measures for the operation of Glen Canyon Dam, and/or to improve survival of translocated humpback chub. Very little historic, pre-dam fish survey information is available, and even less so prior to the introduction of trout to the tributaries in the 1930's. As described for the preferred alternative (Alternative 2), humpback chub translocations initially will be implemented in Shinumo, Havasu, and Bright Angel creeks. Chub have been found in Bright Angel and Havasu creeks in the past, and Shinumo Creek would have been accessible to chub from the mainstem during natural floods that would have occurred. Non-translocated humpback chub are also captured in Shinumo Creek below the lower waterfall approximately 200 yards upstream of the Colorado River.
The CFMP does not clearly outline objectives to achieve goal 4 for Grand Canyon National Park (GCNP) and goal 3 for Glen Canyon National Recreation Area (GCNRA) which reads, "[f]oster meaningful tribal relations and integrate tribal knowledge and perspectives into park management decisions and practices"; however, no specific objectives are listed that would facilitate achievement of this goal. The only item mentioned is to implement NHPA Section 106 consultation for beneficial use of nonnative fish removed. This is a requirement by law and does not seem to be a thorough approach to achieving this goal. Throughout the document, specific actions are discussed in detail on how to achieve goals relating to humpback chub, nonnative fish control, and other native fishes, but	The National Park Service is committed to ongoing, active, and meaningful relationships with American Indian tribes. This is core to our policies and mission and is fundamental to park management. Inclusion of the statement acknowledges the importance for NPS managers to fulfill their obligations toward government-to-government consultation and integration of tribal perspectives into park management. No specific changes are needed in reference to carrying out these responsibilities as related to these goals and the on-going relationships.

discussion of actions to achieve meaningful relations with tribes in order to better resolve conflicts is lacking. There is no mention of this goal in the Desired Conditions section or in actions associated with any of the alternatives.	
A concern was raised about the Cultural Resources discussion on Page 21, paragraph. 3 of the CFMP EA: This paragraph is not accurate. Both NEPA and NHPA require the assessment of impacts/effects, on cultural resources/historic properties, respectively. Neither ARPA nor NAGPRA have these requirements. ARPA calls for the protection of archeological sites that are 100 yrs old or older, while NAGPRA calls for the repatriation of human remains, associated and unassociated funerary objects and objects of cultural patrimony to federally recognized tribes or individuals of federally recognized tribes who are direct descendants or culturally affiliated with said human remains or objects. Western also recommends including the Traditional Cultural Properties (TCP) discussion from Chapter 3 in this section as well, because these are also cultural resources	This comment references a section of the EA entitle "Impact Topics Dismissed." This section explains that NPS believes that the actions analyzed in the EA will not have any impacts that require compliance with ARPA, NAGPRA, NPS 2006 Management Policies and other similar federal statutes, policies, and guidelines. Therefore, this section is accurate and no changes will be made pursuant to this comment. The NPS does recognize the traditional cultural concerns and values placed upon the Colorado River and the possible effects from removal of fish during actions to implement the CFMP. A Memorandum of Agreement (MOA) has been prepared that records the terms and conditions agreed upon to resolve the adverse effects. The NPS and State Historic Preservation Officer are signatories and the traditionally associated tribes are invited signatories.
Ethnographic Resources (Page 81, par. 3). Neither the NHPA nor 36 CFR 800 define TCPs. The NHPA does define Places of Traditional Religious Cultural Significance (PTRCS), which are properties eligible to the National Register and are specific to tribes. A TCP, which is an NPS defined term, concerns any ethnic group or community. A PTRCI is a cultural resource. Western suggests moving this section to the Cultural Resources section in Chapter 1. The EA also states (Page 84) that the preferred alternative would have "an adverse effect to Ethnographic Resources," thus it would be helpful if the NPS would describe in the EA how it is going to avoid, minimize, or mitigate this effect so a FONSI on the preferred alternative can be reached.	The NPS does recognize the traditional cultural concerns and values placed upon the Colorado River and the possible effects from removal of fish during actions to implement the CFMP. A MOA has been prepared that records the terms and conditions agreed upon to resolve the adverse effects. The NPS and State Historic Preservation Officer are signatories and the traditionally associated tribes are invited signatories.

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