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In Reply Refer to:
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02-21-03-F-016

December 6, 2002

Memorandum

To: Regional Director, Bureau of Reclamation, Salt Lake City, Utah
Superintendent, Grand National Park, Grand Canyon, Arizona
Superintendent, Glen Canyon National Recreation Area, Page, Arizona
Chief, Grand Canyon Monitoring and Research Center, USGS, Flagstaff, Arizona

From: Field Supervisor

Subject: Section 7 Consultation on Proposed Experimental Releases from Glen Canyon Dam and Removal of Non-native Fish

Thank you for your October 9, 2002, request for formal consultation with the U.S. Fish and Wildlife Service pursuant to section 7 of the Endangered Species Act of 1973 (16 U.S.C. 1531-1544), as amended (Act). The consultation concerns the possible effects resulting from experimental flows from Glen Canyon Dam, and from mechanical removal of rainbow trout (*Oncorhynchus mykiss*), brown trout (*Salmo trutta*), and other non-native fishes from the Colorado River from above and below the confluence of the Little Colorado River and the Colorado River in Grand Canyon, Coconino County, Arizona. The joint leads for this project are the Bureau of Reclamation (Reclamation), Glen Canyon National Recreation Area and Grand Canyon National Park, and the U.S. Geological Survey's Grand Canyon Monitoring and Research Center (GCMRC).

Your cover letter concluded that the proposed action "is likely to adversely affect" the endangered humpback chub (*Gila cypha*) (hbc) and its critical habitat, the endangered Kanab ambersnail (*Oxyloma haydeni kanabensis*), and the threatened bald eagle (*Haliaeetus leucocephalus*). You also requested our concurrence that the proposed project "may affect, is not likely to adversely affect" the endangered razorback sucker (*Xyrauchen texanus*) and its critical habitat, the endangered California condor (*Gymnogyps californianus*), and the endangered southwestern willow flycatcher (*Empidonax trailii extimus*). Our concurrences for those species are provided in Appendix A of this document.

This biological opinion is based on information provided in your September 2002 Environmental Assessment (EA), titled: "Proposed Experimental Releases from Glen Canyon Dam and Removal of Non-native Fish", telephone conversations, information provided by Reclamation and GCMRC staff, field investigations, and other sources of information. Literature cited in this biological opinion is not a complete bibliography of all literature available on the species of concern, or on other subjects considered in this opinion. A complete administrative record of this consultation is on file at this office.

Consultation History

- Discussions on the need for experimental flows and control of non-native fish species have been underway with the Adaptive Management Program for several months.
- GCMRC developed the white paper titled "Treatment Scenarios for WY 2002-2003" which includes the scenario for the mechanical removal of salmonids.
- A salmonid estimation project was conducted during September 2002.
- A October 9, 2002, request from for formal consultation was received from Reclamation by the FWS on October 15, 2002. Reclamation requested a draft by November 15, 2002.
- A October 29, 2002, letter was sent to Reclamation initiating formal consultation, with an acknowledgment that a final biological opinion would be due February 23, 2003, but that we would attempt to meet their request for an early biological opinion.
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BIOLOGICAL OPINION

DESCRIPTION OF THE PROPOSED ACTION

Proposed operations of Glen Canyon Dam include five types of releases in addition to the regular Record of Decision (ROD) operational flows that would occur within four hydrological scenarios over a period of at least two water years.

The five proposed release types are:

- 8,000 cfs steady flows,
- 6,500-9,000 cfs fluctuating flows,
- 5,000-20,000 cfs fluctuating non-native fish suppression flows,
- 31,000-33,000 cfs habitat maintenance flow, and
- 42,000-45,000 cfs high flows. The magnitude of these short-term releases would not exceed 45,000 cfs but they would vary below this level depending on Lake Powell elevation and generator availability.

The order in which the releases would occur depends on the amount of sediment input from the Paria River or ungaged tributaries in Glen Canyon and upper Marble Canyon (GCMRC 2002b). However, the fluctuating non-native fish suppression flows would occur independent of sediment availability. Given the complexity of the proposal and the many decision points, the proposal is graphically depicted in a flow diagrams found in the September 2002 Environmental Assessment for this project. Sediment conservation flows will begin in 2003 and continue into 2004, but could be delayed subject to meeting the sediment trigger discussed below.

The first release scenario is called the autumn sediment input scenario and could occur if any of the following three conditions are met. First, if at least 500,000 metric tons of fine sediment enters the Colorado River from the Paria River between July 1 and October 31, then dam releases would be operated in a series of alternating 2-week long steady 8,000 cfs releases and 2-week

long 6,500-9,000 cfs fluctuating releases. If the minimum sediment input does not occur, dam releases would follow the regular ROD flows.

Second, if at least 1,000,000 metric tons of fine sediment are present in Marble Canyon by the same date, October 31, the alternating steady and fluctuating releases would continue until December 1. If the minimum sediment input does not occur by October 31, dam releases would follow the prescription of the ROD. If the minimum sediment input is achieved by December 1 of the first year, a comparison would be made between the effectiveness of sediment conservation by the 8,000 cfs steady releases and the 6,500-9,000 cfs low fluctuating releases. The action agencies within the Department of the Interior would decide which flow is most effective at sediment conservation and discontinue the less effective release.

Third, if at least 800,000 metric tons of sediment input is retained in the Colorado River between Glen Canyon Dam and the Little Colorado River by January 1 of the following year, low flows would be interrupted by a powerplant and jet tube total release between 42,000-45,000 cfs that would occur in the first week of January in an effort to "bank" the conserved sediment at higher elevations within the Grand Canyon. This high flow would last for approximately 60 hours. Upramp rates for this release would be 4,000 cfs/hour for the first two hours, then 1,500 cfs/hour up to powerplant capacity, then opening one bypass tube in two steps over the course of six hours until reaching jet tube capacity. The downramp rate would be 1,500 cfs/hour from maximum releases (42,000-45,000 cfs) to 8,000 cfs, and this would take about 22 hours to achieve. A steady release of 8,000 cfs would be continued for a period not to exceed 10 days during which time aerial photography and surveying would occur to document the effect of the high flow test on sediment conservation and other resources. If the minimum sediment accumulation does not occur by January 1, dam releases would change to fluctuating non-native fish suppression releases between 5,000 cfs and 20,000 cfs with an upramp rate of 5,000 cfs/hour and a downramp rate of 2,500 cfs/hour. The fluctuating non-native fish suppression flows would continue from January through March unless a minimum sediment input of 800,000 metric tons is received. These fluctuating non-native fish suppression flows were designed to mimic pre-1990 daily fluctuations and ramp rates. Pre-1990 flows limited natural recruitment of rainbow and brown trout (Maddux et al. 1987).

If the minimum tributary sediment input of 800,000 metric tons occurs in the months of January-March during fluctuating non-native fish suppression flows, the winter sediment input scenario would begin with the release of 42,000-45,000 cfs. This release would have the same features as the high flow test under the autumn sediment input scenario, including the succeeding period of 8,000 cfs steady releases for aerial photography and surveying. It would interrupt the non-native fish suppression flows, but they would be resumed through the end of March following the high flow test and ensuing steady releases.

The third hydrologic scenario is the no sediment input scenario. In this scenario, the minimum sediment inputs necessary to trigger the autumn sediment scenario or the winter sediment input scenario do not occur. Under these conditions ROD operations would continue until at least July 1 of that water year, except for the January to March period of fluctuating non-native fish

suppression flows. Dam releases after July 1 would depend on tributary sediment inputs. If minimum tributary inputs occur and the first scenario has been completed, the fourth hydrological scenario would be initiated. If they do not occur, ROD operations would continue.

The fourth hydrological scenario is the habitat maintenance flow scenario. This scenario would be implemented only under two conditions: 1) the autumn sediment input scenario must have been completed, and 2) a minimum tributary sediment input of 500,000 metric tons must occur between July1-December 31.[1] This scenario is similar to the winter sediment scenario in that a high flow test immediately follows the tributary input. The high release would be at powerplant capacity, last two days, and have 4,000 cfs/hr upramp rates and 1,500 cfs/hr downramp rates.

The Paria River flow necessary to provide the minimum sediment input would be approximately 2,500 cfs, though rare events could be as high as 12,000 cfs. Thus, the combined powerplant capacity and tributary flow would be in the approximate range of 33,500 cfs (31,000 cfs dam release + 2,500 cfs tributary inflow) to 43,000 cfs (31,000 dam release + 12,000 cfs tributary flow). If the combined flows would exceed 45,000 cfs, then dam releases would be reduced to constrain total flow to 45,000 cfs or less. The close association in timing of the sediment input and the ensuing dam release would be facilitated through installation of additional gages on the upper Paria River to serve as an early warning system announcing the inflow.

The habitat maintenance flow would be followed by ROD operations with daily fluctuations until January 1 unless another minimum 500,000 metric ton input occurred, in which case the powerplant capacity releases would be repeated, followed again by ROD operations. On January 1, if there is a minimum sediment retention of 800,000 metric tons in the reach of the Colorado River between Glen Canyon Dam and the Little Colorado River, a high flow of 42,000-45,000 cfs would be released from the dam having the same features as that under the autumn sediment input scenario or winter sediment input scenario. If the minimum amount of sediment is not retained above the Little Colorado River, fluctuating non-native fish suppression releases would be initiated following the January 1 evaluation. These releases would continue until April 1 unless additional sediment is received by the Colorado River sufficient to bring the sediment retained up to the 800,000 metric ton minimum. This amount of additional sediment in the system would trigger a two-day 42,000-45,000 cfs high flow having the same features as in the winter sediment input scenario. Following this high flow, the non-native fish suppression flows fluctuating between 5,000-20,000 cfs would continue through March 31. Dam releases would then revert to those prescribed under ROD operations.

The action area for this project is the Colorado River corridor from Glen Canyon Dam to Diamond Creek, where the effects of fluctuating flows are generally attenuated. A description of the research sampling stations can be found in the GCMRC's "Piscivory by Non-Native

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[1] If the minimum sediment input trigger does not occur during the first or ensuing years of Proposed Action operations, the autumn sediment input scenario would continue to receive the highest priority for completion in the following year.

Salmonids in the Colorado River and an Evaluation of the Efficacy of Mechanical Removal of Non-Native Salmonids."

Action agencies propose to remove non-native fishes (primarily salmonids) from a portion of the action area termed the "depletion reach" which is near the confluence of the Little Colorado River and the Colorado River extending from RM 56.4 to RM 65.8, a total of 9.4 miles (15 km). A control area has been established to determine if differences in fish population characteristics (e.g., relative abundance, size structure, etc.) in the experimental reach is a function of environmental influences/fluctuating flow treatments and not the mechanical removal, a control area has been selected (RM 44 to RM 52). All fish collection, handling procedures, and data recording will proceed as described below for the removal reach except no fish will be euthanized within the control reach. The control areas will be sampled one night per trip, six times per year. Four boats will electrofish for six to eight hours each night. The non-natives caught in these stretches will be measured, weighed, and released. Beginning in 2003 and continuing through 2004, six electrofishing trips a year will be conducted. Trips are scheduled for January, February, and March and again in July, August, and September. The depletion efforts will be conducted by electrofishing in the mainstem Colorado River. All native species will be measured and released. All non-native species will be permanently removed from the project area.

On the 2nd, 4th, and 6th days of the trip, 30 hoopnets will deployed on three nights for 24 hour sets. Set locations will correspond to the 30 standardized locations established by Gorman and Coggins (2000). Deploying nets on the 2nd, 4th, and 6th days of the trip will allow the nets to be fished during time periods when electrofishing activities are not being conducted within the sites that are occupied by the nets. The nets will be deployed between 1100 and 1300 and retrieved the following day (i.e. trip days 3, 5, and 7) during the same timeframe.

All fish captured, including hbc, will be handled in accordance with the fish handling procedures as summarized by AGFD (AGFD 2002). All humpback chub will be measured, weighed, and examined for external parasites and sexual characteristics. Fish over 100 mm (about 4 inches) total length, will be scanned for a PIT tag. All hbc over 150 mm (about 5.9 inches) that do not have tags will be tagged.

Vital statistics will be cataloged for all hbc mortalities. Each individual will be preserved in ethanol, subsequently x-rayed, and a necropsy (including histological analysis of tissues) performed to attempt to ascertain the cause of death or evidence of injury which may have occurred as a result of electrofishing. All mortalities will be reported to the Fish and Wildlife Service within 5 days of trip completion. The specimens will be archived in the Arizona State University collection.

Conservation Measures

The action agencies propose two conservation measures as part of the proposed action. Further details on the methods and timing for these action will be provided to this office prior to their

implementation (Denny Fenn, written communication, 2002). For the humpback chub, approximatley 300 individuals between 30 and 60 mm will be removed from the LCR and Colorado River confluence and transported 9.3 miles upstream above Atomizer Falls in the LCR. Although this stretch of the LCR contains all of the constituent elements of the adjacent downstream critical habitat for hbc, Atomizer Falls is currently an impassable barrier to hbc. The goal of this effort is to increase the probability of hbc surviving floods from the LCR basin, reduced predation, and other inclement environmental conditions. This portion of the LCR is part of the Navajo Nation. Although the Nation's initial reaction has been favorable, permits and final approval have not yet been granted. Once approved, the action will occur during the normal monitoring activities in the LCR, between April and October 2003-2004. This activity will be covered under research permits.

For the Kanab ambersnail, the action agencies propose to temporarily remove and safe-guard between 25 - 40% ($29m^2$ and $47m^2$) of the Kanab ambersnail habitat that will be flooded by a high experimental flow, if the sediment trigger occurs during the autumn months or anytime before December 31. The habitat and ambersnails would be held locally above the level of inundation until the high flow has ended, approximately 60 hours. Habitat and ambersnails will be replaced in a manner that will facilitate regrowth of vegetation. Subsequent monitoring of this conservation measure will be coordinated by GCMRC.

STATUS OF THE SPECIES

Humpback chub

The humpback chub is a medium-sized freshwater fish (to about 51 cm; 20 inches) of the minnow family, Cyprinidae. The adults have a pronounced dorsal hump, a narrow flattened head, a fleshy snout with an inferior-subterminal mouth, and small eyes. It has silvery sides with a brown or olive-colored back.

The humpback chub is endemic to the Colorado River Basin and is part of a native fish fauna traced to the Miocene epoch in fossil records (Miller 1955; Minckley et al. 1986). Humpback chub remains have been dated to about 4000 B.C., but the fish was not described as a species until the 1940's (Miller 1946), presumably because of its restricted distribution in remote white water canyons (USFWS 1990). Because of this, its original distribution is not known. The humpback chub was listed as endangered on March 11, 1967 (32 FR 4001). Critical habitat for humpback chub was designated in 1994 (59 FR 13374).

Seven reaches of the Colorado River system were designated as critical habitat for humpback chub for a total river length of 379 miles (59 FR 13374). Critical habitat in Arizona includes most of the habitat now used by the Grand Canyon population of humpback chub. Designated reaches are the lower 8 miles of the LCR and from RM 34 to RM 208 (Granite Park) along the Colorado River. This represents approximately 28 percent of the historical habitat for the species (USFWS 1994). Known constituent elements include water, physical habitat, and biological

environment as required for each life stage. The dominant factor affecting critical habitat is the presence of Glen Canyon Dam. Non-native fishes also prey on and compete with native fishes. Populations of this species occur in the Little Colorado and Colorado Rivers in the Grand Canyon, Black Rocks area of the Colorado River, Westwater Canyon, Cataract Canyon, Desolation/Grey Canyon, and Yampa Canyon (Valdez and Clemmer 1982, USFWS 1990).

Little is known about the specific spawning requirements of the humpback chub. It is known that the fish spawn soon after the highest spring flows when water temperatures approach 20° C (68° F) (Kaeding et al. 1990; Karp and Tyus 1990; USFWS 1990). The collection of ripe and spent fish indicated that spawning occurred in Black Rocks during June 2-15, 1980, at water temperatures of 11.5° to 16° C (52 to 60.8 ° F); in 1981, spawning occurred May 15-25, at water temperatures of 16°- 16.3° C (60.8° - 61.3°) (Valdez et al. 1982). Adult humpback chub may be found in deep, swift waters with varying depths. Humpback chub spawn in the spring between March and May in the LCR when water temperatures are between 16° and 22° C (60.8° to 71.6°). Swimming abilities of young-of-year (y-o-y) humpback chub were determined to be significantly reduced when laboratory water temperatures were reduced from 20° to 14° C (68 to 57.2°). Humpback chub spawned in Black Rocks on the Colorado River in 1983 when maximum daily water temperatures were 12.6° to 17° C (54.7 to 62.3°) (Archer et al. 1985). Backwaters, eddies, and runs have been reported as common capture locations for young-of-year humpback chub (Valdez and Clemmer 1982). These data indicate that in Black Rocks and Westwater Canyon, young utilize shallow areas. Habitat suitability index curves developed by Valdez et al. (1990) indicate young-of-year prefer average depths of 0.6 meters (2.1 feet) with a maximum of 1.5 meters (5.1 feet). Average velocities were reported at 0.06 meters per second (0.2 feet per second). Many section 7 consultations have occurred on the humpback chub in both the upper and lower basins of the Colorado River. Recovery goals for humpback chub which amend and supplement the 1990 Recovery Plan were finalized this year (USFWS 2002).

Kanab ambersnail

The Kanab ambersnail was listed as an endangered landsnail under the Act without critical habitat in 1992 (57 FR 13657). Two extant populations are known at two southwestern springs: one on private land near Kanab, Utah, and the other at Vaseys Paradise 51.2 km (31.5 river miles) downstream from Lees Ferry along the Colorado River in Grand Canyon National Park (Spamer and Bogan 1993). A third population near "the Greens," a seep-fed marsh, was believed to be lost due to dewatering in the last decade (USFWS 1995b).

However, in August 1998, a meta-population of *Oxyloma haydeni* was discovered near the type locality ("the Greens"), in the Kanab Creek drainage near Kanab, Utah (Meretsky 2000). Dr. S.K. Wu (personal communication) conducted a taxonomic analysis of three collections made from this group and identified them as KAS. Information on genetics is not complete, but appears to conclude that the individuals may be distinct. Preliminary genetic screening also indicates that the ambersnails at Vaseys are genetically distinct from those found in Utah (Miller et al. 1997).

In 1998, the AGFD in coordination with the NPS introduced the KAS into three locations within Grand Canyon National Park. One of these sites, Elves Chasm, has shown success including recruitment, overwinter survival, and increased density of snails (Sorenson and Nelson 2002). Although the area is small (23.5 m^2) it meets an important recovery goal for this species.

Bald eagle

The bald eagle south of the 40th parallel was listed as endangered under the Endangered Species Preservation Act of 1966, on March 11, 1967 (USFWS 1967), and was reclassified to threatened status under the Act on July 12, 1995 (USFWS 1995). No critical habitat has been designated for this species. The bald eagle was proposed for delisting on July 6, 1999 (USFWS 1999). The bald eagle is a large bird of prey that historically ranged and nested throughout North America except extreme northern Alaska and Canada, and central and southern Mexico.

The bald eagle occurs in association with aquatic ecosystems, frequenting estuaries, lakes, reservoirs, major rivers systems, and some seacoast habitats. Generally, suitable habitat for bald eagles includes those areas which provide an adequate food base of fish, waterfowl, and/or carrion, with large trees for perches and nest sites. In winter, bald eagles often congregate at specific wintering sites that are generally close to open water and offer good perch trees and night roosts (USFWS 1995).

Factors that contributed to listing the bald eagle included declines in prey species, hunting, loss of nesting habitat, and reproductive failure due to widespread use of dichloro-diphenyl-trichloroethane (DDT). Since listing, bald eagles have increased in number and expanded in range due to the banning of DDT and other persistent organochlorine compounds, habitat protection, and additional recovery efforts.

Bald eagles are generalized predator/scavengers adapted to edges of aquatic habitats. Bald eagles in the Southwest consume a diversity of food items, including some invertebrates. However, their primary food is fish, which are generally consumed twice as often as birds, and four times as often as mammals. Bald eagles are known to catch live prey, steal prey from other predators (especially osprey), and use carrion. Carrion constitutes a higher proportion of the diet for juveniles and subadults than it does for adult eagles. Diet varies depending on what species are available locally. This can be affected by the type of water system on which the breeding area is based (Hunt et al. 1992).

Even though the bald eagle has been reclassified to threatened, and the status of the birds in the Southwest is on an upward trend, the Arizona population remains small and under threat from a variety of factors. Human disturbance of bald eagles is a continuing threat which may increase as numbers of bald eagles increase and human development continues to expand into rural areas (USFWS 1999). These include extensive loss and modification of riparian breeding and foraging habitat through clearing of vegetation, changes in groundwater levels, and changes in water quality. Threats persist in Arizona largely due to the proximity of bald eagle breeding areas to major human population centers and recreation areas. Additionally, because water is a scarce

resource in the Southwest, recreation is concentrated along available water courses. Some of the continuing threats and disturbances to bald eagles include entanglement in monofilament fish line and fish tackle; overgrazing and related degradation of riparian vegetation; malicious and accidental harassment, including shooting, off-road vehicles, recreational activities (especially water craft), and low-level aircraft overflights; alteration of aquatic and riparian systems for water distribution systems and maintenance of existing water development features such as dams or diversion structures; collisions with transmission lines; poisoning; and electrocution (AGFD 2001; Beatty et al. 1999; Stahlmaster 1987).

ENVIRONMENTAL BASELINE

The environmental baseline includes past and present impacts of all Federal, State, or private actions in the action area, the anticipated impacts of all proposed Federal actions in the action area that have undergone formal or early section 7 consultation, and the impact of State and private actions which are contemporaneous with the consultation process. The environmental baseline defines the current status of the species and its habitat in the action area to provide a platform to assess the effects of the action now under consultation.

Humpback chub

The Grand Canyon population of hbc is the only successfully reproducing population in the lower Colorado River basin (Kaeding and Zimmerman 1983, Valdez and Ryel 1995). Additional aggregations of humpback chub have been documented elsewhere in Grand Canyon (Valdez and Ryel 1995) but the contribution of these fish to the species is not known. Recent data complied by GCMRC indicates overall declines in the abundance and recruitment of hbc in the LCR since the early 1990s. These analyses were made from mark-recapture data in an open population model to construct estimates of the population recruitment (1989-1997 brood years) and sub-adult and adult abundance (including fish over 150 mm [5.9 inches] total length; 1991-1999). Causes for the decline in hbc in Grand Canyon likely include temperature, infestation of Asian tapeworm, predation by or competition with warm-water non-native catastomids, ictalurids, cyprinids and cold-water salmonids within the Colorado River, and the hydrology of the regulated Colorado River.

The 1994 biological opinion written by this office on the preferred alternative on the operations of Glen Canyon Dam concluded that the action is likely to jeopardize the continued existence of the humpback chub and adversely modify its critical habitat. Several reasonable and prudent alternatives were given to remove the jeopardy and adverse modification of critical habitat. Other experimental flows have occurred in the project area including a beach building flow (1996), habitat maintenance flows (1997), and low steady flows (2000). Although some temporary adverse effects to the humpback chub occurred, the flows also benefitted the species and its habitat.

The current proposed action is part of a larger plan to disadvantage non-native fish species in this portion of the Colorado River, particularly rainbow and brown trout, which are estimated to have increased 4 to 6 fold in the last seven years (GCMRC files). In addition to the proposed project, monitoring efforts are ongoing throughout the project area. The National Park Service installed the weir for the brown trout pilot study in Bright Angel Creek on November 18, 2002. The purpose of this weir is to capture brown and rainbow trout. The device will be tested for three 10-day periods. The fate of the fish caught in the weir is not known. The long-term use of the weir as a method for decreasing the numbers of trout has not been determined. All other parameters of the Colorado River through Grand Canyon are expected to remain the same including the cold water releases of 7 to 11 ° C.

Kanab ambersnail

In the project area the Kanab ambersnail occurs in the vegetation at the spring-fed Vasey's Paradise. Vasey's Paradise is a popular water source and attraction site for Colorado River runners; however, access is limited by the dense cover of poison-ivy (*Toxicodendron rydbergii*). The habitat and population size of Kanab ambersnail is influenced by interseasonal and interannual conditions, including die-back of vegetation, killing frosts, monsoon-related scour and other factors. The population size may vary 10-fold between the end of the winter season and the peak of summer reproduction. This species is also threatened by natural and controlled floods at Vasey's Paradise.

Previous consultations for this species in Grand Canyon have included the preferred alternative on the operations of Glen Canyon Dam, above powerplant release experimental flows, and the establishment of a second population of the Kanab ambersnail in Grand Canyon. Reproduction has been documented in the population introduced at Elves Chasm, and appears to be self-sustaining. In 1999, an expert panel was convened to evaluate the status of this species and related mollusk species. Questions about species management and genetic identification remain, and the species' Recovery Plan is in need of revision. An "Interim Conservation Plan of *Oxyloma* (*haydeni*) *kanabensis* complex and Related Ambersnails in Arizona and Utah" was developed by AGFD earlier this year (Sorensen and Nelson 2002).

Bald Eagle

While the bald eagle is a resilient species, rebounding from dramatic population declines in the mid-twentieth century, most of its current habitat is still subject to human manipulation. During the winter months, the Grand Canyon is one of the areas in the State of Arizona where human disturbance is limited. Wintering bald eagles have been documented in the Colorado River corridor, with a concentration around Nankoweap Creek where they opportunistically feed on rainbow trout spawning during January and February. Although some territorial behavior has been noted, no breeding activity has been documented in the project area.

EFFECTS OF THE ACTION

Effects of the action refer to the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated and interdependent with that action, that will be added to the environmental baseline. Interrelated actions are those that are part of a larger action and depend on the larger action for their justification. Interdependent actions are those that have no independent utility apart from the action under consideration. Indirect effects are those that are caused by the proposed action and are later in time, but are still reasonably certain to occur.

Humpback chub

As a result of the electrofishing efforts to collect non-native fishes, humpback chub are also likely to be collected. Although hbc are not the target species for collection during the electrofishing effort, some hbc will be captured and some of the catch is likely to be lethal. Mortality rates for juvenile hbc is estimated at one quarter of one percent for juveniles (0.025%), and mortality rates of adult hbc is estimated at one half of one percent (0.05%).

All hbc captured will be subject to the effects of electofishing narcosis and/or tetany, including immobilization, rigid muscles, and altered breathing. Exposure is planned to be brief with the hbc returning to normal and fully recovering within minutes, although some fish may not. Very few mortalities have been recorded as a result of electrofishing in the LCR reach. Handling stress should be minimal if guidance is followed (AGFD 2002). However, some hbc mortalities are likely during this project. Some vertebral injuries, external injuries, or other long-term effects are expected to occur. Internal soft-tissue hemorrhages have been documented in previous electrofishing evaluations with juvenile humpback chub and bonytail chub (*G. elegans*) (Ruppert and Muth, 1997). The incidence of soft-tissue injury in these studies was 20% on humpback chub and 13% in bonytail chub. Subsequent growth and survival were not affected. The investigators also observed no mortalities, external, or internal injuries (Ruppert and Muth 1997). Once the hbc are released, subsequent predation by non-natives is expected but can not be quantified. Native and non-natives will be released at least 200 meters (656 feet) apart to minimize interactions. Periods of fluctuating flows with high turbidity are likely to result in lower catch rates overall.

Additional hbc are expected to be caught during three nights of hoop netting (Steve Gloss, GCMRC, pers. comm.). Humpback chub could be caught in the hoop net for up to 24 hours, but no mortalities are expected as a result of the hoop netting. Predation on hbc by rainbow trout may occur while both species are held in the hoop nets. The median catch rate for hoop netting below the LCR is 1.17 fish/24 hours, with a minimum of 0.8 and the maximum is 12.0. A total of 90 nets will be set per trip (30 nets per night on three nights). This will be repeated 6 times a year for two years. Given that large numbers of hbc may exit the LCR during the monsoon months of July, August, and September, we estimate that 12 fish/24 hours will be caught. Total estimated hbc caught in hoop nets is 397 each year or 794 over the two-year period.

Estimated catch rates of humpback chub from hoop nets each year.

Trip	24 hr catch rate	net/trip	hbc/trip
Jan	0.3	90	27
Feb	0.3	90	27
Mar	0.3	90	27
July	1.17	90	105.3
July	1.17	90	105.3
Sep	1.17	90	105.3
TOTAL			396 .9 hbc collected per year

The estimated number of rainbow trout that will be collected is also based on previous years catch rate. Anywhere from 1,500 to 3,000 rainbow trout could be caught in the first 10 hours of sampling. Rainbow trout number about 7,000 fish per mile (GCMRC files, AGFD files). Although numbers are not available, some carp, catfish, and other non-natives will also likely be captured. The removal of non-native fish is expected to have a positive effect on the native fishes of the Colorado River. The fluctuating flows are also designed to disrupt rainbow trout spawning which will decrease the overall number of predators on hbc. Also expected to have a positive effect on hbc is the conservation measure to transplant hbc above Atomizer Falls. If successful, it will provide an opportunity for humpback chub to occur in a currently unoccupied reach of the LCR.

Fluctuating flows may negatively affect the humpback chub by altering the benthos. Although the fluctuating flows may increase food availability at the beginning it will probably decrease by April. Fluctuating flows have also been documented to limit solar warming of backwaters, flush organisms and nutrients, and flush young fish from nearshore habitat. If enough trout are removed it is possible we could see an increase in food availability to the hbc because of reduced competition. The Colorado River through Grand Canyon is a complex ecosystem. During the development of this biological opinion it has become obvious that limited information exists on the effects of the total research and monitoring effort in Grand Canyon, that would allow us to effectively assess the effects of this action along with the other ongoing efforts. We do know that the numbers of humpback continue to decline. For the last 10 years, there have been multiple agencies and contractors engaged in research and monitoring in the Colorado River and its riparian communities. For example, the number of times that hbc are estimated to be handled is of great concern. With the number of different agencies and organizations conducting these activities, it becomes very problematic to assess the combined effects.

Kanab ambersnail

Flows above power plant capacity will inundate and scour the occupied habitat of the Kanab ambersnail at Vasey's Paradise. Most if not all snails in the vegetation will be washed down river or covered with sediment. Based on estimates calculated in April of 2002, a flow of 45,000 cfs would equal about 117 m^2 of habitat. This may occur over two years of high flows. The actual number of snails lost will vary by season, with the most individuals and habitat lost during a high flow after spring reproduction in years with low overwinter mortality. The loss of

vegetation below the flood line will also mean that snails which migrate or are washed off the talus slope will have a greater likelihood of falling into the river. The action agencies have proposed a conservation measure to improve the recovery rate of lost vegetation which may reduce this loss. It is not known if this will increase the survival of ambersnails in the transported vegetation.

Bald eagle

The bald eagle will likely continue to feed opportunistically in the project area. If the mechanical removal is successful in reducing the number of salmonids in the Colorado River, there may be fewer trout available during the winter months. Wintering bald eagles are not likely to remain in areas with reduced food resources. There are several alternative places for bald eagles to winter in Arizona and a reduction in numbers of trout in the action area may change feeding local opportunities but is not likely to result in significant effects to the species.

CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, tribal, local or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act. Since the entire project area is within Grand Canyon National Park, all legal actions likely to occur are considered Federal actions.

CONCLUSION

After reviewing the current status of the species under consideration, the environmental baseline for the action area, the effects of the proposed non-native depletion efforts, and the cumulative effects, it is our biological opinion that this action, as proposed, is not likely to jeopardize the continued existence, of the humpback chub, Kanab ambersnail, or bald eagle and is not likely to result in the destruction or adverse modification of critical habitat for the humpback chub. We base these conclusions on the following:

The overall objective of the proposed action is to benefit the humpback chub. Near term adverse effects are designed to be small by comparison.

The Kanab ambersnail habitat at Vasey's Paradise is able to sustain high flows and the vegetation is expected to reach the pre-flood levels in approximately two years.

Although changes in foraging locations and duration may occur in localized areas, the bald eagle will continue to winter in Arizona and feed where opportunities persist. No reduction in wintering bald eagle numbers are anticipated in Arizona as a result of this action.

The conclusions of this biological opinion are based on full implementation of the project as described in the Description of the Proposed Action section of this document, including the Conservation Measures that were incorporated into the project design.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. "Take" is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. "Harm" is further defined (50 CFR CFR 17.3) to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. "Harass" is defined (50 CFR 17.3) as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering. "Incidental take" is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

The measures described below are non-discretionary, and must be undertaken by the action agencies so that they become binding conditions of any grant or permit issued, as appropriate, for the exemption in section 7(o)(2) to apply. The action agencies have a continuing duty to regulate the activity covered by this incidental take statement. If the action agencies (1) fail to assume and implement the terms and conditions or (2) fail to require field crews to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, the action agencies must report the progress of the action and its impact on the species to the Fish and Wildlife Service as specified in the incidental take statement. [50 CFR §402.14(i)(3)].

AMOUNT OR EXTENT OF TAKE

We anticipate that the total level of incidental take of humpback chub will be difficult to detect because of the difficulty in finding dead or injured fish. We anticipate that approximately 400 humpback chub will be captured annually (800 over the two year project) during the hoop netting portion of this proposed action. The incidental take is expected to be in the form of collect, harass, and kill. Most of the take is expected to be in the non-lethal form of collection, harassment, and mortality. We anticipate 20 hbc will be killed as a result of this action.

We anticipate that incidental take of the Kanab ambersnails will be difficult to detect because of the losses that may be masked by seasonal variations. However, the following level of incidental

take can be estimated by the surrogate measure of habitat lost, approximately 117 m^2 over the course of the next two years. Incidental take is expected to be in the form of harm and mortality.

We do not anticipate incidental take of bald eagles.

EFFECT OF THE TAKE

In this biological opinion the Fish and Wildlife Service determines that this level of anticipated take is not likely to result in jeopardy to the humpback chub, Kanab ambersnail, or bald eagle, or the destruction or adverse modification of the critical habitat for hbc.

REASONABLE AND PRUDENT MEASURE #1 (HBC)

The following reasonable and prudent measure is necessary and appropriate to minimize take for the humpback chub.

1. The action agencies shall monitor incidental take resulting from the proposed action and report the findings of that monitoring to the AESO.

Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the Act, the action agencies must comply with the following terms and conditions, which implement reasonable and prudent measure #1 described above and outline required reporting/monitoring requirements. These terms and conditions are non-discretionary.

1.a. The action agencies shall monitor the project area affected by the proposed action to document take of individuals of the species and/or loss of habitat that causes harassment or death to listed species, and report the findings to this office annually.

1.b. The action agencies shall monitor the aquatic food base and other constituent elements of the humpback chub critical habitat in a manner similar to past monitoring efforts, and report the findings to this office annually.

REASONABLE AND PRUDENT MEASURE #2 (HBC)

2. The action agencies shall implement the proposed project to provide the greatest opportunity for humpback chub survival.

Term and Condition

In order to be exempt from the prohibitions of section 9 of the Act, the following terms and conditions, which implement reasonable and prudent measure #2are non-discretionary.

2.a. All hbc captured will be held separately from non-native fishes to minimize stress, predation, and injury during recovery from electrofishing. If this can not be accomplished, the non-natives shall be sacrificed.

2.b. In the control reaches, action agencies shall provide the greatest release distance between native and non-native fishes as possible.

2.c. All hbc shall be processed and released immediately after recovery in the near-shore habitat where they were collected.

2.d. All rainbow trout captured in hoopnets shall be checked for predation on humpback chub.

2.e. Placement of pit tags by field crews shall be conducted only by those individuals previously permitted by the Fish and Wildlife Service to handle and pit tag hbc, or those individuals who have received training by permitted individuals and 20 hours of supervised pit tagging.

REASONABLE AND PRUDENT MEASURE #3 (HBC)

3. The action agencies shall conduct the proposed project in a manner which best coordinates with the other activities that affect the hbc in Grand Canyon.

Term and Condition

In order to be exempt from the prohibitions of section 9 of the Act, the action agencies must comply with the following term and condition, which implements reasonable and prudent measure #3. This term and conditions is non-discretionary.

The action agencies shall develop an annual calendar of research and monitoring activities conducted along the Colorado River below Glen Canyon Dam. If there are additional studies or management actions conducted independently by the National Park Service or Reclamation, those activities shall be included in the same information as a calendar of activities. Necessary information in the calendar of activities will include timing and duration of activities, sampling of listed species including gear types and effort, and the best approximation of numbers of individuals of listed species that will be encountered, collected, harmed, and killed during the effort.

REASONABLE AND PRUDENT MEASURE #1 (KAS)

The following reasonable and prudent measure is necessary and appropriate to minimize take for the Kanab ambersnail.

1. The action agencies shall monitor incidental take resulting from the proposed action.

Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the Act, the action agencies must comply with the following terms and conditions, which implement reasonable and prudent measure #1 described above and outline required reporting/monitoring requirements. These terms and conditions are non-discretionary.

1.a. The action agencies shall monitor potential habitat loss prior to high flow events and recovery rates after the events, and report the findings to this office.
2.a. The action agencies shall make a portion of the KAS collected from the flood zone available as specimens for genetic analysis and collections at the Philadelphia Academy of Sciences.

Review requirement: The reasonable and prudent measures, with their implementing terms and conditions, are designed to minimize the effects of incidental take that might otherwise result from the proposed action. If, during the course of the action, the level of incidental take is exceeded, such incidental take would represent new information requiring review of the reasonable and prudent measures provided. The action agencies must immediately provide an explanation of the causes of the taking and review with the AESO the need for possible modification of the reasonable and prudent measures.

Disposition of Dead or Injured Listed Species

Upon locating a dead, injured, or sick listed species initial notification must be made to the Fish and Wildlife Service's Law Enforcement Office, Federal Building, Room 8, 26 North McDonald, Mesa, Arizona (telephone: 480/835-8289) within three working days from the end of the trip. Written notification must be made within five calendar days and include the date, time, and location of the animal, a photograph if possible, and any other pertinent information. The notification shall be sent to the Law Enforcement Office with a copy to this office. Care must be taken in handling sick or injured animals to ensure effective treatment and care, and in handling dead specimens to preserve the biological material in the best possible state. All specimens shall remain at ASU or another educational institution.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

1 We recommend a study of deer mice *(Peromyscus)* predation on KAS.

2. We recommend coordinating with Reclamation and other parties to complete the risk assessment for the construction and operation of the selective withdrawal structure within one year.

In order for the Fish and Wildlife Service to be kept informed of actions minimizing or avoiding adverse effects or benefitting listed species or their habitats, we request notification of the implementation of any conservation recommendations.

REINITIATION NOTICE

This concludes formal consultation on the proposed action. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

We appreciate your efforts to identify and minimize effects to listed species from this project. For further information please contact Debra Bills (x239) or Tom Gatz (x240). Please refer to the consultation number, 02-21-03-F-016 in future correspondence concerning this project.

Steven L. Spangle

cc: Regional Director, Fish and Wildlife Service, Albuquerque, NM (ARD-ES)
Project Leader, Fish and Wildlife Service, Pinetop, AZ

Bruce Taubert, Arizona Game and Fish Department, Phoenix, AZ
Director, Navajo Fish and Wildlife Department, Window Rock, AZ
Director, Bureau of Indian Affairs, Phoenix AZ
San Juan Southern Paitue, Tuba City, AZ
Pueblo of Zuni, Zuni, NM
Havasupai Tribe, Supai, AZ
Hualapai Nation, Peach Springs, AZ
Southern Paiute Consortium, Fredonia, AZ
Hualapai Fish and Wildlife, Peach Springs, AZ
Hopi Nation, Kykotsmovi, AZ

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Appendix A: Concurrences

In your July 15, 2002, memorandum, you requested our concurrence that the proposed action was not likely to adversely affect the razorback sucker species (*Xyrauchen texanus*) and its critical habitat, the southwestern willow flycatcher (*Empidonax trailli extimus*), and the California condor (*Gymnogyps californianus*). Although not included in the biological evaluation, you later requested concurrence that the proposed project may affect but is not likely to adversely affect, critical habitat for the razorback sucker. We concur with these determinations since the razorback sucker is not likely to occur in the project area during the life of the project. The project is designed to ensure that all carrion will be removed in a way that will not create an attractive nuisance for condors.