United States Department of the Interior
Fish and Wildlife Service
Arizona Ecological Services Office
9828 North 31st Avenue, Suite C3
Phoenix, Arizona 85051
Telephone: (602) 242-0210 Fax: (602) 242-2513

In reply refer to:
AESO/SE
02EAAZ00-2019-F-0045

March 4, 2019

Memorandum

To: Superintendent, Grand Canyon National Park, Grand Canyon, Arizona

From: Field Supervisor

Subject: Biological for Transcanyon Water Distribution Pipeline Project

Thank you for your request for formal consultation/conference with the U.S. Fish and Wildlife Service (Service) pursuant to section 7 of the Endangered Species Act of 1973 (16 U.S.C. § 1531-1544), as amended (Act). We received your letter dated September 17, 2018, via electronic mail the same day. At issue are effects that may result from the proposed Transcanyon Water Distribution Pipeline Project located in Coconino County, Arizona. The proposed action may adversely affect the endangered humpback chub (*Gila cypha*).

In your letter, you also requested our concurrence that the proposed action is not likely to adversely affect the threatened Mexican spotted owl *(Strix occidentalis lucida*), the threatened California condor (*Gymnogyps californianus*), and the endangered razorback sucker (*Xyrauchen texanus*) and its critical habitat. We concur with your determinations and include our rationales in Appendix B.

We based this biological opinion on information provided in the September 17, 2018, biological assessment, telephone conversations, 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, project activities and their effects, or on other subjects considered in this opinion. A complete record of this consultation is on file at this office.

Consultation History

- September 17, 2018: The National Park Service (NPS) at Grand Canyon National Park (GRCA) requested formal consultation on this project.

- November 5, 2018: We responded to your request for formal consultation with a 30-day letter.
- December 21, 2018: Due to a lapse in appropriations, there was a partial government shutdown and we were unable to conduct any work for 35 days.
- January 28, 2019: The partial government shutdown ended.
- February 13, 2019: We provided a draft biological opinion to NPS for review.
- February 22, 2019: We received comments on the draft biological opinion and incorporated/addressed your comments.

BIOLOGICAL OPINION

DESCRIPTION OF THE PROPOSED ACTION

The purpose of the project is to relocate the water intake for the Transcanyon Water Distribution Pipeline (TCWL). The TCWL, which NPS constructed in the 1960s, is beyond its useful life, experiences frequent failures, and requires continual maintenance to repair leaks. The project is located within GRCA in a 12.5-mile corridor from Roaring Springs along Bright Angel Creek and the North Kaibab Trail through Phantom Ranch to Indian Garden, where the TCWL pumps water to the park's South Rim (Figure 1). The NPS proposes to relocate the water intake for the South Rim from Roaring Springs to a new area near Bright Angel Creek at Phantom Ranch. This will eliminate one of the TCWL sections through an area called the "Box," where most of the pipeline breaks and leaks occur. The TCWL plays a critically important role supporting park operations. It supplies all potable water to the park's South Rim as well as the Cross-Canyon Corridor. Water transported by the TCWL supports more than six million annual visitors and approximately 2,500 year-round residents. The NPS also uses water from the TCWL for fire suppression protection for all South Rim and Cross-Canyon Corridor facilities, including more than 800 historic buildings.

The NPS will relocate the water supply source from Roaring Springs Cave to Bright Angel Creek at Phantom Ranch and replace sections of the TCWL south of the Colorado River (Figure 2). A new water intake system will provide drinking water to Phantom Ranch, Indian Garden, and the South Rim. Roaring Springs will continue to provide drinking water to the Roaring Springs Bunkhouse, Cottonwood Campground, and the North Rim. The NPS will not replace the 7-mile section of existing TCWL from the Roaring Springs Pump Station to Phantom Ranch. Instead, NPS will use the section of pipeline from Roaring Springs to Cottonwood Campground (1.5 miles) as a conduit for a smaller waterline to deliver potable water to the campground. NPS will remove the remaining 5.5 miles from Cottonwood Campground to Phantom Ranch over time during routine trail work or left in place where sensitive resources exist.

Project elements include:

- Phantom Ranch Facilities
- Indian Garden Facilities
- TCWL Replacement between Phantom Ranch and Indian Garden
- Roaring Springs and Cottonwood Campground Facilities
- South Rim Water Treatment Plant
- Electrical Line from the South Rim to Phantom Ranch
- Access and Staging Sites

We summarize each of the project elements below, with a focus on the elements that are most relevant to discussing effects of the action on the humpback chub.

Phantom Ranch Facilities

New facilities at Phantom Ranch will include the following: water intake system, raw water storage tank, 1 million gallon/day booster pump station, water treatment plant, potable water storage tank, and temporary overnight accommodations for workers (up to 3,600 square feet

[ft^2]). The construction zone at Phantom Ranch for all of the development will be approximately eight to nine acres, which accounts for construction zones for all buildings, facilities, and utility lines.

NPS will install up to eight wells approximately 60 feet (ft) apart and about 30 ft from the Bright Angel Creek shoreline. The wells will be approximately 35 to 45 ft deep with an 8-inch-diameter well casing, and will be capable of producing 1 million gallons/day with at least one well on standby. In addition to the wells, NPS will install about 1,800 linear ft of waterline within the 30-ft-wide construction zone.

Additionally, because the wells may not provide an adequate water supply, NPS will construct a surface water intake at the south end of Phantom Ranch along Bright Angel Creek, which will consist of the intake structure, water control structures in the creek, and a set of below ground pumps.

- Intake structure: Engineers will design the proposed surface water intake to manage sediment and minimize adverse effects to native fish. The proposed screen size will be 3/32 inch wire mesh or perforated plate, or 1.75 mm slotted plate or wedge wire screens. The intake structure will have an approximate submerged depth of two to three ft and a width of five to seven ft for a total screened area up to 15 ft^2. However, NPS has not located the specific site for the surface water intake pipe, so this is the desired depth, but it could be shallower.
- Water control structures: Water control structures in the form of rock weirs will be required to keep the screen submerged at minimum stream flows. These will be constructed using materials already present in the creek. Additionally, some armoring of the creek banks will be required to stabilize the channel.
- The pump station, consisting of three pumps, will be constructed as part of the intake within a below ground concrete structure. The footprint of the intake structure will be a maximum of 30 ft by 15 ft (450 ft^2).

The NPS will construct the raw water storage tank, 1 million gallon/day booster pump station, water treatment plant, and new overnight accommodations in the Phantom Ranch delta area. The 50,000-gallon potable raw water storage tank will be located on the north end of Phantom Ranch or above the ranch to the east and will be up to 20 ft in diameter (315 ft^2). NPS will construct the facility above grade to minimize excavation. The booster pump station will receive water flow from the Phantom Ranch raw water storage tank and will connect to the TCWL to supply water to the Indian Garden Pump Station. The Phantom Ranch water treatment plant will supply treated water to the Phantom Ranch water distribution system. The building will be approximately 45 ft by 40 ft (1,800 ft^2).

Trenching will be required to run pipes from the water intake to the raw water storage tank, to the booster pump station to the TCWL and the Phantom Ranch water treatment plant for local use. They will also use trenching to run electrical and water utilities to the overnight accommodations for employees.

In general, NPS expects construction of the Phantom Ranch facilities to use small and standard

equipment and typical construction materials, suitable for helicopter or river transport. Types of equipment used for construction of the Phantom Ranch facilities could include a backhoe, loader, rock crusher, rough terrain forklift, skid steer loader, excavator, concrete mixer and dry batch plant, and a wheel or track-mounted drill rig. Recontouring soils and revegetation using native plant species would occur after construction is complete.

Indian Garden Facilities

New facilities at Indian Garden will include a local water treatment plant (450 ft^2), drying beds (100 ft^2), and a potable water storage (200 ft^2). NPS will construct these facilities on the east side of Indian Garden. NPS will construct trenches to run piping from the existing sedimentation tank to the Indian Garden water treatment plant and to run piping from the water treatment plant to the potable water storage tank. NPS will build the water storage tank at the south end of Indian Garden. The park will install new water distribution lines as part of this project, but NPS addressed this action in a previous (2004) environmental assessment.

The Indian Garden facilities will be constructed using equipment similar to those described for Phantom Ranch. The construction zone for the water treatment plant and storage tank, drying bed, and associated piping will be about two acres. Recontouring soils and revegetation using native plant species will occur after construction is complete.

TCWL Replacement between Phantom Ranch and Indian Garden

NPS will replace the TCWL from the southern end of Phantom Ranch (at the Colorado River) to the Indian Garden Pump Station with new pipe in or adjacent to the existing alignment. The new pipe will be 8-inch-diameter steel. The TCWL will be replaced in the same location or adjacent to the existing pipeline. In places where the pipeline is covered by rock and scree, primarily between the Pipe Creek rest house and Plateau Point, the existing rock and scree cover material will be salvaged, and additional material will be collected from active drainages or existing borrow pits within the construction limits. Recontouring and revegetation will occur in drainages. NPS will replace approximately five miles of pipeline within a working corridor about 30 ft wide, resulting in a construction zone of about 18 acres in addition to the drainages and borrow pits.

NPS will conduct project excavation with construction equipment. Should removal of large rock be required, the NPS expects to use nonexplosive rock breaking methods that greatly reduce the noise, dust, and flyrock produced. Types of equipment for pipeline construction could include a mini excavator, mini loader, track chain saw and excavator-mounted wheel saws, rock saw, rock crusher, pipe transport vehicle, welding and cutting equipment delivery vehicle, pipelayer or specialized pipe handling machine or arm attachment, and lightweight and mobile custom lifting and transfer apparatus.

Roaring Springs and Cottonwood Campground Facilities

NPS will install a new 2-inch-diameter waterline from the Roaring Springs Pump Station to Cottonwood Campground and will be approximately 12,000 ft long. The new waterline will follow the existing trail alignment and they may pull the line through the existing TCWL, which will require periodic excavation along the existing TCWL. The NPS will tie the new waterline

into the existing water system connection. Alternatively, the new 2-inch waterline will be buried in the trail and will be constructed within a working corridor about 15 ft wide, resulting in temporary surface disturbance of about 4 acres.

South Rim Water Treatment Plan

The new water treatment plant at the South Rim will have a capacity of 1 million gallons/day and may include a 1 million gallon raw water tank 40 ft in diameter and a new raw water meter vault. All wastewater flows (about 1% of plant flows) will be disposed of in the existing wastewater collection and treatment system. New structures will consist of an 80 ft by 75 ft building, 40 ft-diameter tank, and 8 ft by 8 ft vault. The estimated construction zone will be about 4 acres. Recontouring and revegetating with native plants will occur after construction is complete.

NPS will use conventional heavy equipment such as backhoes, excavators, cranes, cement trucks, and soil compaction equipment for construction.

Electrical Line from the South Rim to Phantom Ranch

The NPS will upgrade an existing aboveground electrical line that starts at the South Rim, runs northwest of "the Battleship," formation and ends at Indian Garden. The electrical line is about 2.5 miles long. NPS will replace and upgrade the conductors using the existing power poles. No roads exist along the electrical line alignment, so NPS will transport materials and workers to the site via helicopter. The NPS does not expect any ground disturbance from replacing the electrical line.

Access and Staging Sites

NPS will use three or four construction camps to house workers at Manzanita Ranger Station and Day Use Area, Cottonwood Campground, the delta area of Phantom Ranch, and Indian Garden Campground. The camps at Phantom Ranch and Indian Garden will house up to 20 people and will include wall tents, kitchen and shower facilities. NPS will capture wastewater and treat it at Phantom Ranch wastewater treatment plant or put it into the septic system at Indian Garden. The camps at Manzanita and Cottonwood will house up to 12 people and will have similar facilities, and wastewater will go into the septic system at these locations. These camps will be located in existing disturbed areas. NPS will house construction staff for the South Rim water treatment plant in developed areas, inside or outside the park, possibly in Flagstaff, Williams, or other nearby communities.

The construction contractor will provide helicopter operations for construction. NPS will expand the park's existing helibase to the northwest to provide a contractor helibase on the South Rim. In addition, NPS will construct new facilities for contractor offices and operations at the existing maintenance complex at the South Rim, including a new staging and equipment storage area. The expanded helibase and contractor operations and staging areas will require an approximate 15-acre construction zone. NPS may construct a new access road for contractor use between the maintenance complex and South Entrance Road. The new access road will be about 1,500 ft long by 30 ft wide with a 24-ft-wide paved surface and 3-ft-wide drainage on either side. Construction effects will extend about 10 ft beyond either side of the road.

The project will use light-duty (1,000-pound maximum payload), medium-lift (K-max, 4,000-pound maximum payload), and heavy-lift (Chinook, 14,000-pound maximum payload) helicopters. They expect that the light-duty helicopter will make multiple flights per day, while the contractor will use the medium-lift helicopter less often and the heavy-lift helicopter infrequently to transport equipment that exceeds the payload capacity of the other helicopters. NPS estimates that the light-duty helicopter will account for about 66% of total flights, while the medium-lift and heavy-lift helicopters will account for about 30% and 4% of total flights, respectively. NPS estimates that the project will result in about 5,500 total helicopter flights over the 3-year construction period in the inner canyon, with about 7 to 12 round-trip flights per day departing from and returning to the expanded helibase at the South Rim on a typical day when helicopters are active. On busy days, up to 20 helicopter flights per day could occur. Helicopters will be active for about 6 hours of the day. NPS expects helicopters to be active for about 30 nonconsecutive months during construction, as needed, and will be active about 20 days per month, depending on weather, project needs, and staffing.

NPS expects access to work sites to be through a combination of helicopter flights, hiking, and small all-terrain vehicle (ATV) use. The contractor will use ATVs in developed areas, such as Phantom Ranch and on trails wide enough to accommodate ATV use. NPS will not modify trails to accommodate ATVs. It is expected ATVs will be used daily during daylight hours. Work site personnel access within two to three miles from the construction camp will be by foot. For distances beyond this, work site personnel will use service helicopter flights and small vehicles including ATVs.

Material staging areas for pipeline construction will be located within the 30-ft-wide construction zone. NPS expects that material delivery from staging areas to work sites will be accomplished primarily using standard mini equipment, operating within the construction zones, as described above. Some locations along the alignment will require helicopter delivery of pipe material because the topography does not allow for vehicle access.

Project schedule

NPS expects the general sequence of construction will be as follows, although much of the work will occur concurrently:

- South Rim water treatment plant, contractor helibase, office, and staging area
- TCWL and electrical line replacement from Phantom Ranch to Indian Garden
- Phantom Ranch water intake, raw water tank, local water treatment plant, and booster pump station
- Phantom Ranch distribution and tank improvements
- Indian Garden facilities
- Cottonwood Campground waterline

Construction will continue for an estimated four to five years, beginning in 2019. NPS expects that work in the inner canyon will continue for about three years, not including work on the South Rim.

Conservation Measures

The following conservation measures apply to humpback chub. The project contains many other conservation measures that we list in Appendix A.

- NPS will implement erosion and sediment control mitigation measures to prevent runoff and sediment discharges into Bright Angel Creek.

- Following completion of the project, NPS fisheries staff will monitor Bright Angel Creek for changes in water temperature. If monitoring indicates that substantial temperature changes that could favor brown trout are occurring in the creek, GRCA will increase removal of nonnative fish.

Action Area

The action area is defined as all areas to be affected directly or indirectly by the federal action and not merely the immediate area involved in the action (50 CFR § 402.02). In delineating the action area, we evaluated the farthest-reaching physical, chemical, and biotic effects of the action on the environment.

The action area for the TCWL project is different for the different species. For humpback chub and razorback sucker, the action area is Bright Angel Creek and the Colorado River within GRCA. Other tributaries in the park confirmed to support humpback chub are the Little Colorado River and Havasu Creek. These tributaries are not in the action area. For the Mexican spotted owl and California condor, we define the action area as the TCWL alignment (cross-canyon corridor), facility construction sites on the South Rim and the inner canyon, and flight paths for project support helicopters. As stated in the proposed action helicopters will depart from the expanded helibase constructed adjacent to the existing South Rim helibase, and fly west of Grand Canyon Village and below the rim to access the TCWL alignment and staging areas; these flight areas are included in the action area for the condor and owl.

STATUS OF THE SPECIES AND CRITICAL HABITAT

In this section, we summarize the rangewide status of each species we considered in this BO. Further information on the status of these species can be found in the administrative record for this project, documents on our web page (Arizona Ecological Services Office Documents by Species), and in other references cited in each summary below.

Humpback chub

The humpback chub, an endemic fish to the Colorado River Basin of the southwestern United States, was listed as endangered on March 11, 1967 (32 FR 4001) and the Service designated critical habitat in 1994 (Service 1994). It is native to the states of Wyoming, Colorado, Utah, and Arizona and there are six recognized populations that occur in mid- and low-elevation, canyon-confined, deep-water regions, including five in the upper basin and one in the lower basin (Lee's

Ferry is the demarcation line between upper and lower Colorado River basins). The upper basin populations occur in (1) the Colorado River in Cataract Canyon, Utah; (2) the Colorado River in Black Rocks, Colorado; (3) the Colorado River in Westwater Canyon, Utah; (4) the Green River in Desolation and Gray Canyons, Utah; and (5) the Yampa River in Yampa Canyon, Colorado. The only population in the lower basin occurs in the Colorado River in Marble Canyon, the Grand Canyon, and Little Colorado River (LCR). The numbers of individuals in upper basin populations have varied over time, with the three largest populations most recently supporting 404 and 1,315 adults in Black Rocks and Westwater Canyon in 2012, respectively, and 1,672 adults in Desolation/Gray canyons in 2015. The smallest populations are in Cataract Canyon with 468 adults in 2003 to 295 in 2005 and in Yampa Canyon of the Dinosaur National Monument (DNM) population with 320 adults in 2001 to 224 in 2003. Individuals have not been collected in the DNM population since 2004; therefore, we consider the population to be functionally extirpated (Service 2017).

The lower basin population is found in Marble and Grand canyons, with individuals occupying about 400 km (249 mi) of the mainstem Colorado River from RM 30 to RM 280, as well as about 18 km (11 mi) of the lower LCR and about 6 km (3.7 mi) of lower Havasu Creek. The core population (i.e., LCR population) includes fish from the LCR and fish in an area of about 15 km (9.3 mi) of the mainstem around the LCR confluence that move into the LCR to spawn and mix with resident fish (Kaeding and Zimmerman 1983; Valdez and Ryel 1995; Douglas and Marsh 1996). The LCR population of chub, consists of an adult population (abundance for 2009–2012) of about 11,500–12,000 adults (Yackulic *et al.* 2014). Researchers have not quantified annual spawning in the LCR, but it could contain millions of fish larvae, with approximately 1% reaching the first year of life. Monitoring detects adult and juvenile chub upstream up through the 30-mile reach.

The humpback chub is a large, long-lived species that may attain a length of 20 inches, weigh 2 pounds or more, and live for 20 to 40 years (Andersen 2009). The humpback chub evolved in seasonally warm and turbid water, and the chub is highly adapted to the unpredictable hydrologic conditions in the Colorado River watershed. Adult humpback chub occupy swift, deep, canyon reaches, but also use eddies and sheltered shoreline habitat (Valdez and Clemmer 1982; Valdez and Ryel 1995; Andersen *et al.* 2010). Spawning occurs on the descending limb of the spring hydrograph at water temperatures typically between 16 and 22°C. Young chub require low-velocity shoreline habitats, including eddies and backwaters.

The main spawning area for the humpback chub within the Grand Canyon is the LCR, which provides warm temperatures suitable for spawning and shallow low-velocity pools for larvae (Gorman 1994). This healthy population provides substantial redundancy and representation for the species in the Lower Basin. The species spawns primarily in the lower 13.6 km (8.5 mi) of the LCR, but spawning likely occurs in other areas of the Colorado River as well (Valdez and Masslich 1999; Anderson *et al.* 2010). Researchers documented spawning and young chub near RM 30 of the Colorado River through Grand Canyon (Anderson *et al.* 2010; K. Young pers. comm. 2018; Dodrill pers. comm. 2018). In addition, surveyors have detected ripe females and multiple sizes of humpback chub in other areas in the western Grand Canyon in recent years (Albrecht *et al.* 2014; Kegerries *et al.* 2015; K. Young pers. comm. 2018; Van Haverbeke *et al.* 2018). Gorman and Stone (1999) found ripe adults aggregated in areas of complex habitat

structure associated with clean gravel deposits among large boulders mixed with travertine masses in or near runs and eddies.

Young humpback chub use areas that provide physical cover and contain some velocity refuges, including shoreline talus, vegetation, and backwaters typically formed by eddy return current channels (AGFD 1996; Converse *et al.* 1998; Dodrill *et al.* 2015). Backwaters can have warmer water temperatures than other habitats, and we frequently observe native fish, including the humpback chub, in backwaters, leading to a common perception that this habitat is critical for juvenile native fish conservation. However, backwaters are rare and ephemeral habitats, so they contain only a small portion of the overall population. Dodrill *et al.* (2015) demonstrated the total abundance of juvenile humpback chub was much higher in talus than in backwater habitats, which could be a factor of availability of talus habitats versus backwaters. The Near Shore Ecology project concluded that backwaters are likely not important to the LCR chub aggregation because they are not a significant habitat component in that area (Pine *et al.* 2013).

As young humpback chub grow, they shift toward deeper and swifter offshore habitats. Valdez and Ryel (1995, 1997) found that young humpback chub remain along shallow shoreline habitats throughout their first summer, at low water velocities and depths less than 1 m (3.3 ft.). They shift as they grow larger and by fall and winter move into deeper habitat with higher water velocities and depths up to 1.5 m (4.9 ft.). Stone and Gorman (2006) found similar results in the LCR discovering that as humpback chub physically develop their behavior changes from diurnally active, vulnerable, nearshore-reliant, to nocturnally active, large-bodied adults, which primarily reside in deep mid-channel pools during the day and move inshore at night.

The humpback chub is primarily an insectivore, with larvae, juveniles, and adults all feeding on a variety of aquatic insect larvae and adults, including dipterans (primarily chironomids and simuliids), Thysanoptera (thrips), Hymenoptera (ants, wasps, bees), and amphipods (such as *Gammarus lacustris*) in the Colorado River population (Department 2001). Donner's (2011) research attributed abundant food resource, including chironomids and simuliids, to 65% of humpback chub production in the Grand Canyon. Feeding by all life stages may occur throughout the water column as well as at the water surface and on the river bottom. Spurgeon *et al.* (2015) also found that humpback chub consumed native fish, and that they occupied a high trophic position in the food web in a Grand Canyon tributary, similar to rainbow trout.

Historically, the humpback chub occurred throughout much of the Colorado River and its larger tributaries from below the Grand Canyon upstream into Arizona, Utah, Colorado, and Wyoming (Service 2002). Historical range and abundance levels are unknown. In 1994, the Service estimated that historical range may have included 2,179 km (1,354 mi) of river (Service 1994), but estimates in 2002 and 2011 have been modified to include only canyon-bound reaches of this previously estimated area, estimating an historic range of approximately 756 km (~470 mi) (Service 2002, 2011). Current resource conditions in both the upper and lower basin are fair to good, and are mostly adequate to support the species (Service 2018).

Annual abundance estimates suggest that sometime between the early 1990s and 2000, the abundance of humpback chub $\geq$150 mm underwent a decline in the LCR (Coggins et al. 2008). As stated above, following the decline was a period of relatively low but stable abundance

between 2000 and 2006, followed by a post-2006 period of significant increasing trend. The LCR population has been relatively stable for about the last five years (Service 2017). We think a number of factors are responsible for the observed increases, including experimental water releases, trout removal, and drought-induced warming (Andersen 2009; Coggins and Walters 2009; Van Haverbeke *et al*. 2018). In addition, translocations of juvenile humpback chub to Shinumo and Havasu Creeks have resulted in increased numbers of adult humpback chub captured in the mainstem aggregations (Persons *et al.* 2017). Data shows that translocations to tributaries provide an adequate mechanism for rearing juvenile humpback chub that may later disperse to the Colorado River and augment aggregations (Spurgeon *et al.* 2015).

Surveys conducted in 2013, 2014, and 2015 suggest that translocated humpback chub have spawned successfully in Havasu Creek (NPS 2013). Humpback chub occupy approximately the lower 5.6 km (3.5 mi) of Havasu Creek, from the mouth to Beaver Falls, which is a barrier to upstream movement of fish. The chub population estimate in Havasu Creek was approximately 297 individuals as of May 2016; with progressively larger cohorts reported by year (NPS pers. comm. 2018). While we have documented reproduction, the population has increased primarily because of continued translocations.

Sampling conducted between October 2013 and September 2014 in western Grand Canyon between Lava Falls (river mile [RM] 180) and Pearce Ferry (RM 280) captured 144 juvenile humpback chub during sampling of the small-bodied fish community. In addition, surveyors collected 209 humpback chub larvae during sampling of the larval fish community in randomly selected sites (Albrecht et al. 2014). Results were similar in larval and small-bodied fish sampling in 2015, when 285 juvenile and 67 age-0 humpback chub were captured during small-bodied and larval fish sampling, respectively, from throughout the study area (Kegerries *et al.* 2015). These results suggest that young humpback chub are using widespread nursery and rearing habitats between RM 180 and RM 280 in the western Grand Canyon. In the spring of 2017, evidence of reproduction and recruitment was documented at 30-mile. During this survey, the Service and Grand Canyon Monitoring and Research Center (GCMRC) documented over 90 young fish, of varying size classes (K. Young pers. comm. 2018; Dodrill pers. comm. 2018).

Humpback chub have expanded in Western Grand Canyon, from near Havasu Creek (RM 158) downstream to below Surprise Canyon (>RM 249). Since 2014, humpback chub in Western Grand Canyon have exhibited annual recruitment and increased catch per unit effort (Pillow *et al.* 2018; Van Haverbeke *et al*. 2018). This expansion has occurred within and outside of the two recognized aggregations (Havasu Creek and Pumpkin Spring) in this area.

Primary threats to the species include streamflow regulation and habitat modification (including cold water dam releases and habitat loss), competition with and predation by nonnative fish species, parasitism, hybridization with other native *Gila*, and pesticides and pollutants (Service 1990, 2002). Upper basin habitat, including channel geomorphology and water temperature have not changed appreciably. However, the presence and operation of Glen Canyon Dam modified habitat in the Grand Canyon, including altered flow (reduced spring peak flow, increased summer and winter flow), temperature regimes, and sediment budget. Predation and competition by nonnative fishes is likely the greatest threat to both upper basin and lower basin populations.

The Service's Humpback Chub Recovery Goals defines recovery for the humpback chub (Service 2002). The Recovery Goals consist of actions to improve habitat and minimize threats. We measure the success of those actions by the status and trend (i.e., the demographic criteria) of the chub population. The Service, the Glen Canyon Dam Adaptive Management Program (GCDAMP), and the Upper Colorado River Endangered Fish Recovery Program (UCRRP), address conservation of all of the upper Colorado River basin populations of humpback chub, and each uses the underlying science in the Recovery Goals. A 5-Year Review conducted in 2011, relied on the information provided in the recovery goals and provides supplemental information on the species' distribution and status (Service 2011), with an additional 5-year review and recommendation for down listing to threatened in 2018 (Service 2018).

The Service designated critical habitat for this species in the LCR, and mainstem from Nautiloid Canyon (RM35) downstream to Granite Park (RM209); however, this action does not affect that area.

Previous Consultations

Given the wide-range of this species, several Federal actions affect this species every year. You can find the formal consultations conducted for the humpback chub in Arizona on our AESO website or Service ECOS humpback chub profile website.

ENVIRONMENTAL BASELINE

The environmental baseline includes past and present effects of all Federal, State, or private actions in the action area, the anticipated effects of all proposed Federal actions in the action area that have undergone formal or early section 7 consultation, and the effect of State and private actions that are contemporaneous with the consultation process. The environmental baseline defines the 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.

Description of the Action Area

As stated above, for humpback chub, the action area for the TCWL is Bright Angel Creek and the Colorado River within GRCA. Other tributaries in GRCA confirmed to support humpback chub are the Little Colorado River and Havasu Creek. These tributaries are not in the action area, and therefore, we will not discuss them further.

Status of the species within the action area

In the GRCA, the largest population of humpback chub is located in the Colorado River near the confluence of the Little Colorado River (outside the action area), and smaller populations are found in two tributaries in the park Havasu Creek (outside the action area) and Bright Angel Creek (inside the action area). In the action area, humpback chub occur also occur in a small aggregation in the Colorado River near the confluence with Bright Angel Creek. Surveyors have occasionally captured chub from this aggregation, in Bright Angle Creek itself (D. Stone,

USFWS personal communication). Pit tag monitoring equipment installed in lower Bright Angel Creek in 2018 has also detected a small number of individual chub tagged in the Colorado River. In May 2018, the NPS and Service translocated 120 humpback chub to Bright Angle Creek in order establish a new chub population within GRCA. NPS will monitor these fish to determine numbers and condition in 2019.

In GRCA, researchers have identified brown trout (*Salmo trutta*), rainbow trout (*Oncorhynchus mykiss*), channel catfish (*Ictalurus punctatus*), and black bullhead (*Ameiurus melas*) as principal predators of young humpback chub. GRCA uses a weir (fish trap) installed in Bright Angel Creek downstream of Phantom Ranch to capture existing brown and rainbow trout as part of nonnative fish control efforts. Prior to implementation of trout removal efforts, Bright Angel Creek was an important source of brown trout in GRCA. The NPS conducts ongoing removal of brown and rainbow trout from Bright Angel Creek using electro-fishing under GRCA's Comprehensive Fisheries Management Plan (NPS 2013). Park biologists conduct electrofishing within Bright Angel Creek across about 9.6 stream miles. These trout removal efforts have resulted in approximately 90% decline in all trout, and during the same period, significant increases in native fish numbers in Bright Angel Creek (Schelly 2018, in prep).

EFFECTS OF THE ACTION

Effects of the action refer to the direct and indirect effects of an action on the species, together with the effects of other activities that are interrelated and interdependent with that action, which 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.

Potential direct effects to humpback chub from the proposed action include potential injury and death to larval fish from entrainment or impingement in the new water intake system. Indirect effects to chub could occur from relocating the water intake, which may result in slightly decreased water temperatures in the lower section of Bright Angel Creek, and construction activities that could increase sedimentation in the creek. Based on information from the NPS, harm could occur to larval humpback chub because of the surface water diversion, but that the other habitat effects are likely insignificant and discountable. We summarize and discuss these effects below.

Surface water intake

Operation of the proposed surface water intake located in Bright Angel Creek could affect early life stages of fish (larval fish) present in the creek, including humpback chub, if the humpback chub recently stocked in to the creek spawn and larval fish are present. An evolutionary mechanism for Colorado River native fish dispersal is drifting in the current. After hatching, larval humpback chub drift passively in the stream current, or weakly swim with the current, along the shoreline and later develop fully formed fins and stronger swimming abilities (Robinson *et al.* 1998). As larval fish are drifting downstream in Bright Angel Creek, the

instream water intake could entrain or impinge larval humpback chub. Entrainment is the unwanted passage of fish through a water intake; this happens when there is no screen or an inadequate screen surrounding the water intake. Impingement is the physical contact of a fish with such a barrier structure (screen) due to intake velocities, which are too high to allow the fish to escape.

A well-designed intake screen structure can minimize the potential for both entrainment and impingement. Project engineers will design the proposed surface water intake to manage sediment and minimize entrainment and impingement effects to humpback chub. The proposed screen size will be 3/32 inch wire mesh or perforated plate, or 1.75 mm slotted plate or wedge wire screens. The proposed screen pore size would limit the potential of fish ≥0.9 inch (23 mm) in size to pass through the screen. Additionally, to the best of their ability, the NPS will ensure that the screened-in area is large enough such that the approach velocity of water into the intake is sufficiently low that a fish may swim to avoid the screen.

Larval humpback chub are only likely to be susceptible to entrainment and impingement on the proposed water intake screen for approximately one month when they are at their earliest/smallest life stages before they are large enough (greater than 30 mm [1.1 inches)] to be excluded from the intake screen. It is difficult to predict the number of larval fish entrained or impinged against the screen or within the diversion pipe, but the screen over the intake will minimize the entrainment of larger juvenile fish that have developed stronger swimming abilities, thus minimizing the effects to humpback chub. The effect to larval fish will likely vary based upon the local stream hydraulics near the diversion point. Due to naturally high mortality of fish during larval life stages, it is highly unlikely that any fatality of larval native fish because of entrainment into the surface water diversion will have population level effects or be at a level that will cause a viability concern (Pine *et al*. 2013). In addition, any larval humpback chub that drift to lower Bright Angel Creek (where NPS will install the surface water intake) will most likely end up in the Colorado River. Chub survival is likely to be lower here than if they remained in Bright Angel Creek, due to potentially higher predation rates in the Colorado River and more exposure to altered habitat conditions (e.g., colder waters, low turbidity).

In summary, we expect that the number of small humpback chub larvae ≤0.9 inch (23 mm) killed or injured due to entrainment and/or impingement from the surface water diversion will be minimal. Humpback chub are rare in Bright Angel Creek, and it is unknown if recently translocated fish have spawned or will spawn in the future. Recent monitoring has rarely detected humpback chub young-of-year, including larval stages downstream of Bright Angel Creek in the Colorado River (Kegerries *et al.* 2017). Because of their larger size and intake design features, adverse effects to larger individual larval chub ≥0.9 inch (23 mm), juvenile chub, and adult humpback chub within Bright Angel Creek from the surface water intake are insignificant and discountable.

Water temperature changes to lower Bright Angel Creek

Relocating the intake for the TCWL from Roaring Springs to just below Phantom Ranch near the mouth of Bright Angel Creek will result in an additional 2.8 cubic feet per second (cfs) of water in Bright Angel Creek following completion of the project. This will restore flows in the creek to conditions that existed before construction of the TCWL in the 1960s. NPS expects that by

relocating the water intake and adding water to Bright Angel Creek from Roaring Springs that water temperatures will decrease slightly in the lower reaches of Bright Angel Creek.

Research has shown that water flow from Roaring Springs provides some stabilization of temperature in the creek over both daily and annual periods (Bair *et al.* 2018, in press). In preparation for this project, Bair *et al.* (in press) assessed potential changes to habitat for native and nonnative fish species from adding flow from Roaring Springs to Bright Angel Creek. Initial modeling results of this study found that habitat may increase for both native and nonnative fish, but we expect variations to exist between species for different seasons and life stages. There will likely be a slight decline in the number of suitable days for humpback chub reproduction, but the decline in suitable reproduction days is very small.

The predicted decrease in water temperature in the lower section of Bright Angel Creek may result in more favorable brown trout habitat conditions. There could also be an increase in the number of days within the optimum temperature range for brown trout growth. Because these water temperature changes will be permanent, the potential exists for the new intake to increase brown trout populations in Bright Angel Creek, thereby potentially increasing predation by brown trout on humpback chub.

NPS will monitor water temperatures in Bright Angel Creek following relocation of the TCWL intake and increase ongoing nonnative fish removal efforts if monitoring indicates that conditions have changed to favor nonnative brown trout. Given the success of past efforts to remove nonnative brown trout that coincided with increases in native fish populations in Bright Angel Creek (Healy *et al.* 2018), this conservation measure is expected to reduce effects to a level where adverse effects of temperature and habitat change on the native fish community will be insignificant.

Sedimentation

Ground disturbance from construction and staging activities within the Bright Angel Creek drainage will expose soils to erosion, which could result in some increased sedimentation and turbidity in Bright Angel Creek. However, best management practices to control erosion and sediment will minimize runoff and sediment discharges into the creek. In addition, project staff will recontour disturbed areas outside of designated trails and structure footprints to match existing grades and revegetate the areas with native species to provide long-term soil stabilization following construction.

The TCWL crossing of Bright Angel Creek at Phantom Ranch has the highest potential for sedimentation and turbidity effects to the creek. Project staff will complete the crossing in one to two days and will disturb a relatively small (15- to 20-ft-wide) corridor. Consequently, creek bed disturbance and sedimentation will be limited and increased turbidity levels will be temporary. Increased turbidity levels will be minor compared to Bright Angel Creek natural turbidity levels during flood events. Native fish are adapted to turbid conditions and negative effects to native fish will not occur because of project activities. Therefore, any effects to humpback chub from turbidity and sedimentation are insignificant.

Summary
Based on the discussion above, we do not think that construction activities and re-locating the intake for TCWL will result in adverse effects to humpback chub or their habitat. However, the surface water intake in Bright Angel Creek at Phantom Ranch may injure or kill an unknown number of small larval humpback chub even with conservation measures in place to reduce the potential for fish entrainment and impingement.

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. We do not consider future Federal actions that are unrelated to the proposed action in this section because they require separate consultation pursuant to section 7 of the Act.

We do not know of any non-federal activities in the area; the action area is on and surrounded by federal lands. The NPS and Service will address future federal projects in the area under separate section 7 consultation.

Cumulative effects to the humpback chub and its critical habitat outside of NPS lands stem from Native American actions, and State, local, or private actions in tributary watersheds upstream of the action area. Native American use of the Colorado River in Grand Canyon includes cultural, religious, and recreational purposes, as well as land management of tribal lands (e.g. recreational use including rafting, hunting, and fishing). We project that these uses will have minimal effects to humpback chub due to the small scale at which they occur.

JEOPARDY ANALYSIS

Section 7(a)(2) of the ESA requires that federal agencies ensure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of any endangered or threatened species.

Jeopardy Analysis Framework

Our jeopardy analysis relies on the following:

"Jeopardize the continued existence of" means to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species (50 CFR 402.02). The following analysis relies on four components: (1) Status of the Species, which evaluates the range-wide condition of the humpback chub, the factors responsible for that condition, and the species' survival and recovery needs; (2) Environmental Baseline, which evaluates the condition of the humpback chub in the action area, the factors responsible for that condition, and the relationship of the action area to the survival and recovery of the species; (3) Effects of the Action (including those from conservation measures), which determines the direct and indirect effects of the proposed federal action and the effects of any

interrelated or interdependent activities on the humpback chub; and (4) Cumulative Effects, which evaluates the effects of future, non-federal activities in the action area on the species. The jeopardy analysis in this biological opinion emphasizes the range-wide survival and recovery needs of the listed species and the role of the action area in providing for those needs. We evaluate the significance of the proposed Federal action within this context, taken together with cumulative effects, for making the jeopardy determination.

Conclusion

After reviewing the current status of the humpback chub, the environmental baseline for the action area, the effects of the Transcanyon Water Distribution Pipeline Project, and the cumulative effects, it is our biological opinion that the action, as proposed, is not likely to jeopardize the continued existence of the humpback chub. We have designated critical habitat for this species, but it does not occur within the action area, therefore, there will be no effects to critical habitat. We base this conclusion on the following:

- The proposed action area for the TCWL project includes a relatively small amount of the occupied humpback chub habitat within and adjacent to GRCA and will not result in any population level effects to humpback chub or preclude recovery or conservation of the species.
- The TCWL project will not reduce the potential for recently translocated humpback chub to establish in Bright Angel Creek.
- The TCWL includes conservation measures that will reduce the potential for larval humpback chub to entrainment or impingement from the water intake pipe. By screening the intake pipe, NPS will reduce the potential for harm to larval fish <0.9 inch (23 mm) in size through entrainment or impingement. Humpback chub of this size are likely only to be present for up to a month each year before they are large enough to escape entrainment and impingement.
- Any effects to humpback chub habitat from temperature changes, turbidity, or sedimentation are insignificant.

We base the conclusions of this biological opinion on full implementation of the project as presented in the Description of the Proposed Action section of this document, including any Conservation Measures that NPS incorporated into the project design.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulations 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 § 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 NPS so that they become binding conditions of any grant or permit issued to an applicant, as appropriate, for the exemption in section 7(o)(2) to apply. The NPS has a continuing duty to regulate the activity covered by this incidental take statement. If the NPS (1) fails to assume and implement the terms and conditions or (2) fails to require the applicant 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 effect of incidental take, the NPS must report the progress of the action and its effects on the species to the Service as specified in the incidental take statement [50 CFR § 402.14(i)(3)].

AMOUNT OR EXTENT OF TAKE

Incidental take of humpback chub is reasonably certain to occur because of the proposed TCWL project, due to the installation of a water intake pipe in Bright Angel Creek where humpback chub are present and may spawn in the future. This incidental take will be in the form of harm (including direct fatality) of larval humpback chub < 0.9 inch (23 mm) in size due to entrainment or impingement on the screened water intake pipe. We anticipate incidental take of humpback chub will be extremely difficult to detect for the following reasons: (1) dead or injured larval humpback chub will be almost impossible to find; and, (2) the larval stage most at risk from the action are already the most vulnerable life stages to natural mortality factors (i.e., predation) and are extremely difficult to monitor. There is no practical way to count or monitor humpback chub larvae less than 0.9 inch (23 mm) that may become entrained or impinged on the water intake pipe given current sampling protocols and technologies.

The best available surrogate indicator of larval humpback chub incidental take is the design and management of the surface water intake pipe itself. The National Marine Fisheries Service defined Best Management Practices for surface water intake pipes as needing to meet the following criteria: 1) minimum fish exclusion size of 0.9 inch; 2) maximum slot opening for a perforated plate 3/32 inch; and, 3) minimum depth of 2 ft (and aim for 3 ft) of surface intake pipe. The NPS is adopting these criteria to extent they can to reduce incidental take of aquatic wildlife, including most all life stages of humpback chub that could occur in Bright Angel Creek. However, the NPS will exceed the amount or extent of incidental take provided if they are unable to maintain the proposed screening and proper functioning condition of the water intake pipe. If take is exceed, then as provided in 50 CFR Section 402.16, reinitiation of formal consultation would be required. Any larval chub < 0.9 inch (23 mm) that becomes entrained or impinged on the intake will be incidentally taken. While we are unable to estimate the number of larval fish of this size incidentally taken because of the proposed action, it will not affect the persistence of humpback chub in Bright Angel Creek, nor would it preclude larval fish recruiting into the currently small population of humpback chub in the action area.

EFFECT OF THE TAKE

In this biological opinion, the Service determines that this level of anticipated take is not likely to result in jeopardy to the species for the reasons stated in the Conclusions section.

REASONABLE AND PRUDENT MEASURES

Humpback chub

The following reasonable and prudent measure is necessary and appropriate to minimize take of humpback chub:

1. The NPS shall monitor the screen and proper functioning condition of the water intake pipe and report to the Service the findings of that monitoring.

TERMS AND CONDITIONS

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

Humpback chub

The following terms and conditions implement reasonable and prudent measure #1 for humpback chub:

1.1 Once constructed, the NPS shall report to the Service the site-specific location where project staff place the intake pipe. This information should include the location, the average water depth at the site, and the measured through-screen approach velocity following completion of the new water intake pipe. We understand that conditions will fluctuate at the site, but we are looking for information regarding the normal operating conditions of the water intake pipe.

1.2 NPS shall monitor and regularly inspect the screen and the water intake pipe to ensure they are maintained and functioning as intended.

1.3 The NPS shall submit annual monitoring reports to the Arizona Ecological Services Field Office by January 31 beginning in 2020. These reports shall <u>briefly</u> document for the previous calendar year the effectiveness of the terms and conditions and reaches of the creek where NPS observes humpback chub, and, if the NPS finds any dead humpback chub, the suspected cause of fatality. The report shall also summarize tasks accomplished under the conservation measures and terms and conditions. The report shall make recommendations for modifying

or refining these terms and conditions to enhance larval humpback chub protection or reduce needless hardship on the NPS.

Review requirement: The reasonable and prudent measures, with their implementing terms and conditions, are designed to minimize the effect 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 NPS 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 Service's Law Enforcement Office, 4901 Paseo del Norte NE, Suite D, Albuquerque, NM 87113; 505-248-7889) within three working days of its finding. 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.

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 that NPS continue to work with the Service and the Arizona Game and Fish Department to implement actions to recover humpback chub and other native aquatic species in GRCA.

In order for the Service to be kept informed of actions minimizing or avoiding adverse effects or benefiting listed species or their habitats, the Service requests notification of the implementation of any conservation recommendations.

REINITIATION NOTICE

This concludes formal consultation on for the Transcanyon Water Distribution Pipeline Project. 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.

In keeping with our trust responsibilities to American Indian Tribes, we encourage you to continue to coordinate with the Bureau of Indian Affairs in the implementation of this consultation. By copy of this biological opinion, are notifying the Chemehuevi Tribe, the Colorado River Indian Tribes, the Havasupai Tribe, the Hopi Tribe, the Kaibab Band of Paiute Indians, and the Pueblo of Zuni of its completion. We also encourage you to coordinate the review of this project with the Arizona Game and Fish Department.

We appreciate the NPS's efforts to identify and minimize effects to listed species from this project. Please refer to the consultation number, 02EAAZ00-2019-F-0045 in future correspondence concerning this project. Should you require further assistance or if you have any questions, please contact Shaula Hedwall (928-556-2118).

Greg Beatty for

Jeffrey A. Humphrey

cc (electronic):

Natural Resource Specialist, Grand Canyon National Park, Grand Canyon, AZ
Section 7 Coordinator, Grand Canyon National Park, Grand Canyon, AZ
Wildlife Program Manager, Grand Canyon National Park, Grand Canyon, AZ
Fisheries Biologist, Grand Canyon National Park, Grand Canyon, AZ
Chief of Science and Resource Management, Grand Canyon National Park, Grand Canyon, AZ
Chief, Habitat Branch, Arizona Game and Fish Department, Phoenix, AZ
Regional Supervisor, Arizona Game and Fish Department, Flagstaff, AZ
Assistant Field Supervisor, Fish and Wildlife Service, Flagstaff, AZ (Attn: Brian Wooldridge)
Field Supervisor, Fish and Wildlife Service, Phoenix, AZ (Attn: Jessica Gwinn)
Director, Cultural Resource Center, Chemehuevi Tribe, Havasu Lake, CA
Cultural Compliance Technician, Museum, Colorado River Indian Tribes, Parker, AZ
Tribal Secretary, Havasupai Tribe, Supai, AZ
Director, Hopi Cultural Preservation Office, Kykotsmovi, AZ
Director, Cultural Resources, Kaibab Band of Paiute Indians, Fredonia, AZ
Director, Zuni Heritage and Historic Preservation Office, Zuni, NM
Environmental Protection Officer, Environmental Quality Services, Western Regional Office, Bureau of Indian Affairs, Phoenix, AZ

TABLES AND FIGURES

Figure 1. Existing pipeline.

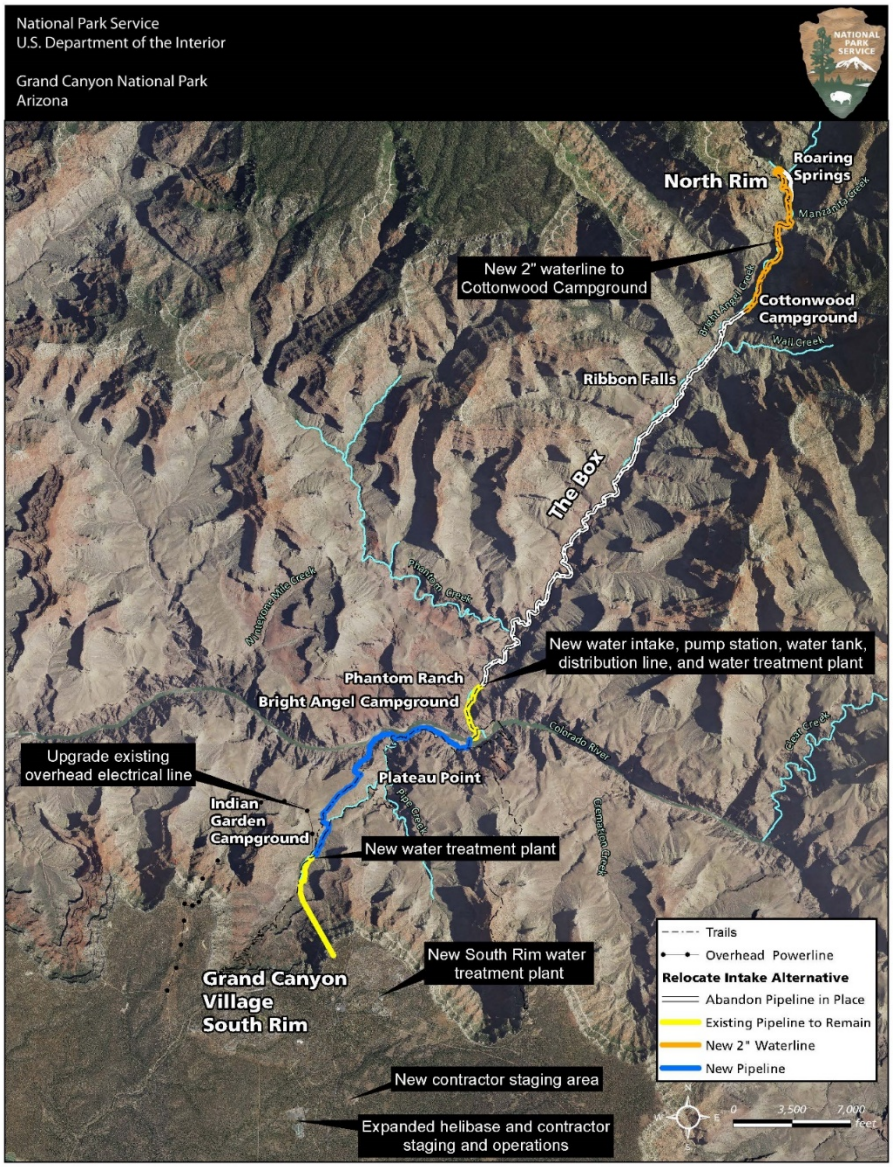

Figure 2. Project area.

LITERATURE CITED

Albrecht, B., R. Kegerries, J.M. Barkstedt, W.H. Brandenburg, A.L. Barkalow, S.P. Platania, M. McKinstry, B. Healy, J. Stolberg, and Z. Shattuck. 2014. Razorback sucker Xyrauchen texanus research and monitoring in the Colorado River inflow area of Lake Mead and the Lower Grand Canyon, Arizona and Nevada. Final report prepared by BIO-WEST, Inc., for U.S. Bureau of Reclamation, Upper Colorado Region, Salt Lake City, Utah.

Andersen, M.E. 2009. Status and trends of the Grand Canyon population of humpback chub. U.S. Geological Survey Fact Sheet 2009-3035, April.

Andersen, M.E., M.W. Ackerman, K.D. Hilwig, A.E. Fuller, and P.D. Alley. 2010. Evidence of young humpback chub overwintering in the mainstem Colorado River, Marble Canyon, Arizona, USA. The Open Fish Science Journal 2010 (3): 42–50.

Arizona Game and Fish Department (AGFD). 1996. The ecology of Grand Canyon backwaters. Cooperative Agreement Report (9 FC-40-07940) to Glen Canyon Environmental Studies, Flagstaff, Ariz.

Arizona Game and Fish Department (AGFD). 2001. *Gila cypha,* humpback chub. Heritage Data Management System, Phoenix, Arizona.

Coggins, L.G. Jr. 2008. Abundance trends and status of the Little Colorado River population of humpback chub; an update considering 1989-2006 data. U.S. Geological Survey Open-File Report 2007-1402.

Coggins, L.G. Jr. and C.J. Walters. 2009. Abundance trends and status of the Little Colorado River population of humpback chub: An update considering data from 1989–2008. Open-File Report 2009-1075, U.S. Geological Survey.

Converse, Y.K., C.P. Hawkins, and R.A. Valdez. 1998. Habitat relationships of sub adult humpback chub in the Colorado River through Grand Canyon: Spatial variability and implications of flow regulation. Regulated Rivers: Research and Management 14: 267–284.

Dodrill, M.J., C.B. Yackulic, B. Gerig, W.E. Pine, J. Korman, and C. Finch. 2015. Do management actions to restore rare habitat benefit native fish conservation? Distribution of juvenile native fish among shoreline habitats of the Colorado River. River Research and Applications. doi:10.1002/rra.2842.

Dodrill, M. 2018. Colorado River 30 Mile humpback chub detections. Personal Communication.

Donner, K.S. 2011. Secondary production rates, consumption rates, and trophic basis of production of fishes in the Colorado River, Grand Canyon, AZ: An assessment of potential competition for food. M.S. thesis, Idaho State University, Pocatello, Idaho, April.

Douglas, M.E. and P.C. Marsh. 1996. Population estimates/population movements of *Gila cypha*, an endangered cyprinid fish in the Grand Canyon region of Arizona. Copeia 1: 15–28.

Finney, S. 2006. Adult and juvenile humpback chub monitoring for the Yampa River population, 2003-2004. Final Report of U.S. Fish and Wildlife Service to Upper Colorado River Endangered Fish Recovery Program, Denver, Colorado.

Fuller, M.J. 2009. Lower Yampa River channel catfish and smallmouth bass control program, Colorado, 2001-2006. U.S. Fish and Wildlife Service, Vernal, Utah. 32pp.

Gorman, O.T. 1994. Habitat use by humpback chub, *Gila cypha*, in the Little Colorado River and other tributaries of the Colorado River. Prepared by U.S. Fish and Wildlife Service, Arizona Fisheries Resources Office, Flagstaff, Arizona, for U.S. Bureau of Reclamation, Glen Canyon Environmental Studies.

Gorman, O. and D.M. Stone. 1999. Ecology of spawning humpback chub, *Gila cypha*, in the Little Colorado River near Grand Canyon, Arizona. Environmental Biology of Fishes 55(1): 115-133.

Kaeding, L.R. and M.A. Zimmerman. 1983. Life history and ecology of the humpback chub in the Little Colorado and Colorado Rivers in Grand Canyon. Transactions of the American Fisheries Society 112: 577–594.

Kegerries, R., B. Albrecht, R. Rogers, E. Gilbert, W.H. Brandenburg, A.L. Barkalow, S.P. Platania, M. McKinstry, B. Healy, J. Stolberg, E. Omana Smith, C. Nelson, and H. Mohn. 2015. Razorback sucker (*Xyrauchen texanus*) research and monitoring in the Colorado River inflow area of Lake Mead and the Lower Grand Canyon, Arizona and Nevada. Final Report, prepared by BIO-WEST, Inc., for the U.S. Bureau of Reclamation, Upper Colorado Region, Salt Lake City, Utah.

Kegerries, R.B., B.C. Albrecht, E.I. Gilbert, W.H. Brandenburg, A.L. Barkalow, M.C. McKinstry, H.E. Mohn, B.D. Healy, J.R. Stolberg, E.C. Omana Smith, C.B. Nelson, and R.J. Rogers. 2017. Occurrence and Reproduction by Razorback Sucker (*Xyrauchen texanus*) in the Grand Canyon, Arizona. *The Southwestern Naturalist* 62(3):227-232.

National Park Service (NPS). 2013. Comprehensive fisheries management plan, environmental assessment, Grand Canyon National Park and Glen Canyon National Recreation Area, Coconino County, Arizona. U.S. Department of the Interior.

Persons, W.R., D.R. Van Haverbeke, and M.J. Dodrill. 2017. Colorado River fish monitoring in Grand Canyon, Arizona: 2002-14 humpback chub aggregations. U.S. Geological Survey Open-File Report 2016-1177, 43 pp.

Pillow, M.J., D.R. Van Haverbeke, and K.L. Young. 2018. Monitoring humpback chub in the Colorado River, Grand Canyon – August 19 – September 4, 2017. USFWS Document No. USFWS-AZFWCO-18-05.

Pine W.E. III,, B. Healy, E. Omana Smith, M. Trammell, D. Speas, R. Valdez, M. Yard, C. Walters, R. Ahrens, R. Van Haverbeke, D. Stone, and W. Wilson. 2013. An individual based model for population viability analysis of humpback chub in Grand Canyon, North American Journal of Fisheries Management 33(3): 626-641.

Robinson, A. T., R. W. Clarkson, and R. E. Forrest. 1998. Dispersal of larval fishes in a regulated river tributary. Transactions of the American Fisheries Society 127(5):772–786.

Spurgeon, J.J., C.P. Paukert, B.D. Healy, M.T. Trammell, D.W. Speas, and E. Omana-Smith. 2015. Translocation of humpback chub into tributary streams of the Colorado River: Implications for conservation of large-river fishes. Transactions of the American Fisheries Society 144(3): 502–514.

U.S. Fish and Wildlife Service (Service). 1990. Humpback chub recovery plan. U.S. Fish and Wildlife Service, Denver, Colorado. 43pp.

U.S. Fish and Wildlife Service (Service). 1994. Final rule, determination of critical habitat for the Colorado River endangered fishes: razorback sucker, Colorado squawfish, humpback chub, and bonytail chub. Federal Register 59: 13374-13400.

U.S. Fish and Wildlife Service (Service). 2002. Razorback sucker (*Xyrauchen texanus*) recovery goals: Amendment and supplement to the razorback sucker recovery plan. Mountain-Prairie Region (6), Denver, Colorado.

U.S. Fish and Wildlife Service (Service). 2011. Biological and conference opinion on the wildlife and sport fish restoration funding of Arizona Game and Fish Department's statewide urban fisheries stocking program for 2011-2021. Consultation 22410-2008-F- 4486. Arizona Ecological Services Office, Phoenix, Arizona.

U.S. Fish and Wildlife Service. 2017. Species status assessment for the humpback chub (*Gila cypha*). U.S. Fish and Wildlife Service, Mountain-Prairie Region (6), Denver, CO. 236 pages.

U.S. Fish and Wildlife Service. 2018. Humpback chub (*Gila cypha*) 5-year review: Summary and evaluation. U.S. Fish and Wildlife Service, Mountain-Prairie Region (6), Denver, CO. 15 pages.

Valdez, R.A. and G.H. Clemmer. 1982. Life history and prospects for recovery of the humpback chub and bonytail chub, pp. 109–119 *In* Fishes of the Upper Colorado River System: Present and Future, W.H. Miller et al. (eds.), American Fisheries Society, Western Division, Bethesda, Maryland.

Valdez, R.A. and W.J. Masslich. 1999. Evidence of reproduction of humpback chub in a warm spring of the Colorado River in Grand Canyon, Arizona. The Southwestern Naturalist 44(3): 384–387.

Valdez, R.A. and R.J. Ryel. 1995. Life history and ecology of the humpback chub (*Gila cypha*), in the Colorado River, Grand Canyon, Arizona: Final Report.

Valdez and Ryel 1997. Life history and ecology of the humpback chub in the Colorado River in Grand Canyon, Arizona, pp. 3–31 *In* Proceedings of the Third Biennial Conference of Research on the Colorado Plateau, C. Van Riper III and E. T. Deshler (eds.).

Van Haverbeke, D.R., D.M. Stone, and M.J. Pillow. 2013. Long-term monitoring of an endangered desert fish and factors influencing population dynamics. Journal of Fish and Wildlife Management 4(1): 163–177.

Van Haverbeke, D.R., D.M. Stone, M.J. Dodrill, K.L. Young, and M.J. Pillow. 2018. Population expansion of humpback chub in western Grand Canyon and hypothesized mechanisms. Southwestern Naturalist 62(4): 285–292.

Yackulic, C.B., M.D. Yard, J. Korman, and D.R. Van Haverbeke. 2014. A quantitative life history of endangered humpback chub that spawn in the Little Colorado River: Variation in movement growth and survival. Ecology and Evolution 4(7): 1006–1018.

Young, K. 2018. Colorado River 30 Mile humpback chub detections. Personal Communication.

APPENDIX A: CONSERVATON MEASURES

The NPS lists these conservation measures in the BA and in the project Environmental Assessment (EA). We have modified the wording to combine some similar items and provide for clarity, but we did not change the meaning of any of these measures. However, we understand that the NPS will provide the conservation measures, as written in the BA and EA.to project staff and/or contractors.

- The project lead will contact the GRCA's wildlife program manager concerning the presence/absence of threatened or endangered species using nearby cliffs/canyons. GRCA's wildlife program manager will be contacted a minimum of two weeks prior to project commencement, and monthly throughout the project, to determine if additional avoidance measures are needed due to the locations of sensitive species.

- Pilots will minimize aircraft use along the rim and cliffs to the greatest extent possible.

- Because condors are less active in the morning hours, pilots will be encouraged to conduct flights prior to 1000 hours, when possible.

- Helicopters will stay at least one mile away from active condor nest locations and vicinities unless there are human safety concerns. The active nesting season is February 1 through September 30. GRCA may modify these dates based on the most current information regarding condor nesting activities (e.g., roosting and fledging) and coordination with their wildlife program manager, Section 7 coordinator, and the Service.

- Helicopters will stay at least 1,200 ft from condors in the air or on the ground/cliffs unless safety concerns override this restriction. If airborne condors approach aircraft, aircraft will give up airspace to the extent possible, as long as this action does not jeopardize human safety.

- If a condor arrives at the site, then work will cease until it leaves on its own or until permitted personnel employ techniques that result in the individual condor leaving the area.

- GRCA will not use light and heavy construction equipment within 0.5 mile from active condor nests.

- The work site will be cleaned up at the end of each day the work is being conducted (e.g., trash disposed of and scrap materials picked up) to minimize the likelihood of condors and other wildlife visiting the project site. GRCA staff may conduct periodic spot checks to ensure project staff are implementing adequate project clean-up measures.

- NPS employees and contractors will use GRCA's Spill Response Plan to prevent potential poisoning of condors and other wildlife, as well as soil and water contamination.

- Project staff will avoid interaction with condors and immediately report condor sightings/visits to GRCA wildlife program staff or park dispatch.

- Work on the existing aboveground electrical line between the South Rim and Indian Garden, including associated helicopter flights, will occur outside the condor (February 1 through September 30) and Mexican spotted owl (March 1 through August 31) breeding seasons. GRCA, in coordination with the Service, may modify these dates based on the most current information regarding condor and Mexican spotted owl-breeding activities (roosting, fledging, etc.).

- In order to minimize noise disturbance within Mexican spotted owl Protected Activity Centers (PACs) during the Mexican spotted owl breeding season (March 1 through August 31), light helicopters will remain at least 1,200 ft from the boundary of any PAC. This distance will increase to 2,000 ft for an S-64 Skycrane (or equivalent helicopter), and to 2,400 ft for a CH-47 Chinook.

- Light and heavy construction equipment will not be used within 0.5 mile from Mexican spotted owl nest/roost sites during the owl breeding season (March 1 to August 31)

- In general, GRCA is not permitting night work as part of this project. However, there may be some instances when crews mobilize to/from the work site at dawn or dusk, or may need to finish a task at the end of the day. GRCA will permit this work only if it is short term, requires minimal equipment, and will not occur within 0.5 mile of Mexican spotted owl PAC boundaries

- Project staff shall comply with the Migratory Bird Treaty Act [16 USC 703]. Any active bird nest shall be left in place and undisturbed until the young hatch and depart. Project staff will avoid vegetation clearing to the greatest extent possible during the primary nesting season (early April through mid-August). If vegetation clearing must occur within the primary nesting season then a qualified biologist will conduct surveys for active bird nests. GRCA will only allow vegetation clearing within the primary nesting season after the qualified biologist determines that no active bird nests are present.

- Project staff will take care not to disturb any wildlife species (reptiles, migratory birds, raptors, or bats) found nesting, hibernating, estivating, or otherwise living in, or immediately nearby, worksites.

- Project staff will not feed or approach wildlife.

- GRCA will have tightly covered trash and recycling receptacles and all dumpsters will be wildlife proof certified.

- Helicopters and fixed wing aircraft will avoid operating within 1,000 ft of eagle nests during the breeding season (currently there are no known eagle nests in Grand Canyon National Park). GRCA will minimize potentially disruptive activities in the eagles' direct flight path between their nest and roost sites and important foraging areas. Regardless of

season, aircraft corridors will be located no closer than 1,000 ft vertical or horizontal distance from communal eagle roost sites, where possible.

- To reduce noise effects to bighorn sheep, helicopters will remain at least 1,500 ft above ground level and maintain that distance while in the canyon, except during takeoff, landing or dropping off or picking up sling loads.

- Following the completion of the project, NPS staff will monitor Bright Angel and Garden Creeks for changes in creek morphology that may directly affect habitat availability for amphibians and bats.

- Project staff will avoid disturbance of northern goshawks during the breeding season by prohibiting vegetation removal and subsequent construction activity from the proposed contractor equipment and storage area from April 1 through July 31. If vegetation removal is required during this time, a qualified biologist will survey for goshawk nests. If the biologist locates a nest, construction activity and vegetation removal will not occur within a 0.5- mile radius of the nest until the birds have fledged.

- If project staff use erosion netting, they will use biodegradable matting with a large-diameter natural fiber to prevent entrapment of wildlife.

- GRCA wildlife biologists will train contractor staff, at the preconstruction meeting, to avoid disturbance to any wildlife species (reptiles, migratory birds, raptors, or bats) found nesting, hibernating, estivating, or otherwise living in, or immediately nearby, worksites.

- If the project creates open trenches or holes, project staff must either use ramps or cover the trench/hole to prevent animals from falling into them. If ramps are used, staff should place ramps every 20 to 50 ft with a slope less than 45°.

- Before removing trees on the South Rim, GRCA will conduct bat surveys to identify which bat species are present. To protect tree roosting bat species, tree removal on the South Rim will occur only during the winter months (November through February).

APPENDIX B: CONCURRENCES

This appendix contains our concurrences with your "may affect, not likely to adversely affect" determinations for the threatened Mexican spotted owl (*Strix occidentalis lucida*), the threatened California condor (*Gymnogyps californianus*), and the endangered razorback sucker (*Xyrauchen texanus*) and designated critical habitat.

Mexican spotted owl

The NPS and Service have designated several Mexican spotted owl protected activity centers (PACs) within or near the action area. At the southern end of the action area, the TCWL passes through the Bright Angel PAC between Indian Garden and the South Rim, with two additional PACs west of Indian Garden. Biologists have documented Mexican spotted owls foraging at Indian Garden, likely drawn to the riparian habitat and abundance of small mammals adjacent to campsites and facilities.

- Helicopters will remain at least 1,200 feet from, or at least 1,200 feet above ground level of, any designated Mexican spotted owl protected activity center. Therefore, use of the helicopter will result in insignificant noise effects to owls occupying habitat beneath the fly routes.

- The TCWL passes through the Bright Angel PAC between Indian Garden and the South Rim; however, NPS will not be replacing this section of the pipeline and no project work will occur within the PAC boundaries. The Bright Angel PAC boundary is approximately 0.28 mile and the nest/roost site is 0.64 mile away from the action area. Based upon the distances to the PAC and nest/roost area, we do not expect any noise disturbance to occur to owls associated with this PAC. The next closest PAC to Indian Garden is Horn Creek, and although the PAC boundary is 0.45 mile from the action area, it is at the top of the large Battleship Ridge within the Horn Creek drainage. Therefore, with the Battleship topography formation between the action area and the Horn Creek PAC, TCWL noise and visual disturbance to Mexican spotted owls will be insignificant.

- Work to upgrade the existing electrical line between the South Rim and Indian Garden will occur within the Horn Creek Mexican spotted owl PAC. To avoid disturbance to breeding owls, this work, including associated helicopter flights, will not occur during the Mexican spotted owl-breeding season (March 1 through August 31).

- The Manzanita Creek PAC boundary is 0.37 miles from one section of the North Kaibab Trail. The distance of North Kaibab Trail to the most likely owl nest/roost areas within the Manzanita Creek PAC ranges from 0.5 to 1.3 miles from the trail. Based on these distances and the topography of the area, potential disturbance from the proposed action will be insignificant and discountable to owls associated with the Manzanita Creek PAC.

- There are two additional PACs, Wall and Trancept, that are 0.47 mile and 0.6 mile from the action area, respectively. Based on these distances and the topography of the area,

potential disturbance from the proposed action will be insignificant and discountable to owls associated with the Wall and Trancept PACs.

- There will be no effect to owl nest/roost habitat from the proposed action.

California condor

The nearest documented condor nest to the TCWL was within the Indian Garden corridor (Garden Creek drainage) in 2012. Most nesting attempts in proximity to Indian Garden have historically occurred on the west side of the Battleship, outside of the Garden Creek drainage. In the past, biologists have located five nests within one mile of the TCWL action area. There are four historic condor nests west of the Battleship area. These nests are within 0.5 mile of the existing overhead electrical line that NPS will upgrade as part of this project. General condor use, not necessarily associated with breeding activity, is high at Indian Garden and South Rim during much of the year, with a peak in activity during the breeding months.

- Implementation of the conservation measures included in the proposed action for the project will significantly minimize the potential disturbance of, and adverse interaction of helicopters with condors. Therefore, the effects of the increased helicopter flights because of this project will be insignificant to condors.

- Implementation of the conservation measures included in the proposed action for the project will significantly minimize the potential disturbance of, and adverse effects of noise and human presence, on condors that may occur in the area. Therefore, the effects of construction activity will be discountable to condors.

Razorback sucker

Within the Grand Canyon, it is likely that razorback sucker historically occurred throughout the Colorado River to Lake Mead (after Hoover Dam construction). Until recently, the last razorback sucker collected from the Grand Canyon (RM 39.3) was in 1993. Recent efforts to better understand the use of the western Grand Canyon by razorback sucker has revealed that the species is still present, but likely rare, in the Colorado River within GRCA.

- Razorback suckers do not occur in Bright Angel Creek and they are exceedingly rare in the Colorado River within the action area. Therefore, we do not expect any effects to razorback sucker from the surface water intake. The species must be present in sufficient numbers to reproduce in order for suckers small enough (0.9-inch or 23 mm) to be susceptible to entrainment and impingement to occur and survey data indicates that razorback suckers are not reproducing in the action area.

- Ground disturbance from construction and staging activities within the Bright Angel Creek drainage will expose soils to erosion, which could result in some small level of increased sedimentation and turbidity in Bright Angel Creek. However, best management practices to control erosion and sediment will prevent runoff and sediment discharges into the creek. In addition, project staff will recontour disturbed areas outside

of designated trails and structure footprints to match existing grades and revegetate the areas with native species to provide long-term soil stabilization following construction. Therefore, there will be insignificant and discountable effects to razorback sucker critical habitat in the Colorado River

- As described for the humpback chub, NPS fisheries staff will monitor conditions in Bright Angel Creek, and if monitoring indicates significant changes in temperature, and brown trout abundance increases in the creek, NPS will implement mechanical removal of nonnative fish. Therefore, the effects to the suitability of the physical habitat conditions for razorback sucker critical habitat in the Colorado River in the action area will be insignificant and discountable.