United States Department of the Interior

Fish and Wildlife Service
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In reply refer to:
AESO/SE
02EAAZ00-2018-F-1161

July 15, 2019

Ms. Laura Jo West, Forest Supervisor
Coconino National Forest
1824 South Thompson Street
Flagstaff, Arizona 86001-3600

RE: Oak Creek Watershed Restoration Project

Dear Ms. West:

Thank you for your request for formal consultation/conference with the U.S. Fish and Wildlife Service (FWS) pursuant to section 7 of the Endangered Species Act of 1973 (16 U.S.C. § 1531-1544), as amended (Act). We received your February 12 request, on February 13, 2019. At issue are effects that may result from the proposed Oak Creek Watershed Restoration Project located in Coconino County, Arizona. The proposed action may affect the threatened western yellow-billed cuckoo (*Coccyzus americanus*), the northern Mexican gartersnake (*Thamnophis eques megalops*) and its proposed critical habitat, the endangered Gila chub (*Gila intermedia*) and its critical habitat, the endangered Gila topminnow (*Poeciliopsis occidentalis*), and the endangered spikedace (*Meda fulgida*).

In your letter, you requested our concurrence that the proposed action "may affect, but is not likely to adversely affect" the threatened Mexican spotted owl (*Strix occidentalis lucida*), the threatened narrow-headed gartersnake (*Thamnophis rufipunctatus*), the Gila trout (*Oncorhynchus gilae*), spikedace critical habitat, and loach minnow (*Tiaroga cobitis*) critical habitat. We concur with your determinations and include our rationales in Appendix A.

You also concluded there would be "no effect" to the endangered southwestern willow flycatcher (*Empidonax traillii extimus*) and its critical habitat, the endangered loach minnow, Mexican spotted owl critical habitat, and proposed critical habitat for the narrow-headed gartersnake and yellow-billed cuckoo. "No effect" determinations do not require review from the FWS; therefore, we will not address these species and/or critical habitats further in this document.

We based this biological opinion (BiOp) on information provided in the February 2019 biological assessment (BA), telephone conversations, 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, habitat restoration activities and its effects, or on other subjects considered in this opinion. A complete record of this consultation is on file at this office.

Consultation History

- February 13, 2019: The Forest Service initiated formal consultation.
- February 19, 2019: We responded with a 30-day letter.
- June 24, 2019: We sent the draft BO to the Forest Service for review.
- July 2, 2019: We received your email approving the draft BiOp.

BIOLOGICAL OPINION

DESCRIPTION OF THE PROPOSED ACTION

The Arizona Department of Environmental Quality (ADEQ) many years ago listed Oak Creek as impaired with exceedances in *E. coli* likely caused by excessive recreational swimming activities and poor sanitation facilities, leaky septic systems and animal defecation. Recreation demand is extremely high along Oak Creek and its tributaries and the high density of roads and trails have resulted in degrading riparian and aquatic species habitat, reduced soil and water quality conditions threatening overall watershed function.

The Forest Service designed the Oak Creek Watershed Restoration Project (hereafter referred to as "the project") to reduce or eliminate ongoing detrimental recreation effects, and restore watershed condition including water quality, aquatic biota, aquatic habitat, and riparian vegetation. In addition, the project will reduce the adverse impacts of recreational activities that are threatening biological, physical and social resource values of Oak Creek, while still providing for safe and efficient public recreational access. The project is located in the upper, middle, and lower Oak Creek watersheds in Coconino County (Figure 1) on National Forest System (NFS) lands managed by the Coconino National Forest.

The Forest Service selected nine activities (see Figure 1 and Table 1) from the Oak Creek Watershed Restoration Action Plan to be included as part of this project. These activities would improve the watershed conditions, wildlife habitat, and water quality. All activities include the use of best management practices (BMPs, Appendix C) to reduce short-term effects of project implementation. For a more detailed description of the projects, please see Appendix B.

Table 1. Proposed activities for the project.

Activity Number	Name	Brief Description
1	Oak Creek Canyon unauthorized roadside parking planning	Restore and rehabilitate unauthorized parking and unauthorized trails in locations along State Route 89A in Upper Oak Creek Canyon. Approximately half of current areas used for unauthorized parking may be restored and the first 100 feet of associated unauthorized trails rehabilitated. Includes use of curbs, gutters, guardrails, fencing, boulders, signage, or some combination. Requires close collaboration with Arizona Department of Transportation (ADOT) to ensure adequate vehicle pullouts for those with disabilities and turnarounds for snow plows.

Activity Number	Name	Brief Description
2	End of Chavez Ranch Road day-use site planning and toilet installation	Develop this area as a low-effect, day-use site to reduce negative effects from unmanaged recreation, including toilet installation outside the 100-year floodplain, parking lot improvement (shrink and grade), gate installation for maintenance access along the Chavez ditch, structures installation to eliminate roadside parking, designation of sustainable access to the bedrock section of Oak Creek, and rehabilitation of disturbed areas. Design a retention basin to accommodate runoff from road entrance, and install a gate for ditch access.
3	Angel Valley 89B Oak Creek day-use site and toilet installation	Design two designated parking areas, install a toilet outside the 100-year floodplain, and restore areas adversely effected by unmanaged vehicle and camping uses. Gate the section of road beyond the parking area and close to public use. Retain road for administrative and permittee access, as well as foot access to Oak Creek.
4	Habitat Improvement for narrow-headed gartersnakes.	Provide access to Oak Creek and West Fork of Oak Creek in hardened, rock-armored locations. Decommission unauthorized trails in the confluence and proposed critical habitat for gartersnake. Remove the 71C trail from official trail system and maps.
5	Spring Creek Aquatic Organism Passage (AOP) on Willow Point road crossing	Remove existing structure at Spring Creek crossing of Forest Road 796. Construct aquatic organism passage (inset ford, low-water bridge, or full spanning bridge). Realign road and improve road drainage. The Forest Service that less than 2 acres of aquatic/riparian habitat would be disturbed, and less than 100 yards of Spring Creek itself.
6	Pet-waste stations near perennial water and trailheads	Install additional pet-waste stations at the following trailheads: West Fork/Call of the Canyon, Bootlegger, Cave Springs, Manzanita, Encinoso, Banjo Bill, Pine Flat, Half Way, Huckaby trailhead, Crescent Moon day-use area, Chavez Campground, Bell Rock, Bell Trail, Cathedral Rock, Chapel Cross, and Chavez Ranch Road.
7	Protection and riparian restoration at Molina homestead	Convert the end of Forest Road 9845 beyond the fence into a trail and realign trail to allow access to Oak Creek without going through Molina homestead site. Restore current road and seed with native vegetation.
8	Lower Oak Creek unauthorized motorized trail closure and restoration	Close and restore motorized unauthorized roads leading across Oak Creek from Forest Road 9813 to Forest Road 119B. Roads may be restored by augmenting existing fencing or by ripping, seeding, planting, and mulching. Trees and shrubs may be cut and used to close the road.
9	Road decommissioning in the Oak Creek watershed	Decommission approximately 19 miles of roads by placing boulders, using vegetative slash, camouflaging entrance points, ripping, and seeding. Use gap fencing or gates to prevent public use on administrative use only Forest Roads. This may include closing some roads, which are currently not designated for public motor vehicle use.

The activities listed in Table 1 are mostly minor actions the Forest Service is implementing to improve conditions in the action area. Although these actions may involve heavy machinery or and ground-disturbance, their footprint is relatively small. The one exception to this is the Spring Creek AOP or low-water crossing replacement (Activity 5). The vehicle crossing on Spring Creek at Willow Point is currently affecting the geomorphic and ecological function of the stream and riparian area. The stream channel at the crossing is much wider and shallower than the channel above and below the crossing, and provides only poor aquatic and near-stream habitat. Therefore, the project proposes to improve habitat conditions here by removing the low-water crossing and replacing it with a structure that improves the habitat at the site; however, this will be a major construction activity.

The Forest Service proposes to restore the AOP at the Spring Creek site through a process of stream simulation design. In stream simulation, engineers use the channel geometry (width, depth, slope, etc.) and bed characteristics (substrate texture, grade control, etc.) from a reference reach to design the channel at the crossing. A key element of stream simulation is to maintain the reference channel width in the crossing structure. This design minimizes increased velocity and hydraulics and supports natural bedload transport processes and aquatic organism passage. It is anticipated that an arched or box culvert or bridge would be constructed at the site. At this time (summer 2018), the concrete crossing at Spring Creek is expected to be replaced by a structure that will eliminate vehicle traffic within the stream channel, and allow for easier passage of native aquatic species as compared to the current condition (shallow water, concrete). In addition, the Forest Service would modify the approach roads on either side of Spring Creek to improve drainage and reduce sediment load into the creek. The Forest Service is currently considering multiple designs, such as a low-water bridge, full-spanning bridge, or a culvert design (arch or box) that allows for natural substrate. They will select the final option in 2019, but we expect similar effects to the creek, species, and adjacent riparian area, regardless of the option they select.

Conservation Measures

The Forest Service developed the following conservation measures and project design features to alleviate effects to federally listed species during implementation of the project. In addition, the Forest Service identified Best Management Practices to control water pollution (see Appendix C in BA), which will also benefit aquatic dependent wildlife species.

- Any vegetation removed for use in restoration activities (obliteration of roads and social trails) will be limited to juniper, chaparral shrub species, catclaw, or acacia. All species of evergreens (other than juniper), Gambel oak, hardwoods (including riparian deciduous species), and mesquite adjacent to riparian areas will not be removed.

- If surveys indicate that southwestern willow flycatchers are present, the Forest Service will not allow operation of heavy machinery within 0.25 mile (400 meters) of occupied habitat during the breeding season (May 1 – August 31). If the Forest Service cannot complete protocol surveys, they will consider potential habitat occupied and active, and breeding season restrictions will apply.

- If surveys indicate yellow-billed cuckoos are present in or near all activity areas except Activity 5 (Spring Creek AOP), heavy machinery within 0.25 mile (400 meters) of occupied habitat would not operate during the breeding season (May 15 – September 30). If the Forest Service cannot complete protocol surveys, they will consider potential habitat occupied and active, and breeding season restrictions will apply.

- The Forest Service will conduct surveys to determine if Mexican spotted owl protected activity centers (PACs) are nesting prior to activities requiring the use of heavy machinery. If the Forest Service cannot complete protocol surveys, they will assume that owls are present and possibly nesting in the PAC. If Mexican spotted owl PACs are active or if surveys are not conducted, heavy machinery would not operate within 0.25 mile (400 meters) of the PAC in the canyon during the breeding season (March 1 to August 31). If there are topographic buffers to noise, this distance may be less.

- As per the Conservation Assessment and Strategy for The Bald Eagle in Arizona (Driscoll et. al. 2006), restoration activities involving heavy machinery would not operate within 1000 feet (ft) (305 m) of an active bald eagle nest during the breeding season (December 1 – June 30).

- Immediately prior to conducting ground disturbing activities within proposed gartersnake critical habitat, the construction footprint and surrounding area will be searched for narrow-headed and northern Mexican gartersnakes. Surveyor requirements include:
    - Prior experience and FWS/Arizona Game and Fish Department (AGFD) permits to conduct surveys for these two species.
    - Report observations (date, time, behavior and a photo if possible) of either narrow-headed or Mexican gartersnakes on or near work sites to FWS (Shaula Hedwall and Jeff Servoss), AGFD (Tom Jones and Mason Ryan), and the Forest Service (Janie Agyagos).
    - Avoid handling gartersnakes unless they are in imminent risk of injury or are injured.

- Monitor project-related sediment using standard Coconino National Forest protocol, or another accepted methodology (e.g., Forest Service Southwestern Region or state of Arizona).

- Specific to Activity 5 (Spring Creek AOP):
    - Install block nets of the appropriate mesh size at the upstream and downstream extents of this site; and
    - Working with FWS and AGFD, use appropriate methods (e.g., electrofishing, seines, minnow traps) to capture and move fishes from the disturbance area prior to instream/near-stream activities.

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 includes each of the nine activity areas on and adjacent to Oak Creek (Activities 1-4, 6-9) and Spring Creek (Activity 5). The areas immediately upstream and downstream of these areas (see Figure 1), may be included if they are affected by the proposed project. The spatial extent for effects (direct, indirect, and cumulative) to aquatic biological resources is riparian and aquatic habitat within the Oak Creek drainage, from the confluence with the Verde River to approximately two miles upstream of the confluence of West Fork Oak Creek. This includes three watersheds: Lower Oak Creek, Middle Oak Creek, and Upper Oak Creek. The majority of sites are located along/near Oak Creek; two sites along tributaries to Oak Creek include the stream crossing of Spring Creek (Activity 5), and the lower 0.5-mile of West Fork Oak Creek (Activity 4).

For this consultation, we define short-term effects as those that occur at the time of project implementation, and may continue for up to two years. Long-term effects could result from three to 10 years post-project.

STATUS OF THE SPECIES AND CRITICAL HABITAT

The information in this section summarizes the rangewide status of each species that we considered in this BiOp. 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.

Gila chub

The FWS listed the Gila chub as endangered with critical habitat in 2005 (USFWS 2005, 70 FR 66664). Primary threats to Gila chub, such as predation by and competition with non-native organisms, and secondary threats identified as habitat alteration, destruction, and fragmentation are all factors identified in the final rule that contribute to the consideration that the Gila chub is endangered or likely to become extinct throughout all or a significant portion of its range.

Scientists formerly considered Gila chub to be a separate taxonomic entity; however, it is now recognized, along with headwater chub and roundtail chub, as a single taxonomic species – the roundtail chub (*Gila robusta*) (USFWS 2017, 82 FR 16981). We intend to reevaluate the current endangered status of the Gila chub. However, until we complete this evaluation and publish potential proposed and final rules to delist the Gila chub, its legal status remains as an endangered species with designated critical habitat. Our effects analysis in this BiOp reflects the fish's current legal status. Moreover, because we have not completed a range-wide status assessment of *Gila robusta*, we briefly provide below general life history and habitat information about the entity formerly known as *Gila intermedia*.

Gila chub is a member of the roundtail chub (*Gila robusta*) complex that also includes headwater chub (*Gila nigra*). The roundtail chub complex has had a turbulent and controversial taxonomic history that includes an assortment of classification schemes. Much of the debate has centered on whether the complex represents a number of nominal species or subspecies of Gila robusta. Minckley (1973) contains a nomenclatorial synonymy for Gila chub.

Gila chub is a thick-bodied species, chunky in aspect (Rinne 1969, 1976, Minckley 1973, DeMarais 1986, Minckley and DeMarais 2000, Minckley and Marsh 2009). Females can reach 250 mm in total length (TL), but males rarely exceed 150 mm (Minckley 1969, 1973, Rinne and Minckley 1991, Schultz and Bonar 2006). Body coloration is typically dark overall, sometimes black or with diffuse, longitudinal stripes, with a lighter belly speckled with gray. The lateral scales often appear darkly outlined and lighter in the center. Breeding males, and to a lesser extent females, develop red or orange on lower parts of the head and body and on bases of the pectoral, pelvic and anal fins.

While most reproductive activity by Gila chub occurs during late spring and summer, in some habitats it may extend from late winter through early autumn (Minckley 1973). Schultz and Bonar (2006) data from Bonita and Cienega creeks suggested that multiple spawning attempts per year per individual were likely, with a major spawn in late February to early March followed by a secondary spawn in autumn after monsoon rains. Reproductive activities in Monkey Spring (now extirpated) reportedly occurred for longer periods than in other populations, as breeding appeared to last virtually all season (Minckley 1969, 1973, 1985). Bestgen (1985) concluded that temperature was the most significant environmental factor triggering spawning. Spawning probably occurs over beds of submerged aquatic vegetation or root wads. Minckley (1973) observed a single female closely followed by several males over a bed of aquatic vegetation in a pond. Nelson (1993) also suspected deep pools with vegetation in Cienega Creek were important sites for spawning but did not witness any associated behavior near submerged vegetation.

Gila chub is considered a habitat generalist (Schultz and Bonar 2006), and commonly inhabits pools in smaller steams, cienegas, and artificial impoundments throughout its range in the Gila River basin at elevations between 609 and 1,676 m (2,000 to 5,500 ft) (Miller 1946, Minckley 1973, Rinne 1975, Weedman *et al.* 1996). Gila chub is a highly secretive species, remaining near cover including undercut banks, terrestrial vegetation, boulders, root wads, fallen logs, and thick overhanging or aquatic vegetation in deeper waters, especially pools (Rinne and Minckley 1991; Nelson 1993, Weedman *et al.* 1996). Recurrent flooding and a natural hydrograph are important in maintaining Gila chub habitats and in helping the species maintain a competitive edge over invading nonnative aquatic species (Propst *et al.* 1986, Minckley and Meffe 1987). They can survive in larger steam habitats, such as the San Carlos River, and artificial habitats, like the Buckeye Canal (Minckley 1985, Rinne and Minckley 1991, Stout *et al.* 1970, Rinne 1976), and they interact with spring and small-stream fishes regularly (Meffe 1985).

Young Gila chub are active throughout the day and feed on small invertebrates as well as aquatic vegetation (especially filamentous algae) and organic debris (Bestgen 1985, Griffith and Tiersch 1989, Rinne and Minckley 1991). Adult Gila chub are crepuscular feeders, consuming a variety of terrestrial and aquatic invertebrates, and fishes (Griffith and Tiersch 1989, Rinne and Minckley 1991). Benthic feeding may also occur, as suggested by presence of small gravel particles.

Gila chub is known to be associated with speckled dace (*Rhinichthys osculus*), longfin dace (*Agosia chrysogaster*), desert sucker (*Pantosteus clarki*), Sonora sucker (*Catostomus insignis*),

Gila topminnow (*Poeciliopsis occidentalis*), desert pupfish (*Cyprinodon macularius*), and Monkey Spring pupfish (*Cyprinodon arcuatus*). Prior to the widespread introduction of nonnative fishes, Gila chub was probably the most predatory fish within the habitats it occupied. In the presence of the nonnative green sunfish (*Lepomis cyanellus*) in lower Sabino Creek, Arizona, Gila chub failed to recruit young (Dudley and Matter 2000). Direct predation by green sunfish on young Gila chub was the acknowledged cause of this observation.

Historically, surveyors have recorded Gila chub from nearly 50 rivers, streams and spring-fed tributaries throughout the Gila River basin in southwestern New Mexico, central and southeastern Arizona, and northern Sonora, Mexico (Miller and Lowe 1967, Rinne and Minckley 1970, Minckley 1973, Rinne 1976, DeMarais 1986, Sublette et al. 1990, Weedman *et al.* 1996). Historically, it is thought that Gila chub distribution was likely more expansive in distribution (Hendrickson and Minckley 1984, Minckley 1985, Rinne and Minckley 1991). Gila chub now occupies an estimated 10 to 15 percent of its historical range (Weedman *et al.* 1996, USFWS 2005) and approximately 25 of these current localities are considered occupied, but all are small, isolated and face one or more threats (Weedman *et al.* 1996, USFWS 2005). The status of several of these populations is uncertain, and the number of localities currently occupied may not persist if they lose connectivity to core populations.

The Agua Fria, Verde, Santa Cruz, San Pedro, and upper Gila are the five subbasins in which Gila chub occur. The Oak Creek Watershed Restoration Project is within the Verde subbasin drainage. The Verde mainstem downstream from Sullivan Lake is mostly perennial to its confluence, and several large tributary systems contribute perennial flows, primarily from the eastern portion of the drainage. Gila chub populations known from four remnant sites within the Verde subbasin: Red Tank Draw, Spring Creek, Walker Creek, and Williamson Valley Wash. The FWS considers the historically occupied Big Chino Wash extirpated; it is likely that Gila chub no longer occur in Williamson Valley Wash as well. However, Red Tank Draw, Spring Creek, and Walker Creek continue to support populations of chub. Red Tank Draw contains many nonnative fishes, but AGFD conducts regular mechanical removal of nonnative fish and the Bureau of Reclamation built a barrier on Spring Creek to protect the chub from green sunfish.

Critical Habitat

The FWS designated critical habitat for Gila chub on approximately 160.3 miles of stream in Arizona and New Mexico that includes cienegas, headwaters, spring-fed streams, perennial streams, and spring-fed ponds. Critical habitat includes the area of bankfull width plus 300 feet on either side of the banks. The bankfull width is the width of the stream or river at bankfull discharge (i.e., the flow at which water begins to leave the channel and move into the floodplain) (Rosgen 1996, USFWS 2005). The FWS identified seven areas or river units of critical habitat (67 FR 51948). PCEs identified for the Gila chub are:

1. Perennial pools, areas of higher velocity between pools, and areas of shallow water among plants or eddies all found in headwaters, springs, and cienegas, generally of smaller tributaries.
2. Water temperatures for spawning ranging from 63°F to 75 °F, and seasonally appropriate temperatures for all life stages (varying from about 50°F to 86 °F.

3. Water quality with reduced levels of contaminants, including excessive levels of sediments adverse to Gila chub health, and adequate levels of pH (e.g. ranging from 6.5 to 9.5), dissolved oxygen (i.e., ranging from 3.0 ppm to 10.0 ppm) and conductivity (i.e., 100 mmhos to 1,000 mmhos).
4. Prey base consisting of invertebrates (i.e., aquatic and terrestrial insects) and aquatic plants (i.e., diatoms and filamentous green algae).
5. Sufficient cover consisting of downed logs in the water channel, submerged aquatic vegetation, submerged large tree root wads, undercut banks with sufficient overhanging vegetation, large rocks and boulders with overhangs, a high degree of stream bank stability, and a healthy, intact riparian vegetation community.
6. Habitat devoid of non-native aquatic species detrimental to Gila chub or habitat in which detrimental nonnative species are kept at a level that allows Gila chub to continue to survive and reproduce.
7. Streams that maintain a natural flow pattern including periodic flooding.

Previous Consultations
Given the wide-range of this species, several Federal actions affect this species every year. A complete list of all formal consultations affecting this species in Arizona is on our Arizona Ecological Services website.

Gila topminnow
In 1967, the FWS listed the Gila topminnow as endangered throughout its range without critical habitat (32 FR 4001). Scientists later revised the species taxonomy to include two subspecies, *P. o. occidentalis* and *P. o. sonoriensis* (Minckley 1969, 1973). *P. o. occidentalis* is the Gila topminnow and *P. o. sonoriensis* is the Yaqui topminnow. Collectively, we refer to *P. occidentalis*, including both subspecies, as the Sonoran topminnow. Both subspecies receive protection under the Act. We did not designate critical habitat for this species.

Minckley (1999) stated that the Yaqui topminnow and Gila topminnow are separate species named *P. sonoriensis* and *P. occidentalis*, respectively (Nelson *et al.* 2004). Other researchers concur, based allozymes (Vrijenhoek *et al.* 1985), mtDNA (Quattro *et al.* 1996, Mateos *et al.* 2002, Hedrick *et al.* 2006), microsatellites (Parker *et al.* 1998, Hedrick *et al.* 2001), and MHC genes (Hedrick *et al.* 2001). Differences in mating behavior (Hurt *et al.* 2004, Hurt and Hedrick 2004), reproductive isolation (Hurt and Hedrick 2003, Hurt *et al.* 2004), and morphology (Minckley 1969 and 1972; Minckley and Marsh 2009) provide additional credence to Minckley (1999). In addition, the Gila and Yaqui River basins have been separate for at least 700,000 years (Melton 1960, Minckley *et al.* 1986, Hurt and Hedrick 2004, Hedrick and Hurt 2012). However, the FWS has not made this name change to 50 CFR 17.11 and the American Fisheries Society/American Society of Ichthyologists and Herpetologists Names of Fishes Committee still considers them subspecies (Page *et al.* 2013); based on a perceived lack of morphological data, and on findings in a Brazilian publication (Lucinda 2003).

The reasons for decline of the Gila topminnow include past dewatering of rivers, springs and marshlands, impoundment, channelization, diversion, regulation of flow, land management practices that promote erosion and arroyo formation, and the introduction of predacious and competing nonnative fishes (Miller 1961, Minckley 1985, Duncan *in press*). Life history

information can be found in the 1984 recovery plan (USFWS 1984), the draft revised Gila topminnow recovery plan (Weedman 1999), and references cited in the plans.

Predation and competition from nonnative fishes have been a major factor in the decline of Gila topminnow (Meffe 1983, 1985; Johnson and Hubbs 1989; Marsh and Minckley 1990; Stefferud and Stefferud 1994) and continue to be a major threat to the remaining populations (Weedman and Young 1997, Minckley and Marsh 2009, Duncan *in press*). The native fish fauna of the Gila basin and of the Colorado basin overall, was naturally depauperate and contained few fish that were predatory on or competitive with Gila topminnow (Carlson and Muth 1989). In the riverine backwater and side-channel habitats that formed the bulk of Gila topminnow natural habitat, predation and competition from other fishes was minimal. Thus, Gila topminnow did not evolve effective mechanisms for protection against predation or competition. Due to the introduction of many predatory and competitive nonnative fish, frogs, crayfish, and other species, Gila topminnow could no longer survive in many of their former habitats, or the remaining small pieces of those aquatic systems that had not been lost to human alteration.

It has long been known and thoroughly documented, that *Gambusia affinis* western mosquitofish (mosquitofish) has major deleterious effects on individual Gila topminnow and their populations (Minckley *et al.* 1977, Minckley *et al.* 1991, Minckley 1999, Voeltz and Bettaso 2003). These publications and others (Meffe *et al.* 1982, Miller 1961, Duncan 2013) have made it abundantly clear that mosquitofish negatively affect topminnow, and documented the likely mechanisms responsible (Meffe 1984, 1985; Schoenherr 1974).

Historically, the Gila topminnow was abundant in the Gila River drainage in Arizona and was one of the most common fishes of the southern part of the Colorado River basin (Hubbs and Miller 1941), particularly in the Santa Cruz system. Surveys also recorded Gila topminnow from the Gila River basin in New Mexico (Minckley and Marsh 2009). Presently, we consider only nine of the 15 known natural Gila topminnow populations extant (Weedman and Young 1997, Voeltz and Bettaso 2003, Duncan *in press*, Service files). Only six of these sites are free of nonnative fish and considered secure. There have been more than 200 wild sites stocked with Gila topminnow; however, topminnow persist at only 50 of these localities. Of these, four sites contain nonnative fish (Service files). Only one of these sites is in New Mexico; the rest are in Arizona. Many of the reestablished sites are very small and may not contain viable populations, as defined in the draft revised recovery plan (Weedman 1999). In addition several of the 50 sites have been reestablished in the last few years, and their eventual disposition is unknown (AGFD 2018).

The status of the species is largely improving. An active recovery program stocks Gila topminnow in Arizona and New Mexico, reestablishing topminnow in “new” sites. The U.S. Bureau of Reclamation has largely funded this program under the Gila River Basin Native Fishes Conservation Program (Duncan and Clarkson 2013, Robinson 2016, Robinson *et al.* 2017, Robinson and Mosher 2018). However, some natural sites continue to slowly decline and the two main threats of long-term drought associated with climate change, and nonnative fishes continue unabated (Duncan *in press*) and will likely affect every natural population.

Previous Consultations
Given the wide-range of this species, several Federal actions affect this species every year. A complete list of all formal consultations affecting this species in Arizona is on our Arizona Ecological Services website.

Northern Mexican gartersnake
The FWS published the notice listing the northern Mexican gartersnake as threatened under the Act on July 8, 2014 (USFWS 2014). We proposed critical habitat on July 10, 2013 (USFWS 2013), but we have yet to finalize this rule. Please refer to these rules for more in-depth information on the ecology and threats to the species and critical habitat, including references. We incorporate the final listing and proposed critical habitat rules herein by reference.

The northern Mexican gartersnake ranges in color from olive to olive-brown or olive-gray with three lighter-colored stripes that run the length of the body, the middle of which darkens towards the tail. It may occur with other native gartersnake species and can be difficult for people without specific expertise to identify because of its similar appearance to sympatric gartersnake species. The snake may reach a maximum length of 44 in (112 cm).

Throughout its rangewide distribution, the northern Mexican gartersnake occurs at elevations from 130 to 8,497 ft (Rossman *et al*. 1996) and Drummond and Marcías-García (1983) consider it a "terrestrial-aquatic generalist." The northern Mexican gartersnake is a riparian obligate (restricted to riparian areas when not dispersing) and occurs chiefly in the following habitat types: 1) source-area wetlands (e.g., cienegas or stock tanks); 2) large-river riparian woodlands and forests; and 3) streamside gallery forests (Hendrickson and Minckley 1984, Rosen and Schwalbe 1988). Emmons and Nowak (2013), when surveying in the upper Verde River region, found this subspecies most commonly in protected backwaters, braided side channels and beaver ponds, isolated pools near the river mainstem, and edges of dense emergent vegetation that offered cover and foraging opportunities. In the northern-most part of its range, the northern Mexican gartersnake appears to be most active during July and August, followed by June and September. At Bubbling Ponds northern Mexican gartersnakes are active from March to October with peak activity and abundance from June to August (Sprague and Bateman 2018, Boyarski et al. unpublished) but may be visible on the surface any day of the year if the previous night's low is above freezing (Emmons *et al.* 2016).

Northern Mexican gartersnakes forage along vegetated streambanks, searching for prey in water and on land, using different strategies (Alfaro 2002). Generally, its diet consists of amphibians and fishes, such as adult and larval (tadpoles) native leopard frogs, as well as juvenile and adult native fish (Rosen and Schwalbe 1988). The northern Mexican gartersnake is an active predator and it was likely heavily dependent upon a native prey base (Rosen and Schwalbe 1988). But, in situations where native prey species are rare or absent, this snake's diet includes nonnative species, including larval and juvenile bullfrogs, western mosquitofish (Holycross *et al*. 2006, Emmons and Nowak 2013), or other soft-rayed fishes.

Native predators of the northern Mexican gartersnake include birds of prey, other snakes, wading birds, mergansers, belted kingfishers, raccoons, skunks, and coyotes (Rosen and Schwalbe 1988, Brennan *et al.* 2009). Historically, large, highly predatory native fish species such as Colorado

pikeminnow and native Chubs may have preyed upon neonate to adult northern Mexican gartersnake where they co-occurred.

Sexual maturity in northern Mexican gartersnakes occurs at two to three years of age in males and at two to three years of age in females (Rosen and Schwalbe 1988, Boyarski et al. unpublished). Northern Mexican gartersnakes are viviparous (bringing forth living young rather than eggs). Researchers have documented mating in April and May followed by the live birth of between 7 and 38 newborns in July and August (Rosen and Schwalbe 1988, Nowak and Boyarski 2012).

The northern Mexican gartersnake historically occurred in every county and nearly every subbasin within Arizona, from several perennial or intermittent creeks, streams, and rivers as well as lentic wetlands such as cienegas, ponds, or stock tanks (Brennan and Holycross 2006, Cotton *et al*. 2013). In New Mexico, the species had a limited distribution that consisted of scattered locations throughout the Upper Gila River watershed in Grant and western Hidalgo Counties (Price 1980, Fitzgerald 1986, Degenhardt *et al.* 1996, Holycross *et al.* 2006). Within Mexico, northern Mexican gartersnakes historically occurred within the Sierra Madre Occidental and the Mexican Plateau, comprising approximately 85 percent of the total range wide distribution of the subspecies (Rossman *et al.* 1996).

At this time and based upon current survey techniques, the only northern Mexican gartersnake populations in the United States where the subspecies remains reliably detected are all in Arizona. These four locations are: 1) the Page Springs and Bubbling Ponds State Fish Hatcheries along Oak Creek; 2) lower Tonto Creek; 3) the upper Santa Cruz River in the San Rafael Valley; and 4) the middle/upper Verde River. In New Mexico, the northern Mexican gartersnake may occur in low population densities within its historical distribution along Mule Creek, Duck Creek, and the Gila River. We know little about the status of the northern Mexican gartersnake on tribal lands, such as the White Mountain or San Carlos Apache nations. We know even less about the current distribution of the northern Mexican gartersnake in Mexico due to limited surveys and limited access to information on survey efforts and field data from Mexico.

Nonnative species are a concern in almost every northern Mexican gartersnake locality in the United States and the most significant reason for their decline. These nonnative fish and crayfish species can contribute to starvation of gartersnake populations through competitive mechanisms, and may reduce or eliminate recruitment of young gartersnakes through predation. Other threats include alteration of rivers and streams from dams, diversions, flood-control projects, and groundwater pumping that change flow regimes, reduce or eliminate habitat, and favor nonnative species, and effects from climate change and drought (USFWS 2014).

Proposed Critical Habitat
The FWS proposed critical habitat for this species in Oak Creek from Midgley Bridge downstream to the Verde River and along Spring Creek. PCEs identified for the northern Mexican gartersnake are:

1. Aquatic or riparian habitat that includes:

a. Perennial or spatially intermittent streams of low to moderate gradient that possess appropriate amounts of in channel pools, off-channel pools, or backwater habitat, and that possess a natural, unregulated flow regime that allows for periodic flooding or, if flows are modified or regulated, a flow regime that allows for adequate river functions, such as flows capable of processing sediment loads; or,
b. Lentic wetlands such as livestock tanks, springs, and cienegas; and,
c. Shoreline habitat with adequate organic and inorganic structural complexity to allow for thermoregulation, gestation, shelter, protection from predators, and foraging opportunities (e.g., boulders, rocks, organic debris such as downed trees or logs, debris jams, small mammal burrows, or leaf litter); and,
d. Aquatic habitat with characteristics that support a native amphibian prey base, such as salinities less than 5 parts per thousand, pH greater than or equal to 5.6, and pollutants absent or minimally present at levels that do not affect survival of any age class of the northern Mexican gartersnake or the maintenance of prey populations.

2. Adequate terrestrial space (600 ft (182.9 m) lateral extent to either side of bankfull stage) adjacent to designated stream systems with sufficient structural characteristics to support life history functions such as gestation, immigration, emigration, and brumation.

3. A prey base consisting of viable populations of native amphibian and native fish species.

4. An absence of nonnative fish species of the families Centrarchidae and Ictaluridae, bullfrogs (*Lithobates catesbeianus*) and/or crayfish (*Orconectes virilis*, *Procambarus clarki*, etc.) or occurrence of these nonnative species at low enough levels such that recruitment of northern Mexican gartersnakes and maintenance of viable native fish or soft-rayed nonnative fish populations (prey) is still occurring.

Previous Consultations
Given the wide-range of this species, several Federal actions affect this species every year. A complete list of all formal consultations affecting this species in Arizona is on our Arizona Ecological Services website.

Spikedace
The FWS originally listed the spikedace as a threatened species on July 1, 1986 (51 FR 23769) and reclassified it to endangered status on February 23, 2012 (77 FR 10810). We designated (March 8, 1994 - 59 FR 10906) and then we re-designated (April 25, 2000 - 65 FR 24328; March 21, 2007 - 72 FR 13356) critical habitat in response to legal concerns and policy changes (see summary discussion at 75 FR 66482, p. 66485). The FWS published the current critical habitat designation simultaneously with the reclassification of spikedace to endangered status on February 23, 2012 (77 FR 10810).

Spikedace is a small silvery fish whose common name alludes to the well-developed spine in the dorsal fin (Minckley 1973). Spikedace live in flowing water with slow to moderate velocities over sand, gravel, and cobble substrates (Propst *et al*. 1986; Rinne and Kroeger 1988). Specific

habitat for this species consists of shear zones where rapid flow borders slower flow, areas of sheet flow at the upper ends of mid-channel sand/gravel bars, and eddies at the downstream riffle edges (Propst *et al*. 1986). Spikedace spawns from March through May with some yearly and geographic variation (Barber *et al*. 1970; Anderson 1978; Propst *et al*. 1986). We have not observed spawning in the wild, but spawning behavior and captive studies indicate fish lay eggs over gravel and cobble where they adhere to the substrate. Spikedace lives about two years with reproduction occurring primarily in one-year old fish (Barber *et al*. 1970; Anderson 1978; Propst *et al*. 1986). It feeds primarily on aquatic and terrestrial insects (Schreiber 1978, Barber and Minckley 1983; Marsh *et al*. 1989). We provide additional details on habitat preferences in the 2012 critical habitat designation (77 FR 10810).

Taxonomic and genetic work on spikedace indicates there are substantial differences in morphology and genetic makeup between remnant spikedace populations. Remnant populations occupy isolated fragments of the Gila basin and are isolated from each other. Anderson and Hendrickson (1994) found that spikedace from Aravaipa Creek are morphologically distinguishable from spikedace from the Verde River, while spikedace from the upper Gila River and Eagle Creek have intermediate measurements and partially overlap the Aravaipa and Verde populations. Mitochondrial DNA and allozyme analyses have found similar patterns of geographic variation within the species (Tibbets 1992; Tibbets 1993).

The spikedace was once common throughout much of the Gila River basin, including the mainstem Gila River upstream of Phoenix, and the Verde, Agua Fria, Salt, San Pedro, and San Francisco subbasins. Habitat destruction, and competition and predation by nonnative aquatic species reduced its range and abundance (Miller 1961; Lachner *et al.* 1970; Ono *et al.* 1983; Moyle 1986; Moyle *et al.* 1986; Propst *et al.* 1986). Spikedace are now restricted to portions of the upper Gila River (Grant, Catron, and Hidalgo Counties, New Mexico); Aravaipa Creek (Graham and Pinal Counties, Arizona); Eagle Creek (Graham and Greenlee Counties, Arizona); and the Verde River (Yavapai County, Arizona) (Marsh *et al.* 1990; Brouder2002; pers. comm.; Stefferud and Reinthal 2005; Paroz *et al.* 2006; Propst 2007).

Partners have recently stocked spikedace in additional streams as part of recovery efforts for the species. In 2007, spikedace were translocated into Hot Springs Canyon, in Cochise County, Arizona, and Redfield Canyon, in Cochise and Pima Counties, Arizona, and these streams were subsequently augmented (Robinson 2008a; Robinson 2008b, pers. comm.; Orabutt 2009, pers. comm.; Robinson 2009a; Robinson *et al.* 2010a; Robinson *et al.* 2010b; Robinson 2011a, pers. comm.; Robinson and Crowder 2014). Both Hot Springs and Redfield canyons are tributaries to the San Pedro River. Efforts to establish spikedace in Hot Springs Canyon are ongoing at this time; however, we suspended augmentation efforts in Redfield Canyon due to drought and a lack of adequate flowing water. Monitoring will continue at this site, and future augmentations may occur if needed.

AGFD translocated spikedace into Fossil Creek, a tributary to the Verde River in Gila County, Arizona, in 2007, and they augmented the population with additional stockings in 2007, 2008, 2010, 2011, and 2012 (Carter 2007; Carter 2008; Robinson 2009b; Boyarski *et al.* 2010; Robinson 2011b). Spikedace continue to be found in Fossil Creek (C. Crowder, pers. comm. 2013; Robinson *et al.* 2014a) and appear to be persisting and reproducing there.

In 2008, spikedace were translocated into Bonita Creek, a tributary to the Gila River in Graham County, Arizona (Blasius 2008, pers. comm.; Robinson *et al.* 2009), and the upper San Francisco River in Catron County, New Mexico (D. Propst, pers. comm. 2010). Partner agencies have temporarily suspended augmentations in lower Bonita Creek due to re-invasion by nonnative species above the fish barrier. Biologists translocated spikedace to the San Francisco River in 2011 and augmented the stocking in fall 2014. Monitoring through traditional means and with the use of environmental DNA detected spikedace in the San Francisco River in 2017 and 2019. Monitoring efforts in the San Francisco River will continue; however, insufficient time has elapsed to allow us to determine if the translocation effort will ultimately be successful and result in establishment of new populations of spikedace in the San Francisco. In addition, shortages of fish have limited translocation options.

Partner agencies translocated spikedace to the Blue River in 2012 following construction of a fish barrier in the lower end of the river (Robinson *et al.* 2014b). Non-native fish reinvaded the Blue River upstream of the barrier, and no subsequent augmentations have taken place while management agencies work to eradicate the nonnative species. Surveys have detected spikedace in the Blue River as recently as 2017, and this repatriation appears to be successful.

AGFD and FWS translocated spikedace to Spring Creek in 2015, and they have augmented this population with annual stockings since. Monitoring in 2018 detected 20 spikedace of varying size, indicating that some reproduction may have occurred (Hickerson and Robinson 2019). Additional stocking and monitoring will be conducted; however, sufficient time has elapsed to allow us to determine if the translocation effort will ultimately be successful and result in establishment of a new population of spikedace.

Spikedace is now common only in Aravaipa Creek in Arizona (Arizona State University (ASU) 2002; Reinthal 2008, Reinthal 2011, pers. comm.) and one section of the Gila River south of Cliff, New Mexico (NMDGF 2008; Propst *et al.* 2009). The FWS presumes spikedace still occupy the Verde River; however, the last captured fish from this river was from a 1999 survey (Brouder 2002, pers. comm.; AGFD 2004). Spikedace from the Eagle Creek population have not been seen for over a decade (Marsh 1996), although they are still thought to exist in numbers too low for the sampling efforts to detect (Carter *et al.* 2007; see Minckley and Marsh 2009). The Middle Fork Gila River population is thought to be very small and has not been seen since 1991 (Jakle 1992), but sampling is localized and inadequate to detect a sparse population. In addition, partner agencies have recently established populations in Fossil Creek and the Blue River in Arizona and the species may become established through reintroduction in the San Francisco River in New Mexico.

Previous Consultations
Given the wide-range of this species, several Federal actions affect this species every year. A complete list of all formal consultations affecting this species in Arizona is on our Arizona Ecological Services website.

Western yellow-billed cuckoo

The FWS listed the western yellow-billed cuckoo as threatened on October 3, 2014 (79 FR 59992); we listed only the Western Distinct Population Segment (DPS). The FWS proposed critical habitat for the cuckoo on August 15, 2014 (79 FR 48548).

The primary threat to the western yellow-billed cuckoo is loss or fragmentation of high-quality riparian nesting habitat. Many factors have altered and eliminated cuckoo habitats, including damming, water diversions, ground water pumping, stream channelization and stabilization, agricultural development, mining, livestock grazing, wildfires, establishment of nonnative vegetation, drought, defoliation of tamarisk by the introduced tamarisk leaf beetle, and prey scarcity due to pesticides (Ehrlich *et al*. 1992, Corman and Wise-Gervais 2005, 79 FR 48548, 79 FR 59992). Habitat fragmentation has led to the isolation of small populations and has increased their susceptibility to further declines and local extirpations due to all the factors discussed above and to stochastic factors such as weather, fluctuating prey populations, and climate change (Thompson 1961, McGill 1975, Wilcove *et al.* 1986).

Cuckoos in the DPS were formerly widespread and locally common in much of the western U.S., Canada, and Mexico (American Ornithologists' Union 1998, Hughes 1999). The largest remaining breeding areas are in southern and central California, Arizona, New Mexico, and northwestern Mexico (79 FR 59992). In Arizona, the species was a common resident chiefly in the lower Sonoran zones of southern, central, and western Arizona (Phillips *et al.* 1964). The cuckoo now nests primarily in the central and southern parts of the state.

Western populations of the cuckoo are most commonly found in large tracks of dense, multi-layered gallery forests consisting primarily of cottonwood (*Populus* species), willow, and mesquite (*Prosopis* species) (including mesquite bosque) along riparian corridors in otherwise arid areas (Laymon and Halterman 1989, Hughes 1999). Home ranges are flexible and territories may overlap in this weakly territorial species (Hughes 1999, Halterman 2009, Sechrist *et al.* 2013). Rangewide, individual home ranges during the breeding season average over 100 ac (Laymon and Halterman 1987; Laymon *et al.* 1997; Laymon and Williams 2002; Halterman 2009; Sechrist *et al.* 2009; McNeil *et al.* 2011, 2012, 2013; Sechrist et al. 2013). However, Laymon et al. (1993) reported an average cuckoo home range size of 42 ac, and home range estimates for radio-telemetered cuckoos in New Mexico varied from 12 to 697 acres (Sechrist *et al.* 2009). In New Mexico, the average maximum daily distance traveled was 2,795 ft, (0.52 mile) and the average maximum seasonal distance traveled was 4,790 ft (0.91 mile).

Extensive riparian forests may support the greatest density of breeding cuckoos, but other habitats are also important for recovery (USFWS 2015). In Arizona, cuckoos may use narrow bands of riparian woodland for nesting (AGFD 2015, Cornell Lab of Ornithology 2015) and even non-riparian habitats (e.g., Madrean evergreen woodlands in the mountain drainages of southeastern Arizona) (Brown 1994, Cornell Lab of Ornithology 2015, Corman and Magill 2000). Tamarisk may be a component of breeding habitat, but there is usually a native riparian tree component present (Gaines and Laymon 1984, Johnson et al. 2008, McNeil et al. 2013, Carstensen et al. 2015). Site-specific variation is likely a result of characteristics unique to each location (e.g., type and quality of habitat, patch configuration) (Hughes 1999, Halterman 2009, Sechrist et al. 2013). Habitat occurs in relatively contiguous stands of dense vegetation, in

irregularly shaped mosaics of dense and open vegetation, and in patches that are narrow and linear or savannah-like.

Humid conditions created by surface and subsurface moisture and a multi-layered canopy appear to be important for successful hatching and rearing of young (Hamilton and Hamilton 1965, Gaines and Laymon 1984). Within the boundaries of the DPS, cuckoos occur from sea level to elevations up to 7,000 ft or more; however, the moist conditions that support riparian plant communities typically occur at lower elevations.

Cuckoo breeding habitat in much of the species' range is associated with perennial rivers and streams in regulated and unregulated flows (Poff *et al.* 1997). In southeastern Arizona, cuckoo's nest along more arid ephemeral and intermittent drainages (Corman and Magill 2000, Corman and Wise-Gervais 2005, AGFD 2015, Cornell Lab of Ornithology 2015). Hydrologic conditions at cuckoo breeding sites can vary widely in a single year and among years, and due to these changes, cuckoos may move from one area to another in the same season and from year to year.

Recent guidance on cuckoo habitat use (USFWS 2015) indicates that cuckoos are more flexible in their choice of foraging and migration stopover habitat than they are in selecting nesting habitat. Foraging areas can be less dense or patchier than nesting areas, with lower levels of canopy cover (Carstensen *et al.* 2015; Sechrist *et al.* 2009; USFWS, unpublished data). In Arizona, adjacent foraging habitat is usually more arid than nesting habitat. Habitat flexibility during migration may extend to monotypic tamarisk and shrubby habitats, hedgerows, coastal scrub, orchards, and semi-desert grasslands.

Previous Consultations
Given the wide-range of this species, several Federal actions affect this species every year. A complete list of all formal consultations affecting this species in Arizona is on our Arizona Ecological Services website.

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 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.

Status of the species and critical habitat within the action area

Gila chub
Suitable habitat for this species occurs in Spring Creek, where Gila chub are abundant. In 2015, the Bureau of Reclamation (Reclamation) built a fish barrier in Spring Creek to protect Gila chub and other native aquatic species from non-native fishes. AGFD conducted surveys in September 2018 and captured hundreds of chub, represented by multiple size classes.

Critical Habitat
Within the project area, Spring Creek (3.6 miles), a tributary to Oak Creek, is the only designated critical habitat. All of the PCEs identified for Gila chub are present within Spring Creek. As noted above, Reclamation constructed a fish barrier to prevent the upstream movement of nonnative fish into Spring Creek.

Gila topminnow
Within the action area, Gila topminnow habitat is present in portions of Oak Creek and Spring Creek. Related to project waters, Gila topminnow were recently stocked within Spring Creek, where project activity 5 (stream crossing replacement) is proposed. AGFD fish surveys in September 2018 targeted topminnow by setting 10 collapsible mesh minnow traps in the large pool upstream of the barrier. They captured 497 Gila topminnow with 471 fish larger than 20mm total length (TL) and 26 fish smaller than 20mm TL. Gila topminnow were visually abundant in the pool formed upstream of the diversion, and presence of young of year fish suggests that the population is well established.

Northern Mexican gartersnake
Northern Mexican gartersnakes are present in Spring Creek, but likely occur in low numbers. Prior to June 24, 2014, the last northern Mexican gartersnake documented in Spring Creek was 1986 (USFWS 2014). However, while conducting fish surveys in Spring Creek, fisheries biologists captured a northern Mexican gartersnake in a submerged hoop net, and the snake drowned in the net. Biologists captured the gartersnake on private property, upstream of the proposed fish barrier. The FWS, AGFD, and Northern Arizona University (NAU) conducted gartersnake surveys in Spring Creek in late May and did not capture any northern Mexican gartersnakes. Ambient air and water temperatures were still relatively cool and it is possible that we were too early or did not put sufficient effort into the best potential habitat. Additional surveys should occur in order to determine the existing population's status.

There is northern Mexican gartersnake habitat (some on private lands) and sufficient prey species (native lowland leopard frogs and native fish) for gartersnakes in Spring Creek. It is likely we will find more gartersnakes along the creek in the future. Additionally, one of the most viable northern Mexican gartersnake populations in Arizona, located at the Page Springs and Bubbling Ponds State Fish Hatcheries, is less than one mile from Spring Creek (straight-line, overland distance) and approximately 4.75 miles stream distance from the mouth of Spring Creek, up Oak Creek to the hatchery location. Therefore, there are nearby northern Mexican gartersnake source populations that likely contribute to Spring Creek gartersnakes.

Proposed Critical Habitat
The FWS proposed to designate 3,131 acres (1,267 ha) of critical habitat along 22.5 stream miles (36.2 km) of Spring Creek, from its confluence with Oak Creek upstream to its origin southwest of Buck Ridge, in Yavapai County, Arizona (USFWS 2013). However, the perennial portion of Spring Creek is limited to approximately 3.9 miles in length. The area of perennial stream includes lands managed by the Coconino National Forest and lands owned by several different private landowners. As stated above, Spring Creek contains populations of lowland leopard frogs and several species of native fish that serve as a prey base for northern Mexican

gartersnakes. However, crayfish are also present in this unit as well as a recent introduction of green sunfish (*Lepomis cyanellus*). Otherwise, this proposed critical habitat subunit contains sufficient physical or biological features, including PCE 1 (aquatic habitat characteristics), PCE 2 (terrestrial habitat characteristics), and PCE 3 (prey base). Although, the creek does contain crayfish (PCE 4 - absence or low level of harmful nonnative species), the level of crayfish in the stream is not currently affecting the viability of the native aquatic species, so it is difficult to speculate how crayfish may or may not be affecting the persistence of northern Mexican gartersnakes. Special management may be required to maintain or develop the physical or biological features, including the elimination or reduction of crayfish.

Spikedace

Suitable spikedace habitat is present within the action area in portions of Oak Creek and Spring Creek. Related to project waters, spikedace are likely to occur within Spring Creek, where project activity 5 (stream crossing replacement) is proposed. Stocking of this species in Spring Creek by AGFD and FWS occurred in 2015, 2016 and 2018, following the construction of the fish barrier in 2015. In September 2018, AGFD targeted spikedace by electrofishing one fixed 100-meter reach and two randomly selected 100-meter reaches in Spring Creek. Biologists captured 20 spikedace with a mean size of 58 mm. The presence of small spikedace (40 mm TL) in September suggests reproduction may be occurring in Spring Creek (Hickerson and Robinson 2019). Spikedace spawn in April to June and reach 35-40 mm standard length by November of their first year of life. As noted above, AGFD stocked spikedace in December 2018 and will monitor the species again in fall 2019.

Affected Environment for All Aquatic Species

Watershed Condition Framework Analysis

The Watershed Condition Framework (WCF) is a comprehensive approach for proactively implementing integrated restoration on priority watersheds on national forests. Watershed condition is the state of the physical and biological characteristics and processes within a watershed that affect the soil and hydrologic functions supporting aquatic ecosystems. Watershed condition reflects a range of variability from natural pristine (functioning properly) to degraded (severely altered state or impaired).

Overall, the Forest Service considers the aquatic habitat in Middle Oak Creek watershed to be "fair." Downstream of Tlaquepaque (resort in Sedona), diversions are causing some dewatering. Perennial stream reaches have a few road crossings including functional bridges and low-water crossings that may impede aquatic organism passage. The team mapped Middle Oak Creek as riparian and rated it at 75 percent properly functioning condition and 25 percent at risk due to a lack of adequate large wood. Insufficient woody material can negatively affect the floodplain and channel ability to dissipate energy and capture sediment. At-risk reaches are at risk from recreation, due to the negative effects of roads and trails.

In the lower Oak Creek watershed, the Forest Service rated the aquatic habitat as "poor." Upstream diversions may partially fragment habitat. Perennial stream reaches have several road crossings including functional bridges and low-water crossings but not enough to block aquatic organism passage. Lower Oak Creek and other streams mapped as riparian are at about 40

percent properly functioning condition and 60 percent at risk (again related to a lack of adequate large wood instream). Creeks mapped as riparian are 60 percent at risk related to altered channel geometry and width-to-depth ratios. Increased bank erosion rates can alter channel geometry and produce wider, shallower channels with reduced aquatic habitat quality. As stated above, these at-risk reaches are at risk from recreation, due to the negative effects of roads and trails.

Water Quality and Soil Conditions

ADEQ classifies Oak Creek as having exceptional recreational or ecological significance, providing habitat for threatened and endangered species. ADEQ has designated Oak Creek and West Fork as Tier III outstanding Arizona waters and as such, they are subject to special protection and standards. These protections and standards call for maintaining and protecting the existing water quality and prohibiting new, or disallowing expanded, point source discharge directly to outstanding Arizona waters. Any upstream discharge or discharge to a tributary needs to demonstrate those discharges would not degrade water quality.

Since 1973, *E. coli* bacteria in Oak Creek have been a concern. Oak Creek is not attaining water quality standards for *E. coli* and has repeatedly exceeded the state water quality standard for full body contact. *E. coli* in stream water is an indicator of fecal contamination. In 1999, ADEQ and the Environmental Protection Agency (EPA) completed and approved a total maximum daily load determination for Oak Creek. They listed sediment, wildlife, recreational uses, and rangeland grazing as probable *E. coli* pollution sources causing impairment in the Slide Rock State Park segment of Oak Creek. Because sediment in streams can exacerbate *E. coli* concentrations, it is prudent to manage nonpoint sources of sediment pollution by reducing soil erosion and sediment delivery. The proposed action aims to reduce the amount of soil erosion and sediment delivery into the action area.

Soil condition (includes erosion and productivity) is rated as mostly poor within the action area (Table 2). Approximately 24 percent of soils are in satisfactory condition, 30 percent are in satisfactory but inherently unstable condition, 2 percent are in unsatisfactory condition, and 44 percent are impaired. The Forest Service has found widespread evidence of accelerated rilling and sheet erosion. On the NFS lands in the watersheds, about 38 percent of soils are impaired or unsatisfactory. About 54 percent of soils are meeting vegetation and soil productivity potential and are in satisfactory condition or satisfactory, but inherently unstable conditions. Approximately 8 percent of impaired and unsatisfactory soils are outside Forest Service management authority. We display the results of the WCF analysis for water quality parameters in Table 2.

Table 2. Watershed Condition Framework analysis results.

Watershed Name	Overall	Aquatic Biota	Riparian Vegetation	Water Quality	Water Quantity	Aquatic Habitat	Roads & Trails	Soil
Upper Oak Creek	Functioning at Risk	Poor	Fair	Poor	Fair	Fair	Poor	Fair
Middle Oak Creek	Impaired Function	Poor	Fair	Poor	Good	Fair	Poor	Poor

Watershed Name	Overall	Aquatic Biota	Riparian Vegetation	Water Quality	Water Quantity	Aquatic Habitat	Roads & Trails	Soil
Lower Oak Creek	Impaired Function	Poor	Poor	Poor	Fair	Poor	Poor	Poor

Aquatic habitat for federally-listed species
The aquatic habitat is fair to poor within the action area, and surveys indicate reduced populations of native frogs, toads, and other aquatic species (gartersnakes, in particular) throughout the watershed. No recent detections of lowland leopard frogs or Arizona toad have occurred within the action area. Aquatic nonnative species (for example, fish, crayfish, bullfrogs, and turtles) are present and pose risks to native species in Oak Creek. Native lowland leopard frogs, Arizona toads, and native Gila trout are lacking in Oak Creek within the Middle Oak Creek watershed.

Biologists consider upper Oak Creek, within the canyon, a cold-water fishery and it supports cold-water salmonids, along with native suckers and minnow species. Nonnative salmonids in Oak Creek Canyon include brown trout and rainbow trout. Brown trout (*Salmo trutta*) are self-sustaining in the canyon and persist as a breeding population. A catch-and-release recreational sport-fishing area occurs in Oak Creek from Call of the Canyon downstream to the Junipine resort. Rainbow trout (*Oncorhynchus mykiss*) stocked in Oak Creek over five years ago were capable of reproduction, but since 2011, AGFD has stocked only sterile triploid trout. With the change to stocking only triploid rainbow trout in Oak Creek, AGFD surveys have rarely detected self-sustaining rainbow trout in Oak Creek during recent surveys.

However, having provided the information above, it is important to note that the only project location where we expect adverse effect to occur to Gila chub and its critical habitat, Gila topminnow, spikedace, and northern Mexican gartersnakes and their proposed critical habitat is from the proposed Spring Creek Aquatic Organism Passage (AOP) on Willow Point road. Below is a summary of the current environmental conditions within Spring Creek.

Spring Creek
Spring Creek currently supports three listed fish species (Gila chub, Gila topminnow, and spikedace) as well as desert sucker (*Catostomus clarkii*), longfin dace (*Agosia chrysogaster*), speckled dace (*Rhinichthys osculus*), lowland leopard frog (*Lithobates yavapaiensis*), and nonnative crayfish. There is little evidence that the crayfish have had much of an effect on the persistence, distribution, or abundance of the native fish and lowland leopard frogs due to the numbers of these fishes and frogs detected during surveys and the abundance of all age classes over a long period. Spring Creek has both private and public (Forest Service) land managers. Based upon aquatic species surveys (conducted with permission) on private lands, the riparian vegetation and aquatic habitat appear to be intact and functioning and there is a strong commitment from the landowners to protect the riparian buffer and support the conservation of native aquatic species within the creek. The Forest Service is also committed to managing their section of Spring Creek to promote native species, reduce invasive vegetation (invasive grasses), and maintain flows.

Beavers have colonized Spring Creek within the last decade and have cut down many riparian trees along the creek. Although beavers can have many beneficial effects in stream systems, the loss of riparian vegetation without regeneration, particularly trees, along Spring Creek could result in mixed effects to the aquatic community. The effects of beaver removing trees along the creek could result in changes from elevated stream temperatures that could negatively affect the native fishes by reducing dissolved oxygen levels to expanded breeding habitat for lowland leopard frogs (a prey species of northern Mexican gartersnakes). Continued monitoring of the site will allow us to track how beavers modify the system over time.

Western yellow-billed cuckoo

In Arizona, yellow-billed cuckoos breed in low elevation areas of large, dense riparian (cottonwood-willow) vegetation; and, where tree form mesquite occurs adjacent to the riparian corridor. Research indicates that the defining characteristics of suitable breeding habitat large trees with a well-developed mid-story beneath the canopy, and high humidity. Cuckoos tend to nest in the mid-story and there is usually a dense canopy of vegetation immediately above nests.

Surveys detected yellow-billed cuckoos within or adjacent to Activities 2 (Chavez Crossing), 3 (Angel Valley), 7 (Molina Homestead) and 8 (Lower Oak Creek). The Forest Service has not conducted protocol surveys near Activity 5 (Spring Creek AOP), but the informal (non-protocol) surveys conducted along Spring Creek did not detect cuckoos.

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, 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 caused by the proposed action and are later in time, but are still reasonably certain to occur.

Gila chub and its critical habitat, Gila topminnow, and spikedace

Activities 1, 2, 3, 4, 6, 7, and 9 will not result in measurable effects to habitat for any of the fish species. Gila chub and critical habitat, Gila topminnow, and spikedace are only present in Spring Creek (see effects discussion below for Activity 5). In the few areas that are proximate to steep slopes and stream habitat, minor disturbance from equipment use could mobilize sediment. However, we expect that the proposed BMPs (Appendix C) will prevent or substantially minimize any short-term effects to aquatic habitat. The long-term benefits of the proposed action will improve hydrologic function and water quality, reduce overall disturbance within or near riparian zones by reducing vehicle traffic on the main gated road, restore of unauthorized roads/trails within and near riparian areas, and reduce vehicle-based camping in riparian areas. In addition, the installation of new toilets and pet waste stations should improve Oak Creek water quality by reducing *E. coli*.

Spring Creek AOP (Activity 5)
During implementation, the Forest Service contractor will use heavy equipment in Spring Creek to remove the existing low-water crossing structure, construct the new structure, improve drainage on the approach road segments, and to re-contour small sections of the channel immediately upstream and downstream of the structure. Based on initial structure designs and field visits, the Forest Service estimates that less than two acres of aquatic/riparian habitat would be disturbed, and the proposed action would directly affect less than 100 yards of Spring Creek. Most of the disturbance to aquatic habitat will occur in the immediate vicinity of the crossing itself, and possibly some disturbance a short distance upstream and downstream. The majority of soil and vegetation disturbance will occur outside of the channel, and engineers expect the disturbed area to stabilize within a year or two post-project implementation. However, actions that remove near stream vegetation may result in short-term increases in sedimentation into Spring Creek. The Forest Service anticipates that there could be measurable increases in turbidity up to 0.5 mile downstream of the crossing. In addition to soil and vegetation disturbance, heavy equipment in the channel and riparian area may also result in indirect, short-term effects to macroinvertebrates, a primary source of food for fish. However, site-specific design features to reduce sedimentation and protect vegetation from heavy equipment work will substantially reduce negative effects to all aquatic organisms, including federally listed fish species.

Prior to construction, the Forest Service, AGFD, and FWS will install block nets (to keep new fish from entering the area), and capture and move as many fish as possible from the disturbance area. Although biologists will move as many native fish as possible out of the construction footprint, the capture and handling of fish can result in injury or mortality and biologists will be unable to capture all fish, so some fish may die. In addition, fish trapped between the block nets, may be vulnerable to predation. Based on the current habitat, we expect native dace, including spikedace to be most likely to occur at the site; there are likely to be fewer Gila chub and Gila topminnow at this site because it currently is a long shallow run and does not contain the pool habitat these species prefer.

Effects to Gila Chub Critical Habitat
This project site includes designated Gila chub critical habitat. Potential effects to the Gila chub PCEs include the following:

- PCE 1: The installation of a structure that spans the channel, rather than blocking the channel like the current structure does, will allow for more natural channel geomorphology and hydrology and will provide a natural array of pools, riffles and runs. This action will result in temporary adverse effects to the channel itself, but will improve this PCE following project implementation.

- PCE 2: We do not anticipate that the new structure will affect water temperatures in Spring Creek. The new crossing structure will provide shading that is lost from removal of the overhanging riparian canopy.

- PCE 3: While there may be short-term adverse effects to water quality from construction activities in and adjacent to the channel, implementation of water quality BMPs will

minimize these effects (see Appendix C). In the long term, we expect water quality to improve because the new structure will remove vehicle traffic from the creek and replace the existing concrete structure with natural stream substrate.

- PCE 4: Construction equipment in the channel will result in short-term adverse effects to invertebrates and aquatic plants. However, in the long term, the replacement of the existing in-channel crossing with a creek spanning structure will reduce sedimentation providing more and better habitat for macroinvertebrates and aquatic plants.

- PCE 5: The installation of a structure that spans the channel, rather than blocking the channel as the current structure does, will allow for more natural channel geomorphology and hydrology and will allow for cover such as downed logs to persist at the site.

- PCE 6: The proposed structure will not affect the composition or abundance of non-native species in Spring Creek. Currently, a constructed fish barrier downstream of the project site prevents the upstream movement of nonnative fishes.

- PCE 7: In the short term, construction will have a short-term adverse effect on flow in Spring Creek, but in the long-term, the proposed structure will restore natural flow patterns.

Summary of effects to Gila chub critical habitat, Gila topminnow, and spikedace
Short-term effects of the action include harm and harassment to Gila chub, Gila topminnow, and spikedace either from being moved from the project site, or if the fish is not captured and is harassed, injured, or killed by heavy equipment in the stream. Fish trapped between block nets may also be vulnerable to predation. There may be short-term increases in sedimentation as the site as vegetation and soil recover in the area adjacent to the new structure.

In the long-term, we expect that the new crossing will produce a substantial benefit to all aquatic organisms by creating a natural stream bottom that eases upstream and downstream movement, reduce sediment input from the approach road segments, and eliminate the risk of direct harm to aquatic species from instream vehicle traffic. Based on field estimates, implementation of this action would restore up to 0.25 acre of aquatic habitat, and enhance up to 0.5 mile of stream.

Northern Mexican gartersnake

Activities 2 and 3 (Chavez Ranch Road and Angel Valley Oak Creek day-use development and toilet installation), 5 (Spring Creek AOP), 6 (pet waste station installation), 7 (riparian restoration), 8 (motorized trail closure and restoration), and 9 (road decommissioning) occur at Oak Creek locations that likely do not support gartersnakes because there is little vegetation and the soil is compacted. Therefore, we do not expect any habitat disturbance associated with these activities. In addition, to reduce the likelihood that individual snakes that may occur are not affected by this project, immediately prior to conducting any ground disturbing activities, the construction footprint and surrounding area will be searched by a qualified biologist (see conservation measures). If a biologist finds a gartersnake, they will avoid handling the gartersnake unless the snake is in imminent risk of injury. The goal will be to divert work away

from where snakes occur and let the snake leave the location on its own. Long-term beneficial effects of these actions will improve gartersnake habitat and its prey by reducing sedimentation, improving water quality, eliminating motorized access (through road decommissioning and restoration), and controlling (through designated parking and trails) access to riparian areas. Therefore, it is unlikely northern Mexican gartersnakes will be affected by these activities.

Spring Creek AOP (Activity 5)
Activity 5, Spring Creek Aquatic Organism Passage on Willow Point Road Crossing, may result in adverse effects to northern Mexican gartersnakes since there will be ground-disturbing activities occurring in the channel and riparian zone when the Forest Service removes the existing crossing structure and installs the new AOP. We have only observed one northern Mexican gartersnake in Spring Creek in recent years (see Environmental Baseline, above). Because the Spring Creek habitat is complex (thick riparian vegetation and coarse woody debris), our ability to detect gartersnakes is reduced. Therefore, it is possible, even with surveys that northern Mexican gartersnakes may be present, but not likely in large numbers. The construction of the Spring Creek fish barrier included efforts to locate gartersnakes prior to and during construction, but observers did not detect any snakes. The Forest Service will conduct a gartersnake search before ground-disturbing activities occur in Spring Creek to reduce the potential for direct effects to individuals when heavy machinery is operating within or adjacent to the creek. Searching for gartersnakes will reduce effects by reducing the potential for heavy machinery to injure snakes through active searching by experienced gartersnake surveyors. Northern Mexican gartersnakes are likely rare in Spring Creek, but if found, activities will be modified to avoid them until they move on their own, or in some cases, a permitted biologist may move a gartersnake to a safe location, away from potential harm.

The Spring Creek Crossing project will temporarily affect northern Mexican gartersnake aquatic habitat and adjacent bank habitat. Effects would include disturbance and removal of vegetation and bank material during the removal of the crossing and installation of the AOP. However, long-term benefits to gartersnake habitat will occur, as vehicles will no longer be driving through the creek. In addition to the construction of a suitable AOP structure across the creek, the road leading to either side of the crossing will have some realignment and water drainage improvements. This will result in a small amount of permanent ground disturbance within potential upland habitat (shedding, hiding, foraging, and brumating). However, the upland area affected will be very small (less than two acres) and the road realignment will ultimately benefit upland, riparian, and instream habitat by reducing sedimentation from the road.

Effects to proposed northern Mexican gartersnake critical habitat
We expect that short-term effects (during construction) will occur to proposed PCE 1c (shoreline habitat), PCE 2 (terrestrial space 600 ft lateral extent), and PCE 3 (prey base). Construction along the bank and within 600 ft of the stream will remove vegetation, likely resulting in some increased sedimentation. As stated above, the realignment of road on either side of the AOP structure will result in a small amount of permanent ground disturbance within the lateral extent of proposed critical habitat. However, the area affected is small (entire project area less than two acres) and the road realignment will ultimately benefit upland, riparian, and instream habitat by reducing sedimentation from the road. In addition, ground disturbance along approximately 100 yards of Spring Creek, may result in dispersion of prey species from this location during

construction. Efforts to move native fish and leopard frogs from the project footprint will result reduce effects to prey species from the project.

Western yellow-billed cuckoo

Chavez Ranch Road, Angel Valley, Molina, and Lower Oak Creek (Activities 2, 3, 7, and 8)
The proposed work at Activity sites 2, 3, 7, and 8, will not alter cuckoo riparian habitat and all will have a protocol survey requirement or a timing restriction to eliminate the potential for noise disturbance during the cuckoo breeding season (May 15 through September 30). Proposed ground disturbing activities associated with Chavez Road, Angel Valley Road, and Molina Homestead, and restoration activities along Lower Oak Creek will not result in ground disturbance in the riparian zone or removal of riparian (including mesquite) trees. Ultimately, these actions will improve habitat conditions for yellow-billed cuckoo by reducing sedimentation, eliminating motorized access, and controlling human access to riparian areas and cuckoo habitat. Therefore, disturbance effects to breeding cuckoos will be insignificant and discountable, and there will be no direct effects to cuckoo habitat from these activities.

Pet Waste Stations (Activity 6)
Installation of pet waste stations will require digging a hole for a pole, which the Forest Service will dig by hand where pole locations occur within 0.25 mile of suitable cuckoo habitat during the breeding season (May 15 through September 30). Since the pet waste station locations are located in parking areas and trailheads and out of suitable cuckoo habitat, there is little potential for visual or aural disturbance to cuckoos from the installation.

Road Decommissioning in Oak Creek Watershed (Activity 9)
All but two roads (FR9845N and 9845R) slated for decommissioning occur far from cuckoo riparian habitat. Since noise disturbance from decommissioning and restoration activities along FR9845N and 9845R occur within close proximity to riparian habitat, the work would be conducted outside of the cuckoo breeding season (May 15 through September 30), unless protocol surveys infer absence. Decommissioning these two roads will improve yellow-billed cuckoo habitat by reducing sedimentation, eliminating motorized access, and controlling access to riparian areas. Therefore, effects to breeding cuckoos will be insignificant and discountable from these road-decommissioning activities.

Spring Creek AOP (Activity 5)
The Spring Creek AOP crossing will result in removal of riparian habitat, but is not expected to disturb cuckoos. The new Spring Creek crossing structure will result in removal of some riparian trees, adversely affecting the existing riparian canopy within the construction footprint. Although riparian vegetation will re-establish eventually, there will be a short-term loss of cuckoo habitat. Since implementation of this activity may occur during the cuckoo-breeding season, there may be noise disturbance to breeding cuckoos. The presence of crews and equipment, along with noise from the equipment may cause flushing, premature fledging, or even nest site abandonment if cuckoos are present. As stated earlier, although protocol surveys have not occurred, informal surveys did not detect cuckoos at the project site in Spring Creek. Based on informal surveys, the Forest Service does not think that cuckoos occur in Spring Creek.

We think that based upon the small project footprint, habitat within the footprint, and the results of the informal surveys, that cuckoos are unlikely to occur within or adjacent to the AOP area.

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.

State lands near the project area include Slide Rock State Park and rangelands near Spring Creek. Activities at the State Park can include new ground disturbing activities (such as construction of a new parking lot) which can result in direct and indirect effects to listed species and/or their habitat. Grazing on state land near Spring Creek could result in minor sedimentation into Spring Creek where northern Mexican gartersnake and listed fish occur.

Private land occurs in Oak Creek and at the headwaters of Spring Creek. Various activities may occur that could affect riparian and aquatic species. Development can result in disturbance and loss of and/or fragmentation of habitat.

JEOPARDY AND ADVERSE MODIFICATION 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 or result in the destruction or adverse modification of designated critical habitat.

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 listed species addressed, the factors responsible for that condition, and the species' survival and recovery needs; (2) Environmental Baseline, which evaluates the condition of the species 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 species; 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.

Destruction/Adverse Modification Analysis Framework

Past designations of CH have used the terms PCEs, PBFs or "essential features" to characterize the key components of CH that provide for the conservation of the listed species. The new CH regulations (79 FR 27066) discontinue use of the terms "PCEs" or "essential features," and rely exclusively on use of the term "PBFs" for that purpose because that term is contained in the statute. However, the shift in terminology does not change the approach used in conducting a destruction or adverse modification analysis, which is the same regardless of whether the original designation identified PCEs, PBFs, or essential features. For those reasons, references to PCEs or essential features should be viewed as synonymous with PBFs. All of these terms characterize the key components of CH that provide for the conservation of the listed species.

The final rule revising the regulatory definition of "destruction or adverse modification of critical habitat" became effective on March 14, 2016 (81 FR 7214). The revised definition states: "Destruction or adverse modification means a direct or indirect alteration that appreciably diminishes the value of critical habitat for the conservation of a listed species. Such alterations may include, but are not limited to, those that alter the physical or biological features essential to the conservation of a species or that preclude or significantly delay development of such features."

Similar to our jeopardy analysis, our adverse modification analysis of critical habitat relies on the following four components: (1) the Status of Critical Habitat, which evaluates the range-wide condition of designated critical habitat in terms of PCEs, the factors responsible for that condition, and the intended recovery function of the critical habitat overall; (2) the Environmental Baseline, which evaluates the condition of the critical habitat in the action area, the factors responsible for that condition, and the recovery role of the critical habitat in the action area; (3) the Effects of the Action, which determine the direct and indirect effects of the proposed federal action and the effects of any interrelated or interdependent activities on the PCEs and how they will influence the recovery role of affected critical habitat units; and (4) Cumulative Effects, which evaluate the effects of future, non-federal activities in the action area on the PCEs and how they will influence the recovery role of affected critical habitat units.

Conclusion

After reviewing the current status of the Gila chub and its critical habitat, the Gila topminnow, the northern Mexican gartersnake and its proposed critical habitat, the spikedace, and the western yellow-billed cuckoo and its proposed critical habitat; the environmental baseline for the action area; and the effects of the proposed 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 Gila chub, Gila topminnow, northern Mexican gartersnake, spikedace, and cuckoo, and is not likely to destroy or adversely modify designated Gila chub critical habitat or proposed gartersnake and cuckoo critical habitat. We base this conclusion on the following:

Gila chub and critical habitat

- Conservation measures to capture and move Gila chub will reduce the effects of the action and the project will not result in population level effects to Gila chub in Spring

Creek. In addition, there will be long-term benefits for Gila chub as the habitat in Spring Creek is improved post-project.

- The Spring Creek AOP will not affect the long-term suitability of Gila chub habitat and designated critical habitat in Spring Creek. Critical habitat would remain functional during implementation of the proposed action, and will continue to serve the intended conservation role for the species. The proposed action will enhance critical habitat and its PCEs following implementation.

Gila topminnow

- Conservation measures to capture and move Gila topminnow will reduce the effects of the action and the project will not result in population level effects to Gila topminnow in Spring Creek. In addition, there will be long-term benefits for Gila topminnow as the habitat in Spring Creek is improved post-project.

Northern Mexican gartersnake and proposed critical habitat

- Gartersnakes are secretive, able to persist in low densities, and occur across various streams in the United States within Arizona and Mexico. Because gartersnake populations occur across a broad area, we anticipate the direct effects caused by this project will not jeopardize the species' continued existence.

- The proposed Spring Creek AOP will not affect the long-term suitability of northern Mexican gartersnake habitat or the gartersnakes ability to use Spring Creek. In addition, the project will ultimately improve habitat in the creek by removing vehicle traffic from the creek bed and reduce sedimentation from the road on either side of the crossing.

- Proposed critical habitat will continue to serve the function and conservation role of critical habitat for the northern Mexican gartersnake.

Spikedace

- Conservation measures to capture and move spikedace will reduce the effects of the action and the project will not result in population level effects to spikedace in Spring Creek. In addition, there will be long-term benefits for spikedace as the habitat in Spring Creek is improved post-project.

Western yellow-billed cuckoo

- The Spring Creek AOP activity will not affect the yellow-billed cuckoo's ability to use the area for breeding into the future.

- The effects to yellow-billed cuckoo habitat from the Spring Creek AOP will remove a small area of vegetation and will not result in a decline in the structural richness of the vegetative community, change the understory vegetation community, or reduce habitat

connectivity in Spring Creek. Therefore, the Spring Creek AOP will not affect the long-term suitability of yellow-billed cuckoo habitat in Spring Creek.

- There is no proposed critical habitat in Spring Creek; therefore, there will be no effect to PCEs from the proposed action.

We based 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 the Forest Service 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 Forest Service so that they become binding conditions of any grant or permit issued to the applicant, as appropriate, for the exemption in section 7(o)(2) to apply. The Forest Service has a continuing duty to regulate the activity covered by this incidental take statement. If the Forest Service (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 Forest Service must report the progress of the action and its impact on the species to the FWS as specified in the incidental take statement [50 CFR § 402.14(i)(3)].

AMOUNT OR EXTENT OF TAKE

Gila chub, Gila topminnow, and spikedace

We are reasonably certain that the proposed action will cause incidental take of Gila chub, Gila topminnow, and spikedace because of actions associated with the removal and replacement of the existing low-water crossing structure in Spring Creek.

- Harassment, direct fatality, or injury to fish from the short-term use of heavy machinery in the creek to remove the existing low-water crossing structure and replace it. Although the Forest Service will work with AGFD and FWS to capture and move fish from the crossing area, there is, still the potential for the action to injure or kill individual fish, as it is unlikely biologists would capture all fish from the area. However, effects will be short-term; long-term the site suitability for all three fish will likely improve.

- Short-term harassment from potential increases in sedimentation as the site as vegetation and soil recover in the area adjacent to the new structure.

We cannot quantify the number of individual Gila chub, Gila topminnow, and spikedace that will escape capture and die during construction within the work area because individuals that biologists do not move during salvage operations will be almost impossible to find or eaten by predators. Thus, we anticipate take in the form of injury or death of all Gila chub, Gila topminnow, and spikedace that are not captured (i.e., that are missed) at the Spring Creek AOP construction site. Because we anticipate any remaining fish will die within the construction footprint, the project cannot exceed this incidental take as long as the project effects are contained within the action area. If monitoring indicates that fish died or are injured because of the proposed action beyond the construction footprint (e.g., contamination), then incidental take will be exceeded.

Northern Mexican gartersnake

The FWS does not anticipate the proposed action will incidentally take any northern Mexican gartersnakes for the following reasons:

- Although the gartersnake is secretive in nature, two gartersnake surveys (2004, 2016) of disparate effort and a number of fish surveys in the creek have only ever located one gartersnake, and we expect the population to exist at a low density. Due to the limited size of the disturbance footprint and the relatively short amount of time required to complete the project, coupled with a lower population density of gartersnakes – we do not expect any incidental take of northern Mexican gartersnakes because of this project.

Western yellow-billed cuckoo

The FWS does not anticipate the proposed action will incidentally take any yellow-billed cuckoos for the following reasons:

- Due to the small size and extent of the project area, and the lack of detections at this site, it is unlikely that cuckoos will be breeding at the Spring Creek AOP crossing. Although the Forest Service has not conducted protocol survey at the site to infer absence, informal surveys have not detected birds; therefore, we are not reasonably certain that cuckoos occur within this small project footprint or the area surrounding it.

EFFECT OF THE TAKE

In this biological opinion, the FWS determines that this level of anticipated take is not likely to result in jeopardy to the Gila chub, Gila topminnow, and spikedace for the reasons stated in the Conclusions section.

REASONABLE AND PRUDENT MEASURES

We determine that the proposed action incorporates sufficient measures that reasonably and prudently minimize the effects of incidental take of Gila chub, Gila topminnow, and spikedace. The Forest Service incorporated all reasonable measures to minimize take into the project description. Thus, no reasonable and prudent measures are included in this incidental take statement.

Disposition of Dead or Injured Listed Species

Upon locating a dead, injured, or sick listed species initial notification must be made to the FWS's Law Enforcement Office, 4901 Paseo del Norte NE, Suite D, Albuquerque, NM 87113; 505-248-7889) within three working days of its finding. Please provide written notification within five calendar days and include the date, time, and location of the animal, a photograph if possible, and any other pertinent information. Send the notification to the Law Enforcement Office with a copy to this office. Take care 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 the Forest Service continue to work with the FWS and the Arizona Game and Fish Department to monitor northern Mexican gartersnake and yellow-billed cuckoo habitat use and behavior on the Verde River and its tributaries.

In order for the Forest Service to inform us of actions minimizing or avoiding adverse effects or benefiting listed species or their habitats, we request notification of the implementation of any conservation recommendations.

REINITIATION NOTICE

This concludes formal consultation on for the Oak Creek Watershed Restoration 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 project exceeds the amount or extent of incidental take, any operations causing such take must cease pending reinitiation.

In keeping with our trust responsibilities to American Indian Tribes, we encourage you to coordinate with the Bureau of Indian Affairs in the implementation of this consultation. By copy of this biological opinion, are notifying the Navajo Nation, Hopi Tribe, Yavapai-Apache Nation, and the Yavapai-Prescott Indian Tribe of its completion. We also encourage you to coordinate the review of this project with the Arizona Game and Fish Department.

We appreciate the Forest Service's efforts to identify and minimize effects to listed species from this project. Please refer to the consultation number, 02EAAZ00-2018-F-1161 in future correspondence concerning this project. Should you require further assistance or if you have any questions, please contact Shaula Hedwall (928-556-2118).

Sincerely,

Greg Beatty for JAH

Jeffrey A. Humphrey
Field Supervisor

cc (electronic):
Chief, Habitat Branch, Arizona Game and Fish Department, Phoenix, AZ
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District Ranger, Red Rock Ranger District, Coconino National Forest, Sedona, AZ
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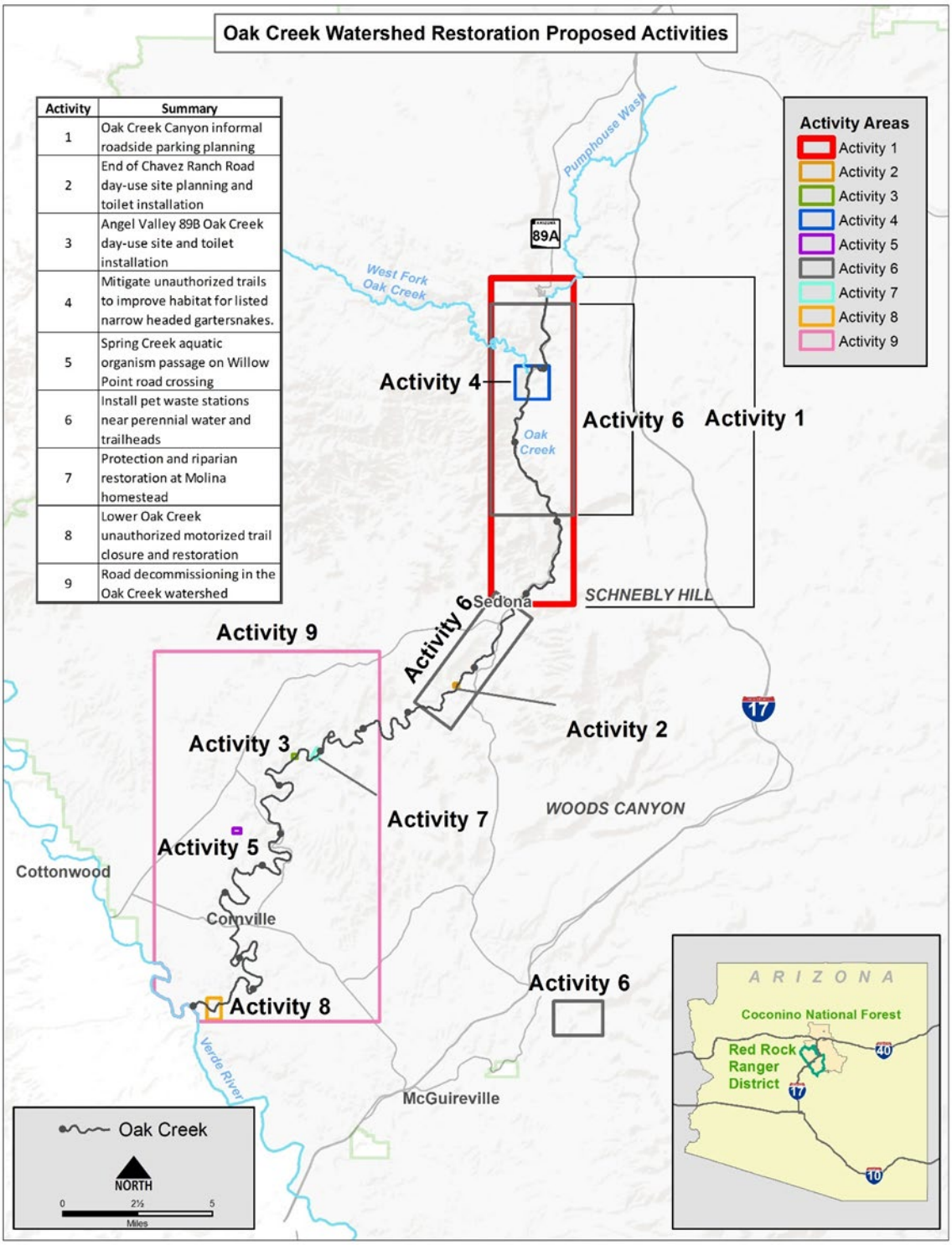
Stewardship Staff Office, Coconino National Forest, Flagstaff, AZ
Forest Biologist, Coconino National Forest, Flagstaff, AZ
Forest Fish Biologist, Coconino National Forest, Flagstaff, AZ
Fish and Wildlife Biologists, U.S. Fish and Wildlife Service (Attn: S. Sferra, G. Beatty, J. Servoss, R. Gordon, D. Duncan, M. Richardson, Z. Jackson, and A.Dean)
Director, Hopi Cultural Preservation Office, Kykotsmovi, AZ
Director, Zuni Heritage and Historic Preservation Office, Zuni, NM
Director, Historic Preservation Department, Navajo Nation, Window Rock, AZ
Director, Apache Cultural Program, Yavapai-Apache Nation, Camp Verde, AZ
Director, Yavapai Cultural Program, Yavapai-Apache Nation, Camp Verde, AZ
Director, Cultural Research Program, Yavapai-Prescott Indian Tribe, Prescott, AZ
Executive Director, Inter-Tribal Council of Arizona, Inc., Phoenix, AZ
Environmental Protection Officer, Bureau of Indian Affairs, Phoenix, AZ

TABLES AND FIGURES

Figure 1. Overview map of proposed activities.



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APPENDIX A: 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 narrow-headed gartersnake (*Thamnophis rufipunctatus*), the Gila trout (*Oncorhynchus gilae*), and spikedace and loach minnow (*Tiaroga cobitis*) critical habitat.

Mexican spotted owl
Activity 1 (Oak Creek Canyon Unauthorized Roadside Parking Reduction), Activity 4 (Unauthorized Trail Mitigation), and Activity 6 (Pet- Waste Station Installation), are the only projects that are in or near Mexican spotted owl PACs.

- During the Mexican spotted owl breeding season (March 1 – August 31), the Forest Service will not allow heavy machinery use in a PAC if owls are determined to be breeding or within 0.25 mile of a PAC if nesting status is unknown. Therefore, there will be insignificant and discountable effects to owls during the breeding season.
- Within recovery or PAC habitat, the action would only remove juniper or chaparral. These species are not key habitat components of owl habitat; therefore, effects to habitat are insignificant.

Narrow-headed gartersnake
Narrow-headed gartersnakes are present within Oak Creek. The known extent of the population occurs predominately in upper Oak Creek Canyon from Midgley Bridge north and up the West Fork of Oak Creek, although individuals are incidentally observed occasionally in Oak Creek, within and downstream of Sedona (near Cathedral Rock). Proposed activities in the uplands of occupied habitat in Oak Creek Canyon are in areas will occur in areas that are denuded, compacted, and do not provide desirable habitat for narrow-headed gartersnakes.

- Although there is the potential for a narrow-headed gartersnake to be incidentally moving through work zones when project implementation occurs, given the low number of narrow-headed gartersnakes in these areas, as well as the lack of habitat in the project areas, the potential for this to occur is extremely low. The requirement to search the general area immediately prior to conducting work with heavy machinery will further reduce this slight potential. Therefore, the effects to narrow-headed gartersnakes from the proposed action will be discountable.
- No ground disturbing activities will occur in aquatic or riparian areas within narrow-headed gartersnake habitat; therefore, there will be no effects to habitat.
- In addition, the proposed actions would reduce trail densities, reduce runoff from dirt parking areas, reduce pet waste in the environment, and enhance native riparian vegetation, all of which should provide long-term water quality improvements and benefit habitat for narrow-headed gartersnakes.

Gila trout
Gila trout occur in the lower portion of the West Fork of Oak Creek and upper mainstem Oak Creek. Activity 1 (Oak Creek Canyon Unauthorized Roadside Parking Reduction), Activity 4

(Unauthorized Trail Mitigation), and Activity 6 (Pet-Waste Station Installation), are the only projects that are proposed in this area.

- Ground disturbance during these activities will be minimal and Best Management Practices will minimize sediment input into the stream channels. Any potential effects, such as minor sediment mobilization, are unlikely to occur. Therefore, we expect discountable effects from these actions to Gila trout and their habitat within West Fork Oak Creek and Oak Creek mainstem.
- The proposed actions adjacent to Gila trout habitat would reduce trail densities, reduce runoff from dirt parking areas, reduce pet waste in the environment, and enhance native riparian vegetation, all of which should provide long-term water quality improvements and benefit habitat for Gila trout within the action area.

Spikedace and loach minnow critical habitat

Activities 2, 3, 6, 7, 8, and 9 will all occur along Oak Creek within designated spikedace and loach minnow critical habitat. Activity 5 is at Spring Creek, which the FWS did not designate as critical habitat for spikedace or loach minnow. Activities 1 and 4 will not affect critical habitat.

- There will be no effects to PCEs 1a, 1c, 1d, because none of the proposed activities will alter Oak Creek's perennial water flow or water velocities (PCE 1a), the gradient and elevation of the creek (PCE 1c), water temperature (PCE 1d), habitat connectivity (PCE 4), the presence of nonnative aquatic species (PCE 5) or the hydrologic regime (PCE 6).
- The proposed activities will not result in any measurable short-term increase in sedimentation (PCE 1b) or measurable short-term affects to the aquatic food base (PCE 2). Therefore, effects to spikedace and loach minnow critical habitat are insignificant.
- The proposed activities will not result in any measurable increases in pollutants (PCE 3), alter the nature of perennial flows (PCE 4), allow for or enhance conditions for nonnative aquatic species (PCE 5), or result in regulation of flows (PCE 6).

APPENDIX B: DETAILED DESCRIPTION OF THE PROPOSED ACTION

ACTIVITY 1: OAK CREEK CANYON UNAUTHORIZED ROADSIDE PARKING PLANNING

Activity 1 evaluated 60 unauthorized parking locations and unauthorized trails associated with these parking locations along State Route 89A at 61 locations between the City of Sedona and the Pumphouse Bridge. These would be individually evaluated, and it is anticipated approximately half the currently available emergency pullouts may be closed under this proposed activity. The Forest Service would close the first 100 feet of unauthorized trails associated with these roadside parking locations. This activity would improve hydrologic function and water quality, which can lead to improvements in aquatic habitat, riparian vegetation, and public safety. In addition, the action would enhance up to two miles of stream, and restore 20 acres of aquatic habitat for threatened and endangered species recovery.

The methods to close unauthorized roadside parking would include, but are not be limited to, full closure with guardrail, full closure with native vegetation using temporary traffic drums during landscape establishment, or closure with maintenance access. Closure with maintenance access would include three options: closure to the public with decorative bollards that unlock for maintenance and emergency service, closure to the public with four-inch wooden posts connected by chain or rope, or installing a combination of permanent flexible delineators and removable tubular markers for designated openings for maintenance and emergency service. Closure methods would comply with Forest Service standards as well as ADOT requirements for the right-of-way.

ACTIVITY 2 – END OF CHAVEZ RANCH ROAD DAY-USE SITE PLANNING AND TOILET INSTALLATION

Activity 2 develops a low-impact, designated day-use recreation site to address the effects from unauthorized recreation at the end of Chavez Ranch Road, while providing a continued, sustainable recreation opportunity at the site. The activity includes installing a toilet located outside the 100-year floodplain, shrinking and grading the parking area using low-impact strategies, defining the parking area, installing structures to eliminate roadside parking, designating two sustainable access points from the parking lot to bedrock section of Oak Creek, and rehabilitating unauthorized disturbed areas to reduce sedimentation inputs. Other work may include installation of a kiosk, picnic table, and trash receptacles; a gate; and a dog-waste station.

The Forest Service would design a retention basin to accommodate runoff from the road entrance to reduce sedimentation and *E. coli* runoff into Oak Creek. Ditch access would remain for the Chavez Ditch, which brings water to local residents for use according to their water rights; however, the Forest Service would install a gate to provide administrative access only along the ditch. This area regularly exceeds *E. coli* standards during regular baseflow water sampling, and installation of a vault toilet and a dog-waste station would curb these contaminants into Oak

Creek. Overall, this activity would enhance about 0.5 mile of the streambank and restore up to 1.2 acres of riparian zone habitat.

ACTIVITY 3 – ANGEL VALLEY 89B OAK CREEK DAY USE SITE AND TOILET INSTALLATION

Activity 3 addresses vehicle use and camping within the riparian and flood zone by planning two small-designated parking areas, installing a toilet outside the 100-year floodplain, and restoring heavily trampled areas. The Forest Service would gate the section of the road beyond the parking area and change the designation from an open road to closed road (administrative use only). The road would continue to provide access for Forest Service permittees, and serve as a foot trail for river access. The Forest Service would conduct trail drainage improvements and use restoration techniques to stabilize the area and spread runoff and infiltrate water as much as possible. Overall, this activity would enhance about 0.5 mile of the stream bank and restore up to 0.8 acres of riparian zone habitat.

ACTIVITY 4 – HABITAT IMPROVEMENT FOR NARROW-HEADED GARTERSNAKES

Activity 4 provides access to Oak Creek and West Fork of Oak Creek in hardened and rock-armored locations and includes decommissioning unauthorized trails leading to the confluence of the creeks. The confluence of Oak Creek and West Fork of Oak Creek is likely the most important narrow-headed gartersnake habitat in Oak Creek. In particular, the Forest Service would close the social trail directly north where the West Fork Bridge crosses Oak Creek. They would adjust the social trail south of the bridge to avoid the wetted, seep areas. The Forest Service would close (using fencing) unauthorized trails between the Mayhew Lodge Historic Site and the gartersnake basking area. They would remove Trail 71C, approximately 0.7 mile, from the official trail system and maps; however, they would not use any ground-disturbing activities to close the trail. Overall, this activity would reduce trail density, reduce sediment inputs into the streams, improve water quality, and create refugia for narrow-headed gartersnake neonates.

ACTIVITY 5 – SPRING CREEK AQUATIC ORGANISM PASSAGE ON WILLOW POINT ROAD CROSSING

Activity 5 replaces the existing low-water crossing structure at the Willow Point crossing on Spring Creek by constructing a new AOP feature and improving road drainage adjacent to the crossing. This would improve aquatic organism passage and reduce sediment delivery into Spring Creek, which impairs water quality and aquatic habitat.

ACTIVITY 6 – PET-WASTE STATIONS NEAR PERENNIAL WATER AND TRAILHEADS

The Forest Service would add pet-waste stations to the following trail heads: West Fork/Call of the Canyon, Bootlegger, Cave Springs, Manzanita, Encinoso, Banjo Bill, Pine Flat, Half Way,

Huckaby Trailhead, Crescent Moon day-use Area, Chavez Campground, Bell Rock, Bell Trail, Cathedral Rock, Chavez Ranch Road, Baldwin trail head, and the Turkey Creek trailheads (both the official trailhead, and the one at the intersection of Verde Valley School Road and the access road to the Turkey Creek trailhead). The Forest Service would work with the City of Sedona and the Oak Creek Watershed Council to help maintain these dog-waste stations. The use of these dog-waste stations would decrease water quality impairment from *E. coli*.

ACTIVITY 7 – PROTECTION AND RIPARIAN RESTORATION AT MOLINA HOMESTEAD

Activity 7 converts the end of NFS Road 9845 past the pasture fence line into a trail that allows access to Oak Creek without going through the Molina Homestead site. The Forest Service would restore the current road alignment in a way that protects cultural resources and includes cultural interpretation at this site, coupled with riparian restoration. Roads no longer used by motor vehicle traffic, would be ripped and seeded with native vegetation. This would improve and protect riparian vegetation, function, and aquatic habitat and reduce sediment delivery to Oak Creek.

ACTIVITY 8 – LOWER OAK CREEK UNAUTHORIZED MOTORIZED TRAIL CLOSURE AND RESTORATION

Activity 8 closes and restores the motorized non-system roads leading across Oak Creek from NFS Road 9813 to Road 119B. This activity would require some augmentation to existing water gap fencing. The Forest Service would close and restore one non-system road from NFS Road 9813 near the gap fencing area. They would restore this non-system road between gap fences by ripping, seeding, planting, and mulching. To help close the roads, the Forest Service would cut and use area trees (juniper, crucifixion thorn) and shrubs (mesquite, acacia, catclaw). The action would improve water quality and enhance approximately five miles of stream.

ACTIVITY 9 – ROAD DECOMMISSIONING IN THE OAK CREEK WATERSHED

Activity 9 decommissions approximately 11 miles of road footprints on roads not designated on the motor vehicle use map. Four and one-half miles would be for unauthorized segments that are adjacent to authorized segments. Six and one-half miles would be for existing segments. Activities may include placing boulders and vegetative slash to camouflage initial entry points or ripping and seeding the entire footprint, the beginning and end of the road, or both.

APPENDIX C: WATER QUALITY BEST MANAGEMENT PRACTICES (BMPS)

AQECO-2. OPERATIONS IN AQUATIC ECOSYSTEMS

- Incorporate Clean Water Act (CWA) 404 permit requirements and other Federal, State, and local permits or requirements into the project design and plan.
- Clearly delineate the work zone.
- Locate access and staging areas near the project site but outside of work area boundaries, AMZs, wetlands, and sensitive soil areas.
- Refuel and service equipment only in designated staging areas (see BMP Road-10 [Equipment Refueling and Servicing]).
- Develop an erosion and sediment control plan to avoid or minimize downstream impacts using measures appropriate to the site and the proposed activity (see BMP Fac-2 [Facility Construction and Stormwater Control]).
- Consider using small, low ground pressure equipment, and hand labor where practicable.
- Ensure all equipment operated in or adjacent to the waterbody is clean of aquatic invasive species, as well as oil and grease, and is well maintained.
- Avoid scheduling instream work during periods that could be interrupted by high flows.
- Avoid or minimize unacceptable damage to existing vegetation, especially plants that are stabilizing the bank of the waterbody.
- Minimize heavy equipment entry into or crossing water as is practicable.
- Conduct operations during dry periods.
- Promptly install and appropriately maintain erosion control measures.
- Promptly install and appropriately maintain spill prevention and containment measures.
- Use suitable species and establishment techniques to revegetate the site in compliance with local direction and requirements per FSM 2070 and FSM 2080 for vegetation ecology and prevention and control of invasive species.
- Use suitable measures to divert or partition channelized flow around the site or to dewater the site as needed to the extent practicable.

FAC-2. FACILITY CONSTRUCTION AND STORMWATER CONTROL

- Establish designated areas for equipment staging, stockpiling materials, and parking to minimize the area of ground disturbance (see BMP Road-9 [Parking Sites and Staging Areas] and BMP Road-10 [Equipment Refueling and Servicing]).
- Control, collect, detain, treat, and disperse stormwater runoff from the site.
- Develop and implement a post-construction site vegetation plan using suitable species and establishment techniques to revegetate the site in compliance with local direction and requirements per Forest Service Manual (FSM) 2070 and FSM 2080 for vegetation ecology and prevention and control of invasive species.
- Install sediment and stormwater controls before initiating surface-disturbing activities to the extent practicable.

FAC-4. SANITATION SYSTEMS

- Use qualified personnel to locate, design, inspect, operate, maintain, and manage sanitation systems.
- Use suitable setback distances from water bodies or other sensitive areas when siting facilities.
- Use proper field investigations and soil tests to determine suitable soils for onsite treatment and disposal systems.

REC-2. DEVELOPED RECREATION SITES

- Relocate trails, parking areas, campsites, play areas, or water distribution points that are causing offsite resource damage.
- Redesign and reconstruct, or close and rehabilitate, areas of recreation sites that exhibit signs of overuse.
- Use suitable measures to restrict access, when necessary, to nearby wetlands and riparian areas that show signs of excessive damage from recreation use to allow for vegetative recovery.
- Rehabilitate unwanted user-created trails and sites within the developed recreation site and employ suitable measures to discourage their creation and use (see BMP Fac-10 [Facility Site Reclamation]).

REC-3. DISPERSED USE RECREATION

- Consider providing primitive sanitation facilities in areas where perpetual concentrated dispersed recreation use is causing adverse effects to soil, water quality, or riparian resources (see BMP Fac-4 [Sanitation Systems]).
- Close and rehabilitate dispersed or undeveloped sites that are causing unacceptable adverse effects on soil, water quality, and riparian resources (see BMP Fac-10 [Facility Site Reclamation]).
- Manage site to mitigate adverse effects of use when closure is not practicable.

ROAD-4. ROAD OPERATIONS AND MAINTENANCE

- Upgrade drainage structures to avoid, to the extent practicable, or minimize direct discharges into nearby waterbodies.
- Construct or reconstruct drainage control structures as needed.
- Ensure that ditches and culverts are clean and functioning.
- Remove berms unless specifically designed for erosion control purposes.

ROAD-6. ROAD STORAGE AND DECOMMISSIONING

- Reclaim unneeded road width, cut, and fill slopes when converting a road for future use as a trail.
- Use suitable measures to ensure that surface drainage will intercept, collect, and remove water from the trail surface and surrounding slopes in a manner that minimizes concentrated flow and erosion on the trail surfaces without frequent maintenance.
- Remove drainage structures.
- Recontour and stabilize cut slopes and fill material.
- Implement suitable measures to promote infiltration of runoff and intercepted flow and desired vegetation growth on the road prism and other compacted areas.