Native Fish Restoration in Fossil Creek
Post-Decisional (Section18) Review

(FSH 1909.15, Chapter 10, §18.1)

Introduction

The Coconino and Tonto National Forests conducted an IDT (interdisciplinary team) review of the analysis for the *Native Fish Restoration in Fossil Creek* project that was documented in the 2004 Environmental Assessment (EA) and Decision Notice and Finding of No Significant Impact signed by the Regional Forester, Southwestern Region on June 8, 2004, for compliance and consistency with agency NEPA policy in FSH 1909.15, Section 18.1. The Bureau of Reclamation was the co-lead for NEPA and signed their Notice of Decision and Finding of No Significant Impact on June 8, 2004.

This Section 18 review consists of two parts:

1. Interdisciplinary review of the project to determine if any new information or changed circumstances exist and if so, whether they are within the scope and range of effects considered in the original analysis, and,
2. Review of the documentation by the responsible official and a determination if a correction, supplement, or revision to the EA is necessary. If not, implementation should continue.

2004 Project Decision

The Regional Forester decision was to construct a fish barrier within the Mazatzal Wilderness, as opposed to an alternative location outside of the Wilderness, to prevent the upstream migration of non-native fish, and to apply antimycin, a piscicide, to remove the non-native fish above the barrier and in upland stock tanks. The decision included minor modifications to the proposed alternative to further minimize wilderness impacts. The rationale for the decision was based on:

- Restoring ecological functionality to wilderness;
- Rarity of values based on the recognition that Arizona ranks number one in the U.S. for the percentage of native fish species at risk. The selected alternative provided almost 3 more miles of stream restored for native fish and would provide for reintroduction of threatened and endangered fishes; and,
- Reduced risk of recreational users being able to transplant non-natives into Fossil Creek above the barrier location because of its remote location.

The project was implemented in fall of 2004. Fish monitoring and barrier inspections have been ongoing.

New Information

A. For seven years, monitoring showed that Fossil Creek remained free of non-native fish above the concrete fish barrier. However, in July 2011, non-native smallmouth bass were detected above the barrier in the Mazatzal Wilderness. During the winter of 2009/2010, a very large flood event resulted in the deposition of a slug of rocks and boulders below the left notch of the barrier (looking downstream). This likely provided the avenue for the non-native fish to swim up and over the fish barrier. Additionally, one of the concrete abutments was damaged.

A temporary barrier was installed in August 2011 upstream of the non-native bass intrusion in order to contain the bass to as small of a reach of the stream as possible. The temporary barrier is located 2.8 miles upstream from the permanent fish barrier. The Arizona Game and Fish Department manually removed as many of the re-invading bass as possible, but were unable to remove them all.

B. In April 2012, 8-9 large adult bass were observed in one location above the temporary fish barrier but below Irving. The Arizona Game and Fish Department has removed all but one. That individual fish was re-detected in the same pool in August 2012, but no young-of-the-year bass have been detected in the reach between the temporary barrier and Irving. Therefore, it appears smallmouth bass have not reproduced in this reach. AGFD personnel are continuing efforts to catch and remove the one individual. Because of their size and other indicators, the smallmouth bass appear to have been illegally transported from another location and released into Fossil Creek.

C. Additionally, ongoing monitoring of stock tanks in the uplands and tributaries that feed in to Fossil Creek has detected non-native fish in several stock tanks in the uplands that could be a source into Fossil Creek.

D. The 2004 Environmental Analysis (EA) included the potential for additional applications of the piscicide antimycin if nonnative fish were found in Fossil Creek in the future. It called for the Forest Service to prepare a supplemental information report to evaluate if treatment(s) are consistent with the EA or not. The selected alternative in the 2004 EA also disclosed the potential for upland treatments based on surveys. The piscicide used for the stream treatment in 2004 was antimycin A, but it is no longer commercially available. The only approved piscicide available is rotenone.

E. As a result of concerns by some members of the public regarding the use of rotenone as a piscicide, the Arizona Game and Fish Department placed a temporary moratorium on the use of rotenone in the state, pending a thorough review by an advisory committee. The results were documented in "Rotenone Review Advisory Committee Final Report and Recommendations to the Arizona Game and Fish Department" (December 31, 2011). Based on the rotenone review, this moratorium on rotenone has since been lifted and rotenone has now replaced antimycin as the primary piscicide used for native fish restoration efforts.

Action Subject to Section 18 Review

In order to restore the native fish assemblage in Fossil Creek, the non-native bass currently present above the fish barrier in the Mazatzal Wilderness and those in upland stock tanks need to be removed. Because of the complexity of habitat and amount of flow present in Fossil Creek, manual removal methods have not been fully successful. Eventually, the stream would revert to an aquatic system dominated by non-native fish and declining native aquatic species.

This review evaluates whether the proposed stream retreatment using rotenone instead of antimycin is within the scope and range of effects of the 2004 decision.

Completed and Ongoing Actions Not Subject to Section 18 Review

Construction of the temporary barrier to contain the bass has been completed (see above).

In early April 2012, the rock and boulder debris below the left notch was removed and redistributed using primitive tools and skills, such as blasting, hand drilling using star bits, and breaking up rocks with sledgehammers.

In addition to the deposition of rocks and boulders below the left barrier plug, a critical portion of the rock abutment that the concrete notch was anchored to was removed by the flood. The abutment needs to be repaired in order to direct stream flows over the left concrete notch as originally designed, which will protect the left bank from erosion, and to prevent non-native fish from swimming up and over the barrier during high flow events. This will restore the barrier to its original functional condition. NEPA has been completed. The Bureau of Reclamation will be awarding the contract for the abutment repair in early October and the work will be completed by mid-November. The work could include some additional rock and boulder removal. A Minimum Requirements Decision Guide and Minimum Tools Analysis has been completed for both the barrier repair and use of rotenone for stream treatment in the Mazatzal Wilderness.

The AGFD is planning on treating Fossil Creek within the timeframe of September 10-28. This timing is important to successful implementation, since treatment needs to occur after spawning but before water temperatures get too cold beginning in October. Although the abutment repair won't be completed until after treatment, the removal of the rock and sediment debris in April restored the effective drop of the fish barrier that will keep nonnative fish from migrating up and over except under extraordinary flood conditions. Because the timing of stream treatment and abutment repair is occurring during a low flow portion of the year, the fisheries biologists do not expect there to be any issues with nonnatives migrating above the fish barrier.

Comparison of Rotenone and Antimycin

This section discusses any potential differences that could occur from using rotenone instead of antimycin in the context of the analysis and disclosure of effects in the 2004 EA and its Decision Notice. Refer to the description of the selected alternative (Proposed Action, Wilderness Alternative) for stream renovation and stock tank treatments on pages 24-27 in the EA.

<u>Scope of Treatment</u>

In 2004, approximately 9.5 miles of Fossil Creek were treated with antimycin. This proposal will treat a subset of the original treatment. At a minimum, the 2.8 mile reach between the temporary fish barrier at the Sally May confluence down to the permanent fish barrier will be treated (Figure 1). At this time, the Arizona Game and Fish Department does not expect that any more of the stream will need treatment, but they are intensively monitoring to determine if there is a need to treat above the temporary fish barrier up to the Irving site. If so, approximately 3.0 miles of stream will also need treatment. Project implementation is expected to take 2-3 weeks.

<u>Application techniques</u>

The proposed rotenone retreatment will use the same techniques as were used during the 2004 project. Native fish will be salvaged from reaches pre-treatment; however, holding tanks for these fish will not be set up at the Irving site. Instead, salvaged fish will be placed in Fossil Creek above the treated reaches. Non-native fish surveys will be ongoing until the retreatment would occur. If non-native fish are found between Irving and the temporary fish barrier and that reach needs to be treated, there may be a run-of-the-river holding facility set up at the Irving site similar to the 2004 project.

As in 2004, the amount of rotenone to be applied will be determined through bioassays and calculations to ensure effective treatment.

Rotenone application and neutralizing techniques will be the same as the 2004 project. Rotenone will be applied using drip stations, backpack sprayers, and sand. There will be fewer drip stations per mile than in 2004. At the lower end of treated reaches, neutralization stations will be set up to ensure proper detoxification occurs. Sentinel fish will be placed below the first detox station to ensure that detoxification is occurring as expected. A certified pesticide applicator will supervise rotenone application.

Control of Other Upstream Sources of Nonnative Fishes

The 2004 environmental analysis disclosed that there would be potential antimycin treatment in upstream stock tanks or tributaries that could serve as a source of nonnative fish in to Fossil Creek. As a result of surveys, the decision included treatment of five stock tanks. In October 2004, the Regional Forester approved the use of rotenone instead of antimycin for the stock tank treatments.

Currently, non-native fish are in two stock tanks within the Hackberry/Pivot Rock Range Allotment that could serve as a source in to Fossil Creek. Recent monitoring has found that non-native green sunfish are within Soldier Mesa Tank (T 13N, R 9E, Sec. 15). Additionally, goldfish may be present in Sand Rock Tank (T 13N, R 8E, Sec. 18).

Immediate removal of non-native species in stock tanks is a mandatory term and condition of the Hackberry/Pivot Rock Range Allotment Biological Opinion (U.S. Fish and Wildlife Service 2003) as follows:

> "2.3 If nonnative species are detected in stock tanks, the Coconino National Forest shall immediately initiate a multi-stakeholder planning effort to remove the nonnative species from the stock tank as quickly as possible. If a complete drying of a stock tank is deemed as the most effective management tool to address the threat of nonnative species, the Coconino National Forest may time this action so as to not place an unnecessary burden on the permittee."

Impacts to Non-Target Organisms

Note: The U.S. Fish and Wildlife Service prepared a detailed comparison of the effects of rotenone compared to antimycin (Hedwall 2012). The following paragraphs summarize the

impacts of the two piscicides from that document. Please refer to the full document for more information.

Aquatic invertebrates

Rotenone and antimycin both affect aquatic invertebrates the same way as fish, inhibiting respiration by blocking biochemical pathways of cell metabolism. The sensitivity of aquatic invertebrate species to rotenone varies.

Both rotenone and antimycin have short-term impacts on aquatic invertebrate abundance and can have longer-term effects on species composition. For both piscicides, the insect groups Ephemeroptera, Plecoptera, and Trichoptera are more sensitive than Coleptera and Diptera, and pre-treatment abundance is reached more quickly than taxonomic composition.

In summary, the effects of rotenone and antimycin on invertebrates are similar. The proposed retreatment will treat fewer miles of stream than the original treatment, leaving more miles of untreated stream to serve as a recolonization source from both above and below treated sections. Therefore, the use of rotenone on aquatic invertebrates will be within the scope and range of effects disclosed in the 2004 environmental analysis.

Amphibians and Reptiles

Both antimycin and rotenone impact gill-breathing life stages of amphibians, i.e. tadpole stages. Adult amphibians have low sensitivity. Therefore, delaying treatments until tadpoles have metamorphosed minimizes mortality.

While air-breathing reptiles are not expected to be directly impacted, the fish prey base of aquatic garter snakes is reduced post-treatment within the treated reach.

Because the effects of rotenone on amphibians and reptiles is the same as antimycin, and the proposed fall treatment with rotenone would be the same timing as when antimycin was applied in 2004, the effects are within the range and scope of effects disclosed for amphibians and reptiles in the 2004 environmental analysis.

Terrestrial birds and mammals

The exposure risk of rotenone to terrestrial organisms is low and studies have shown that it would take levels of consumption of fish, vegetation, and/or water that are not physically possible or probable to reach a lethal dose. Similarly, antimycin has been shown to have low toxicity when tested on a wide variety of terrestrial wildlife. Because rotenone and antimycin affects terrestrial animals similarly, the effects of the proposed rotenone treatment on terrestrial birds and mammals are within the scope and range of effects disclosed in the 2004 environmental analysis.

Evaluation of New Information and/or Changed Circumstances by Resource

Soil and Water Resources

The original EA disclosed Fossil Creek water quality as "inconclusive" (which is Category 3) for all beneficial uses based on the ADEQ 2002 305 (b) Assessment Report. More recent monitoring was conducted and reported in the ADEQ 2006/2008 305 (b) Assessment Report and classifies Fossil Creek as Category 1 – Attaining All Uses which is an improvement over the 2002 report. Some more recent water quality monitoring conducted by NAU detects elevated levels of E. Coli but has not been formally accepted as credible data by ADEQ. Elevated levels of E. Coli are a result of large numbers of recreationists depositing sanitary waste inappropriately near the stream. It is not connected to piscicide effects.

Effects to Water Quality

The proposed rotenone retreatment will use the same techniques as were used during the 2004 project. Similar to the decision implemented in the original EA, a certified pesticide applicator will supervise rotenone application, following label requirements that will mitigate point and non- point source pollution of water quality.

Piscicide treatments would impact only about 2.8 miles of stream (or 5.8 if the reach between Irving and the temporary barrier needs treatment), much less than the original antimycin application of 9.5 miles. Consequently, the effects to water quality are expected to be even less extensive than the original EA. The short-term-effects from use of rotenone at recommended concentrations are similar to antimycin and generally restricted to fish and aquatic macroinvertebrates and not to humans or livestock. Other mitigation measures identified with the application and use of antimycin will be implemented with the application of rotenone and will similarly protect soil and water resources from adverse effects.

Effects to Soils

The original EA disclosed that on-site fish barrier construction would directly affect about 0.4 acres of channel substrates and 0.9 acres of upland soil at the Stehr Lake and the Wilderness area staging areas. Since fish barrier construction is already complete, rotenone application would not disturb the soil at these sites nor contribute to non-point source water pollution.

Summary of Effects to Soil and Water Quality

The use of rotenone on water quality and soils will be within the scope and range of effects disclosed in the 2004 environmental analysis.

Biological Resources

Vegetation

As with antimycin, aquatic and/or riparian vegetation will not be harmed by the application of rotenone.

Terrestrial Wildlife and Human Health and Safety

The 2004 EA disclosed that humans, wildlife, and livestock could be exposed to antimycin during implementation of the project, but that toxicity of antimycin to vertebrate animals is generally restricted to fish and is very low or nonexistent for other vertebrates.

The impacts of rotenone on terrestrial wildlife and humans are essentially the same negligible effects disclosed in the 2004 EA. The opportunity for people, wildlife, and livestock to come into contact with rotenone treated water is minimal. Vertebrate animals would have to consume impossible amounts of rotenone treated water to reach the Environmental Protection Agency's Level of Concern. For example, a 0.25 pound bird would have to drink 25 gallons of treated water in 24 hours and a cow weighing 1,620 pounds would have to ingest 4,615 gallons of treated water in 24 hours to reach lethal dose levels.

Federally-listed Species

Because of the serious decline of fish native to the Gila River Basin, repatriation of native fishes was a key goal of the 2004 project, given the habitat Fossil Creek was expected to provide post-project (EA, pages 2-8, 10, 28). Since the 2004 decision, four species of federally-listed native fish that were not present in 2004 have been stocked into Fossil Creek. They are: Gila topminnow, loach minnow, spikedace, and razorback sucker.

The Biological Assessment and 2004 EA disclosed no effect to listed species, primarily because the species were not present. The potential for providing habitat for repatriation was considered to be positive for razorback sucker, loach minnow, and spikedace. Gila topminnow was not analyzed since the current range was outside of the project area. The EA also disclosed no adverse modification to critical habitat.

Like antimycin, rotenone affects gill-breathing organisms and will result in the death of any fish remaining within treated reaches. As in 2004, salvage of native fish will occur prior to treatment with rotenone. The following sections update the analysis for the four federally-listed fish species that have been stocked into Fossil Creek since 2004.

Gila Topminnow

Gila topminnow has recently been reintroduced into Fossil Creek, and is present in that system. Topminnow once occupied aquatic habitats in the Gila River drainage in New Mexico, Arizona and Mexico below 1,524 m (5,000 ft.) in elevation. At one time this was the most common fish found in the Gila River Basin. Populations of Gila topminnow historically expanded into intermittent waters during wet years and then retreated to headwater springs and perennial reaches of streams during drier years. Their high fecundity and long reproductive season allow them to rapidly expand into new habitat. The life span of this species is approximately 1 year, but it appears to be linked to sexual maturation which is dependent upon time of year in which they were born (AGFD 2001).

Habitat in the Analysis Area

Since 2007, Gila topminnows have been stocked into multiple locations in Fossil Creek above the location of the temporary barrier at Sally May Wash. It is unclear if Gila topminnow have established a self-sustaining population in Fossil Creek (Robinson and Crowder 2012). Suitable habitat, including vegetated stream margins and backwaters, exist from Sally May Wash upstream to the perennial spring inflow in the upper-most reach of Fossil Creek. Some topminnows have been detected in reaches between Fossil Springs and the confluence of Sally May Wash with Fossil Creek (Robinson and Crowder 2012) but none below the temporary barrier.

Environmental Consequences

Treatments will likely occur from the temporary barrier downstream to the permanent barrier. This stretch of Fossil Creek has not been stocked with Gila topminnow, and it does not contain suitable habitat for the species. If treatments do occur between the temporary barrier and the Irving site, any non-salvaged Gila topminnow individuals within that reach would be killed by rotenone. The Gila topminnow was not specifically analyzed within the 2004 EA because the current range was outside of the project area. However, the EA disclosed that all native fish not salvaged would be eliminated in treated reaches, but that genetic repopulation after piscicide application would occur from a combination of returning salvaged fish into the creek, downstream dispersal from non-treated reaches upstream, and translocations (EA pg. 54). This would be the case for the Gila topminnow. Therefore, the effects of the proposed retreatment are within the scope and range of effects in the 2004 EA.

Loach Minnow and Spikedace

Loach minnow and spikedace are historic to the Verde River and have recently been reintroduced into Fossil Creek. It is not known if these species have yet established a reproducing population in the stream.

Loach minnow and spikedace were upgraded from federally threatened to endangered on March 26, 2012 and the lower 13.8 miles of Fossil Creek was designated as critical habitat (USDI 2012). In 2004, critical habitat included the lower 4.7 miles of Fossil Creek and 0.2 miles of that was above the fish barrier.

Habitat in the Analysis Area

Since 2007, loach minnow and spikedace have been stocked numerous times into Fossil Creek above the historic dam site near the headwaters of the stream. Sampling success within Fossil Creek has had low success, and it is unknown at this time if these species have established a reproducing population. 2,900 loach minnow were stocked from 2007 through 2010, and only five were observed in 2008, two in 2009, none in 2010, and one in 2011 (Robinson and Crowder 2012). For spikedace, over 3,000 were stocked from 2007 through 2010, but none were found until 2011 in the upper two reaches of Fossil Creek (Robinson and Crowder 2010). No loach minnow or spikedace have been found in Fossil Creek below the Irving site.

Environmental Consequences

Rotenone treatment of Fossil Creek in fall 2012 will have no effect to the loach minnow, spikedace or their critical habitat in Fossil Creek. Treatments will likely occur from the temporary barrier downstream to the permanent barrier, but could include up to Irving. These stretches of Fossil Creek have not been stocked with loach minnow or spikedace. Individuals of these two species have only been found in the upper two reaches of Fossil Creek, within the vicinity of stocking sites. These areas are well outside of the proposed treatment reach(es).

More critical habitat will be treated than in 2004. This improves a greater number of critical habitat steam miles for these species for future repatriations.

Given that loach minnow and spikedace do not occur within proposed treatment reach(es) and that treatment will improve unoccupied critical habitat, the effects are within the scope and range of effects disclosed in the 2004 EA.

Razorback Sucker

Razorback sucker was once common throughout the Colorado River Basin. The species is believed to have ranged in the Verde River mainstem up to Perkinsville. This belief is based on bone samples taken from an archaeological site near Perkinsville (Minckley and Alger 1968). The species is currently present on the Coconino National Forest in the Verde River and Fossil Creek. Over 1,500 razorback sucker were stocked downstream of the Sally May Wash Confluence in Fossil Creek from 2007 thru 2009, but during snorkel surveys only two razorback suckers were observed in October 2008 (Robinson 2009), none in September 2009 (Boyarski et al. 2011), and none in 2010 (Robinson and Crowder 2012) . However, 19 razorback suckers were captured in fyke nets set across the entire width of the stream within nine days after they were stocked in 2009. No razorback suckers were captured or observed by Marsh et al. (2010) during 2008 thru 2010. Because razorback suckers have not been stocked, captured, or observed since 2009, the species is assumed to not currently be occupying Fossil Creek above the fish barrier.

Habitat in the Analysis Area

It is likely that only rearing habitat is available in Fossil Creek for razorback suckers, so the repatriation goal is for juvenile fish to grow out in Fossil Creek and then disperse downstream to the Verde River. Since 2008, razorback sucker has only been stocked into Fossil Creek downstream of the temporary barrier site at the confluence with Sally May Wash. Sampling success for razorback sucker within Fossil Creek has had low success. Even though suitable habitat exists, razorback sucker has not been collected or observed in Fossil Creek below the Irving site since 2009.

Environmental Consequences

Rotenone treatment of Fossil Creek in fall 2012 will have no effect on razorback sucker in Fossil Creek. No razorback suckers currently occur in the creek. Removing the nonnative fish above the barrier will allow for future repatriation efforts. Effects of the rotenone treatment are within the scope and range of effects disclosed in the 2004 EA.

Southwestern Willow Flycatcher

Since the 2004 Final EA, surveys for the southwestern willow flycatcher have been conducted. This updates the 2004 affected environment section.

Prior to restoration of full flows, riparian habitat along Fossil Creek differed from habitats typically occupied by southwestern willow flycatcher in Arizona due to the higher gradient, the narrow band of riparian vegetation and the relatively open mid- and under-story vegetation layers. Since full flows were restored in 2005, travertine dams have formed step pools with slower water, resulting in better quality habitat for willow flycatchers. In 2011, Matt Johnson from NAU, through an agreement with the Forest Service, conducted surveys for the southwestern willow flycatcher in Fossil Creek in five locations. Routes were placed at these locations based on the marginal flycatcher habitat that is present. Most other areas in Fossil Creek do not meet the habitat requirements. All surveys in 2011 were negative. Because even the best habitat within Fossil Creek is marginal and surveys have been negative, it is the determination that there is a very low possibility that southwestern willow flycatchers nest in the Fossil W&S boundary.

Because rotenone and antimycin affect terrestrial animals similarly, the effects of the proposed rotenone treatment on flycatchers are within the scope and range of effects disclosed in the 2004 environmental analysis.

Sensitive Species

Headwater and Roundtail Chub

Roundtail and headwater chub are both present in Fossil Creek and roundtail are also present in the Verde River. Both are candidate species under the Endangered Species Act (ESA) and have been precluded from listing for now due to higher priority actions. In Fossil Creek headwater chub are found in the headwater reaches above the decommissioned Irving power plant diversion dam. The chub population in Fossil Creek is predominantly headwater chub or intergrades of headwater and roundtail chub, with only 25% of chub between Irving and the fish barrier genetically assignable as roundtail (Dowling and Marsh 2009).

Roundtail chub was included on the Regional Foresters' (USDA Forest Service – Southwestern Region) 21 July 1999 sensitive species list. Taxonomic classification for headwater chub was made in 2000 (Minckley and DeMarais 2000). This classification established the distinction between the roundtail and headwater chub species. Roundtail chub occupy the Verde River and the lower elevation reaches of major tributaries (including Fossil Creek) to the Verde River. Headwater chub, as it name implies, occupies higher elevation reaches of these tributaries.

At the time of the 2004 decision, both the roundtail chub and headwater chub were petitioned for federal listing and subsequently designated as candidate species by the U.S. Fish and Wildlife Service.

Habitat in the Analysis Area

Roundtail and headwater chub that were temporarily salvaged prior to treatment were repatriated into Fossil Creek following stream renovation in 2004. Population size increased rapidly following repatriation, but has since declined somewhat (Marsh et al. 2010). Roundtail and

headwater chub can be found throughout Fossil Creek, from the headwaters down to the confluence with the Verde River. These species, however, are more abundant upstream from the permanent barrier.

Environmental Consequences

The 2004 EA disclosed that stream renovation would kill chubs not captured during salvage operations, but that the project would benefit the two species of chub in the long term by removing competition from nonnative fish and improving conditions for the natives. The proposed project will have the same impacts but within fewer stream miles than the original project. Therefore, the proposed retreatment is within the scope and range of effects of the 2004 EA.

Lowland Leopard Frog

Since the 2004 Final EA, surveys for the lowland leopard have been conducted. This updates the 2004 affected environment section. Prior to restoration of flows and the restoration of the native fishery, very few leopard frogs were found below the Fossil Springs dam. Historically, lowland leopard frogs were found near the Forest Boundary in 1950 but not in 1985, 1990, 1992, or 1995. A survey in 1998 by Environet did not turn up any leopard frogs from the bridge to the Irving Power Plant and further upstream to ca 3,840.

Post full-flow frog surveys from 2005 through 2009, conducted by F.S. biologists, show that leopard frogs responded well to more flows, complex habitats created by travertine dams, and lack of non-native fish. Between restoration of full flows in 2005 and dam-lowering activities in 2009, lowland leopard frogs recolonized Fossil Creek below the dam and reached viable population levels.

After APS lowering of the historic dam in the fall of 2009, the new channel height above the lowered dam was very unstable with raw exposed banks and no vegetation to hold soil in place. Exacerbating this condition were several large flood events in 2009 and 2010 that further scoured the banks and channels and blew out established frog habitat below the dam. As a result frog monitoring showed much lower population levels. Combined with this was an increase in recreation at Fossil Springs and down by the waterfall.

Currently, lowland leopard frogs are known to persist in Fossil from above the springs all the way downstream below the large falls, but not as far downstream as Irving powerplant (See Map Eight). Frog densities are highest from the Springs downstream to just upstream of the large waterfall. While this reach contains the most developed travertine formations and the most complex habitat, suitable habitat exists downstream of there. Why lowland leopard frogs have not recolonized in viable numbers from just above the waterfall downstream is unknown. Lowlands occur from above the waterfall downstream to just above the waterfall trail, but only in very low densities. One attributable cause in this section is the increasing number of recreationists.

Proposed treatment in Fossil, even if they begin at Irving will not affect lowland leopard frogs because they do not occur down in this portion of Fossil Creek.

Given that lowland leopard frogs do not occur within proposed treated reach(es) and that treatment will improve unoccupied habitat, the effects are within the scope and range of effects disclosed in the 2004 EA.

Western Yellow-billed Cuckoo

The western yellow-billed cuckoo is a candidate species. Since the 2004 Final EA, surveys for the yellow-billed cuckoo have been conducted. This updates the 2004 affected environment section.

A single yellow-billed cuckoo was detected in the Fossil Creek riparian area by former Coconino biologist Cathy Taylor. Although surveys conducted by USGS in 2005 and 2006 have not detected yellow-billed cuckoos in Fossil Creek, surveys were not conducted in two thirds of Fossil Creek and there is potential for them to establish occupancy now that full flows have been restored.

The following information was obtained directly from the report " 2008 Common Black-Hawk and Yellow-Billed Cuckoo Distribution and Abundance in the Upper Reach of Fossil Creek, AZ" prepared by Matthew J. Johnson, Research Biologist, Northern Arizona University, Christopher Calvo, Biological Technician, Northern Arizona University , Kenneth E. Etzel, Biological Technician, Northern Arizona University , and Jennifer A. Holmes, Wildlife Biologist, Northern Arizona University:

> NAU has taken the lead on the decommissioning monitoring for yellow-billed cuckoos in Fossil Creek. Beginning in 2005, they have conducted surveys during the breeding season to determine presence/absence and breeding status. In 2008, they completed four Yellow-billed Cuckoo surveys during the four allocated time periods; there were no Yellow-billed Cuckoo detections. No Yellow-billed cuckoos were detected in previous years either. The riparian zone along Fossil Creek includes many areas that appear, based on vegetation characteristics, to be potential Yellow-billed Cuckoo breeding habitat (Halterman 1991, Hughes 1999). All of the important habitat components exist within the riparian habitat along Fossil Creek and currently we are unsure why cuckoos are not present along Fossil Creek.
>
> The Western Yellow-billed Cuckoo may be experiencing what the Southwestern Willow Flycatcher is experiencing, a recent low population level at many sites in the southwest making local populations susceptible to extirpation (Sogge et al 1997, Hughes 1999, USFWS 2002). It is possible that as cuckoo populations in Arizona riparian corridors have become reduced and more fragmented than in the past, and local breeding groups may have produced insufficient young to offset adult mortality. Similar local extirpation of Southwestern Willow Flycatchers has recently been documented (Sferra et al. 1997) and can be driven by habitat loss. As Yellow-billed Cuckoos became rarer in the region, the likelihood of recolonization of former breeding areas could be greatly reduced. Therefore, suitable habitat may currently be unoccupied because the cuckoo is now so rare that there are not enough cuckoos to disperse into and settle in all available habitats. If so, effective management and recovery of current cuckoo populations

and riparian habitats may lead to increasing populations which could resettle in areas such as Fossil Creek.

Environmental Consequences

Because rotenone and antimycin affects terrestrial animals similarly, the effects of the proposed rotenone treatment on cuckoos are within the scope and range of effects disclosed in the 2004 environmental analysis.

Common Black-hawk

Since the 2004 Final EA, surveys for the black-hawk have been conducted. This updates the 2004 affected environment section. The black-hawk has been observed in all reaches of Fossil Creek. Suitable nesting habitat is present from Fossil Springs downstream to the Verde. Some information exists for black-hawk nest sites along Fossil creek due to monitoring conducted by NAU. Since this monitoring from 2005 through 2009 was for APS decommissioning activities, only the portion of Fossil Creek from the springs to just downstream of Irving was monitored. The remaining downstream portion of Fossil with high recreation use was not monitored in those years. In 2009, NAU incidentally found two additional nests further downstream, however, this downstream portion was not thoroughly monitored until 2011. In 2011, the Forest Service funded NAU to continue monitoring nesting black-hawks, but to extend surveys from downstream of Irving to downstream of the last designated recreation site called Mazatzal. Following is a summary of results by year.

In 2005 NAU detected 37 black-hawks and 4 active nests. NAU confirmed one nest with a single nesting and a second nest with one fledgling. The third nest was abandoned and the disposition of the fourth nest was undetermined.

In 2006 NAU detected 28 black-hawks and 3 active nests. One nest had a single nestling, one nest was unsuccessful and the outcome of the third nest was undetermined. A fourth nest was discovered post fledgling/failure; outcome was undetermined.

In 2007 NAU detected 45 black-hawks and 4 active nests all of which had a single nesting and 3 of the 4 nests successfully fledged their single young.

In 2008, NAU detected only 9 black-hawks and 2 active nests. The two nests each had one nestling but it was undetermined whether the nestlings fledged. NAU reported on the decline of black-hawk detections in 2008 (9) from 2007 (45) and predicted that the decline was due to disturbance from increased dam decommissioning activity. In addition, they noted an increase in raven activity, including the documentation of ravens occupying a 2007 black-hawk nest.

Four black-hawk nests were located and monitored in 2009 during the breeding season, two nests (#1 and #2) were located in historical nesting patches (Table 4, Figure 1) and two downstream locations (#3 and #4) were newly discovered in 2009. The surveys in previous years did not extend into this lower reach of the creek where nests #3 and #4 were observed. All nests fledged one young in 2009, however, it was confirmed that nests #1 and #2 initially had at least two nestlings. The cause of mortality of these two nestlings is unknown. Fledglings were sighted at all four nests during post fledging monitoring. Note that detections in 2009 were lower than the

black-hawk detections in 2007 (45). NAU, in their report, speculated the decrease was a result of high visitor numbers in 2008 and 2009.

In 2011, surveys were extended to also include the lower half of middle Fossil Creek (just downstream of the Mazatzal site). In 2011 NAU detected 38 black-hawk detections and six active nests. Nest 1 had two nestlings but subsequent visits did not result in the detection of nestlings or fledglings. Nests 2, 3, 4, 5 and 6 each successfully fledged one young.

Environmental Consequences

Because rotenone and antimycin affects aquatic and terrestrial animals similarly, the effects of the proposed rotenone treatment on black-hawks are within the scope and range of effects disclosed in the 2004 environmental analysis.

Mexican Garter Snake

While status of the Mexican garter snake was upgraded to Candidate, effects disclosed in the 2004 Final EA are the same for the use of rotenone.

Sensitive Bats

Since the 2004 project surveys have detected the presence of several bat species not known in 2004.

Western Red Bat

Habitat in the Analysis Area
This tree-roosting bat occurs along intermittent and perennial streams where they roost in deciduous trees, including riparian trees and Gambel oak. They emerge from their roosts several hours after dusk to forage on a variety of flying insects. Wintering behavior of this migratory bat is unknown, but other species of tree roosting bats over-winter in leaf litter. The main food source for red bats are moths although they also forage on flies, bugs, beetles, cicadas, ground dwelling crickets, and hymenopterans.

Surveys in the Analysis Area
Until 2011, limited bat surveys were conducted in Fossil Creek and there was no record of red bat detection from those efforts. In 2011, a multi-agency effort resulted in hundreds of mist net hours. Two western red bats were mist netted in the middle portion of Fossil Creek. None were captured in the Fossil Springs area or the earthen tanks in the uplands above the rim.

Allen's Lappet-browed Bat

Habitat in the Analysis Area
Although known to occur over a wide range of elevations and vegetation types, the Allen's lappet-browed bat is found primarily in ponderosa pine forests where they roost underneath exfoliating bark on standing ponderosa pine snags. On the Coconino, Allen's lappet-browed bats have been detected in pinyon juniper woodlands. While ponderosa pine forests occur in the watershed but not in the CRMP corridor, pinyon-juniper woodlands (3,544 acres) occur in the

corridor. Allen's lappet-browed bats feed mostly on soft-bodied insects with their main food source of small moths (Microlepidoptera) but also soldier beetles (Cantharidae), dung beetles (Scarabeidae), leaf beetles (Chrysomelidae), roaches (Blattidae) and fly ants (Formicidae).

Surveys in the Analysis Area
Until 2011, limited bat surveys were conducted in Fossil Creek and there was no record of Allen's lappet-browed bat detection from those efforts. In 2011, a multi-agency effort resulted in hundreds of mist net hours. One Allen's lappet-browed bat was mist netted in the drainage upstream of Fossil Springs (riparian with uplands of primarily pinyon juniper with some chaparral), but not in the uplands above the rim nor the middle section of Fossil Creek.

Pale Townsend's Big-eared Bat

Habitat in the Analysis Area
This wide-ranging bat roosts in caves, mines, and other man-made structures including cliff dwellings and abandoned shacks. In the Fossil CRMP corridor, possible roosting habitat occurs in caves, in various abandoned APS flume tunnels, cliff dwellings near Fossil Springs, and abandoned buildings. AGFD's Heritage Data Management System (HDMS) database shows one record of a Townsend's roost in a cliff dwelling within five miles of Fossil creek. Townsend's big-eared bats forage on small moths as their primary food source but will sometimes prey on neuropterans (not aquatic), coleopterans (mostly terrestrial but some have aquatic life stages), dipterans (mostly aquatic, some terrestrial), and hymenopterans (almost all terrestrial).

Surveys in the Analysis Area
Until 2010, limited bat surveys were conducted in Fossil Creek and there was no record of Townsend's big-eared bat detection from those efforts. In 2011, a multi-agency effort resulted in hundreds of mist net hours. One Townsend's big-eared bat was mist netted in the drainage upstream of Fossil Springs, but not in the uplands above the rim nor the middle section of Fossil Creek.

Spotted Bat and Greater Western Mastiff Bat

Habitat in the Analysis Area
Both of these bat species roosts in cracks and crevices along high cliff ledges. Prominent rock features are required for spotted bat roosts. The spotted bat occurs across a range of elevations and habitat types. The mastiff bat occurs at lower elevation and roosts in rugged canyons where there are abundant crevices. Due to their body shape and adaptation for straight, fast flight, mastiff bats require longer stretches of water to drink and this requirement likely is a limiting factor for where they occur on the landscape. Much of the Fossil Creek corridor is suitable for these canyon roosting bats. Spotted bats forage on small moths as their primary food source but will sometimes prey on June beetles and grasshoppers. Greater western mastiff bats feed mainly on terrestrial insects, especially Hymenoptera (bees, wasps, ants and sawflies).

Surveys in the Analysis Area
Until 2010, limited bat surveys were conducted in Fossil Creek and there was no record of these two bat species from those efforts. In 2011, a multi-agency effort resulted in hundreds of mist

net hours, however, no spotted or greater western mastiff bats were mist netted. There are plans in 2012 for additional survey work using acoustical methods which have better chances than mist netting for detecting these high-flying bat species.

Environmental Consequence for All Insectivorous Bats
Rotenone and antimycin both affect aquatic invertebrates by inhibiting respiration by blocking biochemical pathways of cell metabolism. Both rotenone and antimycin have short-term impacts on aquatic invertebrate abundance and can have longer-term effects on species composition. For both piscicides, the insect groups Ephemeroptera, Plecoptera, and Trichoptera are more sensitive than Coleptera and Diptera, and pre-treatment abundance is reached more quickly than taxonomic composition. The proposed retreatment will treat fewer miles of stream than the original treatment, leaving more miles of untreated stream to serve as a recolonization source from both above and below treated sections. Within the treated reach, aquatic invertebrates with an aerial life stage will be temporarily unavailable for foraging bats. This will result in an overall loss of prey base for insectivorous bats in the treated reach for a short time.

Although these species were not specifically analyzed in 2004, the impact of rotenone on aquatic invertebrates will have little to no impact on insectivorous bats. Bats prey on both terrestrial and aquatic insects; however, the majority of prey is terrestrial invertebrates and will not be affected by rotenone. The rotenone treatment will impact a small subset of available prey for bats. The effects of rotenone on invertebrate prey of insectivorous bats are within the scope and range of effects discloses in 2004.

Cultural Resources

The 2004 Environmental Assessment states "No areas of traditional cultural importance… are known within the project area…" Subsequent to 2004, Apache elders from the Yavapai-Apache Nation have specifically told the Forest Service that the entire Fossil Creek canyon is a culturally significant area, although they have also indicated that they do want to pursue the process of officially identifying the canyon as a traditional cultural property (TCP). The Forest Service has long known that the canyon is important to several tribes, and we have managed the area as if it were a formally recognized TCP. The Apache have also expressed that they are satisfied with efforts the Forest Service is making to manage the Fossil Creek area and that they support the restoration of Fossil Creek. Mitigation measures were specified in the original EA document that will protect all known archaeological sites from adverse effects. Explicit recognition that Fossil Creek is a culturally important place does not change the original analysis of environmental consequences.

Also, the exact type of piscicide to be used is different than that specified the original EA. The substitution of piscicide will not change the original analysis of environmental consequences.

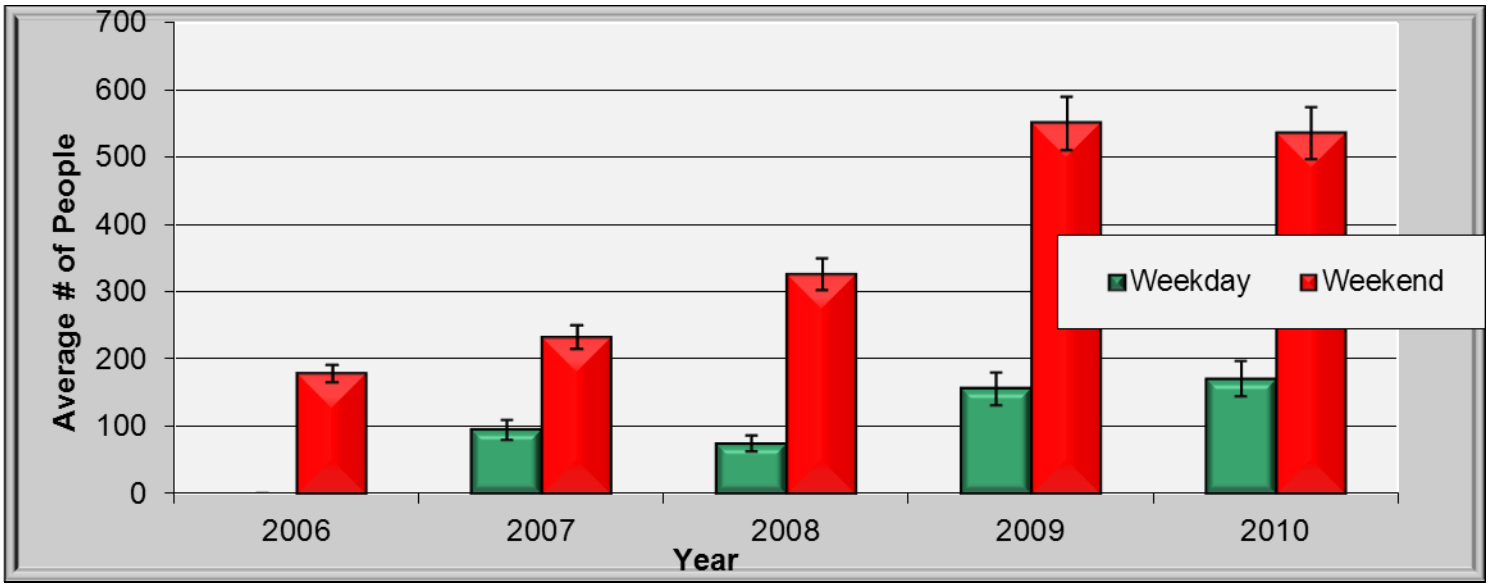
Recreation and Visuals

Notable changes in Recreation and Scenery Affected Environment since the 2004 assessment resulted from the removal of Arizona Public Service Company's (APS) hydroelectric facilities. APS began removal of facilities in March of 2005 with completion of the removal accepted by

the Forest Service in September of 2010. Return of full flows and increased media attention about Fossil Creek has resulted in increased recreation visits.

After the APS dam was removed, the Forest Service started more consistent patrols of the area and began counting numbers of people and vehicles. During the summer of 2009, rangers patrolled nearly every day to interact with visitors and count people and vehicles. Rangers estimated the mean number of visitors for 2006-2010 and the estimates appear in Figure 1. Recreation use has almost tripled during this time.

Figure 1 – Mean Number of People by Year (2006-2010) (Rotert, 2010)



The 2009 and 2012 data collection also showed that weekend use was much higher than weekday use and that use slowed down after September (figure 2).

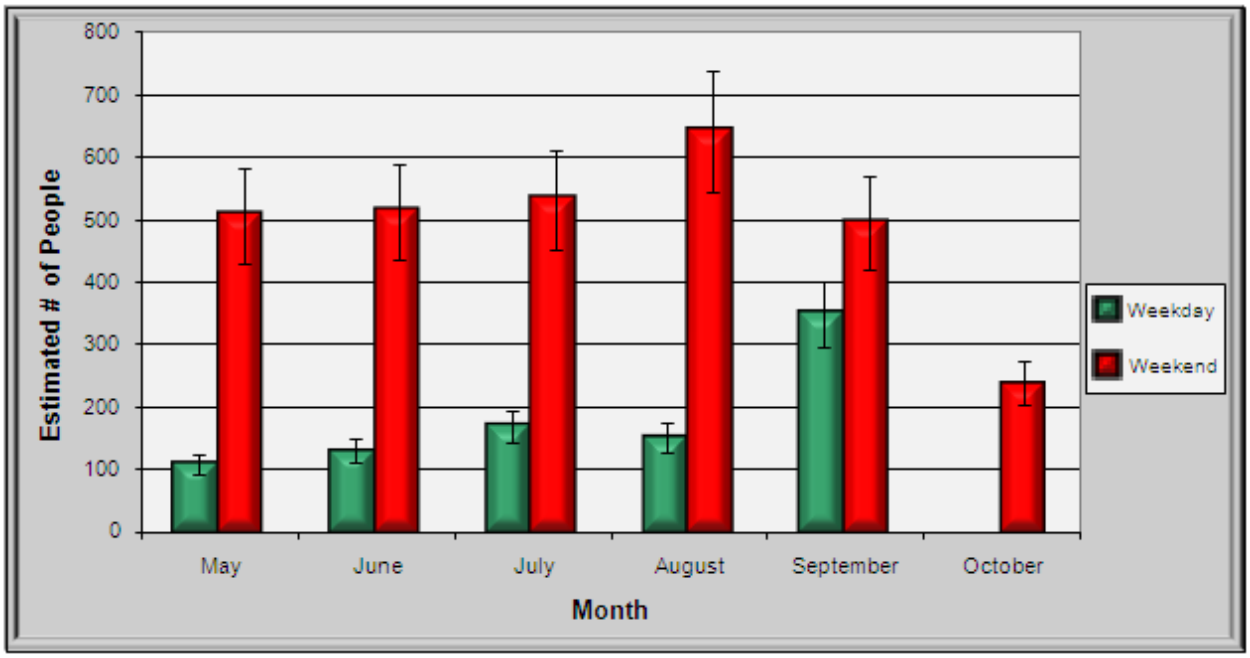


Figure 2 – Average number of people by month (summer 2009) (Rotert, 2009)

Fossil Creek provides outstanding opportunities for a variety of recreational activities and it attracts a wide variety of visitors, many of whom return year after year. The stream is centrally located and is a popular destination for people from Phoenix, Prescott and Chino Valley, the Verde Valley, Flagstaff, Payson, Strawberry, Pine, and Tucson (Rotert, 2009).

Visitors enjoy the shade and cooler temperatures from the dense riparian canopy and there is an abundance of deep, clear pools in which to wade, swim and snorkel. Other recreation opportunities include swimming/wading, camping, hiking, wilderness appreciation, fishing, wildlife and nature observation, photography, bird watching, and potential cultural and historical site interpretation.

With restoration of natural water flows to Fossil Creek since dam removal, new pools, runs, and riffles have established influenced by travertine deposits. The creek will continue to change as new travertine forms on the existing surfaces. The springs that form Fossil Creek keep the water flow constant throughout the year, which is an uncommon and welcome attribute for residents and visitors of the southwest. Travertine formations in the creek tint the water a unique blue-green color (Hohl, 2012).

Increased visitation has resulted in increased litter, human waste, soil compaction and denuded landscapes as new areas and "swimming holes" are discovered. These impacts detract from the overall scenic integrity and aesthetic appeal of Fossil Creek. The most intensively used portions of Fossil Creek continue to be in the roaded section, where access is easiest.

Changes specific to anglers include the fish restoration completed prior to the APS facilities removal and restoration of full flow to the creek bed. New state regulations changed the fishery to a seasonal catch and release artificial lure and fly only, with single barbless hooks. And of course, there was a shift to a native sport fishery from a non-native sport fishery. The deep

pools in Fossil provide ideal settings for fishing, however, the majority of these pools are also destinations for other recreational interests – and thereby likely crowded and difficult to fish. However, the fishing season runs from the first Saturday in October through April 30th, which is outside of the high recreational use season and limits conflicts between anglers and other recreationists.

Environmental Consequences

The environmental consequences of re-treating the creek with piscicide are temporary in nature when considered from a recreation and scenery standpoint. Public access to the creek will be closed during the chemical renovation. The salvage of native fish prior to chemical treatment may be visible if recreationists are in the nearby vicinity. Visitors may notice equipment, including the temporary "holding pens" in the water. The transporting of natives upstream may also be seen if visitors are nearby. Increased activity at drip stations, staging areas, and detoxification stations as staging begins for the treatment may also be noticeable. The proposed helicopter transport of the potassium permanganate (detoxification chemical) will take place prior to the treatment and will be seen from those in the near vicinity. During application at the detoxification stations near the fish barrier, this chemical has a purple tint, which is visible. However, since the area will be closed, this is unlikely to be seen by the public.

After the piscicide treatment is complete, dead fish will briefly be visible in the stream corridor as they wash downstream or are eaten by predators. The treatment effects are not likely to be noticeable in the Verde River (approximately 4.5 miles south of the project area).

Cumulatively, the effect of the increased activity along pedestrian and horse access routes and staging areas will need to be mitigated to ensure a more permanent trail is not established to the barrier site. This work should take place after the barrier repair work is complete and should include any necessary reseeding and re-grading of the access route and staging areas so they are not visually evident.

Environmental Consequences

All of the activities and effects described above were considered and disclosed in the 2004 EA. Therefore, the proposed retreatment with rotenone is within the scope and range of effects originally described.

Wild and Scenic River ORVs

In 2004, Fossil Creek was an eligible wild and scenic river. The analysis done at that time evaluated and disclosed potential effects of fish barrier construction and potential impacts to free-flow and Outstandingly Remarkable Values (ORVs) of Fossil Creek at two different sites. In 2009, Fossil Creek was designated as a wild and scenic river, with the upper and lower sections classified as wild, and the middle section classified as recreational. The fish barrier is in the lower section that is designated as wild. ORVs were listed as fish, geologic, historic, riparian/ecological, and wildlife.

A Comprehensive River Management Plan (CRMP) is currently being developed. In the resource assessment (Forest Service 2011), the ORVs were identified as: fish and aquatic resources, geology, history and traditional uses, recreation, water, and wildlife. The ORVs in the resource assessment differ from those listed in 2004 in that the fish ORV was expanded to include other aquatic species, history was expanded to include traditional uses, riparian/ecological was dropped, and recreation was added.

Environmental Consequences
As described in the other sections, impacts to the identified ORVs from the proposed rotenone treatment are within the scope and range of effects of the 2004 EA. The geologic ORV, not addressed in other sections, will not be impacted by the treatment.

Wilderness

The substitution of rotenone will not have any different effects from those disclosed in the 2004 EA. Helicopters will be used for up to 2 days (Minimum Requirements Decision Guide approved May 31, 2012) versus the 7 to 9 days of helicopter use analyzed in 2004, so effects on people's wilderness experience will be less than in 2004. There are no system trails in the vicinity of the project. Crews will use a Forest Service marked trail which will be rehabilitated after the project in the Wilderness. Crews will camp at a designated camp spot, and an emergency helipad will be identified. Wilderness values associated with native aquatic biota would be restored and enhanced within the same 2.8 miles of stream within the Mazatzal Wilderness. Because of the redesignation of critical habitat for loach minnow and spikedace that includes more of Fossil Creek, the mileage of critical habitat for loach minnow and spikedace increases from 0.2 to 2.8 miles of stream. The same techniques as in 2004 will be used, including application of the chemical through drip stations, backpack spraying, and sand, and the chemical will be neutralized in the vicinity of the fish barrier. Fewer drip stations will be needed in the Wilderness.

Environmental Consequences

The use of rotenone will have the same or fewer effects as the use of antimycin in 2004, except for the increased amount of loach minnow and spikedace critical habitat within wilderness treated. This furthers the main goal of the restoration of Fossil Creek, which was to improve conditions for native fish and allow for repatriation of species.

Air Quality

The application of rotenone is within the scope, intensity, and range of effects described in the 2004 EA. There will be no effects to air quality.

Changes to any applicable Laws, Regulations or Policy

There are no additional changes to laws, regulations, and policies that have not been discussed above that could affect this project.

Conclusion/Finding

Based on the IDT review, I have decided that a correction, revision, or supplement of the *Native Fish Restoration in Fossil Creek* project EA ***is not*** necessary**.** The IDT review found that the effects of the proposed retreatment of Fossil Creek, including upland stock tanks, is within the scope, context, and intensity of environmental effects of those analyzed and documented in the 2004 EA. This document shall serve as the analysis documentation to illustrate the consideration of effects for using rotenone rather than antimycin for fish restoration treatments is within the range and intensity of effects for all resources considered in the 2004 Native Fish Restoration EA. **Project implementation may proceed** under the 2004 decision**.** The environmental review followed the direction contained in FSH 1909.15, Section 18.1 and CEQ regulations §1502.9(c).

_____ _____

Corbin Newman Date

Regional Forester, Southwestern Region

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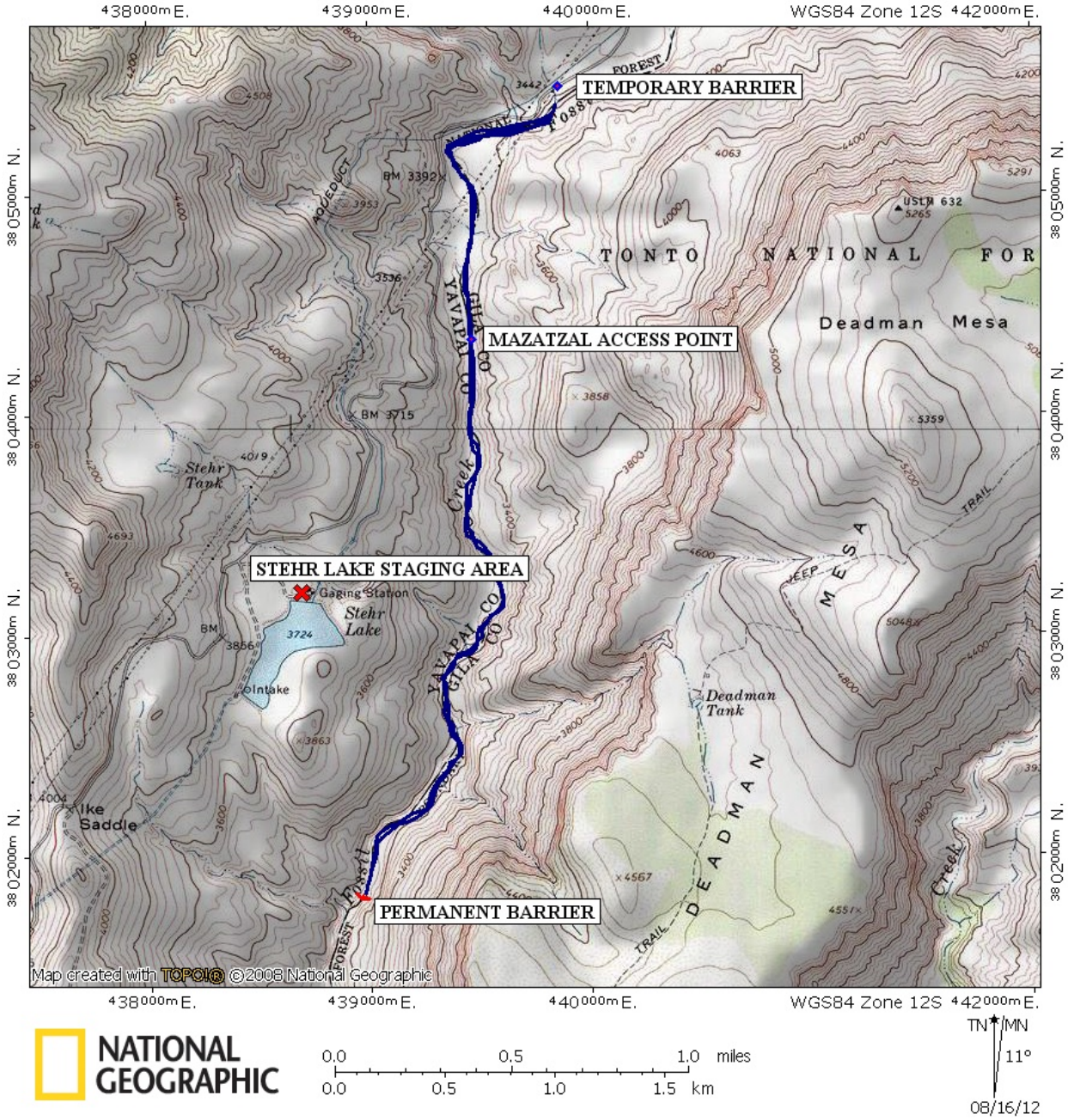
Figure 1. Proposed treatment reach, Fossil Creek.