

FOSSIL CREEK WATERSHED TREATMENT PLAN

Fossil Creek Renovation Project

Intermediate Planning and Public Involvement Proposal

(September 6, 2012)

(Amended to incorporate Title 17-481 and more signage for future treatments; August 28, 2013)

Arizona Game and Fish Department

5000 W. Carefree Highway

Phoenix, Arizona 85086

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1. PROJECT SUPERVISORS

PROJECT MANAGER/ADMINISTRATIVE LEAD/LEAD APPLICATOR

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Arizona Game and Fish Department, Region 2
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(928)-214-1245

Duties: Develop preliminary and intermediate plans and all necessary paperwork to implement project. Treatment Lead

Certifications: Arizona Department of Agriculture (ADA) Agricultural Commercial Pesticide Applicator Certification, Aquatic Applicator Certification

Training: AFS training--Planning and Standard Operating Procedures for the Use of Rotenone in Fish Management

PISCICIDE APPLICATION CREW LEADS

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Certifications: ADA Agricultural Commercial Pesticide Applicator Certification, Aquatic Applicator Certification

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Training: AFS training--Planning and Standard Operating Procedures for the Use of Rotenone in Fish Management

2. PROJECT LOCATION

The proposed treatment area of Fossil Creek is between the temporary barrier located at the confluence of Sally May Wash and Fossil Creek, and the original constructed fish barrier located in the Mazatzal Wilderness about 2.6 miles (4.8 kilometers) downstream. Fossil Creek is part of the Verde River drainage and lies on the border between the Tonto and Coconino National Forests. A large portion of the treatment area lies within the Mazatzal Wilderness. The upper portion of the treatment area is accessible for recreational day use via spur roads off of Forest Road 502.

Fossil Creek drains a series of canyons and their tributaries originating on the Mogollon rim (Calf Pen Canyon, Sand Rock Canyon, Tin Can Draw, Mud Tanks Draw, Boulder Canyon, Cimarron Creek, and Sally May Wash). The treatment area includes Soldier Mesa Tank, Sandrock Tank, and possibly Sandrock Draw Tank (Figure 1). Currently, only Soldier Mesa and Sandrock Tank are known to hold nonnative fish. These tanks are located on the Coconino National Forest and within the upper Fossil Creek watershed. These tanks have been treated in the past to remove illegally introduced fish species and their maintenance must be part of any native fish management plan for the drainage. Periodic treatment of all tanks within the upper Fossil Creek watershed may be necessary to prevent unwanted nonnative species from inhabiting Fossil Creek.

BARRIERS, OWNERSHIP, AND OBSTRUCTIONS

Fossil Creek is the boundary between the Coconino and Tonto National Forests. Most of the treatment reach is located within the Mazatzal Wilderness. Land management authority is with the Forest Service (USFS). Water rights for Fossil Creek were transferred from Arizona Public Service (APS) to the Coconino National Forest and the Forest applied for in-stream flow water rights with the Arizona Department of Water Resources. Fish and wildlife are managed by Arizona Game and Fish Department (AGFD) and U.S. Fish and Wildlife Service (USFWS) in cooperation with the Forest Service. Currently two fish migration barriers exist within the treatment area: a temporary barrier made of wire gabion baskets filled with sandbags is located just upstream of the confluence with Sally May Wash. A permanent barrier (located ~ 2.5 miles downstream of the temporary barrier) is made of contoured concrete to match existing bedrock formations. Both barriers are designed to prevent the upstream movement of unwanted nonnative fish species. After successful treatment of the area between barriers is completed, the temporary barrier will be removed to allow the movement of native fish upstream. Repairs and alterations to the permanent barrier have been made to address the cause of failure that allowed nonnative fish to move upstream.

PUBLIC AND COMMERCIAL INTERESTS (WATER USERS)

Fossil Creek, from its headwaters at the confluence of Sandrock and Calf Pen Canyons above Fossil Springs to its confluence with the Verde River (approximately 27.60 river kilometers, 17.15 river miles) is classified as an Outstanding Arizona Water. This area is used heavily for recreation because of its proximity to Maricopa County and the availability of beautiful swimming holes. One of the unique attributes of Fossil Creek is that prior to the invasion of smallmouth bass, Fossil Creek was the largest and one of only a few streams in Arizona with a pure native fish assemblage. Fossil Creek is managed by the AGFD as a native fishery.

After the decommissioning of the Irving Power Plant and Fossil Springs Dam, water rights for Fossil Creek were transferred from APS to the Coconino Nation Forest and the Forest applied for in-stream flow water rights with the Arizona Department of Water Resources.

Fossil Creek will be closed to all public access during the chemical treatment (See Communications and Site Security Plan) to ensure public safety and a successful treatment.

3. PROJECT BACKGROUND

Originating at Fossil Springs, Fossil Creek flows south and west ~14.5 miles to its confluence with the Verde River. Characterized by lush riparian vegetation and deep lagoon like pools created by calcium carbonate travertine deposits, Fossil Creek is a popular recreation area.

In 2004, Fossil Creek became an expanded refuge for native fish after a Bureau of Reclamation (Reclamation) funded fish barrier was constructed in the lower portion of the stream, the stream was chemically treated to remove nonnative fishes, salvaged native fish were returned to the stream, and full flows were returned to the stream after the Irving Power Plant was decommissioned (Weedman et al. 2005). Between 2007 and 2011 five species of native fish (longfin dace *Agosia chrysogaster*, spikedace *Meda fulgida*, loach minnow *Tiaroga cobitis*, razorback sucker *Xyrauchen texanus*, and Gila topminnow *Poeciliopsis occidentalis*; Table1) were stocked multiple times into Fossil Creek as part of the second phase of the Fossil Creek Native Fish Restoration Project (Robinson and Crowder 2012). As of the end of 2011, it appeared that longfin dace and Gila topminnow had established populations in Fossil Creek, but it was still unclear if spikedace and loach minnow had, and the razorback sucker repatriation appeared to have failed. Fossil Creek is nationally recognized as an important native fishery in the Southwest and continues to be managed for native fish.

Several tanks in the watershed upstream of Fossil Creek were renovated with rotenone in 2005 (Divide Tank, Middle Tank, Black Mack's Tank #2, Soldier Mesa Tank and Antelope Tank). Soldier Mesa Tank was retreated in 2008 and again in 2009. In 2008, Sandrock Tank and Sandrock Draw Tank were also treated. The renovation of these small stock tanks and removal of these nonnative fish species is essential to the preservation of the native fish community in Fossil Creek. The stock tanks located off of Highway 260 are connected with Fossil Creek during periods of significant snow melt and subsequent runoff.

In July 2011, smallmouth bass were detected in Fossil Creek upstream of the fish barrier, thus threatening the upstream native fish assemblage. It is unknown exactly how smallmouth bass invaded Fossil Creek above the barrier, but the most likely explanation is that they were able to move upstream past the barrier after a flooding event in January 2010 moved rocks below the barrier allowing fish to move upstream. Several surveys in the lower portion of the stream were done soon after smallmouth bass were detected, and determined that smallmouth bass were distributed above the barrier to about 4.2 km upstream. Thereafter, AGFD led multiple trips to remove smallmouth bass. In August 2011, a temporary barrier (funded by Reclamation) was constructed in Fossil Creek immediately upstream of the confluence with Sally May Wash to restrict the smallmouth bass downstream. In the summer of 2012, young of the year smallmouth bass were observed upstream of the permanent barrier and downstream of the temporary barrier. A chemical treatment to remove the smallmouth bass in the portion of the stream between the two barriers was tentatively scheduled for summer 2012.

INTENDED OUTCOME AND STATEMENT OF PURPOSE

The intended outcome of the proposed treatment is for Fossil Creek upstream of the permanent fish barrier to have a native-only fish assemblage, free of the threats of nonnative fish. The

purpose of the proposed renovation is to remove unwanted nonnative fish species (smallmouth bass) upstream of the man-made permanent fish barrier on Fossil Creek, Arizona and to restore a native-only fish assemblage.

EMERGENCY RAPID RESPONSE

The proposed project is not an emergency rapid response, but it is a retreatment.

PAST TREATMENT AND JUSTIFICATION FOR NEW TREATMENT

Fossil Creek was treated with Antimycin in 2004 to remove nonnative fishes upstream of the permanent barrier. The treatment was successful and the stream remained free of nonnative fish until smallmouth bass appeared in 2011. The smallmouth bass likely invaded from below the barrier after a flood move substrate below the barrier allowing upstream migration of fish. The substrates below the barrier have been moved and the barrier reinforced, so the proposed treatment has a high probability for success. Success is defined as eradication of smallmouth bass upstream of the barrier.

4. PROJECT SPECIES

TARGET SPECIES FOR FISH REMOVAL

Smallmouth bass and other nonnative fish species. The piscicide will kill all fish that are not salvaged from the treatment reach.

TARGET SPECIES FOR REINTRODUCTION

Native fish species will re-establish within the treatment reach on their own but repatriation of hatchery stock may include: roundtail chub, longfin dace, Gila topminnow, loach minnow, spikedace, and razorback suckers.

NON-TARGET SPECIES WITHIN TREATMENT AREA

Non-target species will include primarily aquatic insects but may include other gill breathing organisms. Amphibians and aquatic reptiles in the treatment area include canyon treefrog (*Hyla arenicolor*), lowland leopard frog (*Rana yavapaiensis*), Sonora mud turtle (*Kinosternon*

sonoriensis), and gartersnakes (*Thamnophis spp.*). See the AGFD Environmental Assessment Checklist (Appendix 1) for a list of species of concern in the project area.

5. MANAGEMENT OBJECTIVES AND RECOVERY PLANS

Fossil Creek is currently managed as a native fishery and native sport fishery by the AGFD. Periodic removal of nonnative fish species from the drainage is part of existing AGFD and USFWS management procedures (including stock tanks in the drainage). Arizona's State Wildlife Action Plan 2012-2022 (AGFD 2012a), and the Arizona State Wildlife Grant Segment 9 Work Plan for July 1, 2012 – June 30, 2014 (AGFD 2012b), both mention removal of nonnative fish species to benefit targeted native fish species. Similarly, the loach minnow recovery plan (USFWS 1991), spikedace recovery plan (USFWS 1991), and Sonoran topminnow recovery plan (USFWS 1984) all recommend reducing threats to native species through nonnative fish removal.

6. PROJECT PARTNERS

Land management authority of the treatment area is shared by the Tonto National Forest and the Coconino National Forest. Because listed species reside in this river, the USFWS and Reclamation are two of our important cooperators on this project. Reclamation has funded the reintroduction efforts for the listed fishes and the installation and repair of fish barriers in Fossil creek under the Gila River Basin Native Fishes Conservation Program. Numerous stakeholder groups and fishing clubs including the Fossil Creek Stakeholder Group, the Native Fish Conservation Team and the Northern Arizona Flycasters also share interest in this resource.

INTERAGENCY RESPONSIBILITIES

Arizona Game and Fish Department

Role: Action Agency, Oversight of the project, public outreach, pre-treatment fish surveys, fish salvage, chemical application, post-treatment monitoring

Contact Information: Scott Rogers (928)-214-1245

Bureau of Reclamation

Role: Barrier repair and helicopter use

Contact Information: Rob Clarkson (623)-773-6252

U.S. Fish and Wildlife Service, Arizona Ecological Services

Role: Endangered species compliance (NEPA)

Contact Information: Shaula Hedwall (928)-226-1289

USDA Forest Service, Coconino and Tonto National Forests

Role: NEPA Pesticide Use Plan, Forest closures, communications equipment.

Contact Information: Cecelia Overby (928)-527-3460

COOPERATOR MEETINGS HELD

- June 25, 2012-- Cooperator meeting FWS, USNF,
 - Discuss bass removal efforts upstream of temporary barrier
- August 1, 2010-- Cooperator meeting FWS USNF
 - Discuss bass removal efforts, discuss preliminary plan, Discuss Section 18 analysis
- August 20, 2012-- FWS (federal aid, and ecological services)
 - Discuss EAC and necessity of a Biological opinion.
- August 29, 2012—Public open house, FWS, USNF, Fossil stakeholder group
 - Discuss proposed upcoming treatment of Fossil Creek

7. ALTERNATIVE METHODS EVALUATION

Smallmouth bass were one of the target species during the 2004 chemical treatment of the Fossil Creek. Smallmouth bass are incredibly detrimental to the survivorship of native fish species in flowing riverine systems. Mechanical removal efforts cannot guarantee a 100% removal of unwanted nonnative fish species. Mechanical removal efforts for smallmouth bass in the treatment reach were attempted in 2011, but a few bass eluded capture and reproduced. Mechanical removal of small bass (young of the year) is rarely successful. More justification is described in the Environmental Assessment (Appendix 2).

8. PISCICIDE PROJECT INTERNAL REVIEW AND APPROVALS

See appendixes for the Piscicide Internal Review and Approval Form (Appendix 3), the Piscicide Project Preliminary Treatment Plan (Appendix 4), the Piscicide Project Public Involvement Plan (Appendix 5), and the Piscicide Project Public Meetings Briefing (Appendix 6).

9. PISCICIDE APPLICATION PLAN

PHYSICAL AND CHEMICAL CHARACTERISTICS OF WATER BODY

The treatment reach of Fossil Creek is characterized by a steep narrow canyon with some braiding of the main channel and some backwater pools. The reach is primarily characterized by fast moving runs and glides. The beginning of the treatment reach sits at an elevation of about 3,400 feet and descends about 400 feet over the course of 2.6 miles. A few deep, fast moving pools are present within the reach with two slow moving pools located at major constriction points within the canyon. Two springs are present in the treatment reach as well.

Fossil Creek is spring fed year-round, but base flows are augmented by significant runoff events during spring snowmelt and monsoonal events. Water in the creek is very clear, only getting turbid during runoff events. Sally May Wash, which is dry except during runoff events, is the only substantial tributary to Fossil Creek in the treatment reach. The confluence of Fossil Creek and the Verde River is located ~ 4.5 miles downstream of the treatment reach. Fossil Creek base flows within the treatment reach are about 42 cubic feet per second (cfs) with pH ranging from 8.9-9.2 and temperatures ranging from 20°C -25°C during summer.

PROTOCOLS AND MONITORING PLAN FOR GROUNDWATER OR SURFACE WATER

Fossil Creek is not used for drinking water and has no hydrologic connections to wells. However because of the high recreational use at Fossil Creek, which includes swimming and camping, water from the treatment area will be tested according to the methods outlined in Finlayson et al. (2010). Water from within the treatment area and downstream will be sampled and submitted to an independent lab for analysis. Water samples will be collected 4 hours after the initiation of the treatment and after the detoxification has ceased. Public reentry into treated area will not occur until after sentinel fish survive for a minimum of 24 hours.

Waters treated with rotenone and used for drinking or with hydrologic connections to wells, when application rate is >40 ppb (>0.04 ppm) rotenone, require the user to be advised against the consumption of water until: (1) active rotenone is <0.04 ppm as determined by analytical chemistry, or (2) fish of the Salmonidae or Centrarchidae families can survive for 24 hours, or (3) dilution with treated water yields a calculation that active rotenone is <0.04 ppm, or (4) distance or travel-time from the application site are known to produce an active rotenone concentration that is <0.04 ppm.

LOGISTICS, METHODS OF OPERATION AND PRELIMINARY SCHEDULE

Pretreatment Fish Surveys

In April 2012, smallmouth bass were detected near the Homestead camping area, upstream of the temporary barrier and upstream of the proposed treatment area. After detection, multiple surveys were conducted above the temporary barrier to remove smallmouth bass and determine the extent of their distribution above the temporary barrier. The smallmouth bass were detected primarily in Homestead area, but one was observed about 600 m downstream above the Boulder Creek confluence. All of the smallmouth bass detected were large individuals. Because of the restricted distribution and size of fish observed, it is possible that these smallmouth bass were illegally stocked into Fossil Creek. Eight of the nine large smallmouth bass detected above the temporary barrier were removed; the other one eluded capture.

The section of stream between the permanent and temporary barriers (proposed treatment area) was surveyed in June 2012, and about 40 age-0 smallmouth bass were detected, indicating the species had reproduced in this section of Fossil Creek.

On July 24, 2012, a plecostomus (nonnative fish common to the pet trade) was also discovered near the Homestead Campground upstream of the proposed treatment area.

The primary goal of the fish surveys described in this plan is to detect the presence of smallmouth bass in the reach of Fossil Creek from Irving Falls to the temporary barrier (target reach; Figure 2). The secondary goal of this survey is to detect the presence of plecostomus in the target reach. The information derived from the surveys will be used to decide if the extent and timing of the proposed chemical treatment of lower Fossil Creek is adequate. If no bass or plecostomus are detected in the target reach, then nonnative fish eradication efforts will not be expended in that reach. If adult smallmouth bass are detected in the target reach, and if it seems likely that they can be removed by mechanical means, then mechanical means will be used to try eradicate them in the target reach. If adult plecostomus are detected in the target reach, and if it seems likely that they can be removed by mechanical means, then mechanical means will be used to try to eradicate them in the target reach. With either of the above two scenarios, the proposed treatment of the treatment reach could proceed as planned. If age-0 smallmouth bass or plecostomus are detected in the target reach, the chemical treatment scheduled for September 2012 may be postponed and the entire section of stream from Irving Falls down to the original fish barrier may be treated at a later date. Any decision to postpone or expand the treatment area will require coordination with our partners (USFWS and USFS).

Methods

There are a variety of sampling gears and techniques that could be used to assess the presence of smallmouth bass in Fossil Creek. Commonly used sampling methods have biases related to fish

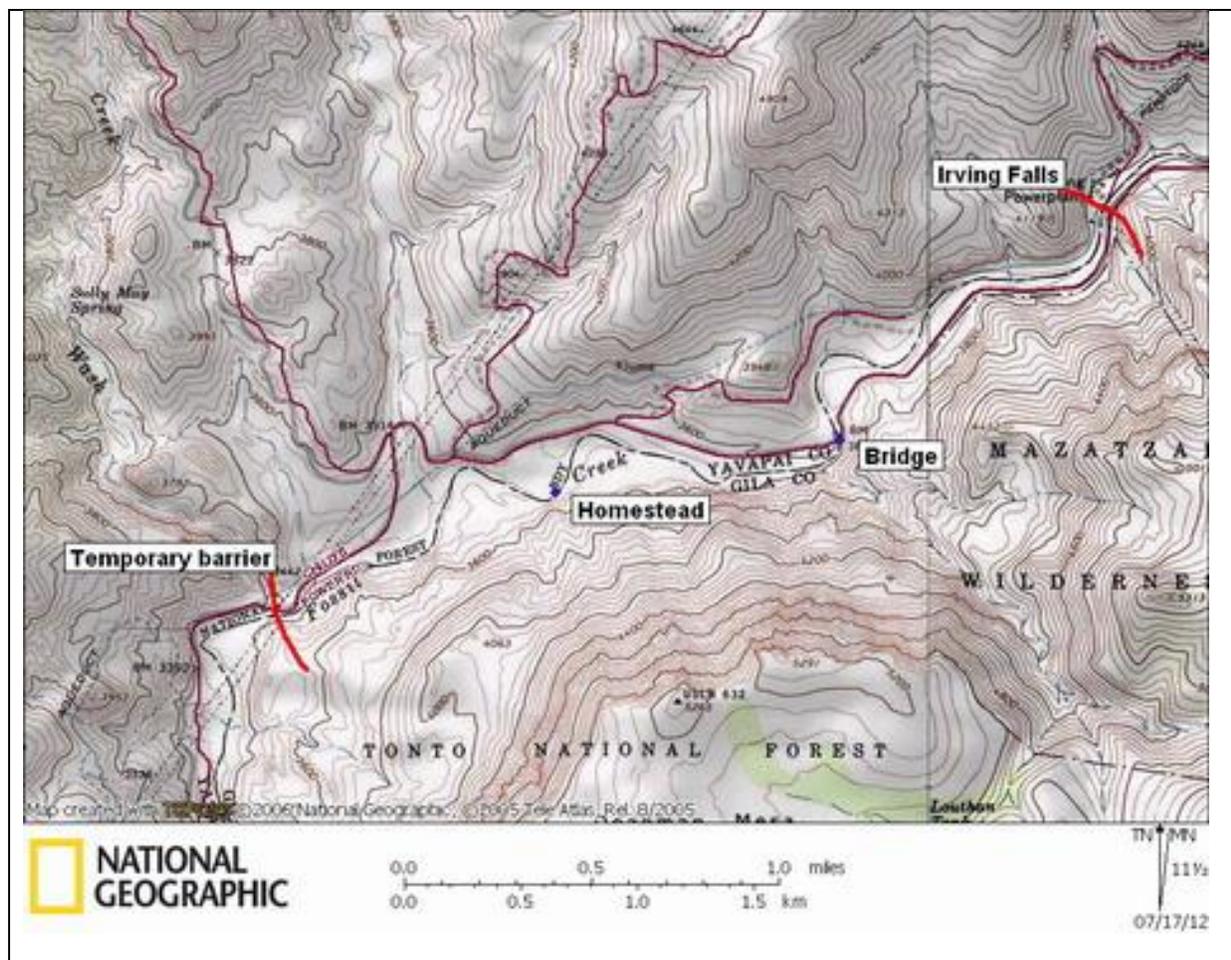


Figure 2. Map showing location of survey reach (between Irving Falls and the temporary barrier) in Fossil Creek targeted for smallmouth bass surveys.

species, fish size and habitat conditions (Bonar et al. 2009; Peterson and Paukert 2009). Backpack electrofishing tends to underestimate abundance of smaller fish, and is not effective in deep water (i.e., > 1.5 m) or wide streams where fish can escape the electric field. For example, Dauwalter and Fisher (2007) reported that electrofishing capture probabilities for smallmouth bass in streams were greater for larger than smaller individuals and that capture probabilities were greater in shallow habitats than deep habitats. Beach seining is more effective at capturing small fish than large fish, and is not effective in all habitat types, being most effective in shallow habitats with small substrate sizes (Portt et al 2006; Dunham et al. 2009; Rabeni et al. 2009). Experimental gill nets can only be effectively set in deeper habitats and are more effective at capturing larger fish than smaller fish (Bonar et al. 2009). Baited traps can capture a variety of fish, but some species tend to avoid them. For example, MacRae and Jackson (2006) reported that baited minnow traps were less effective than snorkeling at detecting small-bodied smallmouth bass. If water is clear with few visual obstructions and the fish species is not

cryptic, then visual techniques (snorkeling or above water observations) can result in high detection probabilities (Hankin and Reeves 1988; Bozek and Rahel 1991; Brewer and Ellersieck 2011).

Smallmouth bass occupy a variety of habitat types throughout their life, and therefore sampling to detect all age-classes is challenging (Peterson and Paukert 2009). Accurate sampling of age-0 smallmouth bass is problematic because they use a variety of habitats (Pert et al. 2002), but sampling for adults is more straightforward because they are generally associated with deepwater habitats (Munther 1970; Probst et al. 1984; Todd and Rabeni 1989; Brewer et al. 2007; Dauwalter and Fisher 2008; Hafs et al. 2010).

Snorkeling is reported to be more efficient than electrofishing for detecting age-0 smallmouth bass (McClendon and Rabeni 1988; Brewer and Ellersieck 2011). Brewer and Ellersieck (2011) compared snorkeling and above water (AW) observation sampling techniques to detect age-0 smallmouth bass in three Missouri streams. They reported that detection probabilities differed between the two observational techniques and differed among channel unit types. Detection probabilities in deep pools were two to three times higher for snorkeling than for AW observation. Conversely, in shallow-water pools and nonvegetated edgewater, detection probabilities were two to four times higher for AW observation than for snorkeling. For AW observations, detection probabilities of age-0 smallmouth bass were about 0.6-0.7 in shallow pools, about 0.75-0.85 in unvegetated edgewater, about 0.40-0.55 in runs, and 0.45 in vegetated edgewater. Brewer and Ellersieck (2011) concluded that above water (AW) observation was most appropriate in shallow water channel units (CU), whereas snorkeling was most appropriate in deepwater CUs for detecting age-0 smallmouth bass. Adult smallmouth bass, which tend to occupy deepwater habitat can be effectively sampled by snorkeling (Goldstein 1978; Barrett and Maughan 1994; Walters and Wilson 1996; Brown et al. 2000, Weidel et al. 2007). Therefore, a combination of AW observations and snorkeling will be used to detect smallmouth bass in Fossil Creek.

Both AW and snorkeling surveys will be replicated. Snorkel surveys are often repeated to increase the likelihood of detecting rare species and to increase the accuracy of the numbers detected (Schill and Griffith 1984; Slaney and Martin 1987; Thurow et al. 2006).

Study Design

The primary goal is to detect smallmouth bass in the target reach, and identify detection locations so that removal efforts can be focused there. Both shorelines of the target reach will be sampled multiple times. The target reach can be considered one site. Alternatively, the reach or both shorelines along the reach could be divided into segments, which would then be considered sites, with the realization that these sites would not be independent of each other in space. The AGFD's Region II Fisheries Program divided Fossil Creek into four reaches for the purpose of monitoring native sport fish. The target reach falls within the bottom three of these reaches, so

those regional designations could be considered sites. Reach B is from Irving Falls downstream about 2 km to FR 708 bridge. Reach C is from FR 708 bridge downstream about 1.6 km to the upper Homestead area, and Reach D is from the upper Homestead area downstream about 1.6 km to Sally May Wash.

MacKenzie et al. (2002) described a maximum likelihood approach to estimate the probability that a site is occupied by a species when detection probabilities are less than 1. MacKenzie and Royle (2005) described the three basic designs for occupancy (presence-absence) studies. The survey design for detecting smallmouth bass in Fossil Creek is basically a standard design, where the sites are sampled K times (MacKenzie and Royle 2005). For their maximum likelihood modeling, MacKenzie et al (2002) and MacKenzie and Royle (2005) assume that occupancy (ψ) and detection probabilities (p) are constant across both space and time. Their modeling resulted in a counter-intuitive result: the optimal number of surveys (K) increases as the probability of occupancy also increases. This implies that an optimal strategy for rare species is to conduct fewer surveys at more sites, while for a common species the optimal strategy is to conduct more surveys at fewer sites.

When they are present in Fossil Creek, smallmouth bass are easily detected with above water visual surveys or snorkeling because water is typically very clear in the stream and smallmouth bass are strikingly different from native fish both in appearance and behavior. For example, smallmouth bass were detected in 7 of 14 (50%) of the combination AW and snorkeling surveys (conducted in a variety of stream locations) since they were first detected above the permanent barrier. In addition, smallmouth bass were detected in 83% of the above water surveys. So probability of detection (p) for both snorkel and AW surveys is likely between 0.50 and 0.80. If it is assumed that smallmouth bass still occupy the target reach, then probability of occupancy can be estimated to be between 0.5 and 0.9. Therefore, based on the above mentioned probabilities of detection and occupancy and on Table 1 in MacKenzie and Royle (2005), the target reach (or each of the three sub-reaches) should be surveyed 3-5 times. Since it is important to detect smallmouth bass if they are present, the target reach will be sampled five times before making the final decision to chemically treat that reach in 2012.

Above Water Observation

Two observers, one on each shoreline, will walk upstream through the entire target reach (~5.1 km) from the temporary barrier to Irving Falls to visually detect the presence of smallmouth bass. For braided sections of stream, additional observers will be utilized, one per braid. Each survey will therefore be conducted by two or more individuals. Surveys will be replicated five times. To minimize potential bias, observers will be alternated so that they don't survey the same bank in two consecutive surveys. Observers will walk slowly along each shoreline, stop when fish are seen, and attempt to identify fish. Observers will focus on shallow near-shore habitat (< 1m depth); habitats deeper than 1 m can be bypassed because snorkelers will sample those. Observers will be targeting age-0 smallmouth bass, but will record the presence of any

smallmouth bass observed. For smallmouth bass observed, the location (NAD 83 UTM coordinates), side of river (left or right facing downstream), habitat type, number observed, and size class (< 50, 50-150, or > 150 mm TL) will be recorded. Each observer on each day will also record the beginning time and ending time (hhmm) of the AW survey. Visibility will be estimated by holding specimens of fish or a similar-sized object first at the water surface, and then sinking them into deeper water until the observer on the shore can no longer identify the object; then the depth of the object will be recorded. Visibility will be estimated both at the beginning and the end of the survey.

Snorkeling

Each deep water (> 1 m depth) habitat from the temporary barrier up to Irving Falls will be snorkeled through by one person (not the same person in each pool). To minimize bias, observers will be alternated so that the same person does not snorkel through the same pools in two consecutive surveys. Snorkelers will be targeting older (> age-0) smallmouth bass, but will record the presence of any smallmouth bass observed. Snorkelers will swim slowly in an upstream direction through each deep habitat and record the presence of any smallmouth bass observed. If several people participate in the survey, they will spread out into consecutive pools, and when a person finishes snorkeling through a habitat, they will move upstream to the next unsampled pool and begin snorkeling there. For each deepwater habitat snorkeled through, the following information will be recorded: start time and end time (hhmm), location (NAD 83 UTM coordinates), habitat type, number of smallmouth bass observed, and size class (< 50, 50-150, or > 150 mm TL) of smallmouth bass observed. Visibility will be estimated with a secchi disk at the beginning of and end of the survey each day; depth (m) at which the disk colors can no longer be clearly seen will be recorded.

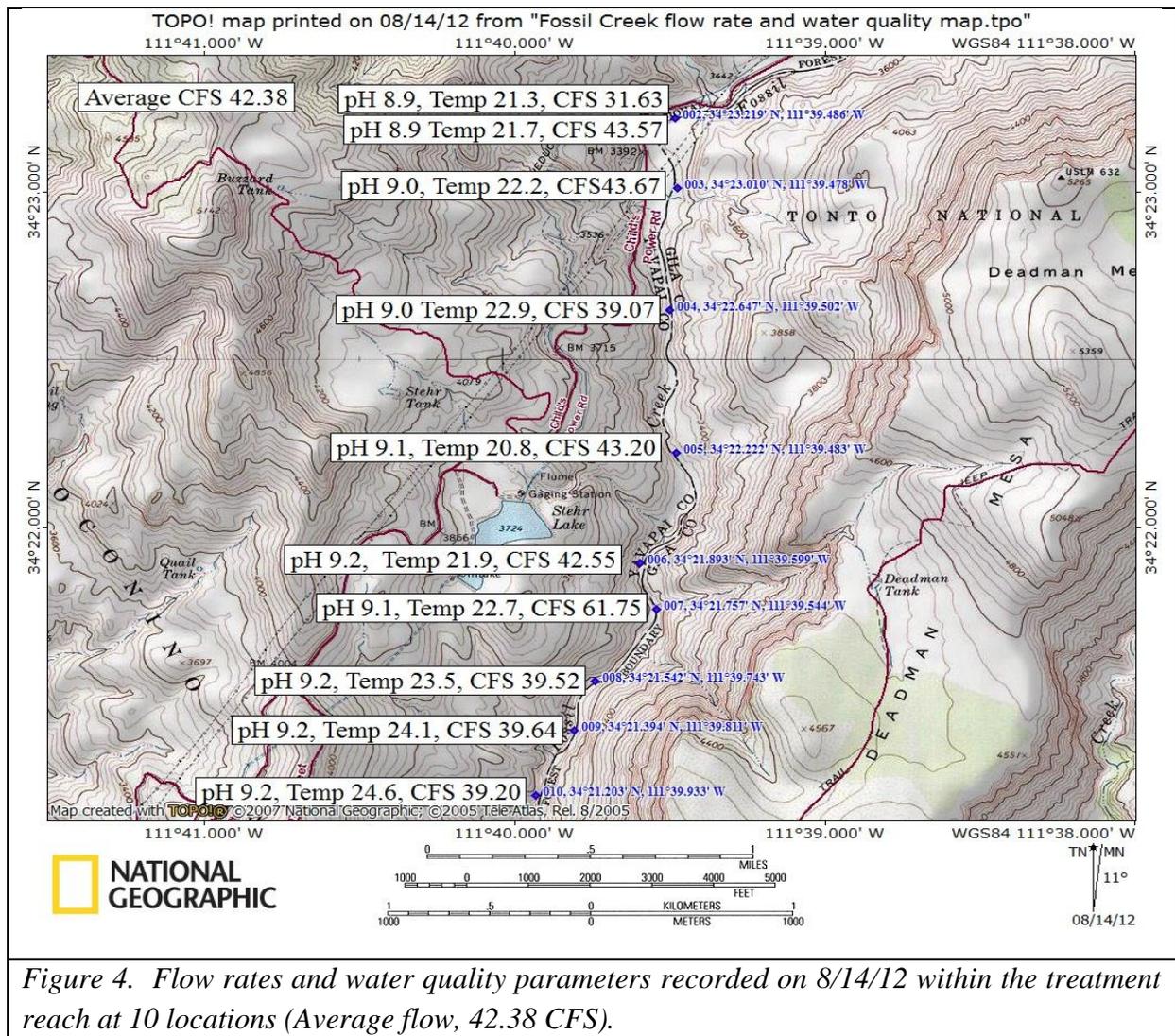
Description of Age-0 Smallmouth Bass:

Age-0 smallmouth bass can be distinguished from all native fish species in Fossil Creek (Figure 2) by vertical bands (brown to green in color) along their fusiform body and a banded tri-colored tail (bands of orange, black, and white from anterior to posterior).

Flow Rate, Flow Travel Time, Temperatures, pH

Flow rate, travel time, water temperature and pH are all necessary metrics for calculating the amount of chemical to be applied to the treatment area. The measurement of flow rates and flow travel time are legal requirements for any application of CFT Legumine as defined by the label (Appendix 7). These metrics were all measured in August 2012 (Figure 4). Flow rate and temperature will be measured again just prior to the treatment and treatment rates may be adjusted accordingly. Travel time of flow from the temporary barrier to the permanent barrier was approximately 3.25 hours (Figure 5).





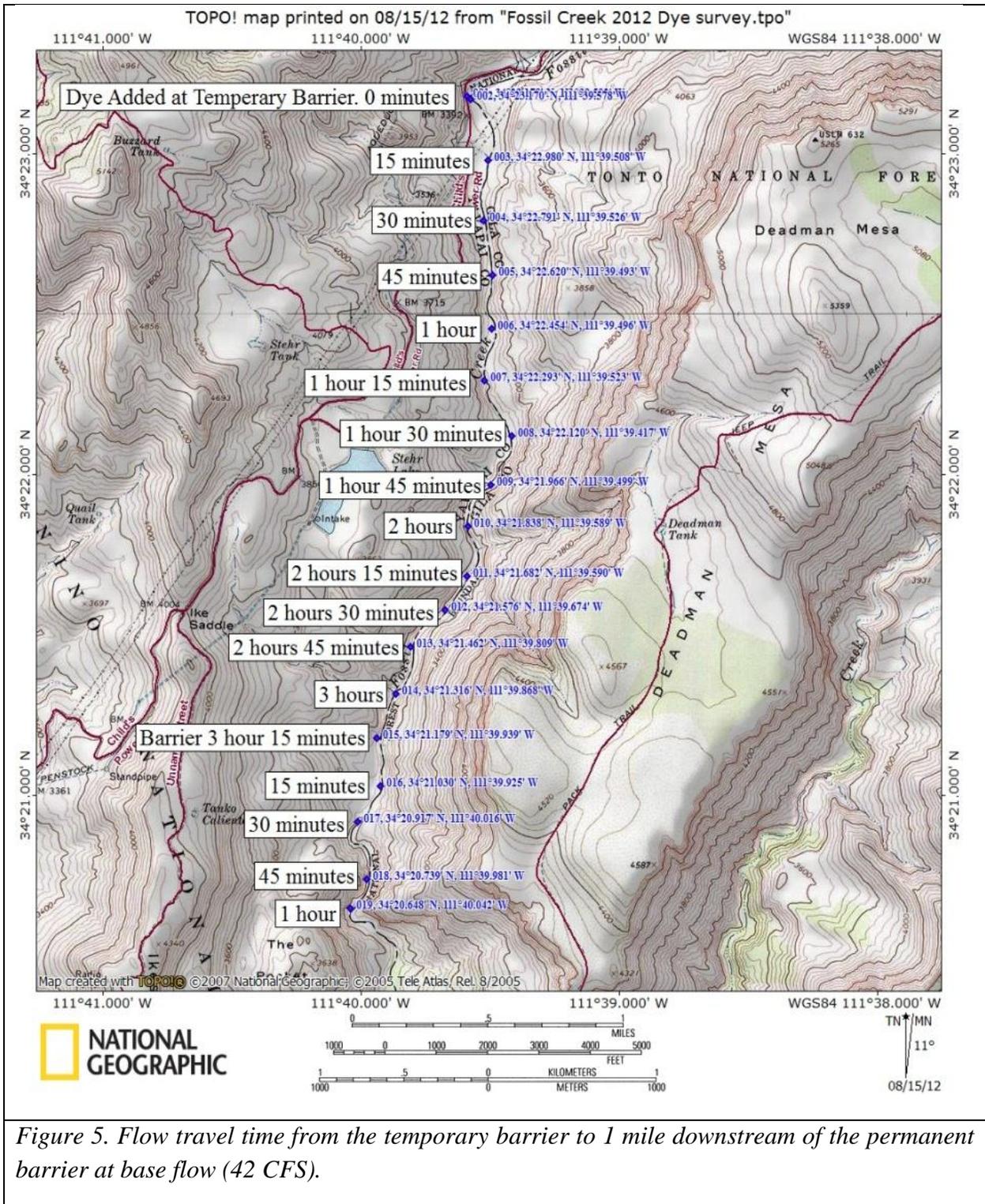


Figure 5. Flow travel time from the temporary barrier to 1 mile downstream of the permanent barrier at base flow (42 CFS).

Bioassay

Bioassays are necessary to calculate the minimum effective dose (MED) of piscicide for the target species within the treatment area. Bioassays are also a legal requirement as per the CFT Legumine label. Laboratory bioassays were completed for both bass and chub. Five bass from Wet Beaver Creek were placed into each of six aquaria (each with a different concentration of rotenone) that contained 40 liters of Fossil Creek water, and held for 4 hours. The same number of fish and tanks were used for roundtail chub. Water in the tanks was at ambient room temperature (74°F), and had a pH of 8.4. Although bass are the target species for this treatment, chub were included in bioassays because they will be used as sentinel fish within the treatment area to monitor the success of the treatment. An additional bioassay was also done for bass in the field at Fossil Creek downstream of the permanent barrier. Five bass were placed into each of six containers (each with a different concentration of rotenone) and held for four hours. Water in the tanks was 79°F with a pH of 8.7. The calculated MED for both chub and bass is 0.025 parts per million (ppm) active rotenone or 0.5 ppm CFT Legumine (Figures 6-8).

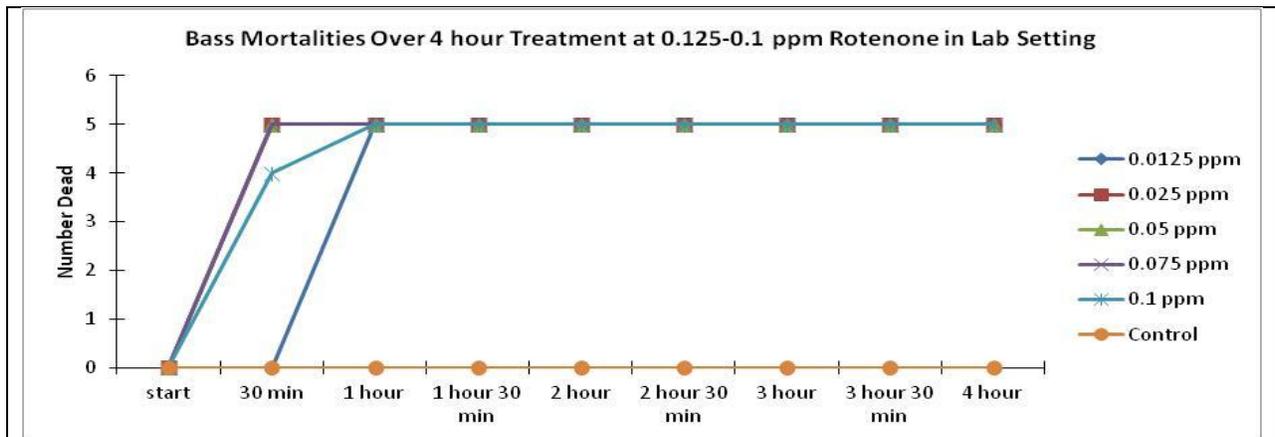


Figure 6. Bass mortality rate by concentration in parts per million (ppm) of active rotenone over a 4 hour period using Fossil Creek water in a laboratory environment.

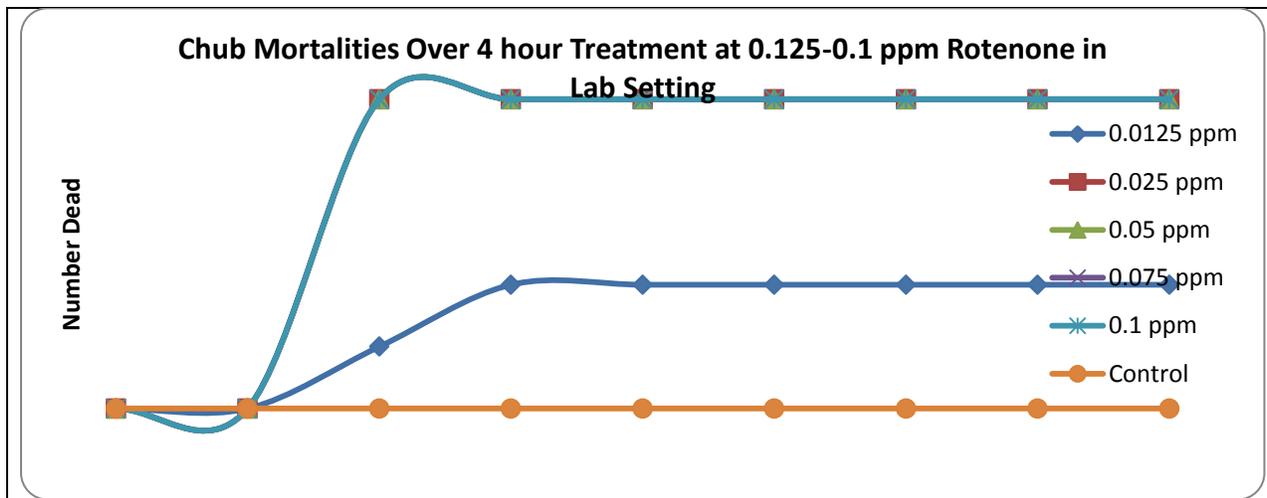


Figure 7. Chub mortality rate by concentration in parts per million (ppm) of active rotenone over a 4 hour period using Fossil Creek water in a laboratory environment.

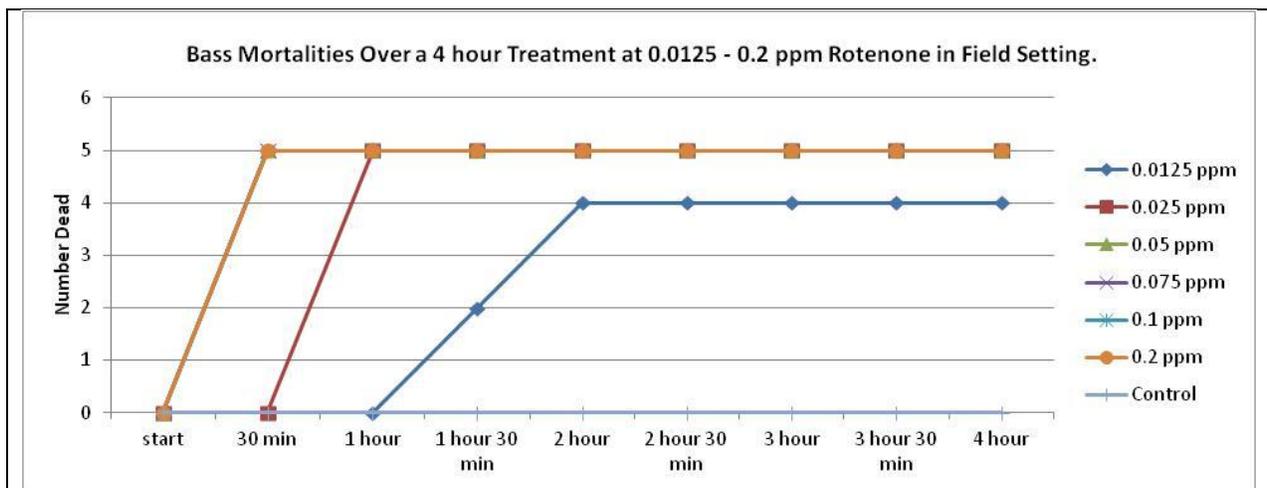


Figure 8. Bass mortality rate by concentration (parts per million (ppm) active rotenone) over 4 hour period at Fossil Creek.

PISCICIDE AND NEUTRALIZATION FORMULATION

CFT Legumine will be the primary toxicant utilized in this proposed treatment. The target concentration of CFT Legumine will be 1 ppm (two times the MED determined by bioassay, AFS SOP:5). Application rates of CFT Legumine will be determined by the formula:

$$X = F(1.699 B),$$

where X = ml/minute of CFT Legumine applied to the stream, F = the flow rate (cfs), and B = parts per million desired concentration of CFT Legumine (CFT Legumine label). Sentinel fish will be monitored throughout the treatment area and concentrations may be adjusted during an 8 hour treatment to successfully complete the treatment. Rotenone Fish Toxicant Powder will be utilized in a sand and gelatin mix and placed in deep pools and in springs (AFS SOP:13.0). Potassium permanganate (KMnO₄) will be used to chemically induce deactivation of rotenone at the downstream end of the treatment area. The target concentration of KMnO₄ will be 6 ppm (4 ppm for rotenone, 1 ppm for organic demand, 1ppm residual, AFS SOP: 7). Application rates of KMnO₄ will be determined by the formula (AFS SOP:7)

$$SF = Y(1.7 Q)$$

where SF= flow of solid KMnO₄ (g/min), Y= desired KMnO₄ concentration in stream (ppm) and Q = stream discharge (cfs). Concentrations of KMnO₄ will be monitored 30 minutes drift (contact) time downstream of the detoxification station and concentration of KMnO₄ will be adjusted to maintain a minimum of 1 ppm residual.

Methods of Rotenone Application

Drip Buckets

Three drip stations will be placed along the length of the treatment reach, one at the temporary barrier, one about 1 hour water travel time downstream, and one about 2 hour water travel time downstream from the temporary barrier (Figure 9). Drip stations will administer undiluted CFT Legumine. The barrier drip station will dispense CFT Legumine at a rate to achieve a concentration of 1 ppm in the creek (application rates in Table 1). The first booster station will dispense CFT Legumine at a rate to add 0.50 ppm. The final booster station will dispense CFT Legumine at a rate to add 0.50 ppm to the stream. The reason for the lower concentrations at the booster stations is because rotenone becomes partially diluted and decomposed as it travels downstream.

Drip containers will be 5 gallon plastic buckets with lids and an adjustable flow style valve placed at the bottom to titrate the appropriate rate of rotenone concentrate over the course of an 8 hour treatment. Lids will be firmly placed on top to seal the container and reduce the likelihood of spills. A copper breather tube near the valve is necessary to maintain a steady calibrated flow.

Certified applicators will comply with safety standards by wearing appropriate PPE (goggles, gloves, cartridge style respirators, long sleeves, etc.). Drip buckets will be filled in a location where a spill is highly unlikely to occur and where spills can be contained. The drip buckets will be filled and the lid to the bucket will be firmly attached to the bucket and securely placed.

Drip Stations Locations

The following locations for drip stations were identified during reconnaissance (Figure 10):

- *Upper* – The first drip station will be located at the temporary barrier (N 34° 23.244' W 111° 39.378').
 - The drip bucket located at the temporary barrier will begin the treatment when the lead applicator says to begin or at a predetermined time. The application of rotenone will not begin until the detoxification station is calibrated and has been running for at least two hours. The target treatment concentration will be at 1ppm CFT Legumine (5%).

- *Middle* – The first booster station will be located ~ 1 hour travel time downstream from the initial drip station (N 34° 22.474' W 111° 39.498').
 - The middle (first) booster station will be turned on one hour after the upper (initial) station. The target concentration will be at 0.50 ppm CFT Legumine (5%).

- *Lower* – The second booster station will be located ~ 2 hours travel time downstream from the initial drip station (N 34° 21.906' W 111° 39.585').
 - The lower (second) booster station will be turned on two hours after the upper (initial) station. The target concentration will be at 0.50 ppm CFT Legumine (5%).

Sprayers and Sand

Four people will spray rotenone throughout the treatment reach, two (one on each shore) in the upper sub-reach from the temporary barrier to the first natural constriction point of the canyon (N 34 21.542 W 111 39.743) and two in the middle sub-reach from the 1st natural constriction point of the canyon to the second natural constriction (34 21.228 111 39.915). The lower sub-reach will not require spray but will require one person to dispense sand rotenone mix.

Rotenone concentrate will be diluted (1 to 2 % solution, AFS SOP:12.0) on site using the following procedure. Crew members wearing the appropriate PPE (goggles, gloves, cartridge style respirators, long sleeves etc) will fill their sprayers ½ way with strained water from the creek. Concentrate rotenone will then be added to the sprayer using a graduated cylinder at the appropriate amount to reach the desired concentration. The sprayer will then be completely filled with strained creek water. Once the lid to the sprayer is securely fastened, gentle agitation of the sprayer in a circular motion for ~ 30 seconds will adequately mix the solution.

TOPO! map printed on 08/22/12 from "Drip and Detox Stations map Fossil Creek 2012 Final.tpo"

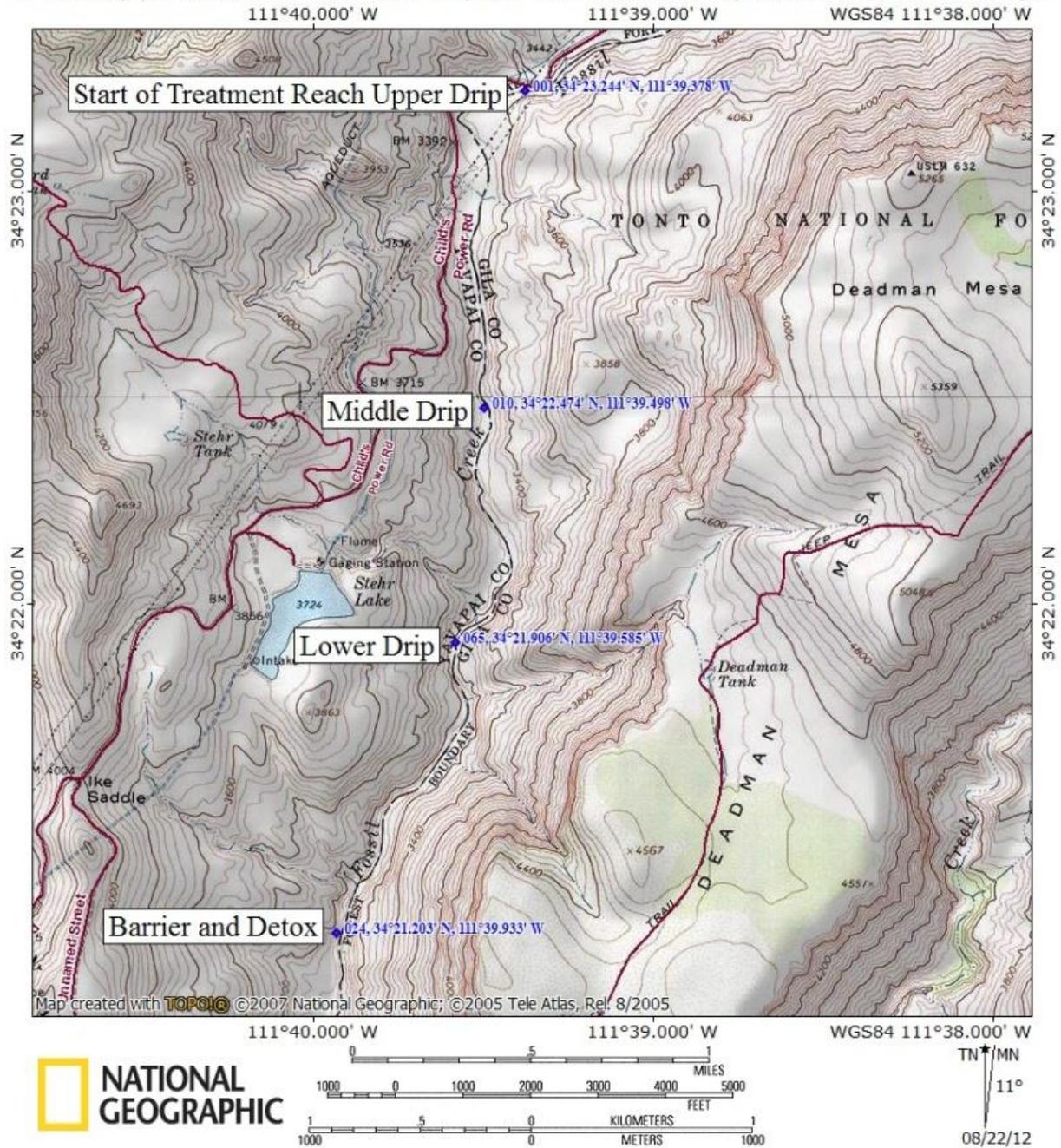


Figure 10. Initial drip station, booster drip stations and detoxification station locations.

Table 1. Application rates of CFT Legumine 5% at 0.25-1 parts per million (ppm) and for stream flows 40-60 cubic feet per second (CFS).

<i>CFT Legumine at 0.25ppm</i>		<i>CFT Legumine at 0.5 ppm</i>		<i>CFT Legumine at 0.75 ppm</i>		<i>CFT Legumine at 1 ppm</i>	
Stream flow (ft³/s)	rate ml/min						
40	17	40	34	40	51	40	68
41	17	41	35	41	52	41	70
42	18	42	36	42	54	42	71
43	18	43	37	43	55	43	73
44	19	44	37	44	56	44	75
45	19	45	38	45	57	45	76
46	20	46	39	46	59	46	78
47	20	47	40	47	60	47	80
48	20	48	41	48	61	48	82
49	21	49	42	49	62	49	83
50	21	50	42	50	64	50	85
51	22	51	43	51	65	51	87
52	22	52	44	52	66	52	88
53	23	53	45	53	68	53	90
54	23	54	46	54	69	54	92
55	23	55	47	55	70	55	93
56	24	56	48	56	71	56	95
57	24	57	48	57	73	57	97
58	25	58	49	58	74	58	99
59	25	59	50	59	75	59	100
60	25	60	51	60	76	60	102

Crew members (wearing appropriate PPE) will spray the solution into locations predetermined during the reconnaissance (Figures 11-17). Each spray crew will have a minimum of two members, one for each shoreline. Each crew member will receive a map with GPS locations of spray locations for their sub-reach. Each crew member will keep a log of the amount of concentrate chemical used and number of times the sprayer was filled.

Three people (the crew leaders from each of the spray crews) will be tasked with applying rotenone sand (AFS SOP:13) to large slow-moving pools and springs. Sand will be applied to predetermined locations identified during the reconnaissance. Sand will be packaged in buckets and labeled with the correct crew number along with the signal word WARNING, name of the chemical and safety contact information. Wearing the appropriate PPE, crew members will apply the sand by hand evenly to the area. If pools are extremely deep (over 6 feet) or have large undercuts, a PVC pipe and plunger system may be used to apply sand at depth. Springs will be

treated at their confluence with the creek if possible to prevent potential negative impacts to native snails.

- *Upper sub-reach spray crew* – The upper sub-reach spray crew will spray from the temporary barrier (N 34° 23.244' W 111° 39.378') downstream to the first natural constriction point (N 34 21.542 W 111 39.743). Specific spray and sand application site locations will be provided on maps (Figures 11, 12, and 13).
 - *Spray Crew #1*- The crew spraying the upper sub-reach will begin spraying 1.5 hours after the start of the treatment.

- *Middle sub-reach spray crew* – The middle sub-reach spray crew will spray from the first natural constriction point (N 34 21.542 W 111 39.743) to the second natural constriction point (N 34° 21.228' W 111° 39.915'). Specific spray and sand application site locations will be provided on maps (Figures 14 and 15).
 - *Spray Crew #2* – The crew spraying the middle sub-reach will begin spraying 2.5 hours after the start of the treatment.

- *Lower sub-reach spray crew* – The lower sub-reach crew (N 34° 21.228' W 111° 39.915') downstream to the permanent barrier has no spray locations. Specific sand application site locations will be provided on a map (Figure 16 and 17)
 - *Spray Crew #3* – The crew will deploy sand 4 hours after the start of the treatment.

Detoxification

Three volumetric feeders will be set up and ready to dispense powdered KMnO_4 at a starting target concentration of 6 ppm to the main stream channel (application rates in Table 2). Hoppers will be located at the permanent barrier and will direct KMnO_4 into the barrier spillway to enhance mixing. Two hoppers will be operated in tandem as primary detoxification and one hopper and generator will be utilized as backups. A four person crew will work the detoxification station (two per 12-hour shift: day and night).

Residual KMnO_4 will be measured every hour at a distance of 30 minutes flow time downstream of the detoxification station (N-diethyl-p-phenylenediamine sulfate method, chlorine test, AFS SOP:7). The crew taking the measurements will also be monitoring sentinel fish and this information will be communicated to the detoxification crew via radio. A minimum of 1 ppm residual will be maintained at all times and application rates will be adjusted accordingly.

Detoxification will continue until sentinel fish (chub) survive for duration of 8 hours inside the treatment area and sentinel fish (bass) survive for duration of 8 hours just downstream of the permanent barrier but outside the influence of detoxification.

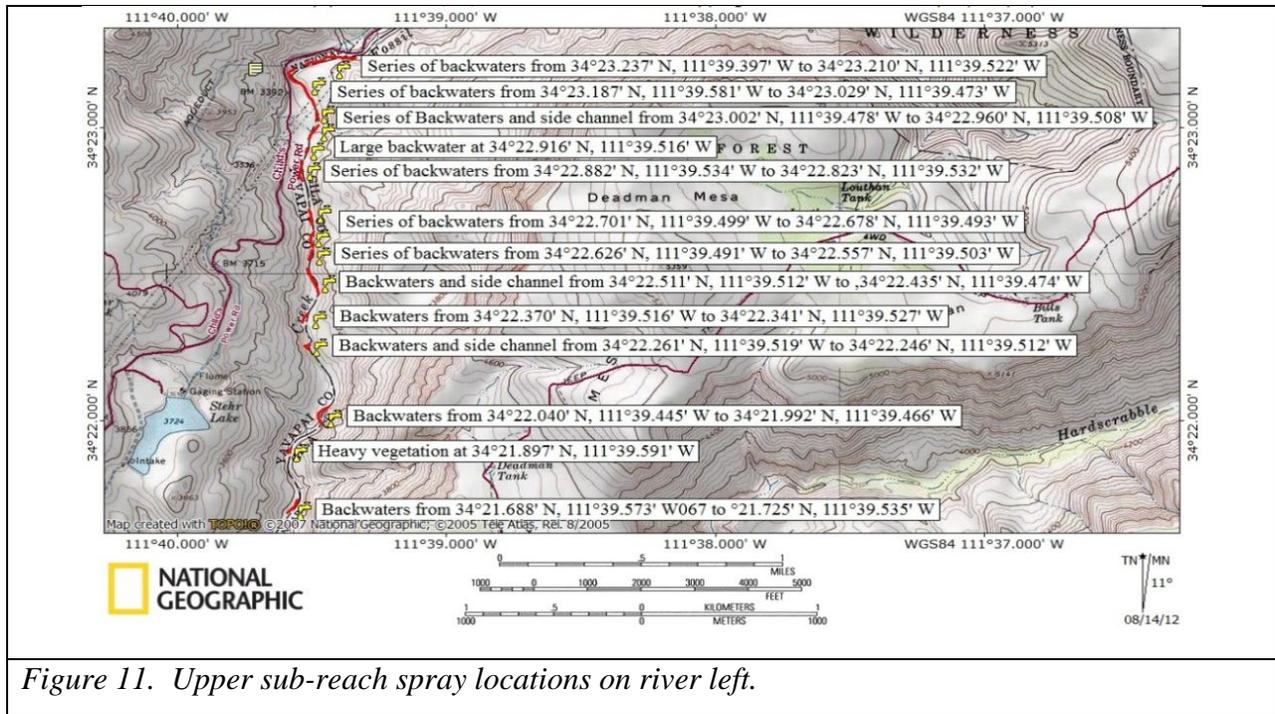


Figure 11. Upper sub-reach spray locations on river left.

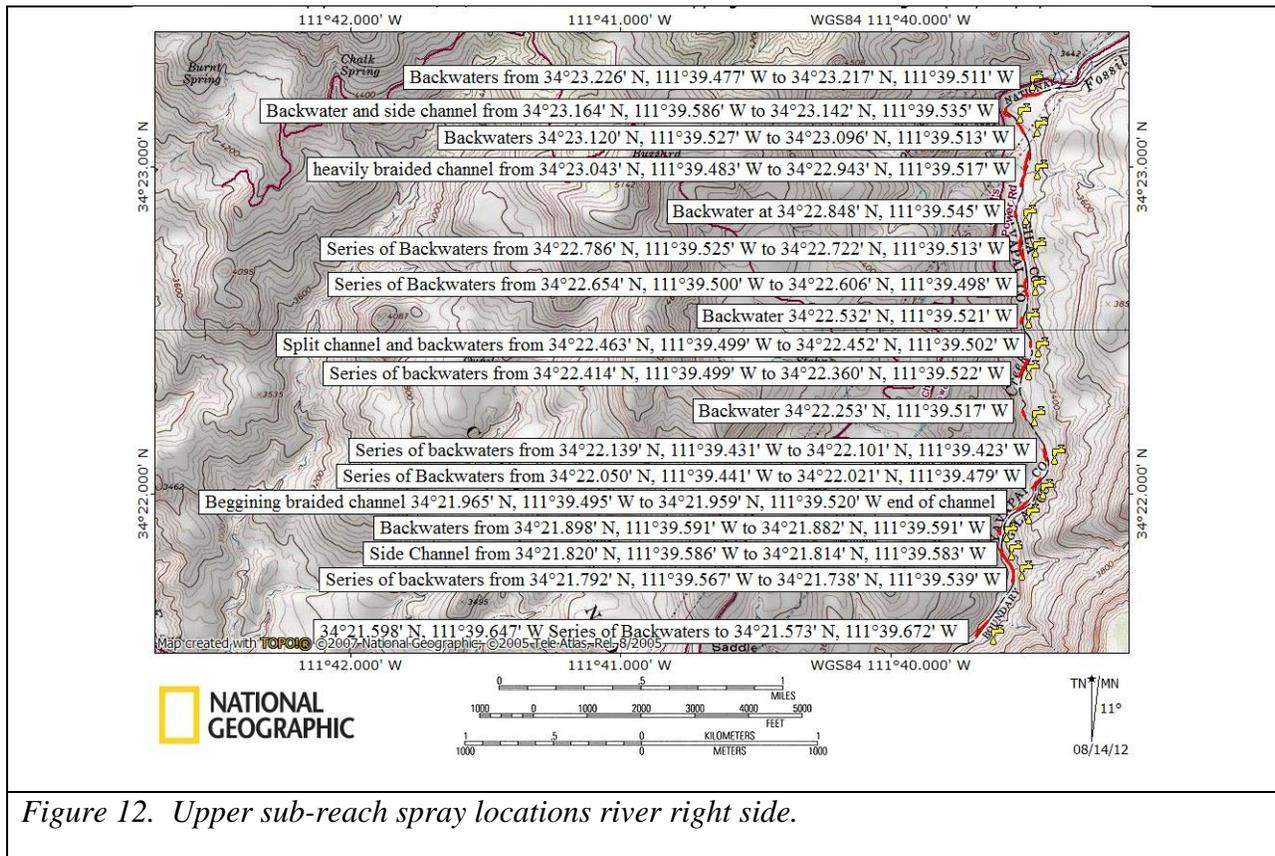


Figure 12. Upper sub-reach spray locations river right side.

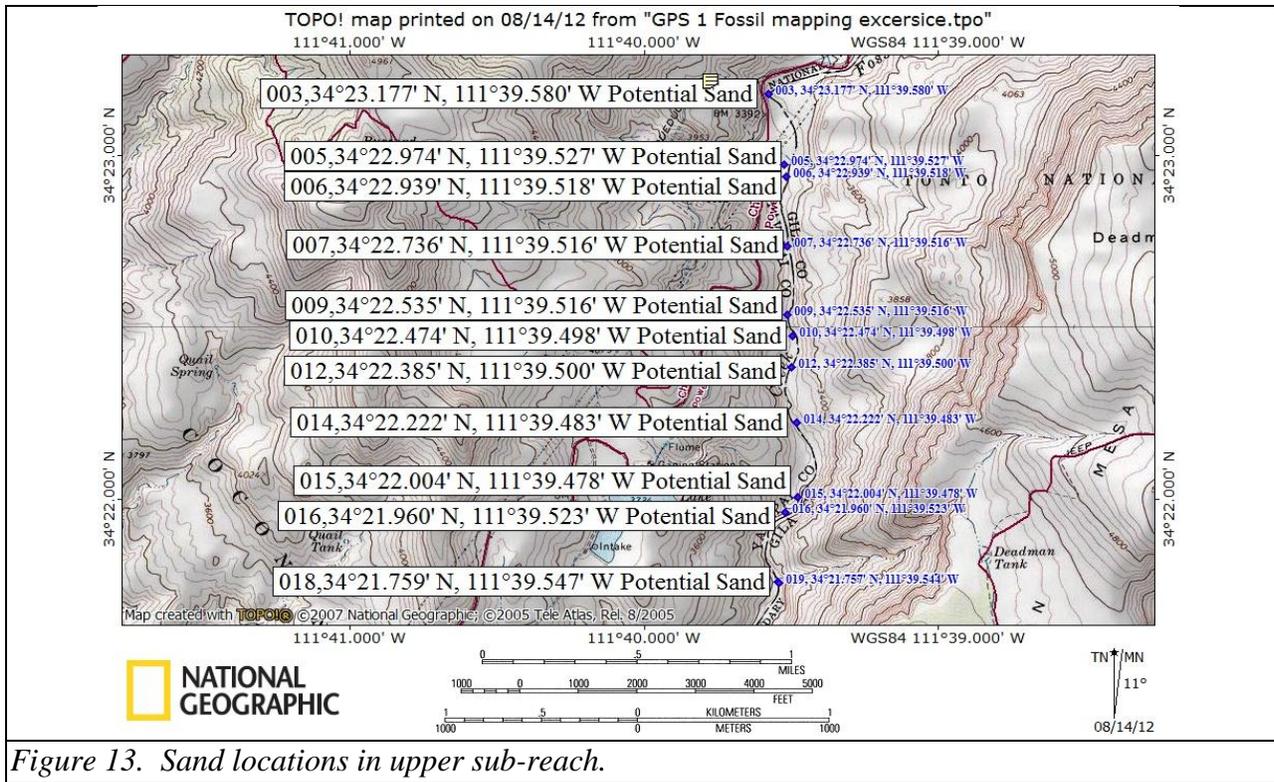


Figure 13. Sand locations in upper sub-reach.

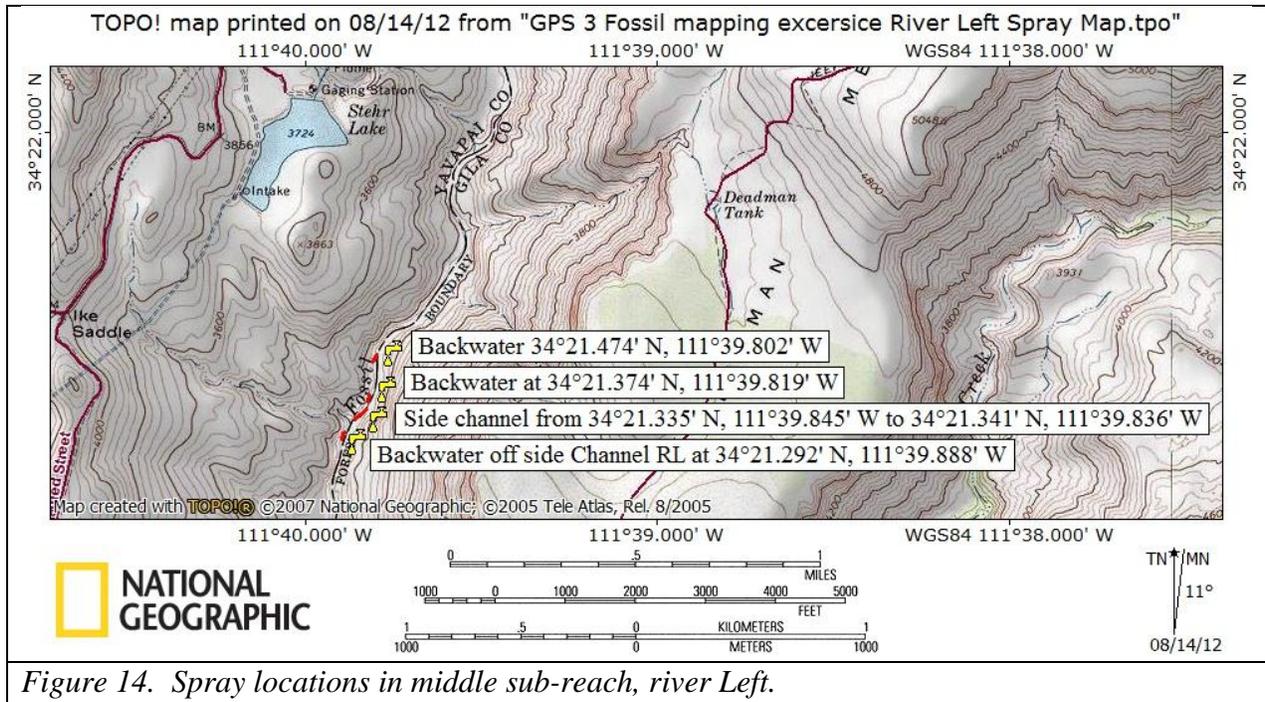


Figure 14. Spray locations in middle sub-reach, river Left.

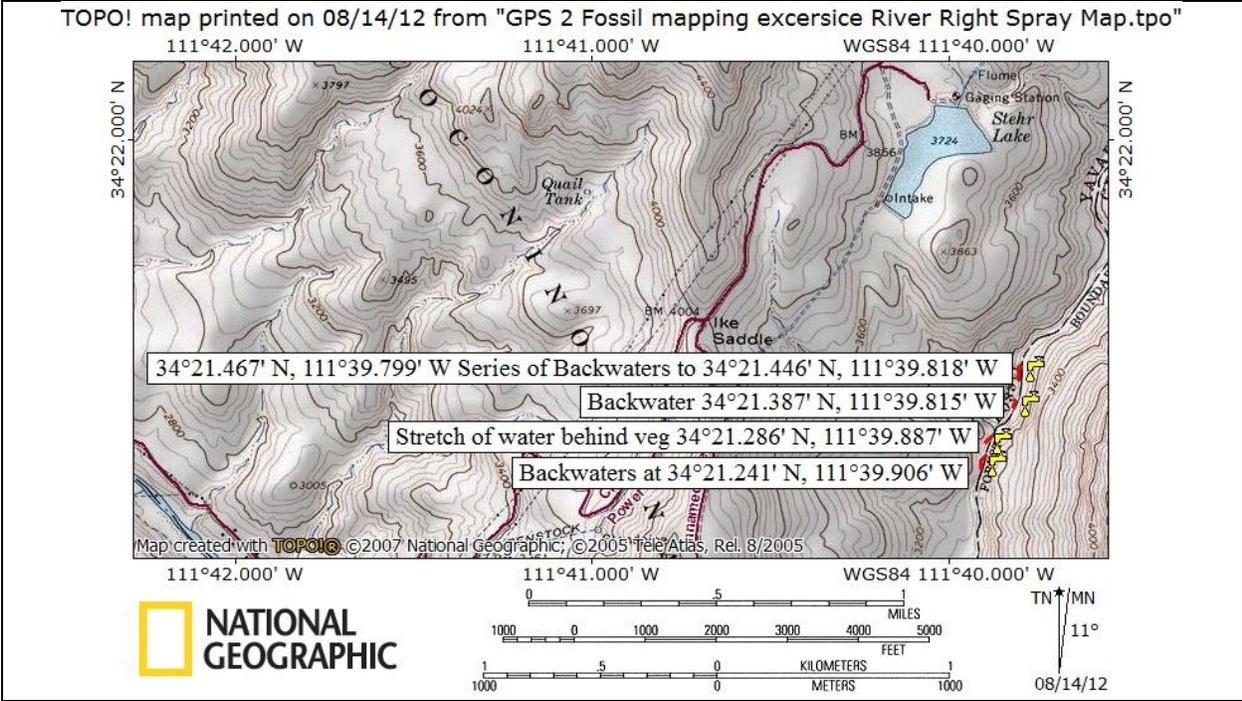


Figure 15. Spray locations in middle sub-reach, river right.

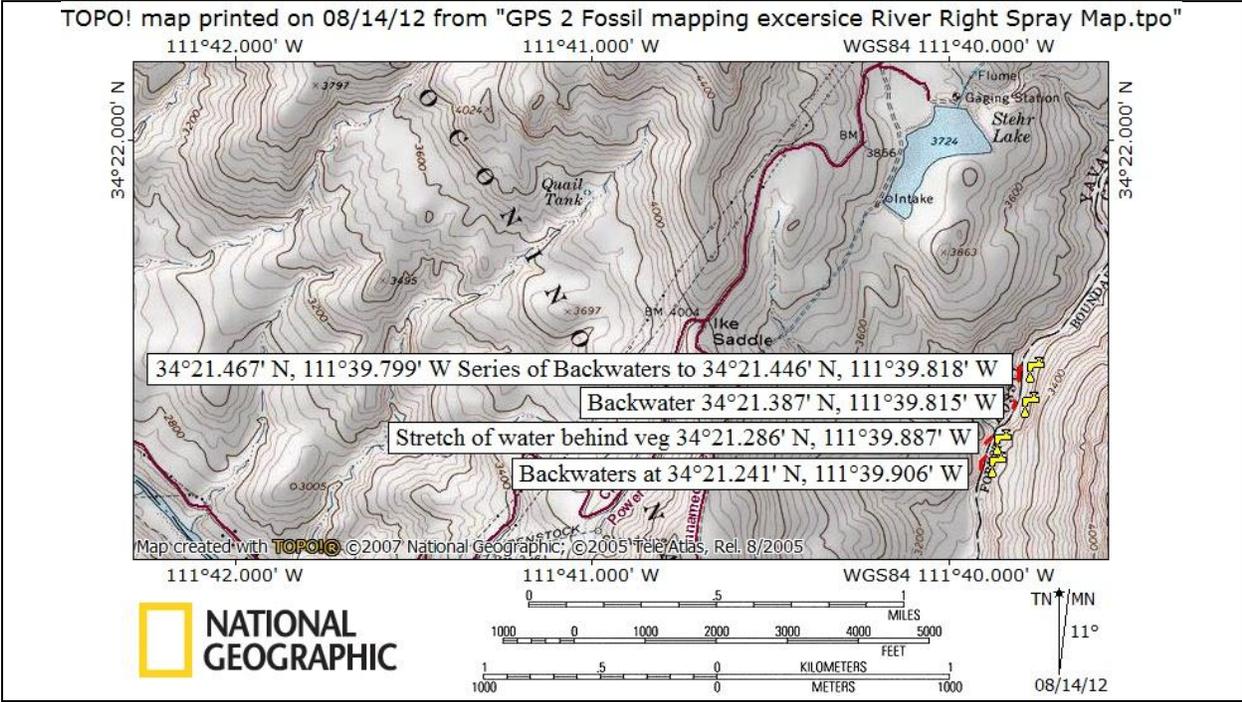


Figure 16. Sand locations in middle sub-reach.

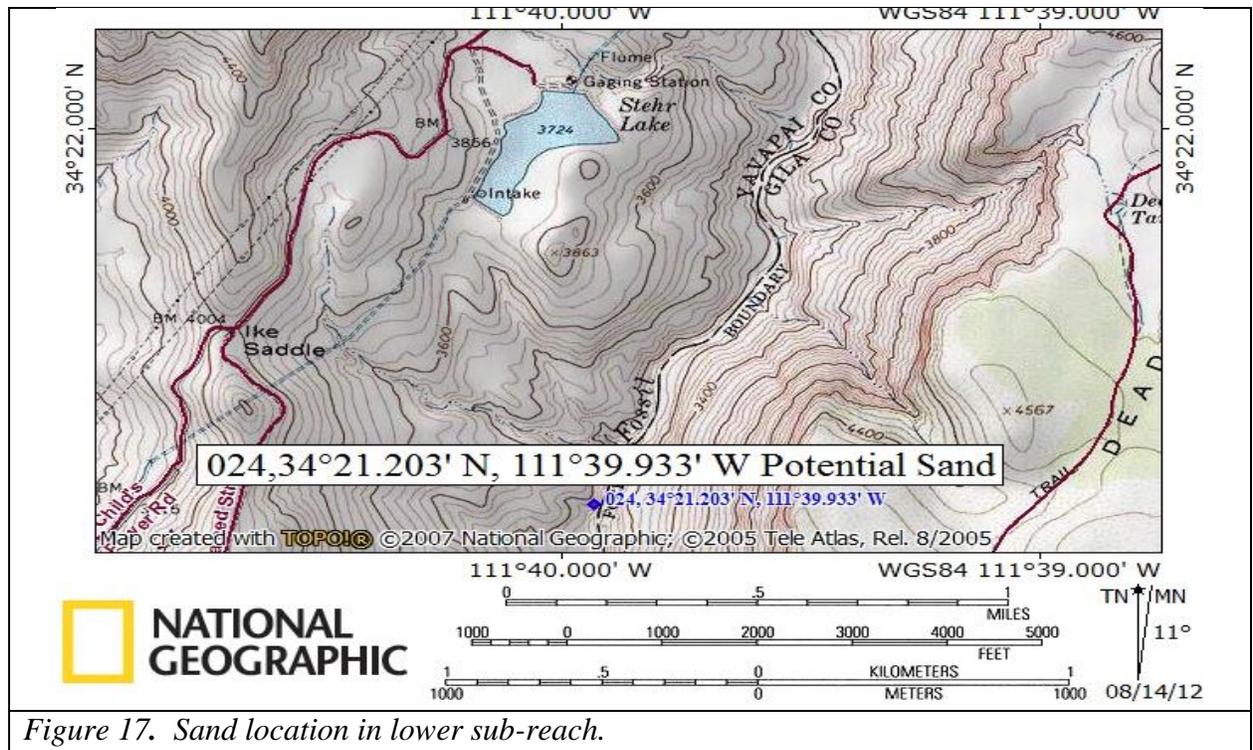


Figure 17. Sand location in lower sub-reach.

Timing of Application

Treatment will occur during late summer to early fall, late enough that bass spawning will have already occurred and eggs have already hatched but early enough that water is still at base flow and temperatures are warm enough to use minimal amounts of chemical. Two applications of rotenone are proposed for fall 2012. The first treatment is proposed for the week of September 10 – 14th. The second application is proposed for the week of September 17-21st. The week of September 24-28 will be an alternative week if one of the previous treatment weeks is delayed because of weather or other reasons.

Required Permits and Approval

- AGFD Fisheries and Nongame Branch Chiefs' and Regional Supervisor's approval at four points in the process and final approval by WMD and FOD Assistant Directors as per AGFD Piscicide Treatment Planning and Procedures Manual (Appendix 8)
- AZPDES permit number AGF2011-002
- AZPDES permit Notice of Intent (NOI)
- Chapter 18 analysis of 2004 Fossil Creek Treatment EA
- Pesticide Use Permit

Table 2. Application rates of $KMnO_4$ at 4, 5 and 6 parts per million (ppm) and stream flows of 40-60 cubic feet per second (ft^3/s).

$KMnO_4$ at 4 ppm		$KMnO_4$ at 5 ppm		$KMnO_4$ at 6 ppm	
Stream flow (ft^3/s)	Application rate g/min	Stream flow (ft^3/s)	Application rate g/min	Stream flow (ft^3/s)	Application rate g/min
40	272	40	340	40	408
41	279	41	349	41	418
42	286	42	357	42	428
43	292	43	366	43	439
44	299	44	374	44	449
45	306	45	383	45	459
46	313	46	391	46	469
47	320	47	400	47	479
48	326	48	408	48	490
49	333	49	417	49	500
50	340	50	425	50	510
51	347	51	434	51	520
52	354	52	442	52	530
53	360	53	451	53	541
54	367	54	459	54	551
55	374	55	468	55	561
56	381	56	476	56	571
57	388	57	485	57	581
58	394	58	493	58	592
59	401	59	502	59	602
60	408	60	510	60	612

Biological and Chemical Monitoring Required

Sentinel fish will be utilized along the length of the treatment reach and below the detoxification station to monitor the efficacy of the treatment and detoxification. Fish will be placed in sealed hoop nets (cages) in the main channel of the stream in slower moving water. Five sentinel fish will be held in each cage during the treatment. Fresh sentinel fish will be caught prior to each treatment and held in portable tanks at each location. Spare hoop nets will be kept on site for use as additional cages. Chub will be used for sentinel fish upstream of the permanent barrier and smallmouth bass will be used downstream.

Chub will be held in cages just upstream of the 1-hour and 2-hour drip stations and just upstream of the permanent barrier to ensure that adequate concentrations of rotenone are carried through the treatment reach to effectively kill all fish species present. Smallmouth bass will be held just downstream of the barrier out of the main flow of detoxicant ($KMnO_4$) to determine if bass are being effectively killed by rotenone. Bass will also be held downstream of the barrier at the 30

minutes water travel time location to ensure that the detoxification station is functioning as intended

Fish behavior will be monitored during and after the treatment within and up to 1 hour drift time downstream of the barrier. The behavior of free swimming fish will also be observed.

The drip station crew leads and detoxification station crew leads will observe and record the behavior of the sentinel fish and the overall progress of the treatment. This information will be communicated to the lead applicator.

General fish behavior will include:

- Tipping – when fish begin to lose their equilibrium,
- Gilling - when fish have lost equilibrium and respiration becomes difficult,
- Death.

The times of the observed behaviors and the number of individuals observed displaying them will be recorded. Spray, drip, and detoxification crew leads will record the GPS locations and above mentioned behaviors of non-sentinel fish along the treatment reach. All information will be communicated to the lead applicator hourly and application rates will be adjusted accordingly.

Rotenone concentrations will also be monitored according to the procedures described above under Protocols and Monitoring of Groundwater or Surfacewater.

Under ARS Title 17, Article 5, 17-481 (Laws 2013, Fifty-first Legislature, First Regular Session), AGFD must conduct soil and water analyses for all rotenone treatments pre- during- and post-treatment and to monitor downstream levels of rotenone until they return to pre-treatment levels.¹

Sampling, Salvage, and Treatment Tentative Dates

- July 25-August 31, 2012 -- Pre-treatment monitoring
- September 5-7, 2012 -- Fish salvage
- September 10-17, 2012 -- First chemical treatment
- September 10-14, 2012 -- Second chemical treatment
- September 17-21, 2012 – Alternative dates for treatment and/or cleanup

¹ Amended 8/28/2013 to incorporate Title 17-481 for future stream treatments.

Fish Salvage

A combination of seines, baited hoop nets, dip nets and angling in appropriate habitat types of the treated reach (temporary barrier to permanent barrier; Figure 9) may be utilized for salvage efforts. Fish salvage activities will take place during the week of September 3, 2012.

Salvage efforts will focus on collection and transport focal fish species: longfin dace, headwater chub, roundtail chub, Sonora sucker, desert sucker, and Gila topminnow. Longfin dace and Gila topminnow of all size classes will be translocated, but for the other species, only individuals > 200 mm TL will be translocated. Likewise, although not detected or encountered during past surveys within the treated reach, any spikedace, loach minnow or razorback sucker captured will be translocated.

Captured fish that fit the size criteria will be held in live cars and then transported via vehicle and released at appropriate locations and similar habitat in readily accessible portions of Fossil Creek above the treatment reach.

Chronological List of Fish Salvage Operations

- Day 1 (September 5): Crew(s) will set hoop nets and seine appropriate habitat between Sally May Wash to Mazatzal)
- Day 2 (September 6): Crew(s) will collect fish from hoop nets set the day before (Sally May Wash to Mazatzal) and place target species and size classes into live cars for subsequent transport in buckets and fish transport cooler/tanks to untreated reach. Crew will set nets from the permanent barrier to Masatzal (Figure 9).
- Day 3 (September 7): Crew(s) will collect fish from hoop nets set the day before (permanent Barrier to Mazatal) and place target species and size classes into live cars for subsequent transport in buckets and fish transport cooler/tanks to untreated reach.

RESTOCKING PLAN

During salvage, fish are moved upstream into untreated areas of the river so that as the treatment is completed, native fish moved upstream and those already present upstream can move back downstream into the treated reach and re-establish a presence there. Given the high densities of native fish upstream of the treatment reach, we expect rapid re-establishment of the native fish community within the treatment reach. If necessary, post treatment efforts can be made to capture and move fish back into the target reach. Also, supplemental stocking of native fish including roundtail chub may be considered after discussion with USFWS, BOR and USFS. Stockings of longfin dace, spikedace, Gila topminnow, and razorback sucker into the Treatment Reach are planned after the renovation when the stream is considered suitable for fish. The razorback suckers would likely not be stocked until 2013.

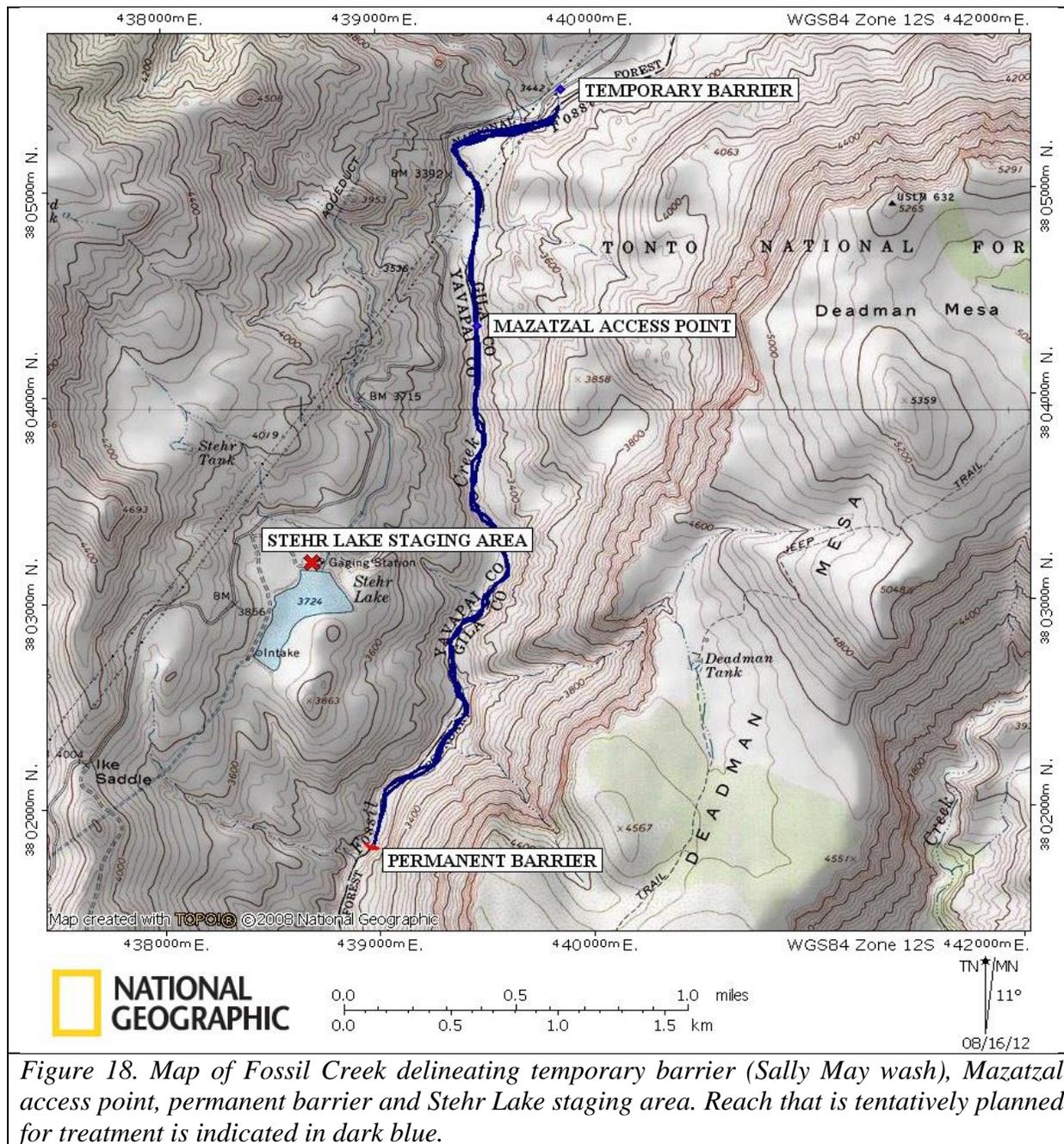


Figure 18. Map of Fossil Creek delineating temporary barrier (Sally May wash), Mazatzal access point, permanent barrier and Stehr Lake staging area. Reach that is tentatively planned for treatment is indicated in dark blue.

10. SITE SAFETY PLAN

All employees involved in the rotenone application will receive safety training and hazard briefing as described below. Scott Rogers (AZGFD), Mike Lopez (AZGFD), Shaula Hedwall

(USFWS), and Matt Rinker (AZGFD) will be responsible for providing the training and hazard briefings. Safety briefings will be given to treatment crews on site at the beginning of each day of treatment prior to any treatment activities. Material Safety Data Sheets (MSDS; Appendix 7) sheets, label, emergency first aid and evacuation site locations and map will be distributed at that time to the entire crew. All AGFD employees handling CFT legumine and potassium permanganate will be required to complete OSHA medical evaluation questionnaires (Appendix 9) and take the OSHA respirator fit test to be cleared for proper respirator use. Fit test will be conducted on-site by a licensed physician (Concentra).

SAFETY TRAINING

All Employees involved in the rotenone application will receive rotenone safety training on-site. All crew leaders will be Certified Applicators having completed the necessary safety training associated with the certification process. All certified applicators will provide a copy of their current applicator certificate prior to treatment activities to be held on record by the project lead (Scott Rogers). On-site training will be given by the treatment lead covering the Chemical label, MSDS sheets, where eye wash stations; first aid; and emergency heli-evac and pedestrian sites are located, how to properly use Rotenone and application equipment, and PPE and its proper use. Upon receiving proof of certification and training all members of the treatment crew will fill out the certification record (Figure 19) to show that they have complete the necessary training requirements.

COMPREHENSIVE HAZARD COMMUNICATION BRIEFING

The comprehensive hazard communication briefing will have the following elements:

- (1) *Verbal warning* - A verbal discussion of the information and warnings on the label and MSDS for the rotenone product will be given on site prior to treatment activities by at least one of the Applications lead(s): Scott Rogers (AZGFD), Mike Lopez (AZGFD), Shaula Hedwall (USFWS), or Matt Rinker (AZGFD). Copies of the MSDS sheets and rotenone product label will be provided to the entire working crew on site during the safety briefing and prior to the treatment via email for review.
- (2) *Review of Rotenone Product Label* - Review of the rotenone product label will be conducted prior to treatment activities. The label and MSDS sheets will be provided to the entire working crew on site during the on site safety briefing. The entire treatment plan

Training Certification Recording:

Rotenone Product _____ Safety Training Record

This is to certify that _____ has received _____ hours of rotenone safety training.

Employee Signature _____

Employee Title _____

Employee Work Location _____ Trainer _____ Date _____

Training Requirements:

- **Safety Procedures:** personal protective equipment, engineering controls, and equipment. Heat-related illness.
- **Pesticide Labels:** signal words, precautionary statements, first aid instructions, mixing and application instructions.
- **Pesticide Handling Procedures:** container handlings, mixing and application equipment, triple rinse containers.
- **First Aid and Decontamination:** for eyes and skin and location of first aid supplies.
- **Emergency Procedures:** the procedures for handling non-routine tasks or emergency situations such as spills or fire.
- **Common Symptoms of Overexposure:** common symptoms of pesticide poisoning and ways poisoning can occur.
- **Exposure Hazards:** including both acute and chronic effects.
- **Environmental Concerns:** such as drift, runoff and wildlife hazards.
- **Laws and Regulations:** applicable laws and regulations, MSDS, Pesticide Safety Information Series, label requirements.
- **Employee Rights:** receive information on pesticides they may be exposed to, rights against discharge or other discrimination due to exercise of these rights.
- **Location of Documents:** Hazard Communication Program plans, pesticide use records, Pesticide Safety Information Series leaflets, MSDS and training records.

Figure 19. Rotenone training certificate recording form.

will be given to the application leads prior to the treatment via email for review. The following information will be discussed with employees prior to treatment activities:

- The chemicals that are in the rotenone product.
- First aid and health warnings.
- Proper use of protective equipment required.
- Directions for applying rotenone. The directions for applying rotenone will provide instruction on:
 1. Application site
 2. Dosage rate
 3. Application method and equipment
 4. Dilution instructions
 5. Application timing and frequency
 6. Restricted entry interval.

The label and MSDS sheets (Appendix 7) will be at the place where the rotenone is mixed and applied.

(3) *Review of Rotenone Product MSDS* - When reviewing the rotenone product MSDS, the following information will be discussed with employees (1) health effects, (2) what to do in an emergency, (3) personal protective equipment, (4) pesticide safety, and (5) rights of employees and where to find out more information on rotenone.

- A. Health Effects—Information on how rotenone can affect health is found in the Hazards Identification Section and in Toxicological Information Section of MSDS.
- B. What To Do In An Emergency—Information on first aid and where to get emergency medical care is found in the First Aid Measures Section of MSDS.
- C. Personal Protective Equipment—Information on the need to wear PPE, how to take care of PPE and what PPE can and cannot protect is found in Exposure Controls/ Personal Protection Section of MSDS. Personal Protective Equipment Needed Includes:
 - i) Protective eyewear
 - (1) Required when mixing, loading and applying

- (2) Safety glasses, shield or full face mask
- ii) Chemical resistant gloves
 - (1) Required when mixing, loading and applying
 - (2) Cannot be fabric lined
- iii) Waders or chemical resistant bib
 - (1) Chemically repellent
 - (2) Insure to protect against heat related illnesses
- iv) Full face cartridge respirator
 - (1) For handling undiluted product
 - (2) Required on label
 - (3) Rotenone is relatively nonvolatile
- D. Pesticide Safety—Information on the meaning of safety statements and safety rules for handling pesticides (e.g., Pesticide Information Series listed under Additional Information).
- E. Rights as an Employee and More Information—Job safety information, and MSDS informs the employee about the pesticide and its dangers. Each employee has the right to know when and where the pesticide was applied, the name of the pesticide, and the EPA registration number.

(4) *Instruction on Application of Rotenone* - including:

- Potential health effects of rotenone found in the Hazards Identification Section and in Toxicological Information Section of MSDS.
- What to do in an emergency and emergency care available. Information on first aid and where to get emergency medical care is found in the First Aid Measures Section of MSDS.
- Personal protective equipment required for rotenone. Information on the need to wear PPE, how to take care of PPE and what PPE can and cannot protect is found in Exposure Controls/ Personal Protection Section of MSDS.
- How to use rotenone safely how all application equipment works, application timing and calibration, and the proper use of personal protective equipment on the product label.
- Rights as an employee and where to find out more information on rotenone. The job safety information and MSDS informs the employee about the pesticide and its dangers. Each employee has the right to know when and where the pesticide was applied, the name of the pesticide, and the EPA registration number.

SPILL CONTINGENCY PLAN

Background

- **Spill Prevention:** Off-site spills may be associated with improper storage or accidents during handling and transport. Generally, all spills must be reported to the state spill response unit and other units as appropriate. Small spills may be contained and the collected material disposed of according to the product label. If these wastes cannot be disposed of by use according to label instructions contact your state pesticide or environmental control agency, or the hazardous waste representative at the nearest EPA Regional Office for guidance.
- **Spill Containment:** The storage of rotenone materials at the project location may be in a location that is graded to allow drainage to the project water body in case of an accidental spill. Containers of rotenone powder and liquid may be set on a plastic barrier, concrete ramp, or other impermeable surface sloped toward the project water body. A small spill of rotenone can then be rinsed into the treated water. The designated storage area on-site should be bermed and should be large enough to contain all the stored material. This will allow recovery of all the material. The berm may be constructed of straw/hay bales or other suitable material and should be lined with heavy duty plastic fabric. Portable bilge pumps, hoses, buckets, drums, absorbent clay and absorbent pads and other recovery equipment as well as personal protective equipment should be maintained in an adjacent area readily available in case of a spill. Each person who controls the use of any property or premises that holds, or has held rotenone, is responsible for all containers or equipment on the property. Unless all such containers are under personal control so as to avoid contact by unauthorized persons, make arrangements to (1) provide a person responsible to maintain such control over the containers at all times or (2) store all such containers in a locked enclosure, or in the case of liquid pesticides in a container larger than 55 gallons (208 L) in capacity, the container shall have a locked closure. Either shall be adequate to prevent unauthorized persons from gaining access to any of the material.
- **Spill management:** In the event of a spill, it is extremely important that the spilled material be contained. If a ground spill occurs, immediately control the spill at its source and contain or channelize the spilled material into a containment area with shovels and other hand tools. Once the material is contained or diked into pools, the applicator should attempt to recover the material by using absorbent materials such as clay, soil, sawdust or straw to absorb pooled liquids or collection by pump or sponge. Recovered material can be applied to the treatment area according to label instructions and other local, state and federal regulations.

Inventory of Materials Used During Treatment

- Rotenone: CFT Legumine™ Fish Toxicant
 - Staging Area: Main Camp at Stehr Lake (up to 30 gallons)
 - Treatment Areas: Upper Drip (up to 12 Gallons), Middle Drip (up to 6 gallons), Lower Drip (up to 6 gallons), Upper spray reach (up to 1 gallon), Middle spray reach (up to ½ gallon).
- Rotenone: Rotenone / Sand Gelatin
 - Staging Area: Main Camp at Stehr Lake (up to 6 gallons)
 - Treatment Areas: Upper spray/sand reach (up to 2 gallons), Middle Drip spray/sand reach (up to 2 gallons), Lower Drip spray/sand reach (up to 1 gallon)
- Potassium permanganate
 - Staging Area: Main Camp at Stehr Lake (up to 10,000 lbs)
 - Permanent Barrier: (up to 10,000 lbs)

Description of Storage Areas

- The storage of rotenone and rotenone-sand-gelatin mixture will be stored on site at the Stehr Lake Camping area. Storage will occur in accordance of the chemical label. Plastic spill containment devices will be placed in a shaded area and covered with a tarp. A certified applicator will be on site 24 hours a day during the duration of the treatment.
- Potassium permanganate will be stored on a tarp and covered with a tarp at both locations (main camp and barrier).

Description of Staging Areas, Mixing Areas, Treatment Areas, and Deactivation Areas

- *Staging Areas* – Two staging areas will be set up during the duration of the treatment.
 1. Rotenone and rotenone-sand-gelatin mixture will be stored at Sterh Lake camp.
 2. Potassium permanganate will be stored at both permanent barrier site and Stehr Lake.
- *Mixing Areas* – Mixing areas will include the Strehr Lake camp, permanent barrier, and miscellaneous locations within the treatment reach for spray crews.

- *Treatment Areas* – The treatment area will include Fossil Creek from the temporary barrier to the permanent barrier including all seeps, springs, and backwaters within that section of creek. The project area is wider in scope and includes Forest roads 502 and 708 along Fossil Creek (Figure 1).
- *Deactivation Areas* – Deactivations will take place at the permanent barrier. Two augers will be operated to dispense potassium permanganate. Another auger and generator will be held on site as backups.

Precautions Specific to Site, Locale, and Treatment

- Liquid formulations will be stored upright with lids securely attached prior to use.
- On site chemical will be kept in canisters with lids.
- Constant monitoring of flows will occur to insure no major increases in stream flows occur during active dripping.
- Access to drips and deactivation stations will be in remote locations and will be closed to the public.

Chain of Command

- In the event that a spill occurs the chain of command will be as follows:
 1. Crew Leader
 2. Treatment/Project Lead (Scott Rogers)
 3. Detoxification Applicator(s) (Mike Lopez, Julie Carter) – In the event that a large spill may affect the dosage of the treatment.
 4. PIO/Organization spokesperson (Tom Cadden (AGFD), Connie Birkland (USFS), Jeff Humphrey (USFWS)): If the spill is large in scale and potential for bad press is a possibility.
 5. EPA – If the spill is significant enough that specially trained professionals need to clean it up. *See Crisis Management Plan and PDMP.*

Contact Information for Downstream Water Users in the Event of a Major Spill

- Salt River Project (602)-236-8811

Contact Information of All Entities That Must be Contacted in the Event of a Reportable Spill

- See Crisis Management Plan
- Arizona Game and Fish Department (623)-236-7201 radio room
- Arizona Department of Agriculture (602) 542-4373
- Environmental Protection Agency (800)-424-8802
- U.S. Fish and Wildlife Service (623)-242-0210
- U.S. Forest Service (928)-203-7505

Specific Spill Containment and Recovery Procedures

- *Small Scale Spills* – In the event that small amount of diluted or concentrated rotenone is spilled along the treatment area dilute the spill with water from the creek and contact your crew supervisor.
- *Medium Scale Spills* – In the event that a spill occurs into the stream of the treatment area that could affect the dosage of the treatment, contact the crew leader, treatment/project Lead and Detoxification Applicator(s). If a medium scale spill occurs on land contact the crew leader, treatment/project lead and detoxification applicator(s) and follow the clean-up procedures described in the MSDS Section 6.
- *Large Scale Spill* – In the event that a large amount of chemical is spilled that is not easily adjusted for by the treatment/project lead or detoxification applicators or easily cleaned up per the clean-up procedures described in the MSDS Section 6 and will almost certainly become public knowledge, potentially effect human health, or property the entire chain of command will be contacted. Best efforts will be made to safely contain the spill until experts specially trained in dealing with large scale spills arrive. In the event of a large scale spill communications between treatment lead and detoxification lead will occur to adjust for increase in treatment rate.

Mode of communication

- The main mode of communication will be the Forest Service hand held radios utilized by all members the treatment crews.

Area Map

The map below shows potential emergency locations, campsites, drip station sites, and chemical storage and mixing areas.

- Emergency areas are shown by a yellow or red cross. Yellow crosses are the Major Medical areas including eyewash stations, first aid kits, and helicopter and/or road access and walk out access.
 1. *Eye wash sites* – are those areas with clean water strictly for flushing of eye in the case of chemical to eye contact.
 2. *Emergency walk-out locations* – are those areas where walking out of the creek to a road way is feasible in case of an emergency
 3. *Heli-evac sites* – are those areas where a helicopter could feasibly long line out a person suffering from a serious injury
- All camps or areas identified by a tent will have drinking water available to prevent workers from overheating. Some camps will also be drip stations, chemical storage and mixing locations.

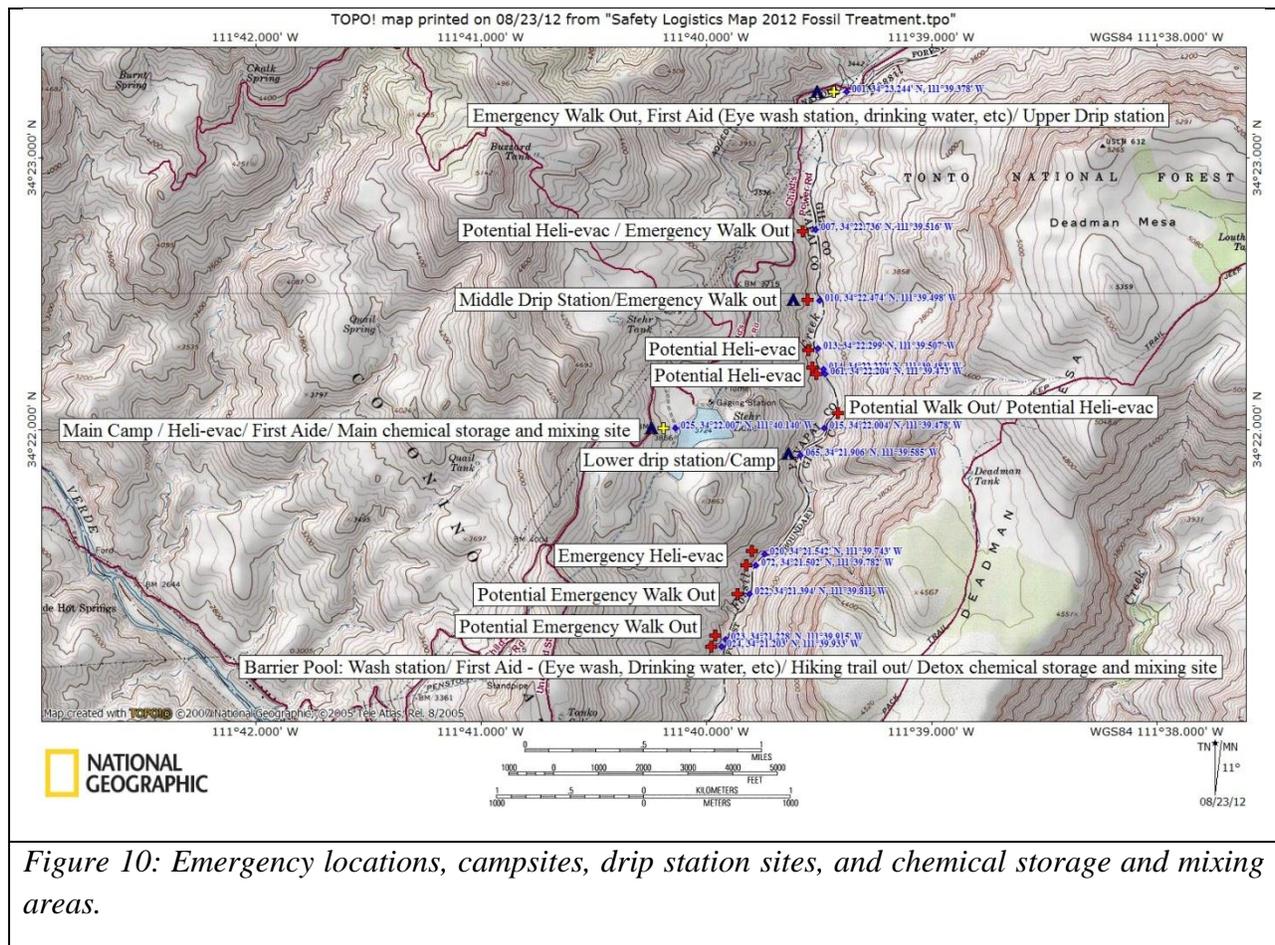
Transportation of Rotenone and Potassium Permanganate

Rotenone (CFT Legumine and Prenfish Fish Toxicant Powder) and KMnO_4 will be transported from AGFD offices in Flagstaff and Phoenix to Fossil Creek in truck beds. Rotenone containers will be placed in a spill container, covered with a tarp, and secured in the bed of a truck. Potassium permanganate containers will be secured in the bed of a flatbed truck and covered with a tarp. Hazardous materials (HAZMAT) vehicle placards (POISON for Rotenone and OXIDIZER for KMnO_4) will be attached to each end and side of the tarp, and shipping papers, spill kits, emergency response phone numbers, and product MSDS will be present in the trucks that transport the chemicals.

After arrival at Fossil Creek, rotenone and KMnO_4 will be stored as described above (Description of Storage Areas). Some of the rotenone and all of the KMnO_4 will be transported by helicopter (sling-loads) from the Stehr Lake Camp to the permanent barrier. The Helicopter Aviation and Evacuation Safety Plan is given in Appendix 10.

11. COMMUNICATIONS AND SITE SECURITY PLAN

The purpose of the communications and site security plan are to mitigate for human recreational exposure to rotenone and to provide an operating protocol for public notification of treatment area restrictions prior to, during, and following application of rotenone. Information relative to water quality monitoring and notifications is also included. Fossil Creek is not used for drinking water and has no hydrologic connections to wells. However because of the high recreational use at Fossil Creek, which includes swimming and camping, water from the treatment area will be tested according to the methods outlined in Finlayson et al. (2010). Water from within the treatment area and downstream will be sampled and submitted to a lab for analysis. Water samples will be collected 4 hours after the initiation of the treatment and after the detoxification has ceased. Public reentry into treated area will not occur until after sentinel fish survive for a minimum of 24 hours.



PRESS RELEASE

Pre-closure Press Release

A press release announcing a public meeting to discuss the planned renovation of Fossil Creek was published on the AGFD's web site on August 23, 2012, and subsequently picked up by two local newspapers (Verde Independent and Payson Roundup). The Forest Service issued the following press release on August 31, 2012 informing the public of the plans to close the Forest in the area of the treatment:

NEWS RELEASE

U.S. Dept. of Agriculture

U.S. Forest Service

Coconino National Forest

www.fs.fed.us/r3/coconino

www.twitter.com/CoconinoNF

www.flickr.com/photos/coconinonationalforest

For Immediate Release

August 31, 2012

Public Affairs Contacts:

Brady Smith, Coconino National Forest, 928-527-3490

Connie Birkland, Red Rock Ranger District, 928-203-7505

Brienne Magee, Flagstaff Ranger District, 928-527-8290

Fossil Creek temporary closure to remove nonnative fish

Verde Valley, AZ – The Arizona Game and Fish Department, the U.S. Forest Service, and the U.S. Fish and Wildlife Service will cooperatively remove nonnative smallmouth bass from a portion of Fossil Creek. In order to carry out the operation, a temporary three week closure is expected to be in place beginning September 10 and will last through September 28, or until removal of the bass is complete.

The smallmouth bass will be removed using rotenone, a naturally occurring chemical that has been used for decades as a piscicide. The purpose of the closure is for public safety, and to allow for agency personnel to complete their job and monitor conditions.

During 2004, a large multi-agency effort involving many stakeholders successfully removed all nonnative fish from this unique travertine stream. Prior to the original renovation, nonnative predatory and competitive fishes such as smallmouth bass were one of the primary causes for the decline of native fish and other aquatic species in Fossil Creek. Nonnative bass reinvaded a portion of the stream in 2011 when an unusually large storm deposited rocks and boulders below the fish barrier, giving the bass an avenue to get up and over the barrier. The rock debris was removed this summer, restoring the function of the fish barrier.

Fossil Creek is part of the Verde River drainage and lies on the border between the Tonto and Coconino National Forests. The proposed treatment area lies within a portion of the Mazatzal Wilderness. Fossil Creek is a national treasure for its many unique qualities, including its native fish and other natural resources.

If you need information on the status of this closure, please call the **Fossil Creek hotline** at **928-226-4611**, Red Rock Ranger District at 928-203-2900, or, or go to www.coconinoforest.us

Notification Requirements Per Title 17-481

Per Title 17-481, AGFD must provide at least 10 days advance written notice to all owners, leasees, and permittees of real property, including federal and state public lands that are contiguous with the treatment area. In addition, two general notices in a daily or weekly newspaper of general circulation near the treatment area must be published.²

Notification of Forest Closure

The Forest Service issued the formal closure order on September 7, 2012. The following closure order was also posted on the Coconino National Forest web site (<http://www.fs.usda.gov/alerts/coconino/alerts-notices>):

Order Number: 04-12-07-W
ORDER USDA – FOREST SERVICE COCONINO NATIONAL FOREST FOSSIL CREEK ROTENONE TREATMENT

² Amended on 8/28/2013 to incorporate Title 17-481.

Pursuant to 16 U.S.C. 551, and 36 CFR § 261.50(a) and (b), the following acts are prohibited on National Forest System lands within the Coconino National Forest, in Yavapai, Coconino and Gila County in the state of Arizona. The restricted area is depicted on the attached map, hereby incorporated into this Order as Exhibit A.

PROHIBITION:

1. Going into or being upon the restricted area; 36 CFR § 261.53(e)
2. Being on the roads; 36 CFR § 261.54(e)
3. Being on a trail; 36 CFR § 261.55(a)

EXEMPTIONS:

1. Persons with a Forest Service permit specifically authorizing the prohibited act or omission.
2. Any Federal, State or Local Officer or member of an organized firefighting force in the performance of an official duty.

AREA DESCRIPTION:

Starting at the junction of the Verde River and the northwest boundary of Township 11 North, Range 6 East, Section 11 (Gila and Salt River Meridian) near Childs, AZ, following the east bank of the Verde River south to the southern tip of the Forest boundary in the northeast corner of Township 11 North, Range 6 East, Section 25, then following the Coconino Forest boundary (middle of Fossil Creek) northeast to the intersection with the eastern boundary of Township 12 North, Range 7 East, Section 15. Thereafter the closure boundary follows this section boundary north until it meets the Fossil Springs Wilderness boundary. Then following the Fossil Springs Wilderness Boundary southwest to Township 12 North, Range 7 East, Section 16 southern edge, departing from Wilderness boundary to the west until it meets Forest Road (FR) 9D (powerline road) at the southeast corner of T12N, R6 ½ E, S17; following FR 9D southwest to its junction with FR 708 in Township 12 North, Range 6 1/2 East, Section 30. The closure boundary then follows FR 708 west to the junction with FR 502, where it then follows and includes FR 502 southwest to the junction of the Verde River at the northwest boundary of Township 11 North, Range 6 East, Section 11.

PURPOSE:

This Order is necessary to protect public health and safety while a portion of Fossil Creek is treated with rotenone to remove nonnative fish.

IMPLEMENTATION:

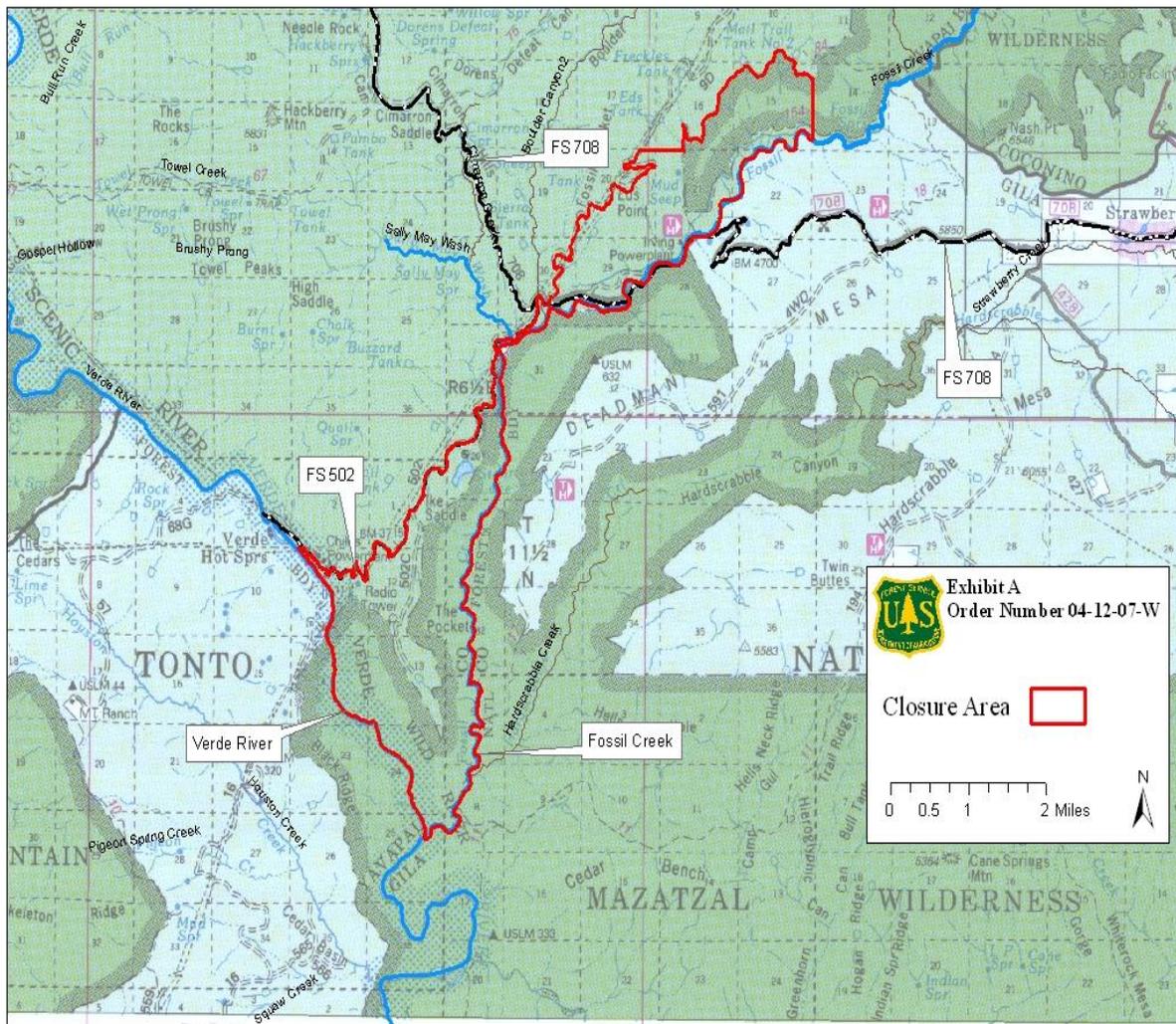
1. This Order will be in effect Tuesday, September 11, 2012 at 8:00 A.M. The closure will remain in effect until rescinded or September 28, 2012.
2. This Order prohibits the acts in that area addressed in Exhibit A.

3. This Order closes Forest Road 502 as well as the camping area near Childs, AZ. Done at Flagstaff, Arizona, this 7th day of September, 2012.

M. Earl Stewart

M. EARL STEWART
Forest Supervisor
Coconino National Forest

Violations of these regulations is punishable as a Class B misdemeanor, by a fine of not more than \$5000.00 for an individual or &10,000.00 for an organization, or imprisonment for not more than six (6) months or both; 16 USC § 551, and 18 USC §§ 3559 and 3571.



POSTING OF CLOSURE INFORMATION

Locations

Appropriate signage describing the area closures and chemical treatments will be placed along the treatment area and at all public access points.

1. *Trailheads*: A) Fossil Springs Trailhead off the FS 708 (Fossil Creek) Road near Strawberry, AZ; B) Trail access to permanent barrier at Stehr Lake; C) All trailheads with access to Fossil Creek from upstream of the treatment area downstream to the confluence of Fossil Creek with the Verde River, with access on both sides of the creek³.
2. *Roads*: A) FS 708 (Fossil Creek) Road closure gate near the Fossil Springs Trailhead; B) FS 708 Road closure gate on the Camp Verde side (location/GPS), C) junction of FS 708 and FS 90D roads, D) junction of Verde River and FS 502 Road, and E) spur road off of FS 708 that provides access to temporary barrier at Sally May Wash
3. *Confluence with other navigable waters*: Confluence of Fossil Creek and the Verde River.
4. *Campgrounds*: Grapevine and Mazatzal campgrounds.

Signs and Placards

The following information will be placed on the placards (signs)

DANGER/PELIGRO

DO NOT ENTER WATER/NO ENTRE AGUA: Pesticide Application

Rotenone CFT Legumine™ 5% is being used to remove nonnative fish from Fossil Creek.

The start date – September 10, 2012

The end date – September 28, 2012

Recreational access (e.g., wading, swimming, boating, fishing, etc.) within the treatment area is prohibited while rotenone is being applied.

Do not swim or wade in treated water while placard is displayed.

Do not consume dead fish from treated water.

For more information contact: Fossil Creek hotline at 928-226-4611, Red Rock Ranger District at 928-203-2900, Arizona Game and Fish Department 928-774-5045, or go to www.coconinoforest.us

³ Amended on 8/28/2013 to prevent public access to the treatment area, including the area downstream that might contain potassium permanganate during the rotenone treatment.

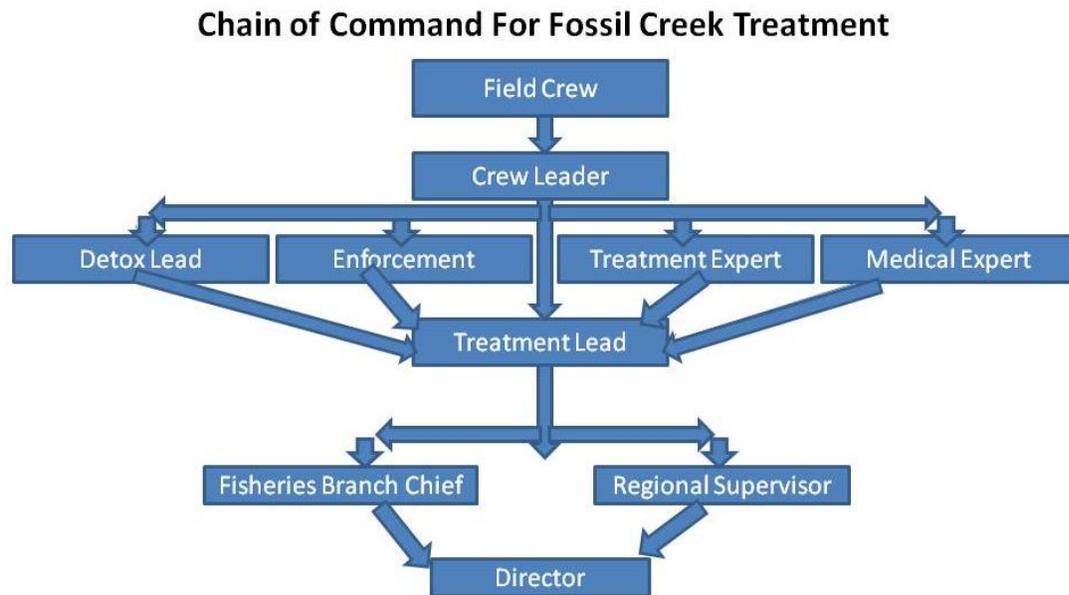
ON-SITE COMMUNICATIONS.

Mode of On-site Communications

Radios will be the primary mode of on-site communications:

1. USFS hand held radios (preferred).
2. AGFD issued hand held radios.
3. Two way personal radios

General Communications Chain of Command



The field crew, crew leaders, and treatment lead will communicate as needed to safely and effectively carry out the Fossil Creek treatment.

Treatment Lead – Scott Rogers (AGFD)

Detoxification Crew Leads – Mike Lopez (AGFD), Julie Carter (AGFD)

Drip Stations Crew Lead – Shaula Hedwall (FWS)

Spray Crew Leads – Matt Rinker (AGFD), Clayton Crowder (AGFD)

For emergency communications (e.g., injury, chemical spill, flash flood, etc) see Crisis Management Plan.

SITE SECURITY

- Site Security will be provided by law enforcement officers from the AGFD. Two officers will be on duty for 24 hours on Tuesday and Wednesday of each treatment week starting at 6:00 am on Tuesday. Two officers will be on duty until 6:00 pm on Thursday of each treatment week.
- Volunteers may be posted at some entrances to the treatment area.
- Law enforcement officers will communicate with each other using the AGFD and Forest Service Radio systems.
- Law enforcement officers will be the main point of contact to inform the public of treatment specifics and area closures.
- FAQ's (Frequently Asked Questions; Appendix 11) Sheets will be provided for LE staff patrolling each closure point to provide information to the public about the treatment and rotenone in general.

12. FISH REMOVAL AND DISPOSAL PLAN

FISH REMOVAL

A portion of the dead fish will be removed from the stream for disposal; removing all dead fish will not be possible given the complexity and length of the treatment reach.

- **Timing:** In general fish removal will occur within 48 hours after the end of each individual treatment.
- **Rationale:** Dead fish will be removed within 48 hours after each treatment to reduce public concerns and perceptions associated with viewing dead fish.
- **Gear:** Dip nets, gloves, block nets, seines, and five gallon buckets will be used to remove dead fish.

FISH DISPOSAL

- **Methods:** Dead fish may be disposed of by:
 1. **Burying:** Fish will be buried onsite within the disturbed flood plain of the creek by burying and completely covering the dead fish with soil and rocks.
 2. **Collection:** Any carcasses needed for other purposes (research needs, etc.), will be removed from the system in sealed containers.

13. CRISIS MANAGEMENT PLAN

BACKGROUND

In anticipation of a treatment not going according to the plan, it is prudent to be prepared to adjust the actions accordingly. For this reason, a crisis management plan should be developed before the treatment. This crisis management plan prepares the agency for any negative development that may jeopardize the rotenone application or its favorable outcome. Before treatment, a crisis team should be identified that will act as an early alert group to develop the situation responses to problematic activities and then use the appropriate crisis team participants and support groups.

Crisis – Crises are those situations that cannot be simply solved by members of the treatment team to allow the treatment to successfully and/or safely occur. If the success of the treatment is jeopardized for whatever reason or public and/or crew safety is at stake, then that situation is deemed a crisis.

CRISIS TEAM

The crisis team should include (1) early alert members (i.e., persons who can handle the crisis and devote exclusive time to the crisis), (2) primary response members (i.e., technical experts in various disciplines), and (3) secondary response members (i.e., high-level persons in the agency, elected officials, and law enforcement).

Crisis teams will include the following members:

- Early alert members (i.e., persons who can handle the crisis and devote exclusive time to the crisis)
 1. Crew Leaders –
 - a. Scott Rogers (Treatment Lead), cell# 928-607-0955
 - b. Mike Lopez (Detoxification Lead, AGFD), cell#
 - c. Julie Carter (Detoxification Lead, AGFD), cell#
 - d. Shaula Hedwall (Crew Leader, USFWS), cell# 928-525-1720
 - e. Matt Rinker (Crew Leader, AGFD), cell#
 - f. Clayton Crowder (Crew Leader, AGFD) 602-717-9890
 2. Crew members
- Primary response members (i.e., technical experts in various disciplines)
 1. Treatment Lead - Scott Rogers (AGFD) 928-607-0955
 2. Detoxification Lead/Treatment Expert - Mike Lopez (AGFD), 928-367-4281
 3. Detoxification Lead/Treatment Expert - Julie Carter (AGFD), 623-236-7576
 4. Treatment Expert - Shaula Hedwall (USFWS), 928-525-1720
 5. Enforcement Expert – Larry Phoenix (AGFD) 928-606-3210

- Secondary response members (i.e., high-level persons in the treatment agency, elected officials, and law enforcement).
 1. AGFD Fisheries Branch Chief (acting) – Marianne Cox, 623-236-7672 office
 2. AGFD Nongame Branch Chief -- Eric Gardner, 623-236-7507 office, 602-350-4004 cell
 3. AGFD Region II Supervisor – Craig McMullen, 928-214-1240 office
 4. AGFD Public Information Officer -- Rory Aikens 602-531-2382 cell
 5. USFWS Public Information Officer USFWS – Jeff Humphreys, 623-242-0210 office, 602-680-0853 cell
 6. USFS Public Information Officer – Connie Birkland, 928-203-7505
 7. AGFD Enforcement Supervisor – Larry Phoenix, 928-606-3210

SITUATION RESPONSE

Each crisis may have its own challenges and will require its own unique set of solutions, but in general any situation response will include the following steps: (1) define the problem and cope; (2) identify targets and issues; (3) select appropriate crisis team; (4) gather facts; and (5) identify a spokesperson.

SUPPORT GROUPS

Support groups are used to provide aid to the crisis response team in the form of verbal or written support of the project and its outcome. Support groups—Support groups normally consist of members of (1) research groups, (2) sports clubs, associations, and organizations, and (3) regulatory governmental agencies. Gain support before the incident becomes a major crisis.

- (1) **NGO's:** Northern Arizona Fly Casters, Federation of Fly-Fishers, Center for Biological Diversity, Fossil Creek Stakeholders group.
- (2) **Regulatory Agencies:** U.S. Fish and Wildlife Service, U.S. Forest Service, Bureau of Reclamation.

STEP-BY-STEP MANAGEMENT OF CRISES

Define the real problem—Gauge public actions and opinions, perhaps by using a newspaper clipping service. Focus on long-term consequences; do not focus on the details. Delegate details to support groups.

Identify a crisis team—Choose the team carefully for the situation from your preselected lists (early alert, primary response, and secondary response members). These individuals should devote themselves entirely to the crisis. Do not delay; act immediately!

Resist combative instincts—No matter what circumstances produced the crisis, keep control, or control of the situation will be lost.

Centralize control of information—Centralize control of information that is released to the public and keep the message consistent and clear.

Communicate and negotiate at the highest level—Follow the chain of command and brief all involved. Keep administration informed.

Contain problem quickly—Contain the problem quickly and stop the erosion of public confidence.

EXAMPLE SITUATIONS AND APPROPRIATE CRISIS TEAM

The following are some possible crisis situations that might occur and the appropriate crisis team used.

Injury – (*See Site Safety Plan*) In the event of human Injury the following team members will be contacted:

- Crew Leader
- Treatment Lead
- Medical Expert
- All Secondary members

Enforcement Issue (*See Site Safety Plan*)—In the event of law enforcement issues the following team members will be contacted:

- Treatment Lead
- Enforcement Specialist
- Enforcement Supervisor

Chemical Spill (*See Site Safety Plan—Spill Contingency Plan*) – There are three basic levels of chemical spills

Contact personnel are dependent upon the scale of the spill:

- Small Scale Spill –
 1. Crew Leader
 2. Treatment Lead
- Medium Scale Spill –
 1. Crew Leader
 2. Treatment Lead
 3. Detoxification Leads and Treatment Specialists

- Large Scale Spill –
 1. All members of all teams.

Environmental – Environmental crises are those uncontrollable natural events that may occur during the course of the treatment and may threaten the success of the treatment or human safety (e.g. lightning, flash floods, fire, problem wildlife)

- All members of all teams.

14. POST-TREATMENT MONITORING AND EVALUATION

POST TREATMENT (SHORT-TERM) ASSESSMENT

Following the completion of each treatment the following assessment steps will be conducted to determine the short-term success of the treatment.

- **Effectiveness of chemical application (i.e., distribution and deactivation of rotenone):** Short term assessment of the effectiveness of the chemical application will primarily involve the use of sentinel fish and the methods used in the section *“Assess the effectiveness of treatment and deactivation”* listed below
- **Public reentry to project area:** Reentry by the public will be allowed after sentinel fish survive for 24 hours.
- **Recovery of baseline environmental conditions:** Recording of pretreatment baseline conditions of within the treatment reach was not planned because the treatment reach is relatively small (~2.6 miles) and is immediately downstream of areas that are densely populated with native fish species that are also present in the treatment reach. Recolonization of the treatment area by native fish species will be rapid, will be monitored and may be supplemented with stocking of hatchery fish.

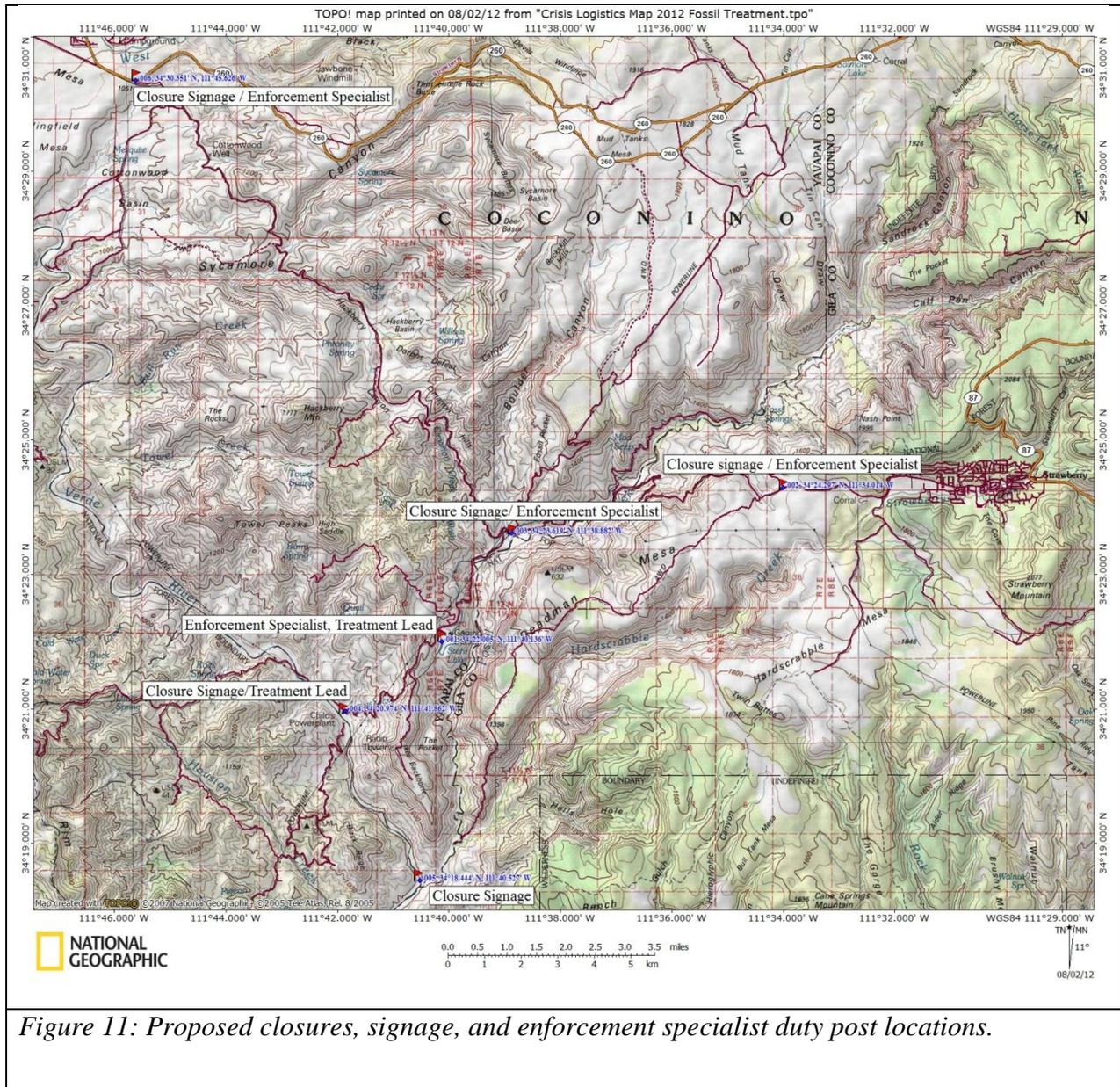


Figure 11: Proposed closures, signage, and enforcement specialist duty post locations.

All personnel will be debriefed as soon as the treatment phase of the projects has been completed to identify problems, determine causes, and propose corrective measures for future treatments. Treatment crew will report to the treatment leads and this information will be reported to the treatment lead. This effort involves the assessment of chemical and biological monitoring data and review of notes and observations recorded during and immediately following the treatment.

ASSESS THE EFFECTIVENESS OF TREATMENT AND DEACTIVATION

The assessment of the effectiveness of the treatment and deactivation operations will enable project leaders to adjust plans based on the actual results. The effectiveness of these operations and related changes in operations will be monitored throughout the project.

The following metrics will be utilized to measure the effectiveness of the treatment:

- **Mortality and behavior of fish:** Fish behavior and mortalities will be recorded by crew during and after each 8 hour treatment. Sentinel fish will be utilized along the length of the treatment reach and below the detoxification station to monitor the efficacy of the treatment and detoxification. Fish will be placed in sealed hoop nets (cages) in the main channel of the stream in slower moving water. Five sentinel fish will be held in each cage during the treatment. Fresh sentinel fish will be caught prior to each treatment and held in portable tanks at each location. Spare hoop nets will be kept on site for use as additional cages. Chub will be used for sentinel fish upstream of the permanent barrier and smallmouth bass will be used downstream.
 - Chub will be held in cages just upstream of the middle and lower drip stations and just upstream of the permanent barrier to ensure that adequate concentrations of rotenone are carried through the treatment reach to effectively kill all fish species present. Smallmouth bass will be held just downstream of the barrier out of the main flow of detoxicant (KMnO₄) to determine if bass are being effectively killed by rotenone. Bass will also be held downstream of the barrier at the 30 minutes water travel time location to ensure that the detoxification station is functioning as intended
 - Fish behavior will be monitored during and after the treatment within and up to 1 hour drift time downstream of the barrier. The behavior of free swimming fish will also be observed.
 - The drip station crew leads and detoxification station crew leads will observe and record the behavior of the sentinel fish and the overall progress of the treatment. This information will be communicated to the lead applicator.
 - General fish behavior will include:
 - Tipping – when fish begin to lose their equilibrium,
 - Gilling - when fish have lost equilibrium and respiration becomes difficult,
 - Death.
 - The times of the observed behaviors and the number of individuals observed displaying them will be recorded. Spray, drip, and detoxification crew leads will record the GPS locations and above mentioned behaviors of non-sentinel fish

along the treatment reach. All information will be communicated to the lead applicator hourly and application rates will be adjusted accordingly.

- **Monitoring KMnO₄:** Residual KMnO₄ will be monitored 30 minutes downstream of the detoxification station. Detoxification application rates may be adjusted to maintain a minimum of 1ppm residual after 30 minutes contact time. Residual KMnO₄ will be measured every half hour for four hours starting 3 hours after the primary drip is turned on. And will be measured once every two hours after the primary drip has been shut off.
- **Sampling for the presence of live fish immediately after each treatment:** The entire treatment reach will be surveyed for the presence of live fish with 24 hours after the end of each treatment. Hoop nets and seines may be utilized in this effort if deemed necessary. However, above water visual surveys will be the primary tool utilized for this sampling effort (see pretreatment survey design above). Deep pools, complex habitat, springs and shallow braided areas will be the primary focus of these surveys. Locations of any live fish observed after the each treatment will be recorded and these “problem” locations will be identified for following treatment/s.

WRITTEN CRITIQUE OF TREATMENT

The AGFD will prepare a written summation and critique of the treatment as soon as possible after the treatment has been completed. A meeting of all those involved in the treatment will be held at the end of each application to get consensus on what worked and what should have been done differently. Topics for the meeting include: if the plan was followed, what problems or issues were associated with the plan, and what improvements were needed. A draft of the written summation and critique will be sent to all personnel involved for review and consensus before completion of the final critique. When appropriate, the critique may be used to update policies and procedures.

POST TREATMENT (LONG-TERM) FISH MONITORING

Recent discovery and monitoring of nonnative bass in the native fish reach of Fossil Creek has brought several points to our attention. (1) Early detection is critically important to any potential success of mechanical removal and in avoiding controversial and expensive chemical treatments. (2) Areas immediately above the fish barrier and close to roads should be priority survey areas for future sampling efforts regarding nonnative species. (3) The AGFD does not have the human resources necessary to monitor Fossil Creek often enough to ensure early detecting of all nonnative species. Enlisting the help of the public and our cooperators is critical to early detection.

We propose the following steps to address these concerns:

- Increase the scope of Fossil Creek fish sampling by the AGFD. Recent sampling efforts by AGFD Department (Region II during 2009-2012) focused on native fish species

within the sport fishing reach just upstream of the propose treatment reach. The AGFD sampling to this end included stratified (by for equal reaches) random baited hoop net sets (N=60) over the 4.5 mile sport fish reach twice yearly. We intend to expand our hoop net efforts to include the proposed treatment reach in the spring and fall during our regular sampling. We also intend to add 1 week to each to our spring and fall sampling to include snorkeling and visual surveys to enhance our ability to detect any nonnative fish species (see pre-treatment monitoring).

- Although we may stratify and randomize our overall sampling over our newly proposed 7.25 mile sample reach, we will focus attention on potential nonnative fish invasion points such as areas near roads or just upstream of the barrier each time we sample.
- We intend to continue to enlist the help of our cooperators in efforts directed toward early detection of nonnative fish species within the native fish reach of Fossil Creek. The AGFD could compile data from all sampling activities and provide a yearly report to be shared with our cooperators. The AGFD will help our cooperators to communicate to their field staff the importance of nonnative fish detection. The AGFD will also produce information to help cooperator staff identify unwanted fish species and provide them directions on reporting detection of these fish species.
- The AGFD will work with our cooperators in developing public outreach materials including signs to identify nonnative fish species. This information will include the appropriate contacts to report potential unwanted fish species.

Long-term Treatment Assessment Report

A long-term assessment report of the treatment will be provided 3 years post-treatment. The long-term assessment will include:

- Determination of the treatment effectiveness and benefits – Continued fish monitoring of the treatment area and upstream are planned to determine the effectiveness of the treatment and continue to monitor for nonnative species.
- Assessment of the public perception of the success of the project – continue to work with stake holders.
- An overall assessment of the project

15. APPLICABLE LAWS AND REGULATIONS

- Arizona Revised Statutes, Title 17-Game and Fish. 17-201: The laws of the state relating to wildlife shall be administered by the game and fish department;
- National Environmental Policy Act (NEPA) of 1969; CEQ Guidelines, 40 CFR (1502.16 part e); see Appendix 2 for the final Environmental Assessment, Appendix 12 for the Section 18

Analysis, Appendix 13 for the Biological Opinion, and Appendix 14 for the Pesticide Use Plan.

- Section 7, Endangered Species Act (ESA) of 1973, as amended;
- Executive Order 11987, Exotic Organisms; Executive Order 13112, Invasive Species; and 50 CFR 92;
- Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) of 1970 (CFR Title 40);
- Clean Water Act (CWA) amendments of 1977, (P.L. 95-217);
- ADEQ standards (Arizona Administrative Code Title 18, Ch 11(401));
- Arizona Pesticide Contamination Prevention Program (ARS 49-301 through 310 and ACC R18-6-101 through 303);
- Aquifer Protection Permit Program (ARS 49-241 through 252 and ACC R18-9-101 through 303);
- AZPDES (ARS 49-255 through 265 and ACC R18-9-A901 through D905); Notice of Intent (NOI; see Appendix 15) and Pesticide Discharge Management Plan (PDMP; see Appendix 16)
- Title 17 Game and Fish, Chapter 3 Taking and Handling Wildlife (ARS 17-301);
- Occupational Safety and Health Act (OSHA) (CFR 1155 Title 29)
- Wild and Scenic Rivers Act (P.L. 90-542); Wilderness Act (P.L. 88-577); National Trails Act (P.L. 90543)
- AGFD's Pesticide Treatment Planning and Procedures Manual (PTPPM) and Environmental Assessment Checklist (EAC)
- Arizona Game and Fish Commission 2011 policy on rotenone use
- ARS Title 17, Article 5, 17-481 Application of aquatic poisons; analysis; notice; exceptions

16. AGFD ENVIRONMENTAL ASSESSMENT CHECKLIST

See Appendix 1.

17. MEDIA RELEASE OF APPROVED ACTION

A media release of the proposed action along with description of the closure area will be released the week prior to the proposed treatment.

18. QUALIFIED REVIEWERS OF INTERMEDIATE PLAN

The following AGFD personnel reviewed the intermediate plan:

Julie Carter, Dave Weedman, Tony Robinson, and Jeff Sorensen

Arizona Game and Fish Department

5000 W. Carefree Highway

Phoenix, AZ 85086

Mike Lopez

Arizona Game and Fish Department

2878 E. White Mountain Blvd.

Pinetop, AZ 85935

19. ARIZONA GAME AND FISH COMMISSION PETITION PROCESS

Rules for petition for rule or review of a practice or policy are explained in Arizona Game and Fish Laws and Rules, under Title 12, Article 6 (Rules of Practice before the Commission), section R12-4-601 (Petition for Rule or Review of Practice or Policy). If an appeal is petitioned, ensure Commission endorsement before proceeding with the project. If the Commission does not endorse the project, cease action on proposed treatment and reconsider other fish removal options to achieve the desired fishery management objective.

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21. SIGNATURE PAGE

Fossil Creek Piscicide Project Intermediate Planning and Public Involvement Proposal

Approved [] by Larry Riley _____ Date: _____

WMD Assistant Director

Approved [] by Leonard Ordway _____ Date: _____

FOD Assistant Director

22. APPENDIXES

APPENDIX LIST

- Appendix 1. Arizona Game and Fish Department Environmental Assessment Checklist for Fossil Creek Treatment
- Appendix 2. Final Environmental Assessment, Native Fish Restoration in Fossil Creek, Coconino and Tonto National Forest, AZ. May 2004
- Appendix 3. Piscicide Internal Review and Approval Form
- Appendix 4. Piscicide Project Preliminary Treatment Plan
- Appendix 5. Piscicide Project Public Involvement Plan
- Appendix 6. Piscicide Project Public Meetings Briefings
- Appendix 7. Piscicide Labels and Material Safety Data Sheets
- Appendix 8. AGFD Piscicide Treatment Planning and Procedures Manual
- Appendix 9. OSHA Respirator Medical Evaluation Questionnaire
- Appendix 10. Fossil Creek Piscicide Treatment Supply Transport Aviation and Evacuation Procedure Safety Plan
- Appendix 11. Frequently Asked Questions Sheet
- Appendix 12. Section 18 Analysis
- Appendix 13. Biological Opinion
- Appendix 14. Pesticide Use Plan
- Appendix 15. Arizona Pollutant Discharge Elimination System Notice of Intent (NOI)
- Appendix 16. Pesticide Discharge Management Plan (PDMP)
- Appendix 17. Aviation Procedure Safety Plan⁴
- Appendix 18. Arizona Revised Statutes, Title 17, Chapter 4, Article 5, 17-481. Application of aquatic poisons; analysis; notice; exceptions
- Appendix 19. Soldier Mesa Tank Treatment Plan

⁴ Appendixes 17-19 added during amendment on 8/28/2013 to incorporate Title 17-481 and attach the treatment plan for Soldier Mesa Tank.