Preliminary Fossil Creek Renovation Plan

(August 28, 2012)

1. PROJECT SUPERVISORS

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2. TREATMENT LOCATION AND PROJECT AREA

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 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.

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 for illegally introduced fish species and their maintenance must be part of any native fish management plan for the drainage. Periodic treatment of these tanks may be necessary to prevent unwanted non-native species from inhabiting Fossil Creek.

The project area includes the treatment area and portion of the two Forest roads (502 and 708) that roughly parallel the creek. The project area also includes the Forest spur roads in the immediate vicinity of each of the six above mentioned tanks.

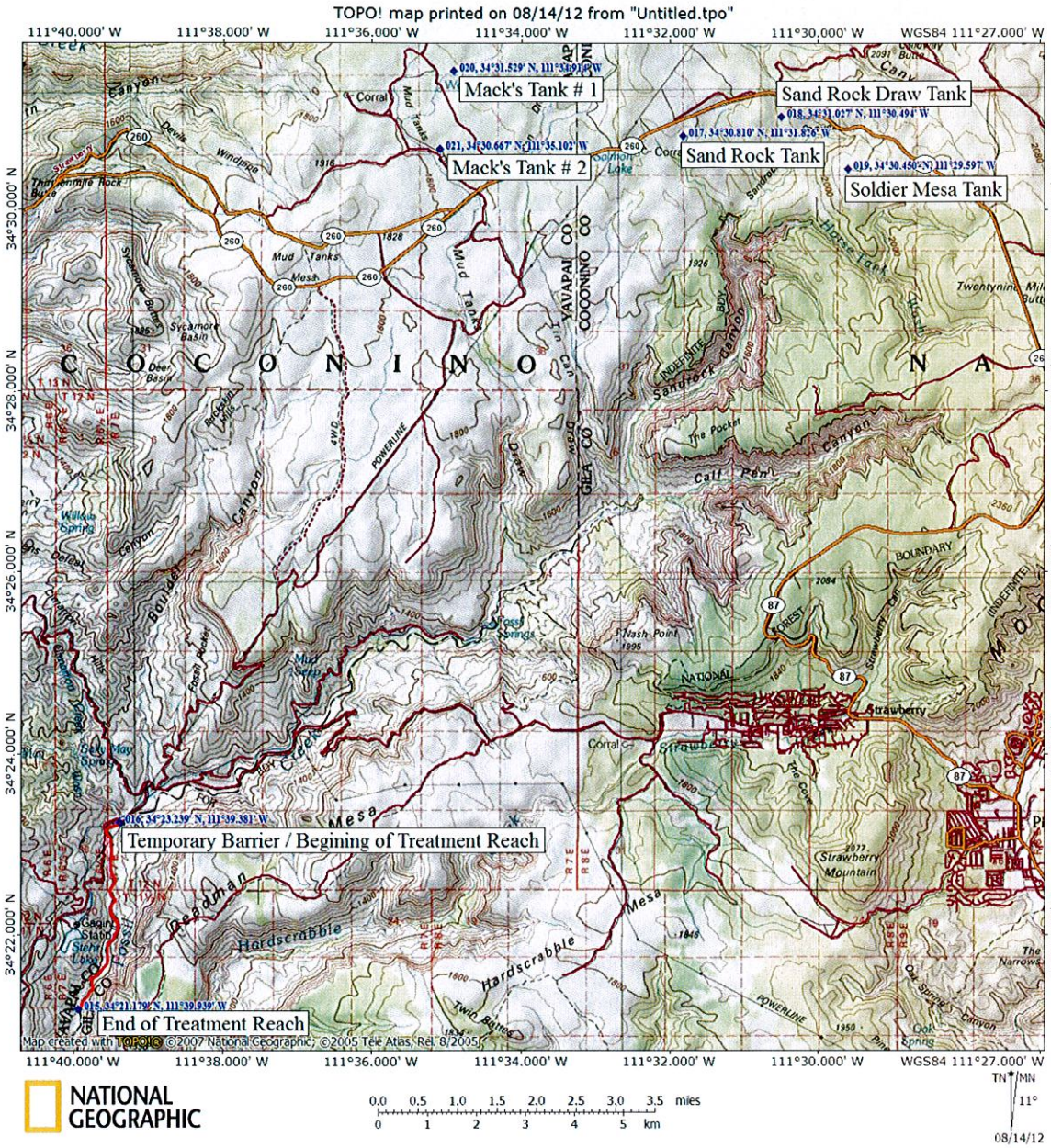

Figure 1: Treatment area (designated by red line) including known stock tanks within Fossil Creek Drainage previously treated for non-native fish and identified as potential illegal stocking locations.

3. 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.

4. 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. 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 and U.S. Fish and Wildlife Service 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 non-native 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 non-native fish to move upstream.

5. 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 ($KMnO_4$) will be used to chemically induce deactivation of rotenone at the downstream end of the treatment area. The target concentration of $KMnO_4$ will be 6 ppm (4 ppm for rotenone, 1 ppm for organic demand, 1ppm residual, AFS SOP: 7). Application rates of $KMnO_4$ will be determined by the formula $SF = Y(1.7\ Q)$ (AFS SOP: 7) where SF= flow of solid $KMnO_4$ (g/min), Y= desired $KMnO_4$ concentration in stream (ppm) and Q = stream discharge (cfs). Concentrations of $KMnO_4$ will be monitored 30 minutes drift (contact) time downstream of the detoxification station and concentration of $KMnO_4$ will be adjusted to maintain a minimum of 1 ppm residual.

6: 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 Department 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 Site Safety Plan) to ensure public safety and a successful treatment.

7. INTERAGENCY RESPONSIBILITIES

In general, 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 U.S. Bureau of Reclamation (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.

- Administrative roles in planning, public outreach, and compliance documentation
    - AZGFD ,USFWS and USFS

- Pre-treatment survey, barrier repair and fish salvage
    - AZGFD, USFWS, USFS and BOR

- Rotenone applications and detoxification
    - AZGFD and USFWS

- Post-treatment monitoring and reporting
    - AZGFD

8. 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);
- 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);
- 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);
- AZGFD's Pesticide Treatment Planning and Procedures Manual (PTPPM); Environmental Assessment Checklist (EAC); and,
- Arizona Game and Fish Commission 2011 policy on rotenone use.

9. 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 be allowed 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.

10. 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 pretreatment fish surveys 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 these surveys 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. 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 USNFS).

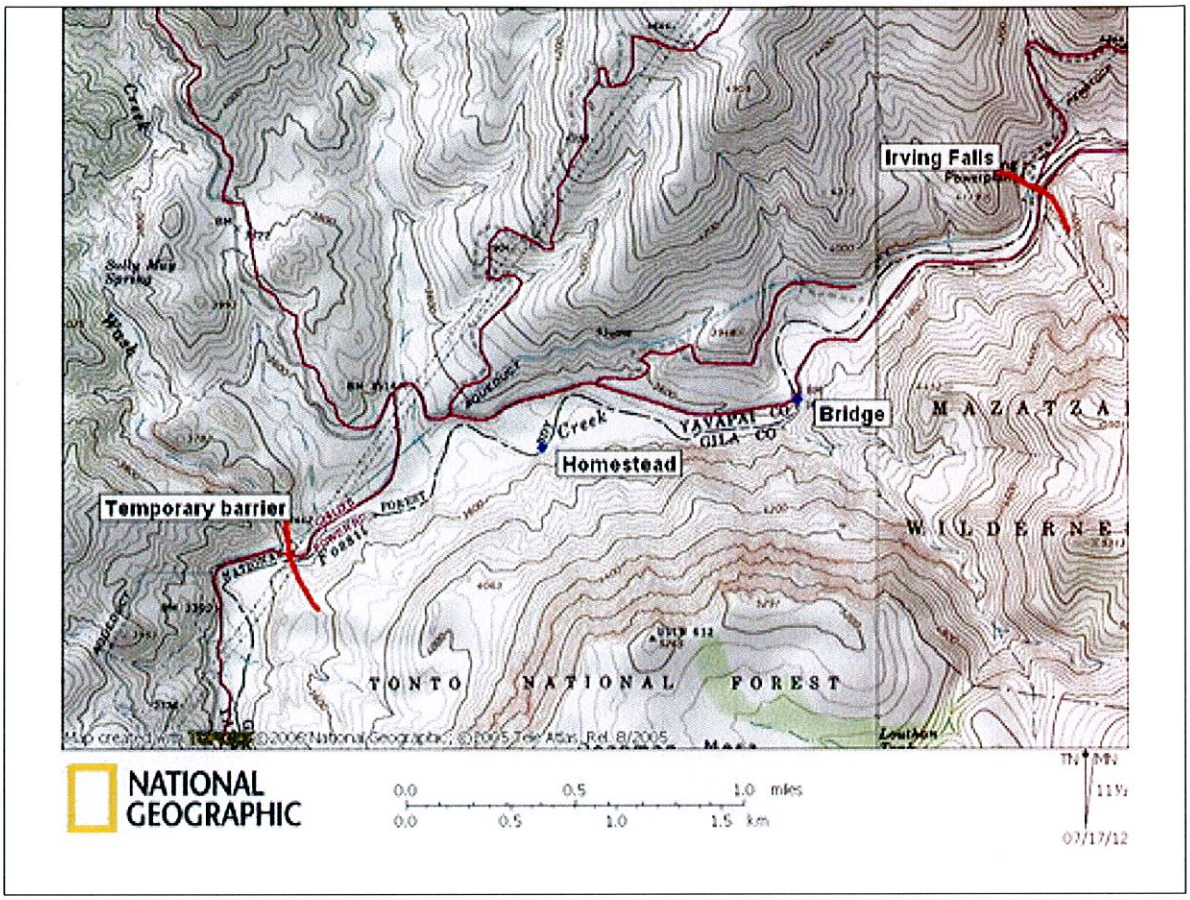

Figure 2. Map showing location of survey reach (between Irving Falls and the temporary barrier) in Fossil Creek targeted for smallmouth bass surveys.

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. 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).

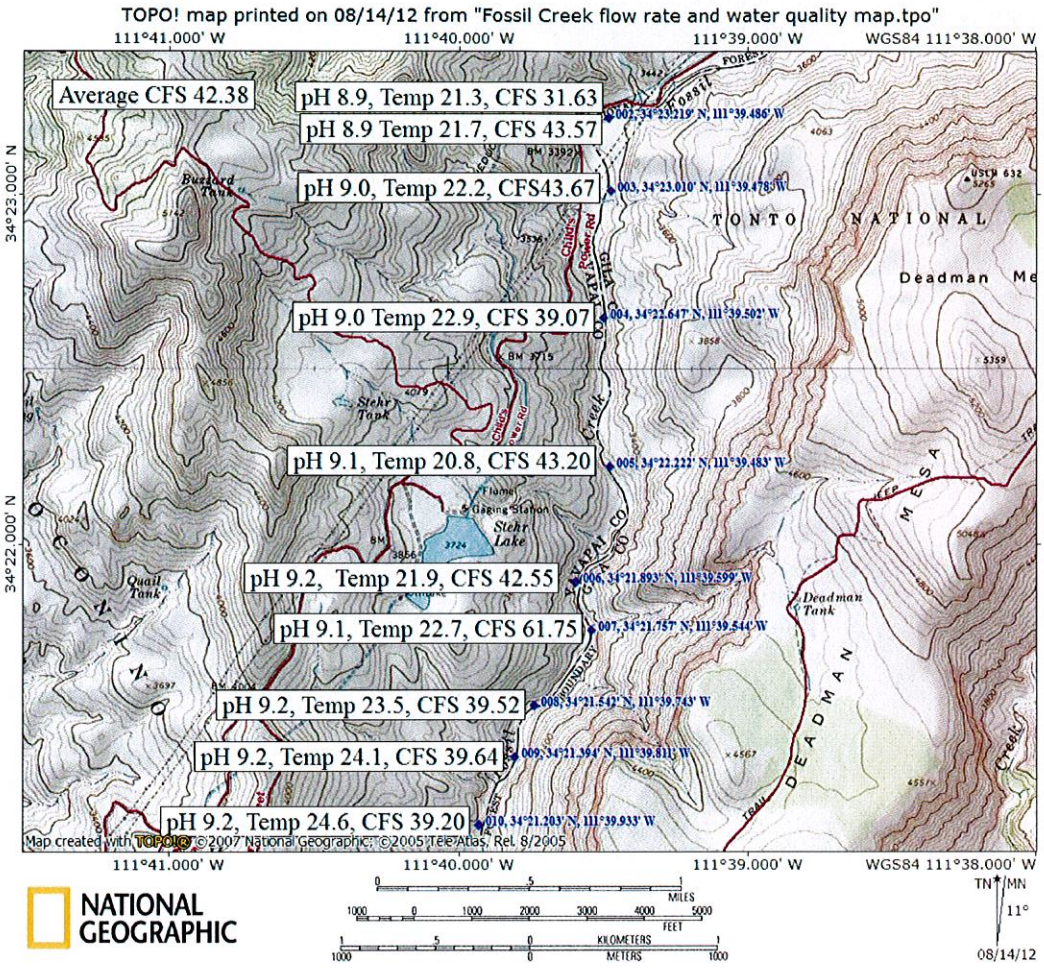

Figure 4. Flow rates and water quality parameters recorded on 8/14/12 within the treatment reach at 10 locations (Average flow, 42.38 CFS).

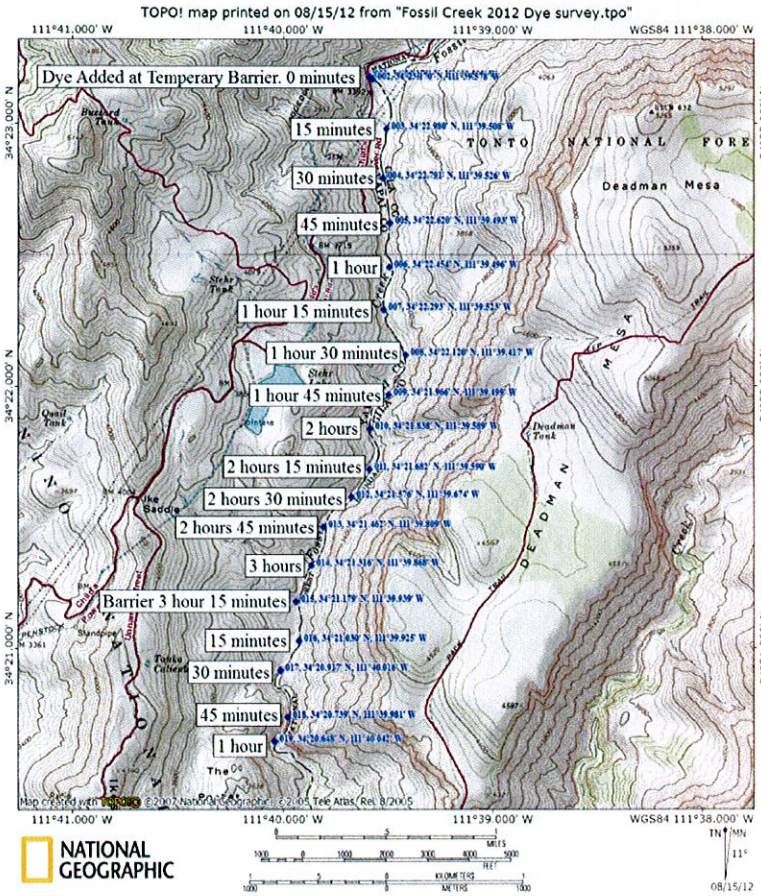

Figure 5. Flow travel time from the temporary barrier to 1 mile downstream of the permanent barrier at base flow (42 CFS).

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).

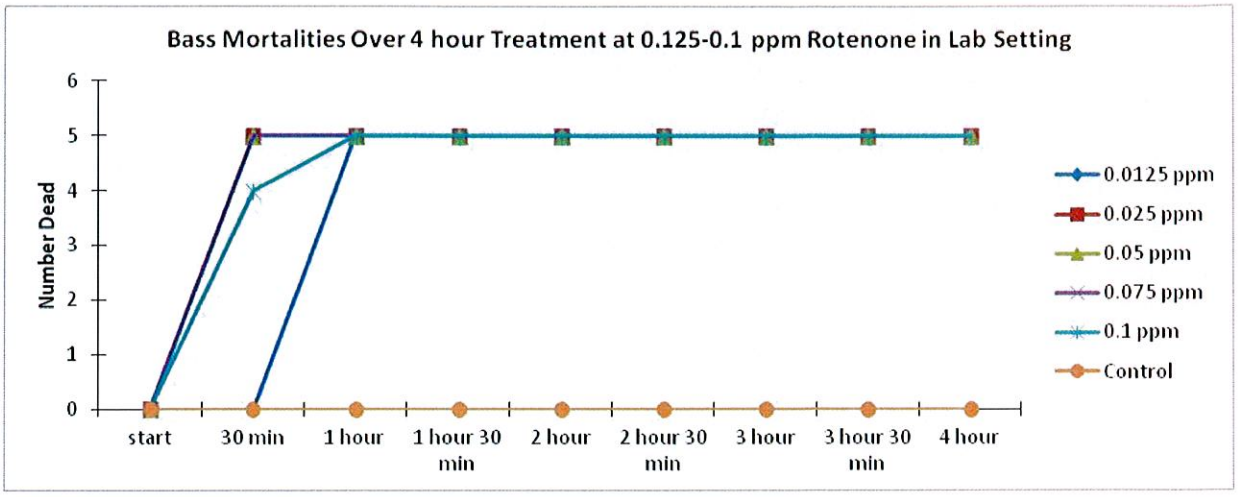

Figure 6. Bass mortality rate by concentration in parts per million (ppm) of active rotenone over a 4 hour period using Fossil Creek water in a laboratory environment.

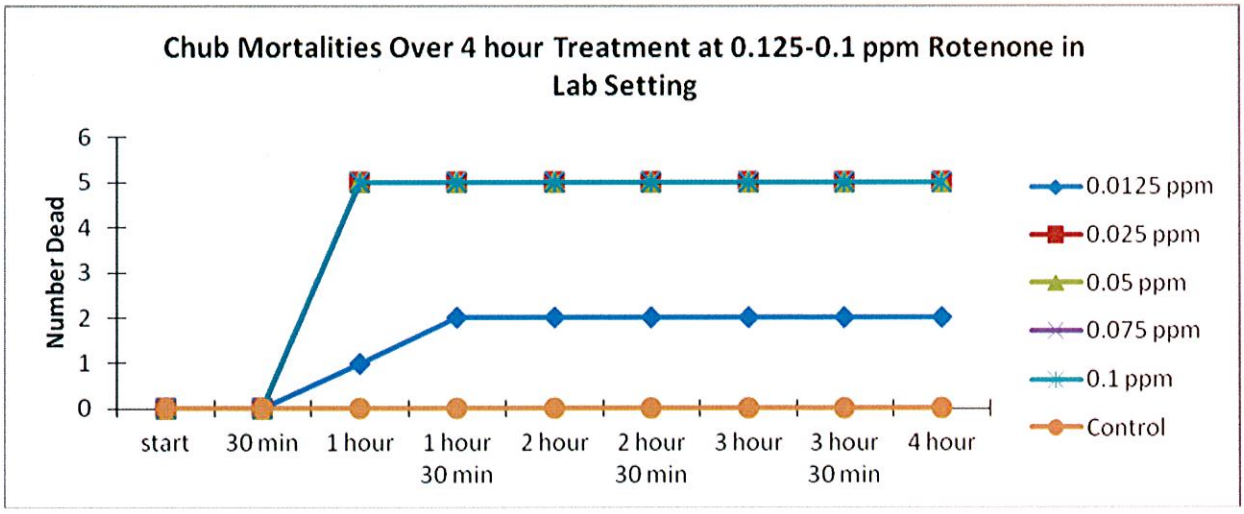

Figure 7. Chub mortality rate by concentration in parts per million (ppm) of active rotenone over a 4 hour period using Fossil Creek water in a laboratory environment.

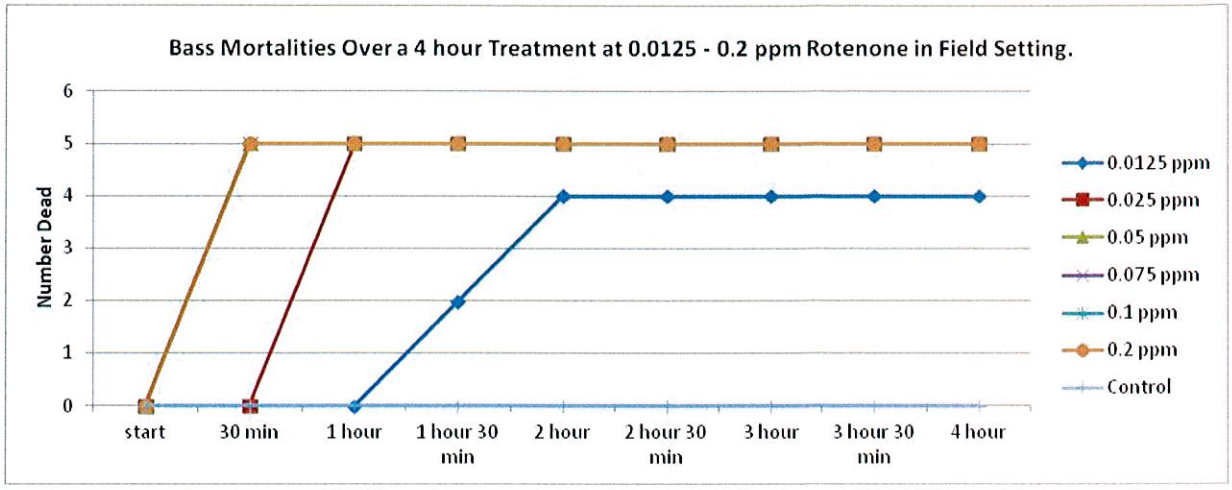

Figure 8. Bass mortality rate by concentration (parts per million (ppm) active rotenone) over 4 hour period at Fossil Creek.

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 rotenone.

- *Middle (1hour)* – 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 rotenone.

- *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 rotenone.

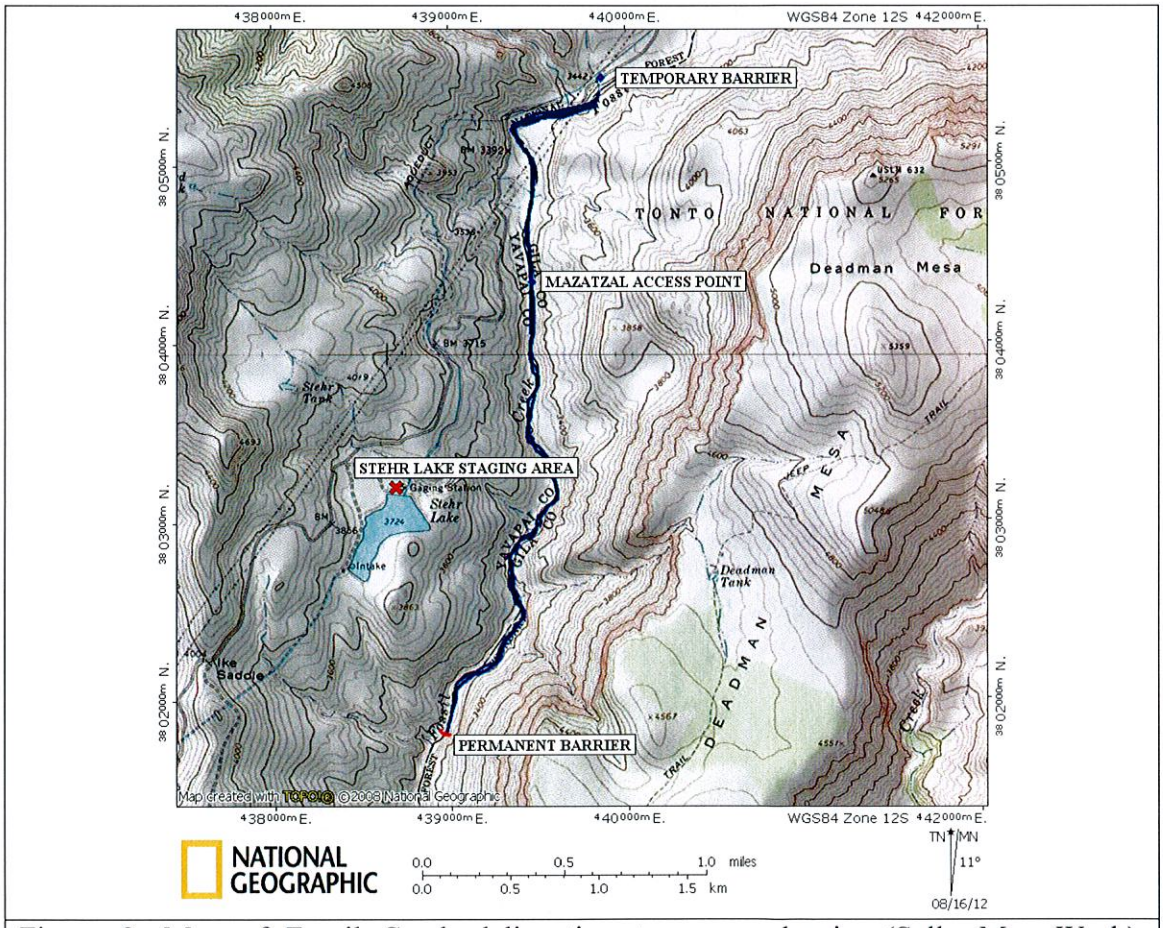

Figure 9: Map of Fossil Creek delineating temporary barrier (Sally May Wash), Mazatzal access point, permanent barrier and Stehr Lake staging area. Reach that is tentatively planned for treatment is indicated in dark blue.

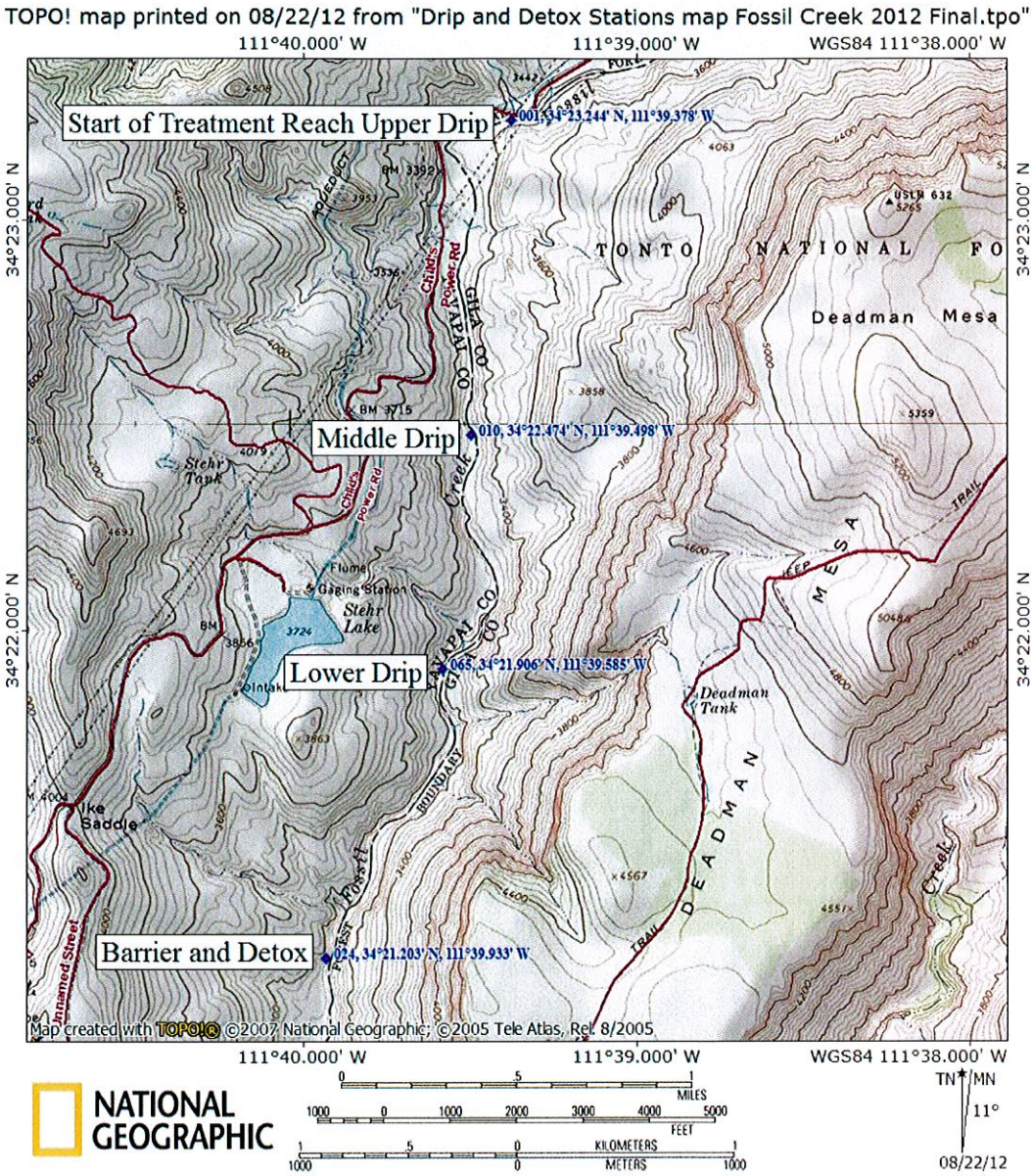

Figure 10. Initial drip station, booster drip stations and detoxification station locations.

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).

CFT Legumine at 0.25ppm		***CFT Legumine at 0.5 ppm***		***CFT Legumine at 0.75 ppm***		***CFT Legumine at 1 ppm***	
Stream flow (ft^3/s)	**rate ml/min**	**Stream flow (ft^3/s)**	**rate ml/min**	**Stream flow (ft^3/s)**	**rate ml/min**	**Stream flow (ft^3/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

Sprayers and Sand

Six 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), 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), and two in the lower sub-reach from the second natural constriction to the permanent barrier.

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 half 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.

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.

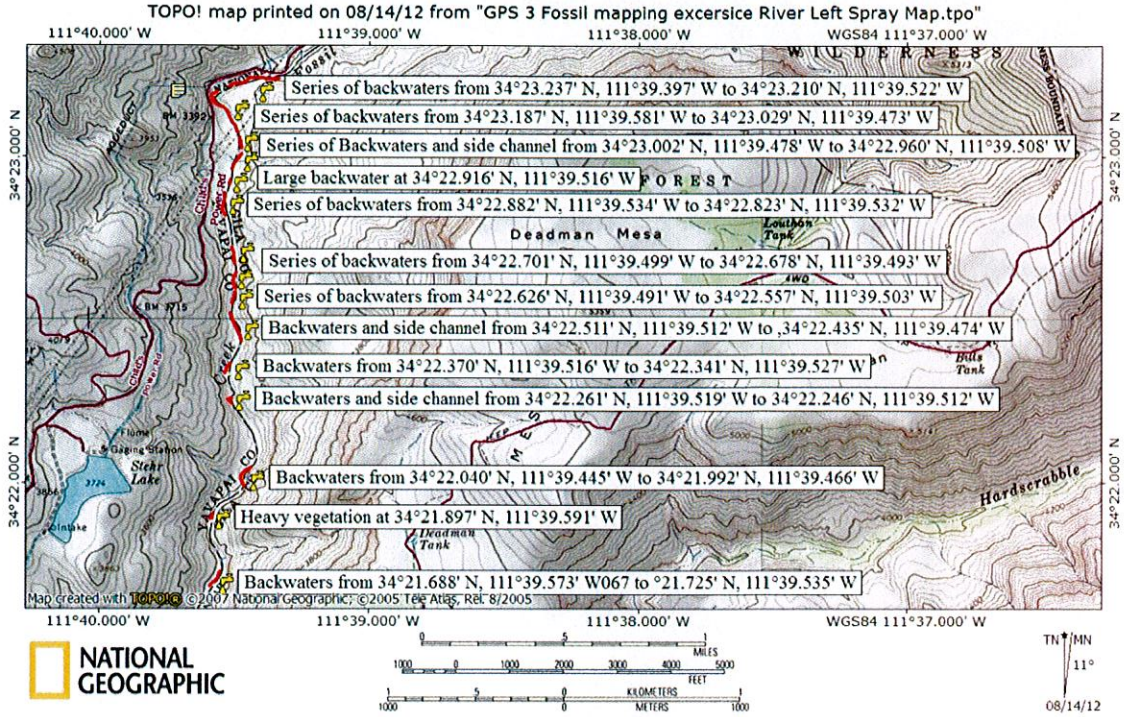

Figure 11. Upper sub-reach spray locations on river left.

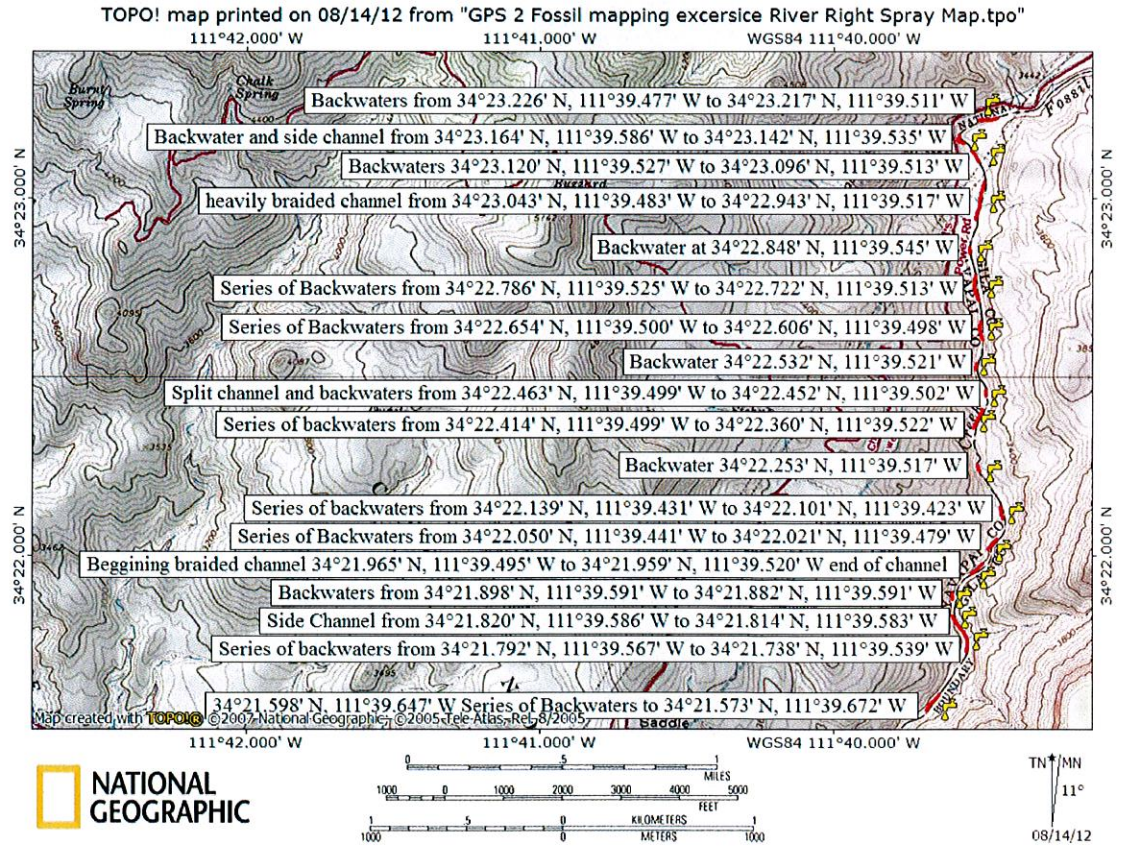

Figure 12. Upper sub-reach spray locations river right side.

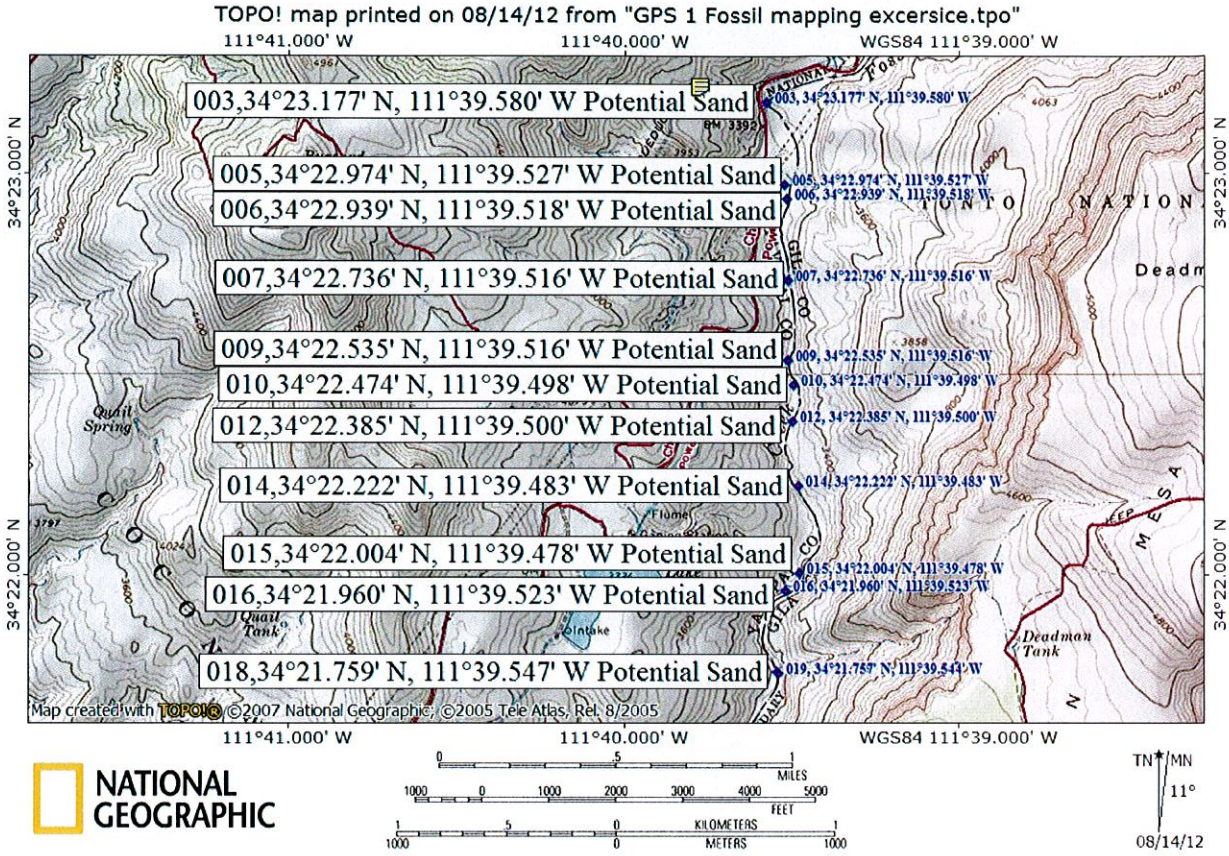

Figure 13. Sand locations in upper sub-reach.

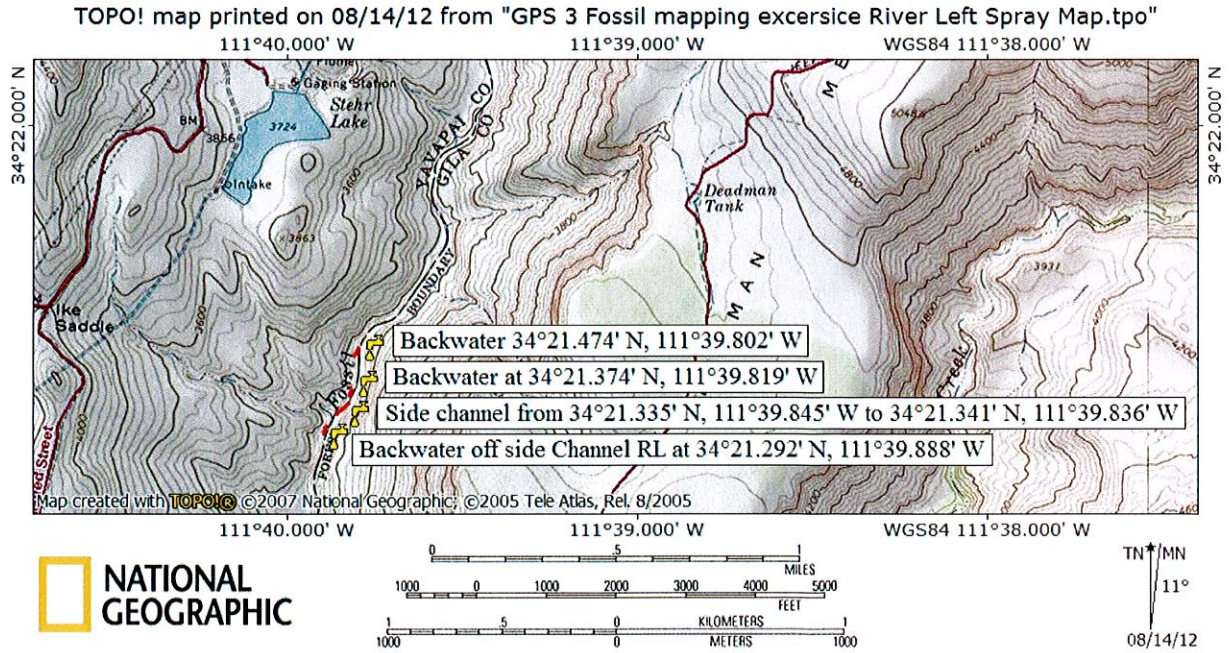

Figure 14. Spray locations in middle sub-reach, river Left.

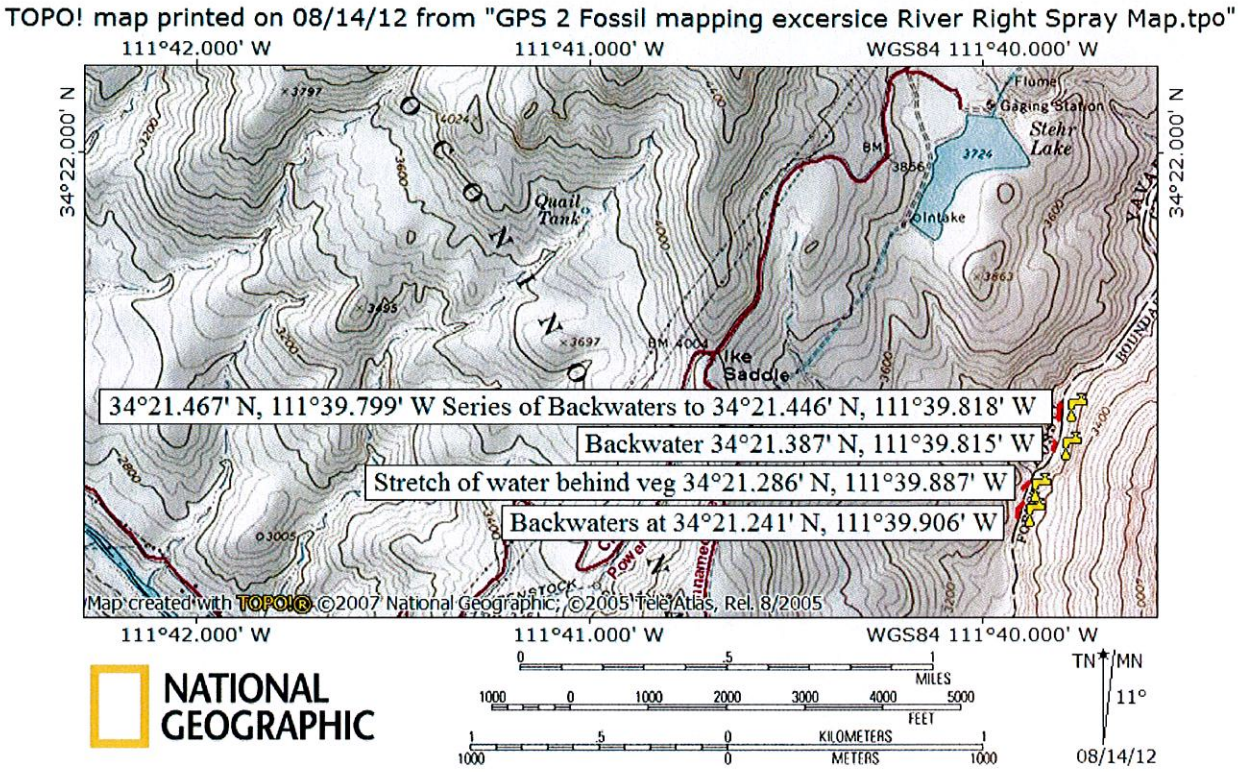

Figure 15. Spray locations in middle sub-reach, river right.

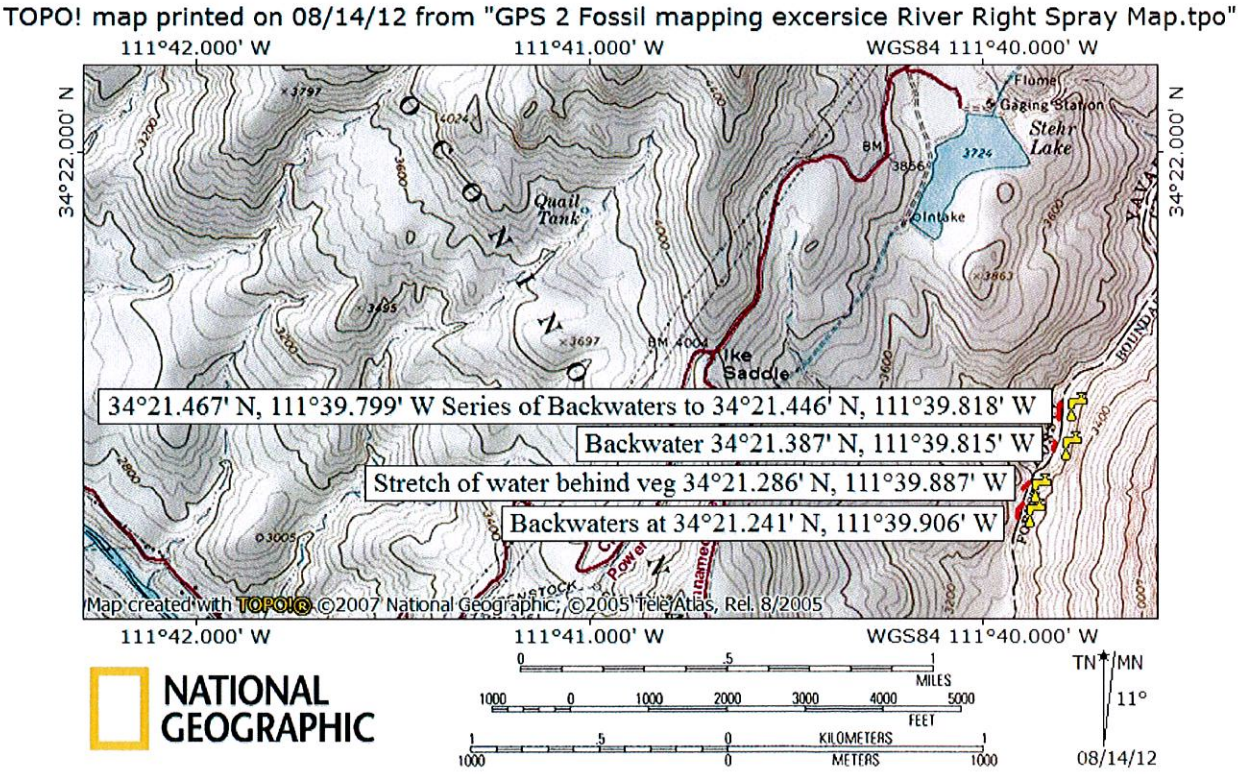

Figure 16. Sand locations in middle sub-reach.

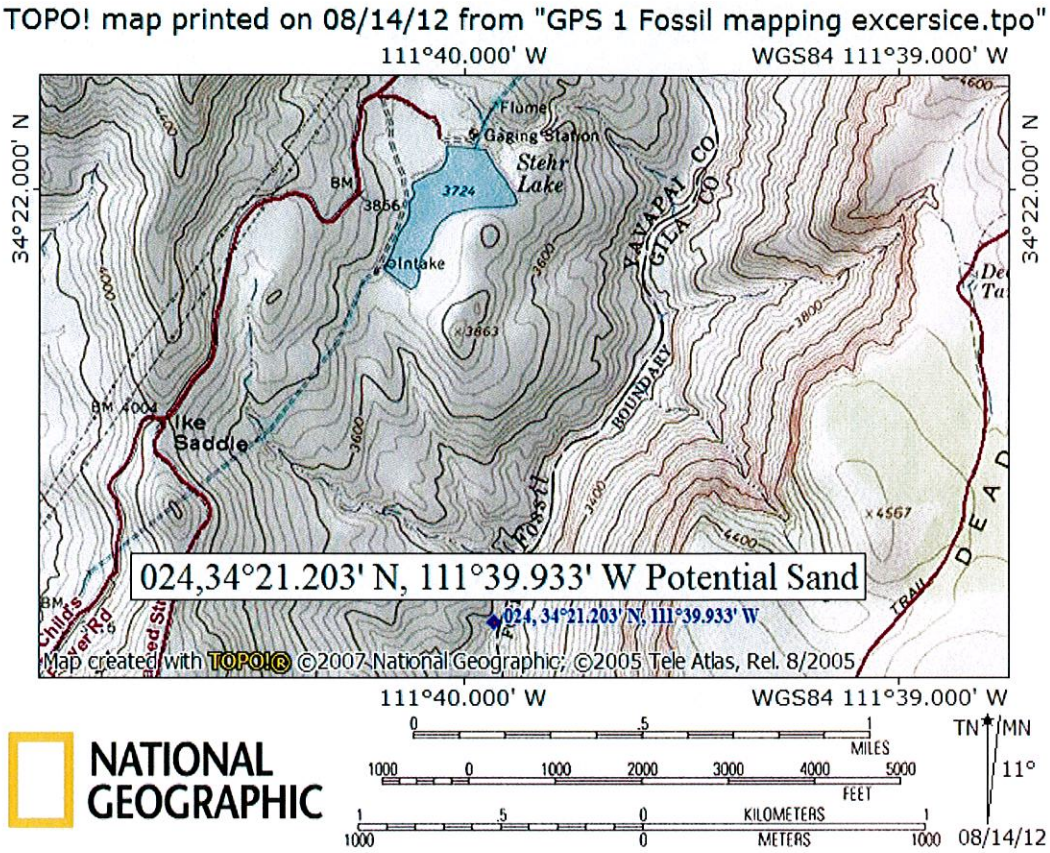

Figure 17. Sand location in lower sub-reach.

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.

Table 2. Varying Application Rates of $KMnO_4$ at 4-6 parts per million (ppm) and 40-60 cubic feet per second (cfs).

$KMnO_4$ 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

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.

Staff needs for rotenone treatment

- *Pre-treatment monitoring and bass removal upstream of treatment area*– (3 people) 28 days
- *Administrative, planning, necessary metrics* – (4 people) 20 days
- *Fish salvage* – (8 people) 4days
- *2 Treatments*– (24 people) 10days
    - *8 of these people need to be certified aquatic applicators.*
- *Post treatment evaluation* – (4 people) 6 days
- *Reporting* – (2 people) 5 days

Equipment needs for rotenone treatment

EQUIPMENT& SUPPLIES	NUMBER
Respirators	12
Dust Masks	60
Nitrile Gloves	250 pair
Goggles/Safety Glasses	50
Chemical Aprons	6
Gasoline	60 gallons
Augers	3
Gas Cans	10
Generators	4
Drip Buckets	8
Sprayers	6
Water Jugs (Wash Stations)	6
First Aid Kits	4
Radios	8
Signs	12
Buckets	20
CFT Legumine	60 gallons
$KMnO_4$	10,000 lbs
Rotenone Sand	2 -5 gallon buckets
Stop Watches	4
Scoops	4
1-liter Chemical Bottles	6
Barrel Pump	2
Live Cars	10
Fish Holding Tanks	4
Block Seine	1

Required Permits and Approval

- Arizona Game and Fish Department Fisheries and Nongame Branch Chief and Regional Supervisors 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
- AZPDES permit number AGF2011-002
- AZPDES permit Notice of Intent (NOI)
- Chapter 18 analysis of 2004 Fossil Creek treatment EA
- Pesticide Use Permit

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.

Sampling, Salvage, and Treatment Tentative Dates

- July 25-August 31, 2012 -- Pre-treatment monitoring
- September 4-7, 2012 -- Fish salvage
- September 10-17, 2012 -- First chemical treatment
- September 10-14, 2012 -- Second chemical treatment
- Septermber 17-21, 2012 – Alternative dates for treatment and/or cleanup

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 treated reach.

Staff Needs for Salvage

Personnel to conduct salvage operations starting Tuesday, September 4th-Sunday, September 9th

- Temporary barrier to Mazatzal (Sept 4-5):
  - Hoop net, seine and dipnet : (4 people)
  - Hoop net, seine and dipnet: (4 people)
- Mazatzal to Permanent Barrier (Sept 5-7):
  - Seine, dipnet and angling: (4 people)
  - Hoopnet, seine and angling: (4 people)

Equipment Needs for Salvage:

Hoop nets (30): Region II, WMRS
Mini hoop nets (8): Region II, WMNG-NFP, WMRS
Seines, 6ft x 4ft 8mm mesh (3): WMNG, WMRS?
Live cars (6-10): WMNG-NFP
Tear-drop dipnets (6): WMNG
Screw-lid buckets (12): WMNG-NFP
Bubblers (12-25): WMNG, WMRS
Large block seine, 1/2" mesh by 30 ftx6 ft (2)
Bait (5 lb): WMRS, Region II
Bait bags (30): WMRS, Region II
Large fish transport coolers (2): WMNG
Fish transport tank (1): Region II

11. 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.

12: ESTIMATED BUDGET

PERSONNEL	Pay periods	Cost	Total Cost
Pre-treatment surveys			
CAP Survey Crew	2.5	$4,200.00	$11,655.00
Interns	3	$2,000.00	$6,660.00
Aquatic Spec	3	$1,600.00	$5,328.00
Spec 2	1	$2,500.00	$2,775.00
Program Manager	3	$2,500.00	$8,325.00
Planning & purchasing			
Interns	0.5	$2,000.00	$1,110.00
Aquatic Spec	3	$1,600.00	$5,328.00
Spec 2	3	$2,500.00	$8,325.00
Program Manager	3	$2,500.00	$8,325.00
Office Manager	0.25	$1,600.00	$444.00
Purchasing Clerk	0.5	$1,200.00	$666.00
PHX Purchasing	0.5	$1,200.00	$666.00
Fish Branch Personnel	0.5	$2,000.00	$1,110.00
Treatment			
Salvage	0.5	$20,000.00	$11,100.00
Setup	0.5	$20,000.00	$11,100.00
Treatment	1	$40,000.00	$44,400.00
per diem		$600.00	$600.00
Post-treatment and report			
Aquatic Spec	0.5	$1,600.00	$888.00
Spec 2	0.25	$2,500.00	$693.75
Program Manager	0.25	$2,500.00	$693.75
		Total estimated cost (personnel)	**$130,192.50**

EQUIPMENT & MATERIALS	COST
$KMnO_4$	$29,848.00
generators	$2,590.00
new auger	$5,522.00
auger parts	$3,671.00
gelatin	$170.00
chlorine test kits	$293.00
Safety Gear	$1,050.00
gas cans	$140.00
chemical containment devices	$120.00
Misc Supplies	$214.00
Rotenone (estimate but uncertain)	$6,000.00
Total estimated cost (equipment)	**$49,618.00**

LITERATURE CITED

Finlayson, B., Schnick, R., Skaar, D., Anderson, J., Demong, D., Dueffield, D., Horton, W., and J. Steinkjer. 2010. Planning and standard operating procedures for the use of rotenone in fish management---Rotenone SOP Manual. American Fisheries Society Publication, 2010.

SIGNATURE PAGE

REQUEST - I request approval (Stage II) of the Preliminary Treatment Plan for Fossil Creek that will allow PTPPM planning to continue to Stage 3: Intermediate Planning and Public Involvement Procedures.

Approved [✓] by Eric Gardner _____ Acting w/ Eric's approval Date: 8/28/12

Approved [✓] by Kirk Young _____ Date: 8-28-2012

Approved [✓] Acting Reg II Supervisor _____ Carl Putch Date: 8/24/12