Public Meeting Briefing
Fossil Creek Treatment 2012

August 30, 2012

1. Recent meeting

A public open house meeting was held at the Verde Ranger District office at 300 East Highway 260 on August 29 (5:00p-7:00p).

2. Participation

Seven people from government agencies were available to answerer questions (Shaula Hedwall USFWS, Cecelia Overby USFS Coconino NF, Michael Childs USFS Coconino NF, Scott Rogers AGFD, Molly Mills AGFD, Chuck Benedict AGFD, and Matthew Rinker AGFD).

Two people attended the open house. One (Michele James, NAU Biological Sciences Dept) attended to represent and communicate discussions to the Fossil Creek Stakeholders Group. The other participant (Mary Ontiveros, Verde Ranger Station) was on staff at the Verde Ranger District office where the meeting took place.

3. Stakeholders invited and public notification

The Fossil Creek Stakeholders group was contacted with information about the open house via the stakeholder's e-mail list serve.

The following individuals were contacted:

A Jay Bronson (NAU)
Chris Coder (Yavapai Apache Tribe)
Daniel Ryan Campbell TNC)
David Ward (USGS science center)
Jane C Marks (NAU)
Kenneth James Adams (NAU)
Kimberly Ashcraft (APS)
Martha E Lee (NAU)
Matthew Joseph Johnson (USGS)
Michelle Harrington (Arizona Rivers)
Rob Clarkson (USBR)
Roderic Alan Parnell (NAU)
Samantha Lynn Franke (NAU)
Sandy Bahr (Sierra Club)
Stefan Sommer (NAU)
Steve Pawlowski (Sierra Club)

Zacchaeus G Compson (NAU)
Damon Peterson (NAU)
Jim Logan (N AZ Audubon)
Paul Marsh (ASU)
Jill Grams (interested public and SWCA)
Larry Phoenix (AGFD)
Luke A Avery (interested public and GCMRC)
Robin Silver (CBD)
Sally and Jerry Stefferud (fish biologists)
Mike Ward (interested public)
Tom Hildebrandt (AZ Riparian Council)
Tim Flood (non-profit water group)
Elizabeth Dykstra (USFS)
Cecilia Overby (USFS)
Sam Frank (AZ Wilderness Coalition)
Michele James (NAU)

The Northern Arizona Flycasters and public officials for the Town of Camp Verde were contacted by AGFD staff prior to the Camp Verde open house meeting.

A press release was submitted by AGFD on 8/23/2012. This press release was on our webpage and was picked up by several outlets (*Payson Roundup, Verde Independent,* and *The Fishing Wire*, See **APPENDIX A**). We also forwarded the news release to the County Boards of Supervisors for Yavapai and Gila counties, and to the State Senator and House Members for Legislative District 1.

4. Meeting Format

The open house included a meet and greet followed by a 30-minute PowerPoint presentation regarding the Fossil Creek renovation (see **APPENDIX B**). Questions were encouraged after the presentation and answers were provided by agency staff.

A signup sheet (see **APPENDIX C**) and comments box were provided at the meeting. No written comments were submitted.

5. User support/Opposition

Feedback from recent open house meeting (8/29/2012)

Some of the questions/comments from the meeting are listed below:

- **What measures (monitoring) will be taken after September?** Increase AGFD hoop net sampling to include the treatment reach. Include additional snorkeling and above water visual surveys in future sampling efforts.

- **We need more concerted education and outreach for illegal stocking of fish.** Opportunity with Fossil Creek Management Plan revisions to incorporate more effort in these areas. Focus signage at near road access areas.
- **Are people really dumping bass into the creek (Homestead Camp)?** It is impossible to know how the bass at Homestead Camp got there. The bass behavior, distribution and size are consistent with illegal stocking.
- **Will the treatment harm the native frogs?** That's why the treatment is occurring in the fall when there are no gill-breathing forms of frogs in the water and all the tadpoles have metamorphed.
- **Cecelia Overby - what are your sign needs?** 6 barricades 2 roads closure signs.
- **A sign at the 260/708 road junction is needed that is easy to read from vehicle and large.** Needs to include dates and duration of project. Shaula has the old signs from the 2004 treatment. Sign needs to include where the road is closed.
- **Can we change the information on the Forest Service electric sign on Highway 260 to say what roads are closed?**
- **May consider using the Forest Service** Twitter feed to announce the days of the closure during the treatment.
- **Will there be any monitoring other than for fish after treatment?** Water quality monitoring after treatment in addition to fish monitoring. No aquatic invertebrate monitoring will be conducted because no pre-treatment data was collected for a comparison. Aquatic invertebrates will recover quickly because of relatively short length of the treatment area and its location just downstream and upstream of an area densely populated with native fish.
- **Why are we using Rotenone instead of Antimycin?** Supply (little to none available) and quality control issues with Antimycin.
- **What will happen to the fish in the treatment reach?** All fish that are not salvaged and moved upstream of the treatment reach will be killed. The treatment reach will recover quickly because of its location just downstream of an area densely populated with native fish. We are also considering supplemental stocking of several species back into the treatment reach.

Chris Coder (Yavapai Apache Tribe) communicated with Shaula Hedwall prior to the meeting and had no concerns over the treatment. He did have some concerns over land management.

Feedback from previous outreach

Northern Arizona University provided chemical treatment, power plant decommissioning, and monitoring information on their website (http://www.verde.nau.edu/FossilCreekProject). Northern Arizona University also set up two open houses on October 29 and 30, 2003 in the communities of Pine and Camp Verde, Arizona to discuss the 2004 chemical treatment, decommissioning of the Irving Power plant, and subsequent monitoring of Fossil Creek.

Location and time of the two open houses were:

Pine, Arizona: Friday October 29
Pine-Strawberry Community Cultural Hall (behind Pine-Strawberry Museum)
3886 Highway 87
5 - 8 p.m.

Camp Verde, Arizona: Saturday October 30
Town of Camp Verde
Parks and Recreation Meeting Rooms 206 and 207
473 Main Street (park at Town Hall parking lot; rooms are in the middle building)
9 a.m. - noon

Approximately 20 people showed up at public meetings in 2004 (12 people in Camp Verde, Fewer than 10 people at Pine). Comment and feedback was generally positive.

The *Draft Environmental Assessment for Native Fish Restoration in Fossil Creek*; which was prepared by the Bureau of Reclamation and The Forest Service (Coconino and Tonto national Forests) in cooperation with the U.S. Fish and Wildlife Service and AGFD for the 2004 initial treatment of Fossil Creek was mailed to more than 90 addressees including all interested persons, organizations, and agencies on December 23, 2003 for 30-day comment. Eleven comments were received by January 28, 2004, of which one was signed by four conservation groups (American Rivers, Sierra Club-Grand Canyon Chapter, Friends of Arizona Rivers, and the Center for Biological Diversity). In addition, a public notice was published in the *Arizona Republic* and news releases were sent to other news media regarding availability of the draft EA. The draft EA was also available on the Coconino National Forest NEPA website and at specified offices of the Coconino and Tonto National Forests.

Public comments were generally supportive of the project, but many respondents asked the agencies to conduct thorough analyses and disclose effects of the action being proposed.

Feedback from the 2004 public meeting

Eleven respondents submitted written comments on the native fish restoration project during the 30-day public comment period. These comments included:

- Disclosure of effects of renovation and neutralization chemicals on water quality.
- Disclosure of effects of renovation and neutralization chemicals on human health and safety.
- Disclosure of effects of renovation chemicals on non-target biota.
- Disclosure of how renovation and neutralization chemicals will be applied.
- Disclosure of how native fish will be salvaged and returned.
- Disclosure of effects of fish barrier construction on sediment transport and stream dynamics
- Disclosure of effects of fish barrier on gene pool of aquatic macroinvertebrates on and fish.
- Disclosure of importance of Fossil Creek to native fish restoration and recovery.

Although no significant issues were identified from public scoping, the Forest Service identified the following significant issues for the project:

- Effect of nonconforming uses in designated wilderness (i.e., non conforming structure and use of motorized equipment).
- Effect on Wild and Scenic River eligibility and classification

- Potential for nonnative fishes to be reintroduced into the creek at some time after the chemical renovation.

b. Anticipated level of conflict, controversy, opportunity or concern about the proposed project or piscicide use?
None reported.

c. How much do the major stakeholders care about these issues or project?
In general all Stakeholders are in strong support of the chemical renovation of Fossil Creek.

Necessity for another meeting

Given the neutral or positive nature of comments to date, we do not believe that another meeting is necessary.

6. Justification to move forward

Based on previous outreach efforts and the recent meeting (few participants) and results (generally positive comments), we believe that adequate public involvement has been carried out. We request permission to continue with the intermediate planning that includes the treatment plan along with site safety plan, communications plan, fish removal and disposal plan, crisis management plan and post-treatment plan. We hope to have a draft of these by the end of tomorrow (8/31/2012).

SIGNATURE PAGE

REQUEST - I request approval (Stage II) of the Public Meeting Briefing that will allow PTPPM planning to continue to Stage 3: Intermediate Planning and Public Involvement Procedures.

Approved [✓] by Eric Gardner _____ Date: 8/30/12

Approved [✓] by Kirk Young _____ Date: 8-30-2012

Approved [✓] by Acting Reg II Supervisor _____ Date: 8/30/12

APPENDIX A

Arizona Game and Fish Department

NEWS RELEASE

Aug. 23, 2012

Agencies propose removing smallmouth bass from Fossil Creek

Public meeting set to discuss creek renovation

FLAGSTAFF – The Arizona Game and Fish Department, the U.S. Forest Service, and the U.S. Fish and Wildlife Service are hosting a public meeting at the Verde Ranger District office at 300 East Highway 260 starting 5 p.m. Aug. 29 to discuss removing unwanted smallmouth bass from a unique native fish haven in Fossil Creek using rotenone, a naturally occurring piscicide.

Rotenone affects gill-breathing species such as fish, has a short life span, and quickly biodegrades into harmless substances. Fossil Creek was originally treated to remove unwanted non-native fish in 2004 to create this unique sanctuary for native aquatic species, including chub.

"The whole point of the meeting is to advise the public of the proposed treatment of a portion of Fossil Creek," says Scott Rogers, fish program manager for Game and Fish. "We will have representatives there providing information about the proposed treatment, length of time it will take, and answer questions the public may have."

The proposed treatment, scheduled for September, will be in an area of Fossil Creek between a temporary fish barrier located at the confluence of Sally May Wash and Fossil Creek, and the original fish barrier located in the Mazatzal Wilderness approximately 2.6 miles downstream.

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 the Mazatzal Wilderness.

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 in Fossil Creek. Their presence now threatens all of the native aquatic species in the creek, including the unique native sport fishery for chub.

It also took a major effort to restore the historical flows to Fossil Creek – a significant portion of those flows had been diverted for hydro-electric generating purposes for almost a hundred years to help Arizona grow and flourish.

The U.S. Fish and Wildlife Service is committed to providing access to this meeting for all participants. Please direct all requests for sign language interpreting services, close captioning, or other accommodation needs to Jeff Humphrey, 602-242-0210, jeff_humphrey@fws.gov, TTY 800-877-8339 with your request by close of business Aug. 24.

Biologists Plan To Poison Bass In Fossil Creek

Game and Fish, Fish and Wildlife to hold public hearing Wednesday in Camp Verde

8/25/2012

The Arizona Department of Game and Fish in September will use a fish-killing poison to kill non-native bass that have invaded about 2.6 miles of Fossil Creek — perhaps the premier native fish refuge in the state.

#Game and Fish and the U.S. Fish and Wildlife Service will hold a public hearing in Camp Verde on Aug. 29 starting at 5 p.m. to get public reaction on plans to use the chemical rotenone in the stretch of the creek upstream from its junction with the Verde River.

#"The whole point of the meeting is to advise the public of the proposed treatment of a portion of Fossil Creek," said Game and Fish Program Manager Scott Rogers. "We will have representatives there providing information about the proposed treatment, length of time it will take and answer questions the public may have."

#The bass invaded the clear, travertine-tinted, spring-fed stream sometime last year, when flood waters left sand and boulders piled up on the downstream side of a fish barrier intended to keep bass, catfish, carp and other non-native fish out of the pristine stream.

#Game and Fish employees discovered bass a short distance above the breached barrier last year. That triggered a request to the U.S. Forest Service for permission to build a temporary fish barrier upstream until Game and Fish and the U.S. Fish and Wildlife Service could repair the main barrier. However, the Forest Service enforced rules against using heavy equipment in a wildness area, which delayed the installation of the second temporary barrier by several months.

#Subsequently, biologists discovered about a dozen bass more than a mile above the temporary barrier. They caught most of those bass, but several vanished.

#"The whole point of the meeting is to advise the public of the proposed treatment of a portion of Fossil Creek."

#Scott Rogers

#Game and Fish Program Manager

#All that led to the current proposal to use a plant-derived poison that suffocates any creatures that breathe through gills.

#Game and Fish had for more than a year suspended use of rotenone, the most common chemical used to kill off fish in a stream. Several studies had raised questions about how fast the chemical dissipated, especially when used in streams that provide drinking water. Fossil Creek empties into the Verde River, which runs downstream into reservoirs that provide drinking water to Phoenix. However, the chemical typically dissipates quickly.

#Game and Fish lifted the moratorium on use of rotenone after a scientific committee came up with upgraded guidelines for its use.

#Game and Fish biologists recommended the effort to kill any non-native fish that have invaded the lower reaches of the creek to protect one of the premier refuges for native fish in the southwest.

#The spring-fed flow of Fossil Creek was for a century diverted down a flume to spin the turbines on a hydro-electric power plant, which helped feed the electrical needs of Phoenix in the 20th Century. However, Arizona Public Service seven years ago agreed to decommission the power plant and return the flow of the creek to the streambed.

#Game and Fish used electro-shocking to remove as many native fish in the creek as possible, including headwater and roundtail chub, sonoran suckers, several minnow-like dace and others. Most of those fish are endangered as a result of a century of dams and diversions that have transformed almost every stream and river in the southwest.

#Biologists killed off all the non-native fish like catfish, bass, red shiners, carp and others that had come to dominate the stream, before finally returning both the native fish they had removed and the full flow of the spring to the creekbed.

#The native fish have thrived in the deep, crystal clear pools of the resurrected stream. An estimated 20,000 headwater chub alone now live in the creek, with large populations of half a dozen other native fish.

#The invasion of the voracious smallmouth bass and any other fish that managed to surmount the damaged fish barrier could threaten a rare native fish success triumph.

Verde Independent 8/25/2012

Editorial: Perfection at Fossil Creek?

Will Fossil Creek ever really be restored to what it once was? Three government agencies have done a great job of trying to meet the ideal, but interference will always prevent perfection.

The issue of the smallmouth bass at Fossil Creek is one of those interferences. And it's the kind of issue that could have agencies chasing their tails. The nonnative bass first showed up suspiciously, possibly planted by folks who care more about fishing than about the health of native species.

All nonnative fish were removed from Fossil Creek eight years ago in the ongoing restoration effort. The smallmouth bass showed up this year.

The fish were removed, a fish barrier was put in place, and then the fish barrier failed. Whether a man-caused failure or a slip of nature, the barrier was breached and the smallmouth bass were back. Now the agencies - U.S. Forest Service, Arizona Game & Fish and the U.S. Fish & Wildlife Service - will kill the fish with a piscicide next month.

If, after the Fossil Creek waters are treated with rotenone, the smallmouth bass return yet again, this could turn into a cycle that no one wants to get into. The agencies' efforts are laudable but it is hoped they are not in vain. Dealing with the same problem over and over is exasperating.

The world of Fossil Creek is different than it was a hundred years ago before the water was diverted for hydro-electric power.

Restoration of the flows has met many unexpected challenges, from messy men to invasive species. Those continual obstacles, while met head-on by the agencies, will prevent the area from ever being exactly as pristine as it once was.

You can't go home again, as they say.

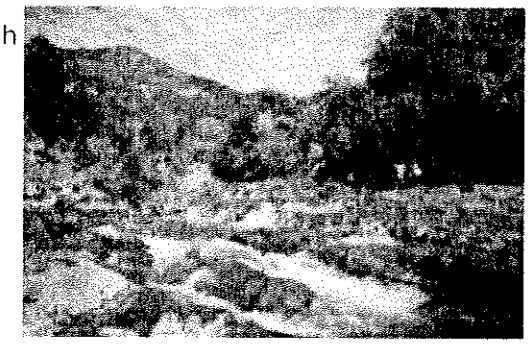
Arizona Game & Fish is co-hosting a meeting to explain the piscicide treatment on Aug. 29 at the Verde Ranger District office at 300 E. 260 in Camp Verde starting 5 p.m.

http://verdenews.com/Main.asp?SectionID=36&SubSectionID=73&ArticleID=49805

The fishing wire 8/24/2012

Arizona G&F Proposes Smallmouth Bass Removal at Fossil Creek

CAMP VERDE, Ariz. - The Arizona Game and Fish Department, the U.S. Forest Service, and the U.S. Fish and Wildlife Service are hosting a public meeting at the Verde Ranger District office at 300 East Highway 260 in Camp Verde starting at 5 p.m. on Wednesday, Aug. 29, to discuss removing unwanted smallmouth bass from a unique native fish haven in Fossil Creek using rotenone, a naturally occurring piscicide.



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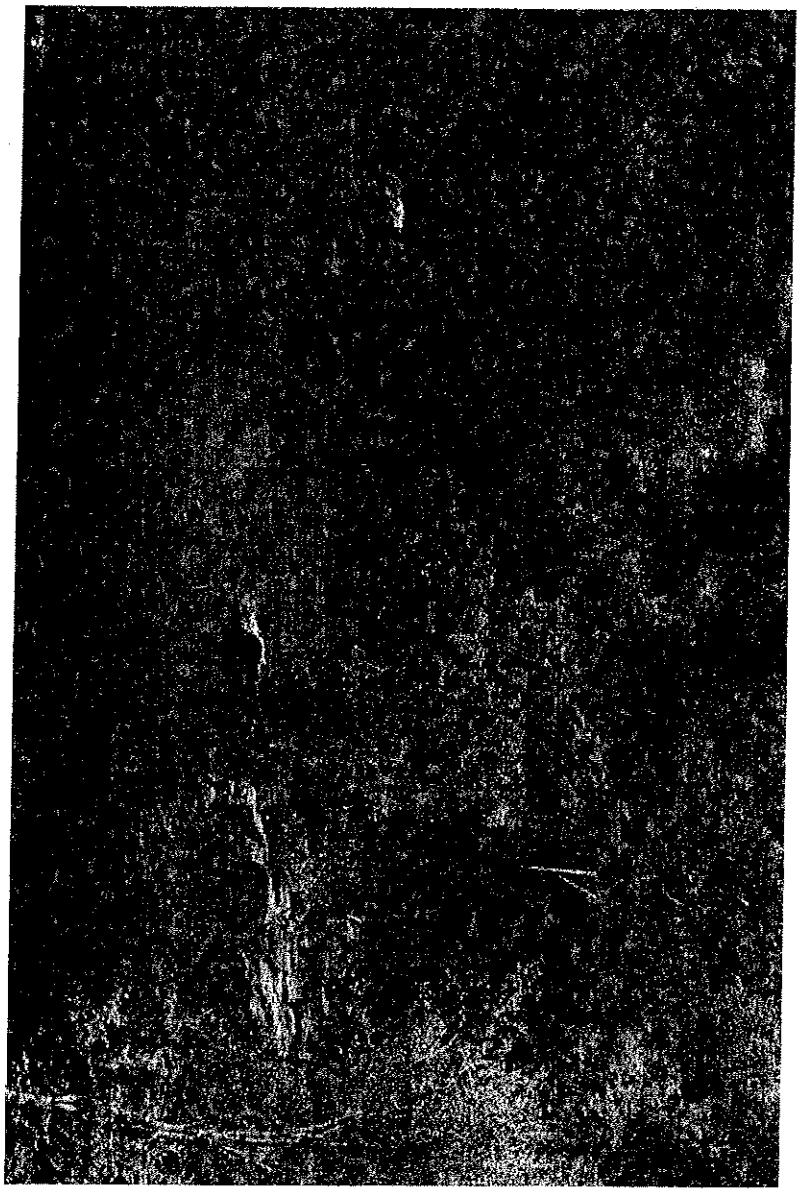
APPENDIX B

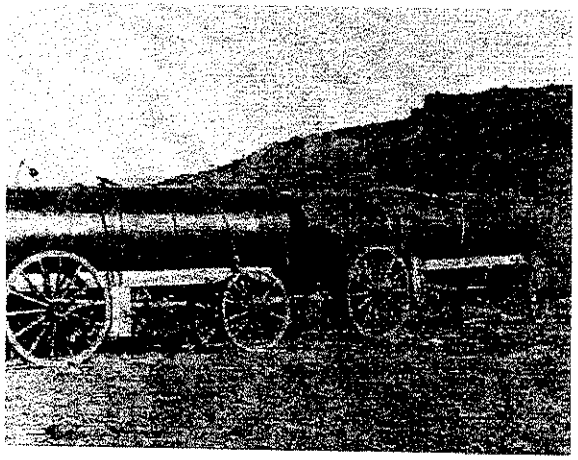


Fossil Creek

Proposed Fish Renovation Project (2012)

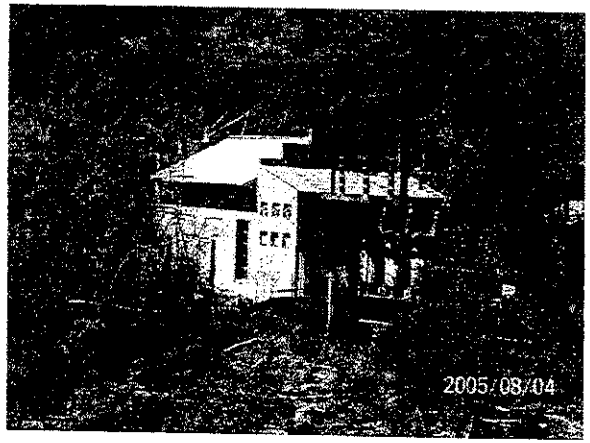
History

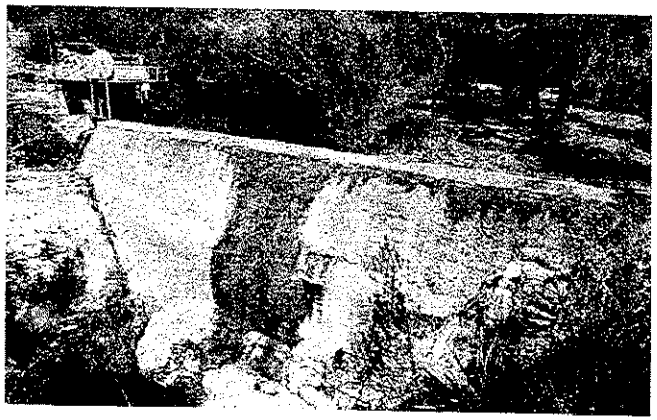
In the early 1900s, the Arizona Power Company, a predecessor to Arizona Public Service (APS), built two power plants (Childs and Irving) to serve the mining communities in Jerome, Crown King, and the Prescott areas. One of these power plants, Irving, involved construction of a dam on Fossil Creek near Fossil Springs. The Irving Power Plant was completed in 1915.



History

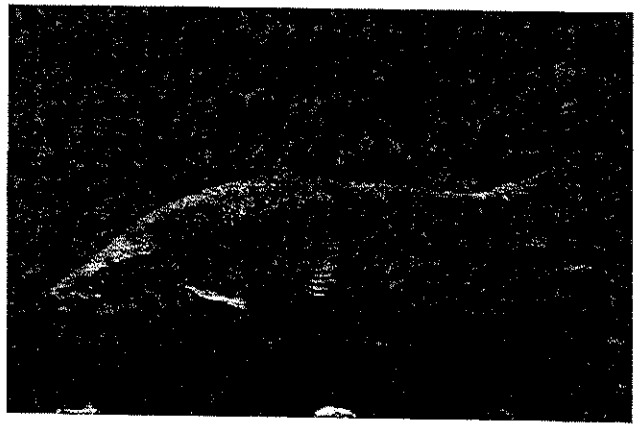
In 1998, multiple groups asked APS to return full flows back to Fossil Creek. After several years of meetings with multiple cooperators APS signed a settlement agreement stating that full flows would be returned to the creek. APS also agreed to remove most of the infrastructure including all of the buildings at Childs and the top 14ft of the diversion dam at Fossil Springs.





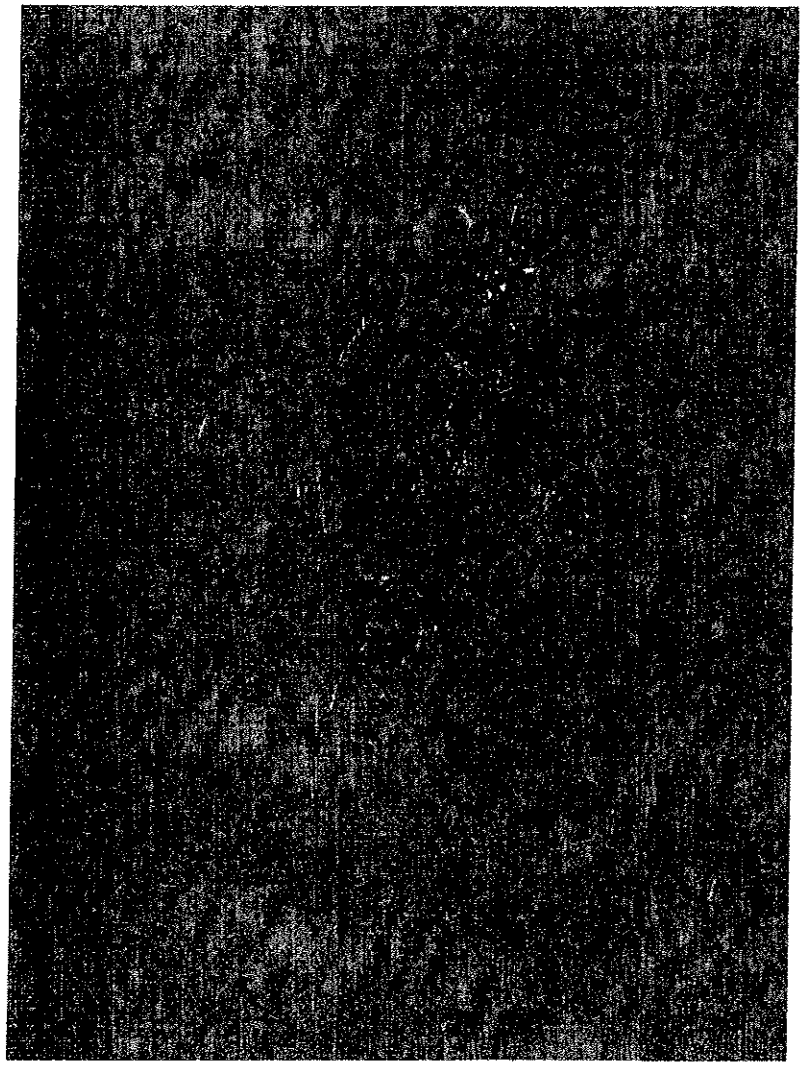
History

In January 2001, a draft project proposal was completed with supporting letters from several organizations. The proposal included building a barrier, renovating the stream, and managing the fishery for native fish.



History

In the Fall of 2004, the chemical renovation of Fossil Creek was accomplished. Prior to renovation, native fish were salvaged from the creek to be repatriated after renovation. Stock tanks and other waters in the watershed were also chemically treated to remove non-native fishes such as green sunfish. Full flows were then restored to Fossil Creek in 2005.



Fishery Recovery

History

In the Spring of 2008, a working group consisting of personnel from AGFD, USFWS, CNF, TNF and fly fishing clubs met to prepare a sport fishing regulation package for consideration by the AGFD Commission at a Commission meeting in October 2008. In October 2008, the regulation was approved by the Commission.

ANGLERS NOTICE
YOU ARE ENTERING A SPECIAL FISHING REGULATION AREA

Fossil Creek is **open** for fishing from the **first Saturday in October thru April 30.**

During this time fishing is allowed between the waterfall located approximately 1 mile above the flume trail parking lot and the lowermost powerline immediately below Sally May Wash.

All other parts of Fossil Creek are closed to fishing.

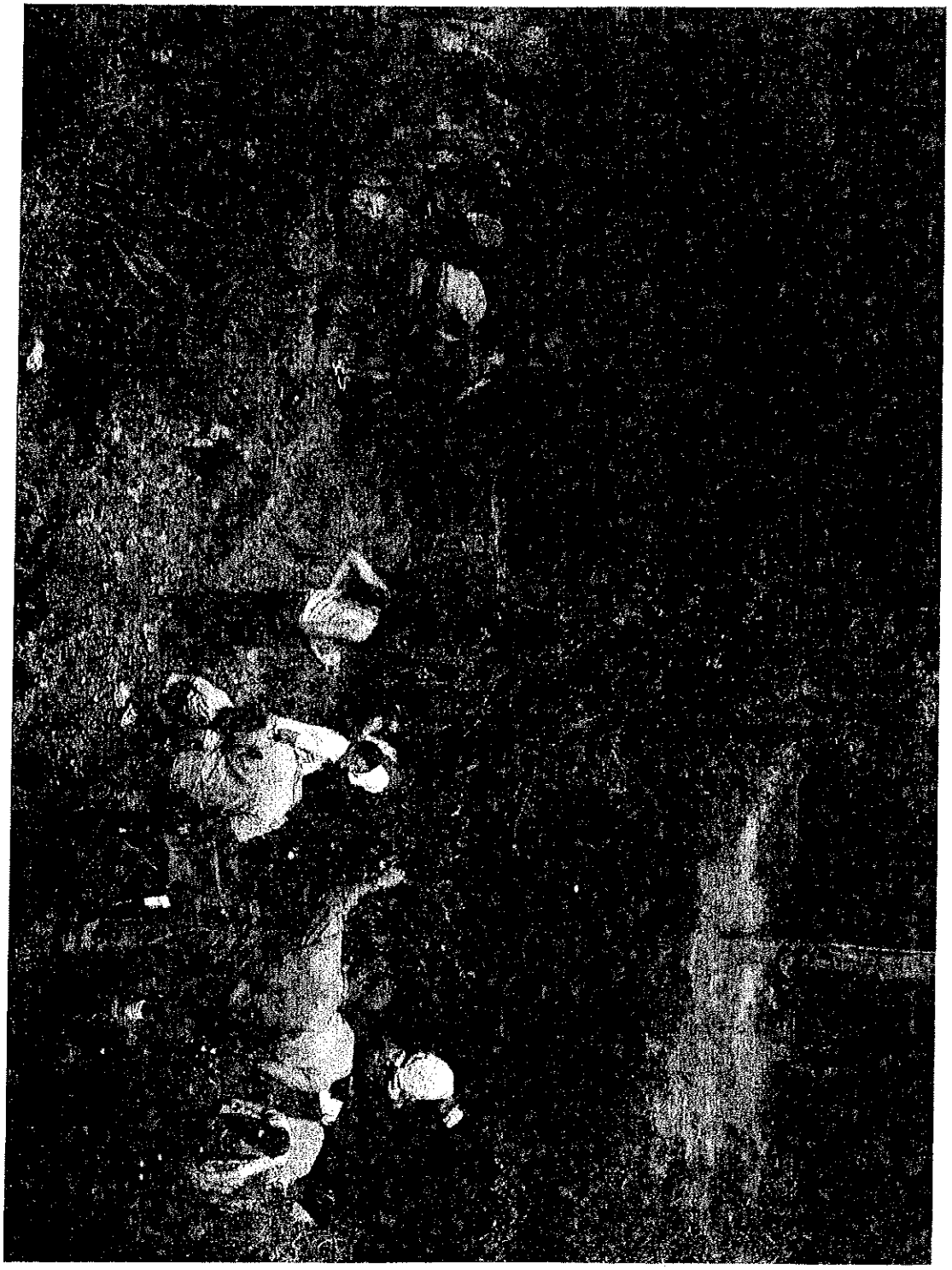
Catch and Release - All fish must be released unharmed immediately

Artificial lures and flies single barbless hooks only. No bait allowed!!

TIPS FOR CATCH AND RELEASE
ALL FISH IN ALL WATERS

TACKLE
- **Use strong tackle and bring the fish in quickly.**
- **Use flies or lures and single barbless hooks.**

HANDLING FISH
- **Keep the fish in the water while removing the hook.**
- **If the fish is hooked deeply, cut the line near hook.**
- **DO NOT touch head especially the eyes and gills. DO NOT squeeze the fish.**
- **Measure and photograph the fish while it is in the water.**



Late July 2011

BASS ABOVE THE BARRIER !!!!

How did they get there??????

Floods in winter of 2010 filled in behind barrier creating a fish ladder at high flows.

Mechanical Removal

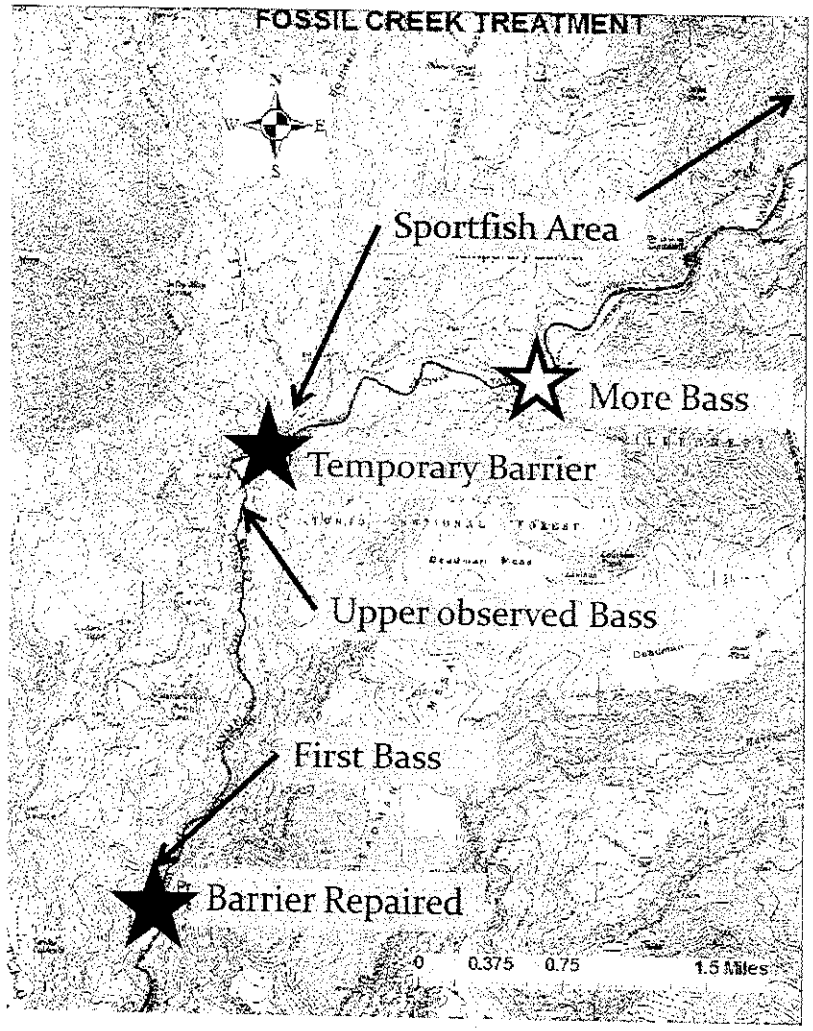
Build temporary barrier upstream

Aug 2011

Fix Permanent Barrier

Bass contained

Begin discussions of chemical renovation and treatment Plan



More Bass April 3, 2012 Bass discovered upstream of temporary barrier.

Response to newly discovered bass

- **Did extensive surveys for bass above the temporary barrier.**
  - Only found bass at the homestead camp site (150 ft off the road) about 1.25 miles upstream of the temporary barrier. None found near temporary barrier.
- **AGFD spent many months removing bass (May-July).**
  - 8 of 9 observed bass were removed.
- **Five follow up surveys from Irving to temporary barrier in July and August.**
  - The single Bass "the one that got away" observe on one survey.
    - "the one that got away" still maintains its nickname.
    - We will continue to attempt to find and remove any observed bass
  - No small bass (young of the year) observed upstream of the temporary barrier

Proposed Treatment

- Chemical renovation from the temporary barrier to the permanent barrier
- Proposed Salvage and treatment in September 2012
- In the process of gathering public feedback and Commission approval.

Proposed treatment schedule

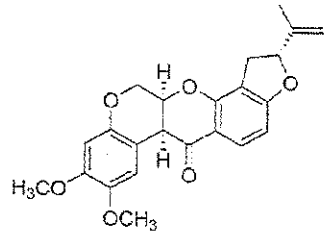
- Crew shows up on Tuesday for ***mandatory*** training and crew assignment (crew leaders must be certified aquatic pesticide applicators)
  - Crews
    - Base Camp
      - Safety officer
    - Rotenone drip stations (Three stations)
      - Crews of two or three
    - Spraying and sand crews (three)
      - Crews of two to four
    - Detoxification station
      - Crew of four
    - Law enforcement
- Treatment starts Wednesday morning (8 hour treatment)
- Detoxification continues for an additional 12-20 hours unless sentinel fish are still dying.
- Cleanup begins on Thursday
- Cleanup continues on Friday

Proposed Fossil Creek Closure

- The Forest Service proposes to close access to Fossil Creek including Fossil Springs beginning Saturday, September 8. Closures will likely be from Tuesday through Friday each week through the end of September, or until the removal of bass is complete. The closure is for the purpose of protecting public safety.

- Limited access will be allowed to individuals whose destination is Childs on the Verde River. These individuals will be required to display a pass that will be available at the closure located at the intersection of FS road 708 and 502.

What is rotenone?



- Botanical substance derived from legumes
- Used for centuries to capture fish for food in many countries
- Used in agriculture, pest management
- Used in fisheries management since 1930's; affects gill breathing organisms by interfering with cellular respiration
- Degrades rapidly in environment

Rotenone use in Arizona

- Since 1990, AGFD has used rotenone as a fish removal tool in 22 waters
  - 15 golf course ponds or stock tanks
  - 4 streams
  - 3 lakes

How is rotenone used for fish management?

- Can be applied in streams, lakes, and reservoirs as a fish removal tool for the following circumstances:
  - Control of undesirable fish
  - Eradication of harmful exotic fish
  - Eradication of fish to control disease
  - Restoration of threatened and endangered species

Why are we using rotenone in Fossil Creek?

- Native fishes are in trouble! Fossil Creek is an important refuge for many native aquatic species
- Mechanical removal not sufficient to remove smallmouth bass
- Best tool to meet our objectives

Rotenone EPA registration

- Rotenone is registered as a restricted use pesticide for fish removal by the Environmental Protection Agency (EPA)
- Applications of rotenone are designed and implemented following product label requirements and the Rotenone Standard Operating Procedures Manual as regulated by the EPA
- EPA conducts risk analyses and scientific studies to determine safe levels for use

Regulations and oversight

- Rotenone use must adhere to the following:
  - EPA re-registration of rotenone
  - Rotenone product labels
  - Rotenone Standard Operating Procedures Manual
  - Department of Environmental Quality Pesticide Discharge Management Plan guidelines
  - National Environmental Policy Act guidelines
  - AZGFD Commission Policy on Rotenone
  - AZGFD Piscicide Treatment Planning and Procedures Manual
  - Internal review and public outreach

Toxicity of rotenone

- Highly toxic to gill breathing organisms: fish, tadpoles, and macroinvertebrates

- Not toxic in amounts we use to other animals because of natural enzymes in the digestive tract that neutralize rotenone

Toxicity = Concentration + Exposure

Rotenone and the environment

- Degrades quickly by physical processes and biological mechanisms (such as temperature, sunlight, oxygen, and pH)
- Breaks down further with use of $KMnO_4$
- In moving water, rotenone degrades within hours
- In standing water, rotenone degrades from days to months
- Absorbs to soil particles, limiting mobility

Rotenone and the environment

- Because rotenone is highly insoluble in water and binds to organic matter (soil), it has limited mobility to reach groundwater

- Long-term monitoring (10 years) at Lake Davis in CA did not detect rotenone or any formulation products in 80 wells within treatment area

Conclusions

- Bass are above the fish barrier in Fossil Creek
- Bass threaten the existence of native fish in this important native fish haven.
- We believe that bass are currently contained between the permanent barrier and the temporary barrier.
- We propose chemical renovation of the area between the permanent and temporary barriers.
  - After successful renovation, the temporary barrier will be removed.

Conclusions

- Rotenone will not contaminate groundwater, so there it little risk of public exposure to treated drinking water
- Terrestrial wildlife may be exposed during treatment, but cannot consume enough treated water to reach toxic levels
- Fish, aquatic invertebrates, and larval amphibians are most sensitive
- Aquatic invertebrates generally completely recover within 1 year

Conclusions

- Fishery managers evaluate potential impacts closely, developing treatment plans to minimize exposure to the public and non-target organisms
- EPA reregistration, product labels, rotenone SOP manual, AZGFD Commission Policy on rotenone, and AZ Piscicide Manual serve as critical guides to conduct safe treatments
- End point of rotenone treatments can be controlled using $KMnO_4$ for neutralization

Thank you!
Questions???

Toxicity of rotenone

- Maximum concentration for use is 200 parts per billion (ppb) rotenone in water
  - 200 ppb = 1000x below dose with no effects on humans
  - EPA determined safe for drinking water at 40 ppb and for water contact (swimming) at 90 ppb
  - AZ treatments range between 25-100 ppb
  - EPA and labels require temporary area closures until acceptable levels return

Rotenone and Parkinson's Disease

- Rats and mice injected with large amounts of pure rotenone for weeks to months into the brain, veins, skin or into the stomach reproduce some symptoms of PD
- These studies research pathway of PD, not to find the cause
- No studies conclusively link rotenone exposure and PD
- Unrealistic exposure route for humans

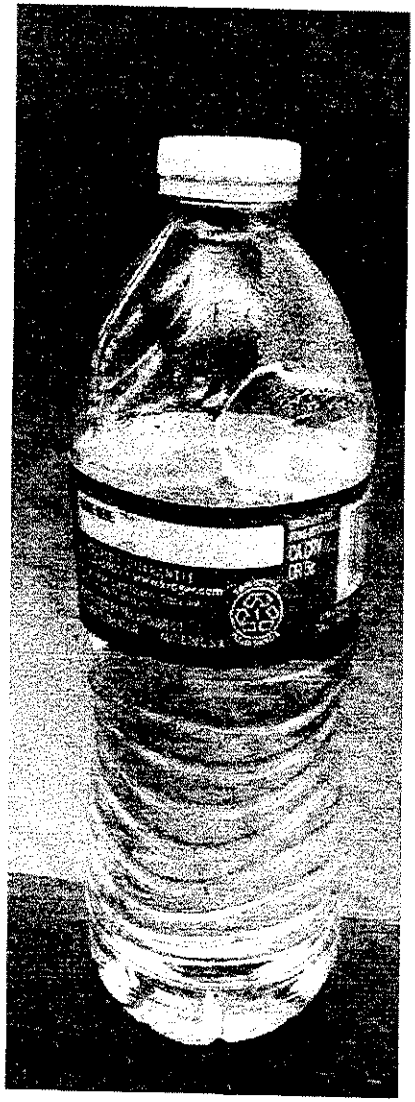
Exposure example #1

- Rotenone injected into rats at a concentration of 5.0mg/kg body weight daily for 12 weeks produced PD-like symptoms

- What is the equivalent for humans?

Exposure example #1

- At a 50 ppb rotenone treatment, a 154 lb person would have to be injected with 1,800 gallons/day for 12 weeks to produce PD like symptoms
- That's 15,000 small (500ml) water bottles injected daily for 3 months



Exposure example #2

- A single lethal dose of rotenone for humans is 300-500 mg/kg body weight

- If a 160 lb person consumed water from a rotenone treatment at 200 ppb, they would have to consume 23,000 gallons of the treated water in one sitting to achieve a lethal dose

Risks to humans

- EPA considers chronic risk to humans from rotenone exposure during fish removal treatments to be low because:
  - Rapid degradation of rotenone
  - Faster degradation at end point with $KMnO_4$
  - New engineering controls and safety gear protect applicators
  - Applications follow label requirements
  - Adequate signage, public notice, and/or area closures to minimize public exposure during treatments

APPENDIX C

PROPOSED FOSSIL CREEK RENOVATION
PUBLIC MEETING

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Michele James	PO Box 5870 Flagstaff, AZ 86011 NAU	Michele.James@NAU.EDU	(928) 774-3056	Biological Sciences Dept NAU
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