

# Renovation of Stocktanks in the Fossil Creek Watershed: Final Report



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August 2005

Document No.: USFWS-AZFRO-FL-05-011

## Introduction

During the initial planning stages of the Fossil Creek Native Fish Renovation Project, biologists identified a need to address the impacts of non-native fish and crayfish populations at the watershed level and their potential to access Fossil Creek during runoff events. Stock tanks within the Fossil Creek drainage were identified as a potential source of non-native fish within the watershed. Although the primary concern was that non-native fish may enter Fossil Creek during high flow events, the removal of non-native fish from stock tanks occupied by the threatened Chiricahua leopard frog (*Rana chiricahuensis*) would also aid on-going recovery actions for the frog.

An aerial flight conducted by the Bureau of Reclamation in June 2002 located 127 stock tanks in the Fossil Creek drainage. Sixty-five of the stock tanks were dry, 48 were holding water, and 14 were of undetermined status. Of the 62 stock tanks that were holding water or of undetermined status, 48 drained directly into Fossil Creek upstream of the proposed fish barrier and were identified as potential points of entry for non-native fish and crayfish into Fossil Creek.

In 2003, the Bureau of Reclamation, under the Central Arizona Project Fund Transfer Program, contracted the University of Arizona to survey these 48 stock tanks to determine which tanks contained non-native fish and would need to be renovated prior to the restoration of Fossil Creek. During this study, each of the tanks was surveyed using several methods including seines, minnow traps, and gill nets; only five of the tanks contained non-native fish (Cashins 2003). The five tanks (Soldier Mesa, Mack's, Divide, Middle, and Black) are all located on the Coconino National Forest, east of Camp Verde off Highway 260 (Figure 1). Soldier Mesa, Divide, Middle, and Black tanks all contained green sunfish (*Lepomis cyanella*) and Mack's Tank contained goldfish (*Carassius auratus*).

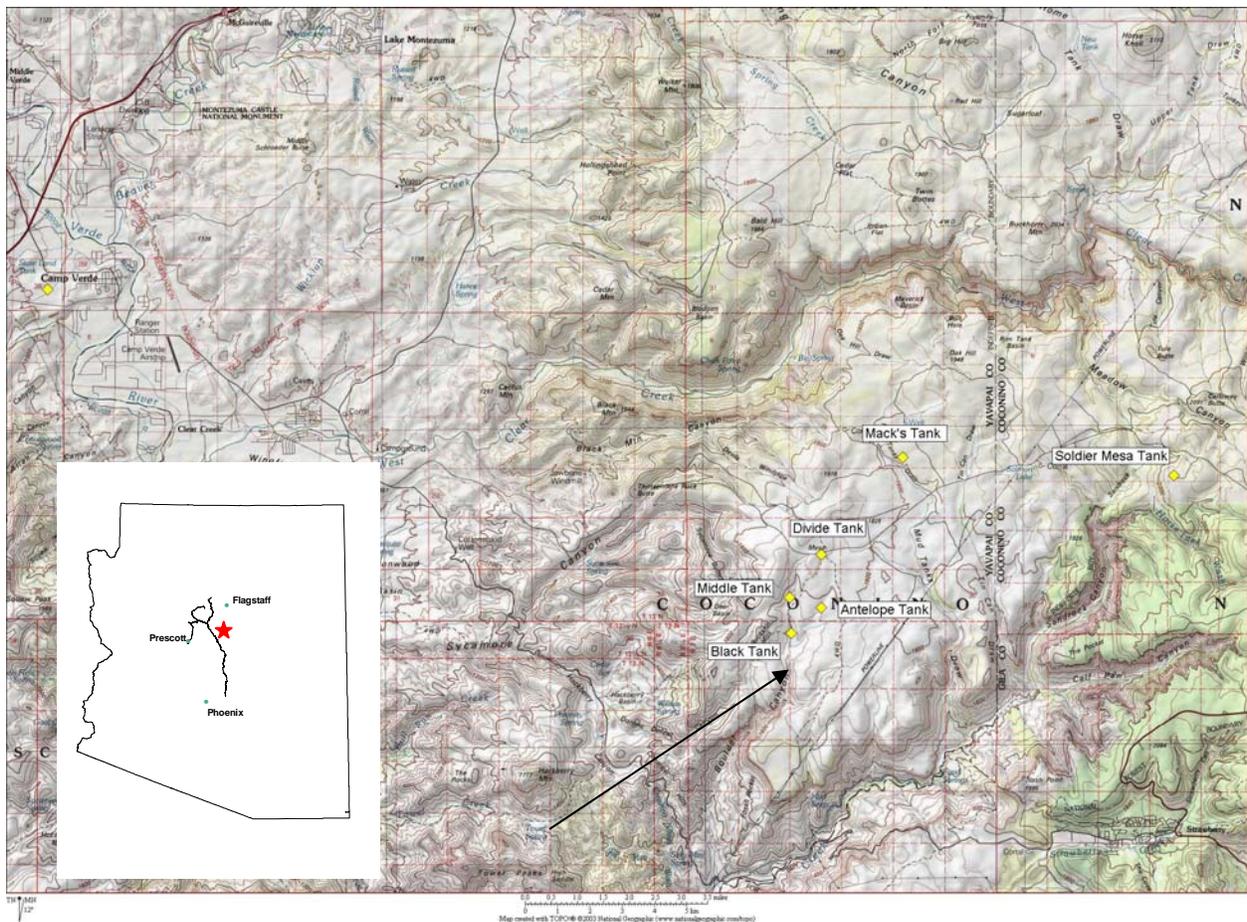


Figure 1. Yellow diamonds indicate location of stock tanks within Fossil Creek drainage that were renovated during 2005. Arrow indicates start of Boulder Canyon, which was also treated downstream to the confluence of Fossil Creek.

In June 2004, the Bureau of Reclamation awarded a contract to the U.S. Fish and Wildlife Service's, Ecological Services Flagstaff Suboffice and the Arizona Fishery Resources Office, to remove non-native fish from the five tanks and complete monitoring prior to the return of full flows to Fossil Creek, which was in June 2005. The objective of the project was to eliminate non-native fish from these stock tanks to remove a potential source of contamination to Fossil Creek and promote further conservation of Gila River basin native fishes. The contract specified completion of the following tasks: (1) pre-treatment coordination with the Coconino National Forest and livestock permittees, (2) renovation using pumps and a chemical piscicide, accompanied by (3) detoxification, (4) removal of sediment and sealing of Black Tank, (5) post-treatment monitoring to assess treatment effectiveness, (6) re-treatment if necessary, followed by post-treatment monitoring, and finally (7) preparation of a final report that documented project completion.. This chapter represents fulfillment of objective 7 under CAP Funds Transfer Program, Task 4-47.

## **Methods**

### *Coordination*

We completed the renovation as a cooperative project among the U.S. Fish and Wildlife Service, Arizona Game and Fish Department, and Coconino National Forest. We met with Coconino National Forest Service staff and the grazing permittees for the Fossil Creek, Thirteen Mile, and Hackberry-Pivot Rock allotments on March 3, 2004. The permittees did not oppose the proposed action and agreed that if we planned the project so that no livestock were in the pastures during or immediately following the renovation, they would not have any issues with the project. We agreed to keep them informed throughout the project of our progress and any changes to the proposed renovation plan. During later discussions, the Forest Service expressed concern over pumping the stock tanks dry due to drought conditions and because the tanks might not re-fill. Therefore, we decided to use piscicide to remove non-native fish versus pumping the stock tanks dry.

### *Plan Development and Consultation*

Originally we planned to complete the project during the spring and summer of 2004, prior to the chemical renovation of Fossil Creek. The original proposed action included pumping the tanks dry when they were low (prior to monsoon season) and removing sediment from Black Tank to increase its ability to hold water. However, as noted above, the Forest Service did not want to pump the tanks dry during a drought. Therefore, we determined that the best alternative would be to chemically renovate the stock tanks with piscicide. During the NEPA process, only antimycin was analyzed and approved for use on Fossil Creek. However, we were concerned about the effectiveness of antimycin due to the high pH environment of these stock tanks. Based on several years of water quality data collected by the U.S. Fish and Wildlife Service and Arizona Game and Fish Department, the mean pH of the five stock tanks ranged from 8.4 to 9.8, which could render the antimycin ineffective. We worked with the Forest Service to complete an amendment to the Fossil Creek Native Fish Restoration Environmental Assessment. This document analyzed whether the effects of using rotenone in the stock tanks would be the same as using antimycin. The effects were determined to be similar, so we received approval from the Forest Service to use rotenone. However, we did not receive this approval until the renovation of Fossil Creek was underway, so the stock tanks were treated after Fossil Creek was chemically renovated. In addition, a very wet winter in 2004 resulted in the tanks overflowing into Boulder Canyon and an additional stock tank (Antelope Tank), so we also treated these areas.

We developed a pesticide use plan (PUP) in cooperation with the U.S. Forest Service and Arizona Game and Fish Department to guide the application of the chemical renovation of the stock tanks. This task was completed in early December 2004 and the PUP was signed by U.S. Forest Service's Regional Office on December 17, 2004. We conducted informal section 7 consultation on potential effects from the project on the Chiricahua leopard and received a concurrence letter from the Fish and Wildlife Service dated March 21, 2005. NEPA compliance was completed via the Final Environmental Assessment for Native Fish Restoration in Fossil Creek (Bureau of Reclamation 2004) and amendment.

## Results

### *Renovation*

Renovation of all five tanks was completed by March 29, 2005. The Bureau of Reclamation provided the rotenone (Prentox®) in late January 2005. The U.S. Fish and Wildlife Service and the Arizona Game and Fish Department completed all renovations as a cooperative effort. Prior to treatment, we calculated the volume of each tank and the appropriate amount of rotenone to treat to the label specifications. The four stock tanks containing green sunfish were treated with rotenone at 1 part per million (ppm) and Mack's Tank, which contained goldfish, was treated at 4 ppm (per the label specification for goldfish). Rotenone was applied using backpack sprayers along shorelines and small boats to cover deeper sections of each tank. We used electric boat motors to mix the chemical into the water column. In all tanks containing green sunfish, distressed fish began appearing in approximately 15 minutes after chemical application, and fish were dying or dead within one hour of application. Mack's Tank contained goldfish; it took approximately three hours before fish began dying.

In addition to the five stock tanks, we treated a sixth stock tank (Antelope Tank) and portions of Boulder Canyon (a tributary to Fossil Creek that drains Divide, Antelope, Middle, and Black tanks) with rotenone on March 23, 30, and April 13, 2005. Although we had not originally planned to treat Antelope Tank or Boulder Canyon, high winter precipitation caused the stock tanks to overflow into the Canyon and green sunfish were able to move down drainage from Middle and Black tanks. We coordinated the treatment of these additional areas with the Arizona Game and Fish Department and Forest Service. Antelope Tank and Boulder Canyon were both treated at approximately 1 ppm. We used 2.83 gallons of rotenone to treat Boulder Canyon and 0.73 gallons to treat Antelope Tank. Table 1 lists the approximate stock tank volumes and gallons of rotenone used.

Table 1. Amount of Prentox® used to treat stock tanks and Boulder Canyon in the Fossil Creek drainage.

Stock Tank Name	Volume (acre/foot)	Gallons of Prentox® needed to treat at 1ppm	Gallons of Prentox® needed to treat at 4ppm
Soldier Mesa Tank	2.84	0.95	
Divide Tank	8.45	2.82	
Middle Tank	6.25	2.08	
Black Tank (including arm)	5.61	1.87	
Mack's Tank	4.83		6.44
Antelope Tank	2.2	0.73	
Boulder Canyon	8.49	2.83	

We did not use potassium permanganate to detoxify the rotenone following renovation since livestock would not use these tanks for several months following treatment. In addition, the organic load in the tanks helped detoxification to progress without the use of additional chemical.

We signed all stock tanks during piscicide treatment and announced treatment dates and locations in the local newspapers to ensure that the public was aware of temporary closures at the stock tanks. All access points were also posted with this information.

### *Monitoring*

We began monitoring the five tanks began on August 9, 2005. We sampled tanks using monofilament sinking experimental gill nets (100ft x 6ft) set for approximately 24 hours. No fish were captured during this monitoring effort. In addition, crayfish densities in Soldier Mesa and Divide Tank appeared reduced. These stock tanks are very simple habitats and as such, this monitoring protocol was determined to be adequate to determine whether fish were present within the tanks. Cashins (2003) used the same sampling technique when he originally surveyed the tanks. Because of their potential use for ranid frog recovery, these tanks will continue to be monitored into the future.

## Discussion and Recommendations

As described above, the original methods for accomplishing the objectives were modified extensively. The overall objective was met with these modifications and the non-native fish have been removed from the stock tanks and drainages that could act as source areas for contamination of Fossil Creek. The project was successful due to effective communication among the agencies involved and the flexibility of the program and the agencies to respond to changing conditions. For long-term success, we need to continue to actively deter the public from stocking fish in these stock tanks and be prepared to chemically renovate these tanks again if non-native fish are detected. Therefore, we offer the following recommendations:

- We recommend that agency law enforcement personnel assist biologists working in this area to ensure that non-native fish are not re-stocked in these tanks. In conjunction with our Chiricahua leopard frog recovery work, the U.S. Fish and Wildlife Service Ecological Services Flagstaff SubOffice and Arizona Game and Fish Department (Region 2) intend to continue to monitor the six treated stock tanks for the presence of non-native fish. We know that Divide Tank was re-stocked with green sunfish following the 2002 drought, and we expect that this may happen again. We are working with the Arizona Game and Fish Department and U.S. Forest Service to post signs reminding the public that it is illegal to move live fish, crayfish, and bullfrogs into these stock tanks. However, all agencies should target enforcement and education to keep these species out of the area.
- We recommend that all agencies including Arizona Game and Fish Department, U.S. Fish and Wildlife Service, U.S. Forest Service, and Bureau of Reclamation develop a plan for periodic monitoring of Boulder Canyon and all of the stock tanks that drain into Fossil Creek above the barrier. In order to keep non-native fish out of the renovated portion of Fossil Creek, we need to ensure that potential sources of contamination are identified and dealt with rapidly. Currently there are a number of stock tanks on the Coconino National Forest side of Fossil Creek that are monitored by the Fish and Wildlife Service, Arizona Game and Fish Department and Forest Service. However, there are many stock tanks that are not visited, particularly on the Tonto National Forest that should be periodically monitored. The plan should identify a schedule for surveying the tanks that are not visited regularly, as a part of ranid frog or other surveys.
- We recommend that agencies and cooperators meet annually to discuss the results of on-going monitoring in Fossil Creek and the surrounding areas (including the stock tanks and Boulder Canyon) and identify tasks each agency can complete to ensure we are actively working to keep non-native fish out of Fossil Creek.
- We recommend that the Arizona Game and Fish Department, Fish and Wildlife Service, Forest Service, and Bureau of Reclamation work with other interested parties to develop a method of controlling crayfish. Currently, crayfish occur in Fossil Creek and in many stock tanks in the drainage. Control of this non-native species would benefit all native fish and ranid frogs. Three of the six stock tanks that were chemically renovated cannot be used by Chiricahua leopard frogs due to the presence of crayfish.

## Literature Cited

Cashins, Scott. 2003. Fossil Creek stocktank Survey: Coconino National Forest. Final Report to the U.S. Fish and Wildlife Servi In partial fulfillment of Cooperative Agreement No. 1425-97-AA-32-00410 (BOR) and No. 1448-20181-97-H716 (FWS) For Central Arizona Project Fund Transfer Program Task 4-30.

Final Environmental Assessment Native Fish Restoration in Fossil Creek, Coconino and Tonto National Forests, Arizona. 2004. U.S. Department of the Interior, Bureau of Reclamation, 170pp.