

# ARIZONA NATIVE FISH RECOVERY AND NONNATIVE FISH CONTROL

FWS Agreement No. 201816J808

Final Report—May 28, 2010

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## INTRODUCTION

The Central Arizona Project (CAP) Gila River Basin Native Fishes Conservation Program (Program) was established in response to the 1994 biological opinion on CAP water transfers to the Gila River basin for the purposes of conserving native fishes and managing against nonnative fishes. By transporting non-native fishes between the Colorado and Gila River basins, the CAP is likely to adversely affect aquatic and riparian species within the entire basin of the Gila River, including headwater streams in Arizona. A high priority of the CAP Program to conserve and recover native fishes of the Gila River basin is to replicate remaining populations of federally listed species into suitable, protected streams and repatriate populations of listed and other native fishes into streams from which they have been extirpated. The objective of the cooperative agreement was for Arizona Game and Fish Department (Department) and the U.S. Fish and Wildlife Service (Service) to work cooperatively to monitor, assess, and recover federally listed and native species impacted by the operation of the CAP, with emphasis on spinedace *Meda fulgida*, razorback sucker *Xyrauchen texanus*, Gila topminnow *Poeciliopsis occidentalis*, Gila chub *Gila intermedia*, and loach minnow *Rhinichthys cobitis*.

This final report fulfills section VI.B.8 and section XIII.A requirements under the cooperative agreement to provide a draft report of each task to the Service Project Officer within 22 months after the final signature on the agreement (fully signed on June 28, 2006). The period of the agreement was from June 28, 2006 through June 28, 2008, but was extended to October 31, 2009. This report summarizes activities through October 31, 2009, during which time \$788,000 was expended. The Department was responsible for nine tasks identified in the scope of the cooperative agreement (section VI.B 1 through 9). The nine tasks were (paraphrased for brevity):

1. Review the list of anticipated stream repatriations provided in Appendix B and determine if the projects are viable. The Department will coordinate with stakeholders that are potentially affected by the project, and then either continue with the project or terminate the project.
2. Accomplish necessary environmental compliance, and undertake the actual repatriation and monitoring.
3. Review recent and historical collection records for loach minnow and spinedace in Eagle Creek and Verde River.
4. Perform an intensive, opportunistic fish survey of Eagle Creek targeting known and suspected loach minnow and spinedace sites.
5. Perform an intensive, opportunistic fish survey of the Verde River targeting known and suspected spinedace sites.

6. Transport live samples of loach minnow and spikedeace to Bubbling Ponds Hatchery Research Facility (Bubbling Ponds).
7. Provide quarterly progress reports for each project.
8. Provide a draft report for each task to the Project Officer within 22 months after the last signature on the agreement.
9. Incorporate comments from the project officer and cooperators in the draft report and provide a final report to the Project Officer within 30 days of receipt of comments.

Priority Actions identified in Appendix B were:

1. Acquire loach minnow and spikedeace
2. Turkey Creek repatriations
3. Post/Welsh repatriations
4. Ash Creek repatriations
5. Topminnow stockings
6. Arizona trout stream repatriations
7. Redrock Canyon repatriations
8. Arnett Creek repatriations
9. Blue River repatriations
10. Boyce-Thompson Arboretum renovation

## **RESULTS**

The Department was able to fully staff the program by December 2007. Immediately after the signing of the cooperative agreement, a temporary Department program manager was assigned to the program. A full-time program manager was hired in November 2006. A program coordinator was hired in March 2007, and a program biologist was hired in December 2007. The program coordinator and biologist both moved on to other positions in 2008; both positions were refilled early in 2009.

A protocol to safely and securely transport live fishes was written, and equipment necessary to safely and securely transport live fishes was purchased. In addition, a Hazard Analysis and Critical Control Point (HACCP) plan for the collection, transportation, and stocking of listed-native fishes within the Gila River Basin was written, and protocols implemented to avoid the inadvertent transportation of unwanted non-target organisms.

Most priority actions are still in progress. Program staffing issues and bureaucratic processes within the Department and within the various cooperating agencies caused some delays. In addition, because population establishment is the metric of success for attempted repatriations, periodic post-project monitoring is necessary. The cooperative agreement scope of work, part VI.B.1.f indicates that the Department is responsible for monitoring the repatriated populations at 1 year post-stocking. However, population establishment can require more than one stocking. For example, if few or no fish are captured during post-stocking monitoring, then an additional stocking(s) become necessary to establish a population. Conversely, it might be determined that the site does not provide conditions suitable for population establishment, and therefore the project can be terminated.

Status and results of each of the priority actions listed in Appendix B of the cooperative agreement, and additional actions that were added by the Technical and Policy Committees, are given below. Results of the first six tasks listed in section VI.B of the cooperative agreement are incorporated within the results of the priority actions. Project descriptions were derived from annual fund transfer agreements between Reclamation and the Service.

For the projects that include repatriations, the goal is to establish populations within the systems where the species are stocked (i.e., to repatriate the species to the systems). A population is considered to have established (a successful repatriation) when it is reproducing to the point where it is self-sustaining (Griffith et al. 1989, Bright and Smithson 2001, Armstrong and Seddon 2007). Monitoring is necessary to determine if a population has established. Williams et al. (1988) recommended regular monitoring after repatriations to determine initial survival, recruitment of young, and persistence through environmental stochasticity. Reproduction occurs during establishment, therefore evidence of reproduction does not in and of itself indicate that a population has established. Evidence of production of successive generations over an extended period of time (years) is partial evidence that a species has established a population. Positive population growth and spread (increased dispersion) are other indicators of population establishment (Ostermann et al. 2001; Bright and Smithson 2001).

### **Acquire Spikedace and Loach Minnow**

Status: Ongoing.

Description: This task originally had a focus just on spikedace from the Verde River and spikedace and loach minnow from Eagle Creek, but it was expanded to include all populations of spikedace and loach minnow in need of refuge populations or propagation. Each population is likely genetically unique (Tibbets and Dowling 1996) and represents a significant remnant of the evolutionary legacy of these declining species. It thus is essential to acquire individuals from them as an assurance against extirpation in the wild of these distinctive lineages. Intensive, directed efforts to capture individuals, bring them into a holding and propagation facility, build up their numbers, augment source stocks, and replicate populations into streams, must occur in the immediate future. The Department will also coordinate with tribes and the State of New Mexico to acquire spikedace or loach minnow from their jurisdictions. Fish will be transported alive to Bubbling Ponds.

Results: We acquired data on spikedace and loach minnow locations from SONFISHES (Arizona State University), the Department's Habitat Data Management System (HDMS), New Mexico Department of Game and Fish (NMDGF), the Service, and several university professors. Since the 1980s, spikedace have been found in eight localities, representing five populations, three in Arizona and two in New Mexico (Desert Fishes Team 2003, USFWS 2007, Paroz and Propst 2007). Populations within Arizona are: 1) Eagle Creek, 2) Aravaipa Creek and its tributaries, and the middle Gila River near Cochran (may be an artifact of fish washing down from Aravaipa Creek during flood events), and 3) the Verde River. However, the species is only consistently found at one of the Arizona locations, Aravaipa Creek. Spikedace were last captured in 1999 in the Verde River, 1991 in the middle Gila River near Cochran, and in 1989 in Eagle Creek. Populations within New Mexico are found in the upper Gila River (vicinity of the Birding Area) and the Gila River forks. Spikedace remain abundant in the upper Gila River in

the Gila Birding Area, but are rare in the Gila River forks area. Spikedace were last captured in the Middle Fork Gila during 1995.

Based on captures since 1980, there are eight extant loach minnow populations, five in Arizona and three in New Mexico (Desert Fishes Team 2003, USFWS 2007, Paroz and Propst 2007). Populations in Arizona are found in: 1) Aravaipa Creek and its tributaries; 2) East Fork Black River and its tributaries North Fork East Fork Black River, Coyote Creek, and Boneyard Creek; 3) Blue River and its tributaries including those in New Mexico; 4) Eagle Creek; and 5) White River and its tributaries East Fork White River and North Fork White River. However loach minnow in the Blue River may actually be two distinct populations: the upper Blue and lower Blue (Tibbets and Dowling 1996). Loach minnow are only consistently captured in two of the Arizona locations (Aravaipa Creek and Blue River). The status of the population(s) in the White River drainage on the White Mountain Apache Reservation is unknown. Loach minnow were last captured in 1997 within Eagle Creek, and in 2005 in the North Fork East Fork Black River. Populations within New Mexico are found in 1) the San Francisco River and its tributaries, 2) the upper Gila River (vicinity of the Birding Area), and 3) the Gila River forks.

We produced a draft study plan for the project (AZGFD 2007). Also, in collaboration with U.S. Forest Service (USFS), U.S Bureau of Reclamation (Reclamation), and the Service we developed priorities for holding and propagating spikedace and loach minnow at Bubbling Ponds. Two of the main goals for Bubbling Ponds are to provide refuge for rare populations of spikedace and loach minnow, and to propagate the populations in need of replication (Ward 2008). The populations in most need of refuge are those that are the rarest: spikedace from Eagle Creek, Verde River, and the Gila River forks, and loach minnow from Eagle Creek, North Fork East Fork Black River, and Gila River Forks area. Two loach minnow populations (San Francisco River and upper Gila River) are abundant and relatively secure, and so do not require hatchery refuge at this time. Priorities for propagation are different; all populations are in need of replication, but some are higher priority because of the temporal readiness and location of repatriation streams. Loach minnow from Aravaipa Creek, Blue River, and Gila River forks, and spikedace from Aravaipa Creek, the upper Gila River, and the Gila River forks presently have the highest priority for propagation.

As of October 31, 2009, we have acquired spikedace from three of the four metapopulations, and loach minnow from three of the eight metapopulations. We acquired both spikedace and loach minnow from Aravaipa Creek and are holding and propagating both species at Bubbling Ponds. We acquired loach minnow from the Blue River during June 2007, March 2008, and June 2009 (Robinson 2009a), and are holding them and propagating them. We acquired loach minnow and spikedace from the Gila Forks Area (collected by NMDGF), and are holding and propagating them. We acquired spikedace and loach minnow from the upper Gila River (Birding Area) in June 2007 and are holding and propagating spikedace at Bubbling Ponds; all of the loach minnow were lost due to an Ich (*Ichthyophthirius multifiliis*) outbreak soon after acquisition. We acquired more Gila River spikedace from NMDGF in June 2009. We will continue to periodically acquire additional spikedace and loach minnow from the locations mentioned above to maintain brood stock. We began communications to acquire White River loach minnow from the White Mountain Apache Tribe. We sent the Director of the White Mountain Apache Tribe Wildlife and Outdoor Recreation Department a letter requesting loach minnow in February 2008;

to date we have not received a response. In addition, on our behalf, the Service's Arizona Fishery Resources Office (AZFRO) communicated with the White Mountain Apache Tribe about the possibility of acquiring White River loach minnow for refuge and propagation at Bubbling Ponds Hatchery.

Using our study plan and location information from the SONFISHES and HDMS datasets, we surveyed the Verde River, Eagle Creek, and North Fork East Fork of Black River during 2007-2009. We surveyed Eagle Creek in 2007 (Carter et al. 2007) and 2008 (Bahm and Robinson 2009b), targeting reaches not sampled by Paul Marsh of Arizona State University, who sampled his fixed sites. We surveyed the upper Verde River in June-August 2007 (Chmiel 2007a, 2007b, and 2007c), June-July 2008 (Bahm and Robinson 2009a), and June 2009 (Robinson and Crowder 2009). We surveyed the East Fork Black River tributaries during August 2007 (Carter 2007a), July-August 2008 (Robinson et al. 2008), and July 2009 (Robinson et al. 2009). No spikedeace or loach minnow were captured in any of the streams surveyed. In addition, we requested permission (verbally, plus a formal letter was sent in April 2007) from the San Carlos Apache Tribe to survey the portion of Eagle Creek on their lands, and to bring any loach minnow or spikedeace captured back to Bubbling Ponds for refuge and propagation. We worked through AZFRO to coordinate with the San Carlos tribe, and AZFRO scheduled a survey of Eagle Creek on San Carlos Apache lands for the middle of May, 2008, which was subsequently cancelled.

### **Turkey Creek Repatriations**

Status: Ongoing.

Description: Turkey Creek, tributary to O'Donnell Canyon (Babocomari River drainage) in southeastern Arizona, represents historical habitat for longfin dace *Agosia chrysogaster* (last found in 1993), Gila chub (last encountered in 1991), and likely Sonora sucker *Catostomus insignis* and desert sucker *Pantosteus clarki*. However, during 1994 through 2006 no fish were captured and the stream was considered fishless. The dace and suckers are declining range-wide but are still relatively widespread and common, while Gila chub has been listed as an endangered species. O'Donnell Creek upstream from the Turkey Creek confluence was renovated in 2002 to remove green sunfish *Lepomis cyanellus* and restore its population of Gila chub. The O'Donnell Creek population of Gila chub could be replicated in Turkey Creek. This opportunity was especially attractive because non-native fishes were considered absent from Turkey Creek and a native fish assemblage thus could be restored without threats of alien fishes. Attributes that help reduce the chance of reinvasions by non-natives include relative isolation from O'Donnell Creek and Babocomari River by many miles of normally dry streambed. Tasks for the Department were to survey to confirm fishless status, evaluate for the potential emplacement of a fish barrier, complete environmental compliance, and then capture appropriate numbers of Gila chub from O'Donnell Creek and translocate them to Turkey Creek. It also was recommended that longfin dace, Sonora sucker, and desert sucker from suitable source populations be repatriated to the stream.

Several additions to the planned tasks occurred. After the repatriations of longfin dace and Gila chub (see Results), nonnative fish were found in Turkey Creek and Gila chub did not establish. Therefore a renovation became necessary to secure the stream for native fishes. A fish barrier needs to be erected either in Turkey Creek or downstream in O'Donnell Creek to prevent the

reinvansion of nonnative fishes. The Department will communicate with all private landowners in Turkey Creek drainage and attempt to acquire permission to eradicate (likely via chemical renovation) nonnative fishes in all tanks and perennial stream sections. If landowners are agreeable to a renovation and if a barrier is constructed, then the Department will renovate the tanks and stream, prior to repatriating native fishes.

Results: The Department's Region 5 personnel stocked nine Gila chub (O'Donnell Creek stock from International Wildlife Museum) and 50-100 longfin dace into Turkey Creek during December 2006. During April 2007, Department personnel surveyed Turkey Creek and O'Donnell Creek (Carter et al. 2007; Clarkson et al. 2007); other reaches of O'Donnell Creek were surveyed by Reclamation at the same time. No Gila chub were captured in Turkey Creek, but 27 longfin dace were captured. Gila chub were captured in O'Donnell Creek, but were not very abundant (Clarkson et al. 2007). The decision was made to write a new Environmental Assessment Checklist which would allow augmentation of Turkey Creek, O'Donnell Creek, and stocking of Gila chub and longfin dace into a pond on private property along Turkey Creek. Suzanne Ehret drafted the EAC, but it has yet to be fully signed. Department personnel surveyed Turkey Creek again in November 2007 and found three green sunfish and numerous longfin dace (Ehret 2007a). Department and Reclamation personnel surveyed Turkey Creek on May 7 2008 and found green sunfish and largemouth bass *Micropterus salmoides* (Ehret 2008a). Three ponds on a private parcel upstream of the perennial portion of the stream were also surveyed during 2008, two had mosquitofish *Gambusia affinis*, green sunfish, and largemouth bass, and the third had green sunfish (Ehret 2008b). The stream and all upstream stock tanks will have to be renovated before native fish are stocked into Turkey Creek; the feasibility of renovation needs to be agreed upon by all stakeholders. We communicated with the two private landowners, one was agreeable to the project and the other would not make a decision. If he doesn't decide by the end of summer 2010, we will consider the answer a negative. Regardless, the amount of available habitat for Gila chub in Turkey Creek appears to be fairly limited, as the cooperative land owner communicated that the creek went mostly dry, except for a few isolated pools, during the summer of 2009.

### **Post Canyon/Welch Spring Repatriations**

Status: Ongoing.

Description: Post Canyon is a spatially intermittent tributary to O'Donnell Canyon (Babocomari River drainage) in southeastern Arizona. Due to lack of historical surveys, the only native fish recorded from Post Canyon is Gila chub. However, downstream in O'Donnell Canyon, longfin dace and Sonora sucker were present until very recently. Several other native fishes, such as desert sucker, and desert pupfish *Cyprinodon macularius* were historically found in the Babocomari River. The dace and suckers are declining range-wide, while the pupfish and Gila chub are listed as endangered.

Upstream of the confluence of Post Canyon and the unnamed canyon containing Freeman Springs, a reach of perennial surface flow is associated with Welch Spring, an in-channel upwelling in Post Canyon. This perennial reach has no records of fish. A bedrock ledge about 1.6 km below Welch Spring forms a partial, and possibly complete, barrier to upstream fish movement. Above the ledge, the stream flows through a lush cienega of long, narrow, deep

pools connected by small channels or marshy areas of poorly defined channel. This opportunity for native fish restoration is especially attractive because non-native fish are absent, allowing restoration of a native fish assemblage without threats of alien fish. O'Donnell Creek upstream from the Post Canyon confluence was renovated in 2002 to remove green sunfish and restore its population of Gila chub. Post Canyon in the Welch Spring reach offers an opportunity for replication of that chub population. Tasks for the Department were to survey to confirm fishless status, complete environmental compliance, and capture and translocate an appropriate number of Gila chub from O'Donnell Creek to Post Canyon. Other native fishes such as longfin dace, Sonora sucker, and desert sucker could also be repatriated if suitable habitat exists.

Several additions to the planned tasks occurred. After the initial fish survey (see below) the habitat in Post Canyon near Welch Spring was assessed to be insufficient for native fish establishment. However, sufficient habitat was present in a short perennial section downstream of two dams in the unnamed canyon containing Freeman Spring. This perennial section contains green sunfish, so a renovation would be necessary prior to establishment of native fish. Post Canyon downstream of the perennial section is typically dry, which would reduce, but not eliminate the chance of nonnative fish reinvasion. A barrier would need to be constructed downstream to prevent the upstream migration of nonnative fishes. A barrier in lower O'Donnell Creek would protect Post Canyon, but a barrier further upstream in O'Donnell Creek would not. If the decision is made to move forward with the renovation and establishment of Gila chub into the perennial section, with or without a barrier, the Department and Bureau of Land Management (BLM) will complete necessary environmental compliance, and the Department will then renovate the section and subsequently stock Gila chub, and possibly other native fishes as described above.

Results: Post Canyon, Welch Spring, and Freeman Spring and the canyon downstream to the confluence with Post Canyon were surveyed by Research and Region 5 personnel during April 2007 (Ehret et al. 2007). Habitat in Post Canyon downstream of Welch Springs was assessed to be insufficient for native fish re-establishment. There did appear to be sufficient habitat near Freeman Springs and between and below two dams in the canyon just upstream of the confluence with Post Canyon. However, green sunfish were present below the two dams. In addition, personnel from the National Audubon Society's Appleton-Whittell Research Ranch communicated that Freeman Springs tends to dry every year during the early summer, and the only reach that has perennial water is just below the two dams. On May 7, 2008 the Department surveyed below and between the two dams (Ehret 2008c). One hundred and thirty-nine green sunfish were mechanically removed from below the two dams; no fish were captured between the two dams. We propose to renovate the reach below the two dams, and then stock Gila chub and longfin dace. We began coordination with the various agencies to complete this action. A biological assessment and evaluation and possibly ESA consultation needs to be completed by Bureau of Land Management and an Environmental Assessment Checklist needs to be completed by Department.

### **Ash Creek Repatriations**

Status: Deleted.

Description: Ash Creek is a 14-mile long, intermittent tributary to Salt River (Gila River drainage) in south-central Arizona. There are no historical fish records for the upper 7 miles of Ash Creek, but similar streams along the middle Salt River such as Cherry and Coon creeks represent historical habitat for longfin dace, speckled dace *Rhinichthys osculus*, roundtail chub *Gila robusta*, Sonora sucker, and desert sucker. Roundtail chub is biologically imperiled but is not listed as threatened or endangered nor is it a candidate species (but it was petitioned to be listed). There also are no records of non-native fish species from upper Ash Creek, and that reach of the stream was presumed fishless. An opportunity existed to replicate populations of roundtail chub and associated native fishes in upper Ash Creek. This opportunity was especially attractive because non-native fishes were absent from upper Ash Creek and a native fish assemblage thus could be restored without threats of alien fishes. Attributes that help prevent invasions by non-natives include relative isolation from Salt River by several waterfalls that create barriers to upstream movement by fishes. Following a survey to confirm fishless status and compliance with appropriate environmental regulations, it was proposed that appropriate numbers of roundtail chub be captured from Cherry Creek or other suitable source and translocated to upper Ash Creek. It also was recommended that longfin dace, speckled dace, Sonora sucker, and desert sucker from suitable source populations be repatriated to the stream.

Results: After the May 2006 determination by the Service that listing roundtail chub was not warranted, all of the proposed fish species to be stocked into Ash Creek were non-listed species. The Department considered stocking spikedace and loach minnow, but decided not to stock these species in the immediate future because of landowner objections to the stocking of listed fish species. Therefore, CAP funds were not expended on the project.

### **Gila Topminnow Stockings**

Status: Ongoing.

Description: A primary goal of the Gila topminnow recovery plan is to repatriate Gila topminnow into suitable sites throughout its historical range. This species has been extirpated from most of its historical range and much of the historical habitat is irrevocably destroyed or contaminated with nonnative aquatic species. However, small isolated habitats still exist that may have the potential for successful repatriation efforts that, with long-term management, may allow this species to persist into the future and achieve recovery. The Gila topminnow stocking program languished for over a decade (1990s) due, in part, to lack of resources on the part of the management agencies. During that period, many sites were identified as suitable for such repatriation efforts and some portion of those have already undergone all or part of the environmental compliance and other paperwork that is needed to allow stocking to occur. The Department will stock approximately six, but no less than four, sites with Gila topminnow that have already undergone environmental compliance. The sites are to be identified and may be on Federal, State, or private lands. Gila topminnow stocks used will be in accordance with the draft revised recovery plan for the species. Funds will be used for equipment, travel, and other costs associated with the stockings and with short-term monitoring of repatriated populations.

Gila topminnow repatriation sites are often suitable for desert pupfish, because the two species utilize some of the same habitats. Desert pupfish will be stocked into some of the repatriation sites if habitat is judged suitable.



Results: Gila topminnow were stocked into eighteen sites. Gila topminnow repatriations into 10 of these sites are described in more detail within other tasks described in this report; the 10 are: Fossil Creek, Bonita Creek, Morgan City Wash and Chalky Spring, Fresno Canyon, Burro Cienega in New Mexico, and four sites on the Muleshoe Cooperative Management Area. Desert pupfish were stocked into many of the same 18 sites and are also reported here.

Potential sites to repatriate Gila topminnow were visited and evaluated, environmental compliance was completed, and other agencies and landowners were coordinated with before any stockings. Many of the sites described in following paragraphs were identified in the draft recovery plan (Weedman 1999) and in Voeltz and Bettaso (2003) as potential sites to stock Gila topminnow. Posey Well in the San Simon Valley southeast of Safford was evaluated and Department and BLM environmental compliance was completed, but habitat improvements still need to be completed by BLM. Several sites on Tonto National Forest (TNF) were visited, compliance is nearly complete or is complete, and will be stocked during 2010-2011: Rock Springs near Sunflower, Cottonwood Artesian (site #77), Walnut Springs (site #392), and Mud Spring north of Roosevelt Lake. A few other sites on the TNF (Grapevine Canyon, Seven Springs Wash, Camp Creek, and Lime Creek) were visited and evaluated, but environmental compliance has not yet begun because TNF wanted to focus on the sites mentioned above first. Perlite Spring on TNF northwest of Superior was visited but was dry so is no longer being considered. Nursery Tank in McDowell Mountain Regional Park was evaluated and environmental compliance completed, but cattails needed to be removed before fish were stocked; stocking of desert pupfish is planned for 2010. An artificial pond at Utery Mountains Regional Park was evaluated and a Certificate of Inclusion and Department EAC drafted, but neither compliance document has been completed. Five ponds within Robbins Butte Wildlife Area (Arizona Game and Fish Department) were evaluated, and an EAC and Certificate of Inclusion completed. The ponds will be stocked late in 2009 or in 2010. Sites stocked during the reporting period are summarized below.

*Tonto National Forest:* Three sites on TNF were stocked with Gila topminnow: Mud Springs (site #18), Fossil Creek, and Cottonwood Spring. For all sites but Fossil Creek, Gila topminnow originated from Boyce Thompson Arboretum's Ayer Lake and are Monkey Spring lineage (Gila topminnow at Boyce Thompson Arboretum were previously considered a mixed lineage). Sharp Spring lineage Gila topminnow from Dexter National Fish Hatchery (DNFH) were stocked into Fossil Creek.

*Mud Springs (site #18):* Mud Springs is located just off of Highway 87 in the Mazatzal Mountains in the Mesa Ranger District, TNF (Robinson 2008f, Robinson 2009c). Mud Springs consists of four earthen ponds (here labeled as the south, middle-south, middle-north, and north ponds) and a cement tank. On June 12, 2007, 103 Gila topminnow and 146 desert pupfish (Santa Clara Slough origin) collected from Ayer Lake at Boyce Thompson Arboretum were stocked into the south pond; this augmented the existing population of Gila topminnow. Gila topminnow were abundant and desert pupfish were present with ever increasing numbers in July 2007, October 2007, November 2008, and August 2009. On October 15, 2009 27 desert pupfish from DNFH (Santa Clara Slough origin) were stocked.

Desert pupfish from The Nature Conservancy's (TNC) Lower San Pedro River Preserve (El Doctor Marsh origin) were stocked into the fishless pond middle-south pond on June 12, 2008. Desert pupfish were still present in November 2008, and August 2009, and the catch rates in 2009 were greater than 2008. One hundred sixteen Gila topminnow (76 from the cement tank and 40 from the south pond) were stocked on August 26, 2009. On October 15, 2009 25 desert pupfish from DNFH (Santa Clara Slough origin) were stocked.

On July 15, 2008, Gila topminnow from Boyce Thompson Arboretum were stocked into the fishless middle-north pond. Gila topminnow were still present in November 2008, but none were captured or observed in August 2009. On October 15, 2009 74 desert pupfish from DNFH (Santa Clara Slough origin) were stocked.

On July 15, 2008, 121 desert pupfish from Desert Botanical Garden (Santa Clara Slough stock) were stocked into the fishless north pond; 79 died during transport. Desert pupfish were present during monitoring in November 2008 and August 2009. One hundred Gila topminnow from the south pond were stocked into the north pond on August 26, 2009. On October 15, 2009 15 desert pupfish from DNFH (Santa Clara Slough origin) were stocked.

Cottonwood Spring: Cottonwood Spring is on TNF in the Goldfield Mountains. On August 29, 2008, Department and TNF Service personnel collected 200 Gila topminnow from Boyce Thompson Arboretum's Ayer Lake and transported them and stocked them into Cottonwood Spring (Robinson 2008e). During monitoring on November 21, 2008 311 Gila topminnow were captured (Robinson 2008g), and on November 3, 2009 947 were captured. Therefore, a self-sustaining population of Gila topminnow is considered established in Cottonwood Spring. Hopefully the population will continue to persist.

Fossil Creek: We stocked 17,554 Gila topminnow (Sharp Spring lineage) into Fossil Creek during the reporting period. No topminnow were found during any monitoring in 2008, but were found during 2009. For more detail see the Fossil Creek repatriations task.

Maricopa County Parks: Five sites were in Maricopa County Parks. Three of the Maricopa County Parks were enrolled in the statewide Safe Harbor Agreement for Topminnow and Pupfish in Arizona through Certificates of Inclusion. Morgan City Wash and Chalky Spring were not covered under a Safe Harbor Certificate of Inclusion because the land actually belonged to Reclamation.

Pemberton Pond: On March 13, 2009 we stocked 120 Gila topminnow (Cottonwood Spring lineage from aquarium at the Region 6 office) and 79 desert pupfish (69 from Desert Botanical Garden and 10 from the Phoenix Zoo) into Pemberton Pond in McDowell Mountains Regional Park (Orabutt and Robinson 2009). Forty-four topminnow and five desert pupfish were captured during monitoring on May 20, 2009. The remaining 21 Gila topminnow in the Region 6 office aquaria were stocked on July 9, 2009. An additional 51 desert pupfish, from DNFH, were stocked on October 15, 2009 and 33 Gila topminnow were moved from the pond to the cement trough. Hundreds of Gila topminnow were observed in Pemberton Pond before the stocking. Based on the monitoring information, Gila topminnow reproduced but we do not yet know if they have established a self-sustaining population in Pemberton Pond.

Willow Spring: On March 24, 2009 113 Gila topminnow from Boyce Thompson Arboretum's Ayer Lake were stocked into Willow Spring in White Tank Mountains Regional Park; 1056 others died during transportation. On May 1, 2009 an additional 182 topminnow from Boyce Thompson were stocked; 196 others died during transport. No topminnow were seen before stocking the fish on May 1. In June 2009 topminnow were observed in Willow Spring by a Department Wildlife Biologist. On October 30, 2009 an attempt was made to monitor the population, but the spring pool was dry. This site should be considered failed, and it is recommended that it not be reconsidered for any future stockings.

Spur Cross Solar Oasis: On March 24, 2009 404 Gila topminnow from Boyce Thompson Arboretum were stocked into Spur Cross Solar Oasis pond in Spur Cross Conservation Area; 125 other fish died during transport and the fish stocked were in poor health. The pond also contained longfin dace which were stocked in summer 2008. On April 30, 2009 an additional 300 Gila topminnow from Boyce Thompson Arboretum were stocked; it is unclear how many died during transport as the remaining fish were held and stocked into Willow Spring on the following day. No topminnow were seen in the pond before fish were stocked on April 30. John Gunn, the park supervisor, reported that topminnow were abundant in June 2009. During October 19, 2009 monitoring, 918 Gila topminnow were captured, 21% of which were <1 cm TL. Based on monitoring information, Gila topminnow reproduced, but it cannot yet be concluded that they have established a self-sustaining population in Spur Cross Solar Oasis.

Morgan City Wash: We stocked 330 desert pupfish and 2,392 Gila topminnow (Sharp Spring lineage) during 2009. For detail, see the repatriation of native fishes to Morgan City Wash and Chalky Spring task.

Chalky Spring: We stocked 1,214 Gila topminnow (Sharp Spring lineage) into Chalky Spring during 2009. For detail, see the repatriation of native fishes to Morgan City Wash and Chalky Spring task.

Muleshoe Conservation Management Area: Gila topminnow were stocked into four sites in the Muleshoe Conservation Management Area, located in the southwestern edge of the Galiuro Mountains (Robinson 2008h). Gila topminnow stocked were of Bylas Spring lineage. Desert pupfish from TNC Lower San Pedro River Preserve (El Doctor Marsh origin) were also stocked into the same locations, and one additional location. For detail on these sites, see the Muleshoe Ecosystem Repatriations task.

Swamp Springs Canyon: We stocked 524 Gila topminnow and 521 desert pupfish into Swamp Springs Canyon during the reporting period. We tentatively consider Gila topminnow established, but have insufficient information on desert pupfish to determine if they have established.

Cherry Spring Canyon: We stocked 539 Gila topminnow and 521 desert pupfish into Cherry Spring Canyon during the reporting period. We tentatively consider Gila topminnow established, but have insufficient information on desert pupfish to determine if they have established.

Secret Spring: We stocked 499 Gila topminnow and 496 desert pupfish into Secret Spring in 2007. We consider Gila topminnow established, but have insufficient information on desert pupfish to determine if they have established.

Headquarters Spring: We stocked 275 Gila topminnow and 295 desert pupfish into Headquarters Spring in 2008. We tentatively consider Gila topminnow established, but no pupfish were found in subsequent monitoring.

*Arizona State Parks:* One site within Sonoita Creek State Natural Area which is owned and managed by Arizona State Parks was stocked.

Fresno Canyon: Departmental personnel stocked 1,000 Gila topminnow (translocated from Coal Mine Canyon) into Fresno Canyon in 2008. Gila topminnow are tentatively considered established. For detail see the Fresno Canon renovation task.

*Bureau of Land Management Sites:* Three sites on BLM land were stocked with desert pupfish. One site, Tule Creek, had an existing population of Gila topminnow. A second site, Howard Well, was fishless, and Gila topminnow were planned to be stocked after desert pupfish established. The third, Bonita Creek, was stocked with both Gila topminnow and desert pupfish.

Tule Creek: Tule Creek, located northwest of Lake Pleasant was stocked with 234 desert pupfish from Boyce Thompson Arboretum on September 19, 2007; five additional pupfish died during transport. No pupfish were captured or observed during monitoring in November 2007, November 2008, February 2008, or October 2009; Gila topminnow were abundant during all of the monitoring. Based on monitoring, it does not appear that desert pupfish established a population in Tule Creek. On October 14, 2009 an additional 129 desert pupfish from DNFH were stocked.

Howard Well: Howard Well is located southeast of Safford in the San Simon Valley. On July 1, 2008 253 desert pupfish (233 from TNC Lower San Pedro River Preserve and 10 from Boyce Thompson Arboretum) were stocked into the fishless Howard Well. Desert pupfish were observed during a visual survey of Howard Well in August 2008. During February 2009 Heidi Blasius of Bureau of Land Management observed desert pupfish and poeciliids in Howard Well. In March 2009 Heidi captured fish and identified the poeciliids as Gila topminnow; it is unknown how Gila topminnow got into the pond, either they were inadvertently stocked with the desert pupfish, or someone illegally stocked them. During October 19, 2009 monitoring, 24 desert pupfish and 397 Gila topminnow (17% juveniles) were captured. After monitoring on October 19, 2009, an additional 58 desert pupfish from DNFH were stocked. Based on monitoring information, it seems likely that Gila topminnow are established, but it is still unclear if desert pupfish have established a population.

Bonita Creek: Department personnel stocked 975 Gila topminnow (Bylas Spring lineage) and 147 desert pupfish (from TNC Lower San Pedro River Preserve) into Bonita Creek during 2008. For detail, see the Bonita Creek renovation task.

*Gila Topminnow Transfer to and stocking in New Mexico:* New Mexico Department of Game and Fish requested the Department supply them Gila topminnow so that two sites could be stocked; only one site, Burro Cienega, was stocked during the reporting period.

### **Arizona Trout Stream Repatriations**

Status: Ongoing.

Description: Higher elevation cold-water streams in the Gila River basin in eastern Arizona historically were occupied by a suite of native fishes including Apache trout *Oncorhynchus gilae apache*, Gila trout *Oncorhynchus gilae* (also present in New Mexico), chubs of the genus *Gila*, speckled dace, loach minnow, spikedace, desert sucker and Sonora sucker. The native trouts were nearly eliminated by a combination of angler removal, stream renovation to enhance introduced trouts of several species, and hybridization with and genetic swamping by alien rainbow trout. As a result of contracting range and diminishing numbers, both native trouts were federally listed as endangered. A management strategy for the native kinds was developed that incorporated the placement of fish barriers on selected streams, renovation upstream to remove all fishes, and restocking with pure strains of the native trout. However, this approach did not always accommodate repatriation of other native species, which were largely extirpated by earlier human impacts or the combined prior stream management for non-native trouts and subsequent management for native trout. A fully restored native fish community upstream from barriers in these streams would include the native trout plus the native minnows and suckers. Repatriation and improved population status for the nongame native fishes will conserve these native species.

The Department will perform repatriation stockings of native non-game fishes into eastern Arizona streams that are managed for Apache trout. Priority stream sites are those with fish barriers planned or in place, and which are occupied by or scheduled for stocking with native trout. Such streams already have been identified as part of the recovery planning and implementation programs for Apache and Gila trouts. Stocking into other suitable streams may be considered but should not interfere with repatriation to priority streams. Species to be stocked should include chubs of the genus *Gila*, speckled dace, loach minnow, spikedace, desert sucker and Sonora sucker. Source populations should be geographically nearest downstream neighbors to the repatriation stream, and number of individuals removed should not obviously deplete the source. Multiple stockings into each repatriation stream should be performed successively for at least three consecutive years or until the desired populations are established, and beyond that for genetics management.

Results: Most of the focus for this project has been on the Black River watershed, as that is where most of the Apache trout recovery work in the Gila River basin has been focused. Loach minnow is the only listed-species planned for repatriation in the Black River watershed. So far only non-listed species have been repatriated, and those repatriations were completed with non-CAP funds.

In March 2007, we sent a letter to the Apache-Sitgreaves National Forest (ASNF) Supervisor seeking permission to sample for loach minnow on North Fork East Fork Black River, and to either bring fish to Bubbling Ponds, or to translocate them directly into West Fork Black River,

Bear Wallow Creek, and Fish Creek. After discussions with ASNF and the Service, the decision was made to survey North Fork East Fork Black, and if any loach minnow were captured to bring them to Bubbling Ponds Hatchery for refuge and propagation. The ASNF also requested that we draft a study plan, which we did. North Fork East Fork Black River was surveyed in 2007, 2008, and 2009 but no loach minnow were found. We will continue to attempt to acquire loach minnow in upcoming years. White River loach minnow are the next best alternative lineage to use for Black River watershed repatriations. We sent the Director of the White Mountain Apache Tribe Wildlife and Outdoor Recreation Department a letter requesting White River lineage of loach minnow in February 2008; to date we have not received a response. Stocking of loach minnow into West Fork Black River, Bear Wallow Creek, and Fish Creek is postponed until we have propagated fish to stock. Habitat information from each of these three proposed recipient streams and from North Fork East Fork Black River was acquired from the Department Region I Fisheries Program Manager to evaluate the presence and extent of habitat for loach minnow in the proposed repatriation streams. Data were entered into the computer, but only preliminary analyses have been completed, which indicate that Bear Wallow Creek may have habitat that is most similar to North Fork East Fork Black River.

### **Renovation and Repatriation of Native Fishes into Redrock Canyon**

Status: Ongoing.

Description: Redrock Canyon is a tributary to Harshaw Creek, tributary to Sonoita Creek east of Patagonia, Arizona. Redrock Canyon and tributaries support an important wild population of endangered Gila topminnow. Other native fishes recorded from the drainage include desert sucker, longfin dace, and speckled dace. Over the past two decades, two native fish species have been extirpated from Redrock Canyon above the natural waterfall located about two-thirds of the way from the top of the watershed to the confluence of Redrock Canyon with Sonoita Creek. Desert sucker was recorded below the falls in 1987 and then not again until 2001. Although desert sucker were not recorded above the falls during the initial surveys of the canyon in the 1970's, it is presumed to have originally occupied most of the canyon. Longfin dace were present above the falls until 1995, but have not been found there since that time, despite thorough sampling. They have remained present and common below the falls. Speckled dace have never been recorded from Redrock Canyon, however, Sonoita Creek below its confluence with Redrock Canyon supports one of only three known speckled dace populations remaining south of the Gila River. It is likely that speckled dace were once a part of the fish fauna of Redrock Canyon, but were extirpated due to the substantial human alterations of the watershed and stream during the past 150 years. During the past two decades there have been significant efforts in Redrock Canyon to remove adverse impacts to Gila topminnow and to set the stage for increasing the distribution and size of its population there. As part of future efforts, it is considered important to restore the other native fish species which once shared Gila topminnow habitat.

Nonnative western mosquitofish invaded the system in the latter part of the 20th century, and this nonnative fish in combination with drought has resulted in the near elimination of Gila topminnow (Duncan and Garfin 2006). Several other nonnative species have been recorded in Redrock Canyon, including largemouth bass and bluegill *Lepomis macrochirus*, but have been eliminated by drought and failure of an upstream stock tank dam. By eliminating western

mosquitofish from the drainage, nearly 14 miles of channel suitable for Gila topminnow in the Redrock Canyon drainage can be reclaimed for the four native fishes, and possibly Gila chub, which was likely an historical component of the assemblage.

A lengthy dry segment in the lower end of Redrock and Harshaw canyons prevents upstream movement of nonnative species during most times, but a constructed barrier against upstream invasion is needed for times when flood flows allow fish access from downstream waters.

Funds were provided to the Department to complete environmental compliance and other necessary actions to chemically renovate Redrock Canyon to remove western mosquitofish and restock native fishes. Replicates of the Redrock Canyon stock of Gila topminnow are available to provide stock for reestablishment of the population. The Department was to obtain stock of desert sucker, longfin dace, and possibly speckled dace from lower Redrock Canyon or Sonoita Creek, and possibly Gila chub from Sheehy Spring and transport and stock those fish into appropriate areas of Redrock Canyon. Ideally, renovation should occur following construction of the fish barrier, but as all but one mile of the drainage is protected by a natural barrier, renovation and repatriation activities can proceed in advance of the barrier construction.

Results: Coordination and compliance activities were initiated and are still in progress. A Biological Assessment for construction of a barrier, chemically treating the stream with piscicides, and repatriation of native fishes was drafted in September 2007 by Reclamation and a final decision notice was issued in June 2008, and went through the 45-day appeal period. The Coronado National Forest (CNF) issued a Finding of No Significant Impact in a July 14, 2008 Decision Notice. However, the CNF subsequently withdrew the Decision on October 14, 2008. The Department then decided to move forward with renovation of Redrock Canyon once all environmental compliance was completed but to support a barrier on Sonoita Creek instead of one in Redrock Canyon, because a larger watershed which includes Redrock Canyon could be protected. The CNF began to draft a new Environmental Assessment for the Redrock Canyon renovation. Department staff also began to survey all tanks in the Sonoita Creek watershed. Department staff examined maps and satellite imagery and identified 129 tanks (some verified on the ground) in the Sonoita Creek watershed, 40 of which appeared to have water in the satellite images (Ehret and Dickens 2009). During the summer of 2009, Department staff surveyed 64 of the tanks, 26 of which had water (Ehret and Dickens 2009). Only three of the 26 wet tanks contained fish (yellow bullhead). Four of the wetted tanks had bullfrogs. The remaining 65 tanks need to be visited.

### **Repatriation of Native Fishes into Arnett Creek**

Status: Ongoing.

Description: Arnett Creek and its tributary Telegraph Canyon are located on the TNF, Pinal County, near Superior, Arizona. Arnett Creek has been the subject of ongoing efforts to make it suitable for repatriation of native fishes. A barrier was constructed by the Forest Service, using Reclamation and other funds, and has since been improved to remedy some design weaknesses. Arnett Creek was renovated in 1997 to remove nonnative fish and surveys in summer 2001 found no nonnative fish present. Plans for the stream included repatriation of longfin dace, desert sucker, Gila chub, Gila topminnow, and possibly other native fish species. NEPA analysis

has already been completed for this action. The Department will obtain stocks of the species on the final list and transport and stock those fish into Arnett Creek. Choice of stocks of Gila topminnow will be based on the draft revised recovery plan and those of other species will be based on any existing genetic information or on use of stocks from the most proximate population to Arnett Creek.

Results: Department personnel assessed the perennial status of Arnett Creek in January 23, 2007 and estimated that there were approximately 1,000 m of perennial water; no fish were observed. In March 2007 Department and Service personnel electrofished and measured habitat in Telegraph Canyon and Arnett Creek. No fish were captured or observed, but crayfish were observed in Arnett Creek. The estimate of perennial water was revised to 730 m. Habitat looked good for Gila topminnow. Less habitat was deemed available for Gila chub and desert sucker, but Telegraph Canyon could probably support a small population of Gila chub. Department, Service, and Forest personnel met with the Superior Allotment lessee to discuss repatriations of listed fish into the streams. Arnett Creek is fenced to exclude cattle, but the lessee is allowed to graze Telegraph Canyon. He rotates his 50 head from pasture to pasture every six months, so there is relatively little impact to perennial water in Telegraph Canyon. The allotment management plan could be modified such that the lessee could continue his current operations, and that the Biological Opinion could be modified to allow take. The Department EAC has been drafted and signed. Tonto National Forest drafted a Biological Assessment and Evaluation (BAE), and sent it the Service and initiated Endangered Species Act (ESA) section 7 consultation regarding the project. The ESA section 7 consultation was not completed during the period reported on in this report. Once the BO is completed and the Forest comes out with a favorable Record of Decision, we will stock Gila topminnow into Telegraph Canyon and Arnett Creek. We will monitor the stocked fish to determine if Gila topminnow establish populations.

We did move forward with stocking non-listed species. On July 7, 2007 Department personnel stocked approximately 60 longfin dace into Telegraph Canyon (a tributary to Arnett Creek) and 40 longfin dace into Arnett Creek. The longfin dace originated from the Hassayampa River. On September 24, 2007, Department personnel observed longfin dace in the pool where they were stocked in Telegraph Canyon and downstream for 100 meters. In addition, larval fish were observed, indicating that the fish had reproduced. On September 26, 2007, Department personnel visited Arnett Creek, but only observed or dip-netted two longfin dace, but the water was turbid. Department personnel also conducted the 6-month post-stocking monitoring on January 15, 2008. Flood events in both Telegraph Canyon and Arnett Creek were evident by debris piles, and pools filled with sediment. No fish were observed in either stream. The Department conducted the one-year post-stocking survey on July 23, 2008 (Robinson 2008c). Longfin dace were abundant and widely dispersed throughout the perennial sections of each stream, and multiple age classes of longfin dace were observed in each stream, indicating that they had established populations. The habitat was assessed to still be suitable for Gila topminnow, but the habitat for Gila chub had decreased in quality. Department and Forest personnel visited Telegraph canyon during July 2009. The amount of wetted habitat was greatly reduced (probably only 200 m total), but longfin dace were still observed both upstream and downstream from where they were stocked. Habitat in sufficient quantity was still available for Gila topminnow, but because of the reduced amount of habitat, we do not recommend stocking Gila chub or desert or Sonora suckers.



## **Native Fish Repatriations into Blue River**

Status: Ongoing.

Description: The Blue River drainage in Arizona and New Mexico currently supports loach minnow, speckled dace, longfin dace, desert sucker, and Sonora sucker. The connectedness, size, and complexity of the system suggests that other species such as spikedace, Gila chub, roundtail chub, Gila trout, razorback sucker, flannelmouth sucker *Catostomus latipinnis*, Gila topminnow, woundfin *Plagopterus argentissimus*, desert pupfish, and Colorado pikeminnow *Ptychocheilus lucius* also possibly occurred in Blue River but were extirpated by the same factors that eliminated them from many other habitats in the Gila River basin. Threats to the continued existence of these species have not been alleviated, and with the possible exception of Gila trout, reductions in abundance and range continue. Repatriation of fish to suitable habitat is among alternatives available for management of imperiled native fishes. Several fish barriers are planned for the drainage that will assist these efforts. Wild fish from geographically nearby sites are available to support such stockings, which are considered a high priority for species recovery.

The objective of this task was to repatriate native species into Blue River, or to translocate extant species to other streams within the Blue River basin. These activities involve coordination and communication with partners (the Service, NMDGF, and ASNF), determination of appropriate species and numbers to be stocked, identification of source populations, transport to the repatriation or translocation sites, stocking, and reporting. Source populations should be geographically nearest neighbors to Blue River, and number of individuals removed should not obviously deplete the source. Multiple stockings should be performed successively at three-month intervals for at least three consecutive iterations, or until the desired populations are established, and subsequent augmentations should be performed for genetics management. A final report will be prepared and submitted that will detail source location(s) (county, legal description, GPS coordinates), repatriation site(s) (county, legal description, GPS coordinates), date, local conditions at time of stocking, numbers stocked, and other pertinent information to ensure that a complete record is made of the activity.

The objective and tasks were altered from their original descriptions. The objective was shortened to just repatriation of native fish species to the Blue River. Multiple stockings of each species will occur, likely at annual intervals. Sources of native fish were expanded to include hatchery stock. The list of potential species to stock has been decreased to roundtail chub and spikedace.

Results: Department personnel met with ASNF, Reclamation, and Service personnel on April 10, 2007 to discuss the Blue River project. The ASNF reviewed and assessed whether or not to designate the Blue River as Wild and Scenic. The proposed barrier was being held up because of the potential designation. Reclamation will draft an EA and a barrier could potentially be constructed in 2010. The local community is also developing a fisheries management plan in collaboration with the Department, Reclamation, and the Service. Stocking of listed species (spikedace) or unlisted species (roundtail chub) may not occur until after the barrier has been constructed.

Nonnative fish may be further upstream than suspected. In May 2008, Reclamation conducted a fisheries survey of the lower Blue River from the mouth upstream 14 km to Juan Miller Crossing (Clarkson et al. 2008). Nonnative fishes were relatively uncommon but included flathead catfish *Pylodictis olivaris*, channel catfish *Ictalurus punctatus*, red shiner *Cyprinella lutrensis*, fathead minnow *Pimephales promelas*, common carp *Cyprinus carpio*, and rainbow trout *Oncorhynchus mykiss*. During June 2-4, 2009, the Department mechanically removed nonnative piscivorous fish from the lower Blue River. The crew snorkeled through pools, speared and removed 70 channel catfish, 4 flathead catfish, 3 rainbow trout, and 1 common carp. The crew thought that with additional time they could effectively control or possibly even completely remove all piscivorous nonnative fish from the lower sub-reaches of the river. They did not observe any channel catfish less than 90 mm TL, suggesting that the species had not reproduced in 2009. The four smallest channel catfish observed (all between 94-140 mm TL) were all captured in the reach closest to the mouth, supporting the hypothesis by Clarkson et al. (2008) that channel catfish and flathead catfish that they captured in the lower Blue River were immigrants from the San Francisco River that had taken up residence in suitable habitats, and environmental conditions might have precluded their reproduction or recruitment. A second removal effort is planned for 2010.

### **Boyce-Thompson Renovation**

Status: Considered terminated.

Description: Ayer Lake at Boyce-Thompson Arboretum, near Superior, has been a dependable site for maintaining refuge populations of both Gila topminnow and desert pupfish since the 1970s. In addition, these Ayer Lake populations have been used to establish new populations of these two species throughout the Gila River Basin. However, periodically, the pond was contaminated with nonnative species and has to be renovated. It was last renovated in 1983. During 1986 monitoring, nonnative fathead minnow were discovered in the pond, and have been present ever since. Red swamp crayfish *Procambrus clarki*, another nonnative species, was first observed during 1976 monitoring, and it continues to inhabit Ayer Lake. Before the time that this original description was written, efforts to obtain a stock of 200-300 Gila topminnow from the pond found topminnow scarce. Pupfish were the most numerous species, with fathead minnow second and Gila topminnow a poor third. Desert pupfish in the pond are from Santa Clara Slough via DNFH. Gila topminnow are likely Monkey Spring stock only. Given the recent trend in topminnow and fathead populations, it is again desirable to renovate the pond to remove the nonnative fish. A second reason to eradicate fathead minnow is to prevent the inadvertent transportation with Gila topminnow and desert pupfish and stocking into repatriation sites for these two endangered species. The Department, in cooperation with Arizona State Parks, will renovate the pond at Boyce-Thompson Arboretum to remove all nonnative fish.

Results: On April 16, 2007 Department personnel surveyed Ayer Lake using 20 baited minnow traps to determine relative abundance of native to nonnative fish species; fathead minnow dominated the catch (1,465 fish), but fair numbers of desert pupfish (275) and Gila topminnow (57) were also captured. However, topminnow are much more efficiently captured by seining, with hundreds captured in one seine haul in July 2007.

We communicated with Boyce Thompson Arboretum personnel regarding renovation of Ayers Lake. The staff had some concerns, and asked for information regarding rotenone effects on other organisms. A brief document describing historical management of listed fish species in Ayers Lake, summarizing the effects of rotenone on aquatic invertebrates, and outlining several management options was drafted and sent to the Arboretum, for their consideration (Robinson 2008a). The Arboretum has communicated that they are not supportive of a chemical renovation of Ayers Lake. Therefore, this project should be removed from the list of projects.

**Muleshoe Ecosystem Repatriations (Redfield Canyon, Hot Springs Canyon, Swamp Springs Canyon, Cherry Spring Canyon, Secret Spring, and Headquarters Spring)**  
Status: Ongoing.

Description: A high priority of the CAP Program is to replicate remaining populations of federally-threatened loach minnow and spokedace into suitable protected streams in the Gila River basin. Aravaipa Creek, a tributary to the lower San Pedro River, is host to sizeable populations of both species, and is thus a source for needed population replications. Hot Springs Canyon, a tributary to the middle San Pedro River, retains a native fish assemblage of five species to the near exclusion of non-native forms. Attributes of Hot Springs Canyon that help prevent invasions by non-natives include its isolation from the mainstem San Pedro River by over five miles of normally-dry streambed, and a long reach of ephemeral discharge of the San Pedro River at and upstream from its confluence with Hot Springs Canyon. Hot Springs Canyon is also being considered for emplacement of a fish barrier. The Department was tasked with completing necessary environmental compliance, development of translocation protocols (including post-translocation monitoring needs), translocation of spokedace and loach minnow from Aravaipa Creek to Hot Springs Canyon, and subsequent monitoring.

Alterations to the original project description included expanding the number of waters to be repatriated with native fishes. Redfield Canyon was included as another stream to repatriate Aravaipa lineages of spokedace and loach minnow. Several waters were targeted for repatriations of Gila topminnow and desert pupfish, including but not limited to Swamp Springs Canyon, Cherry Spring Canyon, and two unnamed springs near the Muleshoe Ranch Cooperative Management Area headquarters.

Results: This task was one of the biggest success stories of the program. The first stockings occurred on October 4, 2007, utilizing staff from multiple agencies and volunteers. Spokedace and loach minnow from Aravaipa Creek were transported via helicopter and then stocked into Redfield Canyon and Hot Springs Canyon (200 fish of each species into each stream). Gila topminnow (Bylas Spring lineage from ASU) were brought to TNC San Pedro River Preserve ponds near Dudleyville, where they and desert pupfish from the ponds were transported by helicopter to three sites on the Muleshoe where they were stocked; 500 of each species into Swamp Springs, 500 of each species into Cherry Spring, and 1,000 of each species into Secret Spring. In November 2007, the topminnow and pupfish sites were monitored and fish of both species were observed. During the 6-month post-stocking monitoring for topminnow and pupfish on April 7-8, 2008, abundant multiple age-classes of topminnow were observed and captured and a few desert pupfish were captured and observed at Secret Spring. Both species were still persisting at Cherry Spring, but only one topminnow and four pupfish were captured.

At Swamp Spring, just one Gila topminnow and no desert pupfish were captured. One-year post-stocking monitoring for all repatriated fish species was done on September 15 and 16 2008 (Robinson 2008h). Gila topminnow were thriving (over 2000 captured) in Secret Spring, and ten desert pupfish were also captured. In Swamp Springs Canyon, 69 (both juveniles and adults) Gila topminnow and 14 desert pupfish (all adults) were captured. In Cherry Spring Canyon, eight Gila topminnow (seven adult and one juvenile) and no desert pupfish were captured. In Hot Springs Canyon, 11 loach minnow (nine adults and two juveniles) and four spikedeace (all adults) were captured. In Redfield Canyon, 12 spikedeace (ten adults and two juveniles) and one loach minnow (an adult) were captured.

Supplemental stockings of each species into the same sites except Secret Spring were done on September 17, 2008 (Robinson 2008h): 1000 loach minnow and 500 spikedeace into both Hot Springs Canyon and Redfield Canyon, 250 Gila topminnow and 250 desert pupfish into both Cherry Spring Canyon and Swamp Springs Canyon. In addition, 275 Gila topminnow and 290 desert pupfish were stocked into a new site, Headquarters Spring. During subsequent monitoring in March and September 2009, both juvenile and adult Gila topminnow were found in all sites where they were stocked during 2007 and 2008, and numbers captured in September 2009 tended to be greater than what were stocked in 2008. The same was not true of desert pupfish, as less than 10 were captured in each of the four locations during March 2009, and during September 2009 desert pupfish were only captured in Secret Spring (6 fish) and Cherry Spring (5 fish). We tentatively consider Gila topminnow to have established populations in each site, but it is unclear if desert pupfish persist or are in the process of establishing populations in the sites. Both loach minnow and spikedeace were captured in both Hot Springs Canyon and Redfield Canyon during the September 2009 monitoring, and a greater number of each species was captured in September 2009 than during September 2008. However, all but one individual captured during September 2009 was greater than 40 mm TL, lending no evidence that spikedeace or loach minnow reproduced earlier in 2009.

Additional fish were stocked during October 2009, but not into all sites, and not all species. We considered Gila topminnow to have established populations in the four sites where they were stocked, and therefore no more were stocked. Desert pupfish, loach minnow, and spikedeace stocks were limited in supply. Because desert pupfish did not appear to be persisting or thriving, and because numbers available to stock were limited, we decided to stock all desert pupfish and only desert pupfish into a newly created pond on the hill behind the casitas at the Muleshoe Ranch headquarters; 196 were stocked on October 28, 2009. Bubbling Ponds had relatively few Aravaipa lineage spikedeace and loach minnow (< 400 of each species) available to stock during autumn 2009 and there were three streams (Fossil Creek, Redfield Canyon, and Hot Springs Canyon) scheduled for supplemental stockings. In addition, spikedeace and loach minnow abundance in Aravaipa Canyon during October 2009 was estimated to be low (Dr. Peter Reinthal, University of Arizona personal communication). Also, based on monitoring, spikedeace and loach minnow numbers and available habitat were estimated to be greater in Hot Springs Canyon than in Redfield Canyon. Therefore all 386 spikedeace and 156 loach minnow were stocked into Hot Springs Canyon on October 28, 2009; one additional spikedeace and four loach minnow died during transportation.

During a pre-stocking survey and assessment on August 17, 2007, a few green sunfish were removed from Redfield Canyon. During a second pre-stocking survey to determine the extent and abundance of green sunfish on September 11, 2007, 66 green sunfish were removed from Redfield Canyon. On the same day, 207 Gila chub, 78 speckled dace, and 44 Sonora sucker were moved from below to above the natural fish barrier in Redfield Canyon. The Nature Conservancy has a CAP contract to mechanically remove green sunfish from Redfield Canyon.

### **San Pedro Pond Stockings**

Status: Ongoing.

Description: Reclamation rehabilitated two groundwater-supplied ponds on TNC Lower San Pedro River Preserve for use as native fish and waterfowl habitat. Beginning in 2000, Reclamation used the larger pond (~3 surface acres) as a grow-out and refuge facility for razorback sucker. The large pond had further potential as a refuge for Gila chub, and both ponds could be used similarly for desert pupfish and Gila topminnow. The purpose of this project was to acquire and stock individuals of Gila chub, desert pupfish, and Gila topminnow into the refuge ponds. The Department was tasked with completing the necessary environmental compliance, identifying appropriate stock, acquiring, and stocking Gila chub, desert pupfish, and Gila topminnow into ponds on the Lower San Pedro River Preserve. Gila chub were to come from extant San Pedro River basin populations, while suitable source stocks of pupfish and topminnow had not been specifically determined. Reclamation will conduct annual post-stocking monitoring of the repatriations.

The ponds were stocked with razorback sucker and desert pupfish prior to this cooperative agreement. Razorback sucker were stocked into the larger, west pond by the Bureau of Reclamation in 2000. On May 3, 2005, Department, Reclamation, TNC, and Arizona State University personnel stocked approximately 750 desert pupfish (from USFWS Cibola National Wildlife Refuge Headquarters refuge pond) into the west pond.

Results: On July 13, 2006, Department, Service, and TNC staff stocked approximately 200 Gila topminnow into the smaller pond; the topminnow originated from Bylas Spring, San Carlos Apache Reservation. As of autumn 2007, Gila topminnow and desert pupfish were reproducing and the populations abundant, and both were used for several repatriations (desert pupfish into Cherry Spring, Swamp Spring, Secret Spring, and Tule Creek; Gila topminnow into Burro Cienega NM). A sample of 60 topminnow and 60 pupfish were collected on December 4, 2007 and sent to DNFH for a health assessment; no parasite or pathogens of concern were detected. However, desert pupfish collected on July 25, 2008 and stocked at Walnut Spring were parasitized by *Lernaea cyprinacea*. The razorback sucker population was monitored by Reclamation during summer 2008 and fish were in good condition with multiple age classes observed. The ponds were drawn down for improvements beginning in September 2008. During the drawdown all razorback suckers suffered mortality. Salvaged desert pupfish and Gila topminnow were treated to remove *Lernaea*. The ponds were refilled early in 2009, and in April approximately 1,100 Gila topminnow were stocked into the larger pond and 250 desert pupfish into the smaller pond. Gila chub are planned to be stocked into the larger pond. After discussions amongst biologists from several agencies and universities, it was decided that the Babocomari-T4 Spring-O'Donnell Creek lineage would be replicated in the TNC pond. In August 2009 an attempt was made to

remove all Gila chub from T4 Spring; only four chub were captured after two seine hauls, 20 daytime mini-hoop net sets, and 27 overnight mini-hoop net sets. The four Gila chub were transported to Bubbling Ponds where they were quarantined and treated to remove parasites. In September 2009 the four chub were added to an existing population of O'Donnell Creek lineage Gila chub at the International Wildlife Museum (IWM). The plan is to remove some chub from IWM in 2010 and stock them into the larger of the Lower San Pedro River Preserve ponds. Additional chub may also be acquired from O'Donnell Creek.

### **Fossil Creek Repatriation of Listed Fish Species**

Status: Ongoing.

Description: In 1999, Arizona Public Service signed an Agreement in Principle to decommission the Childs-Irving Hydroelectric Project facilities and return full flows to Fossil Creek. A fish barrier was constructed in 2004 to prevent upstream movement of nonnative fishes. Later during 2004, native fish were salvaged and held while the stream above the fish barrier was treated with chemical piscicides to remove nonnative fishes. Early in 2005, salvaged native fish were returned to the stream, and then during June, full flows were returned to Fossil Creek. The objective of this task was to stock and establish several federally listed species into Fossil Creek. Highest priority species to stock were spikedace, loach minnow, and longfin dace. Middle priority species were desert pupfish, Gila topminnow, and razorback sucker. Low priority species were woundfin and Colorado pikeminnow.

Results: Two multi-agency meetings were held to discuss the project during 2007 (April and October). The group decided on species to stock, and priorities for the stockings. We completed Departmental environmental compliance (Environmental Assessment Checklist: EAC). We conducted habitat surveys in October 2007, and then developed a plan on where to stock which species (Carter 2007b). Recommendations as to where to stock each species were presented to the multi-agency team and accepted. Fish stockings began in November 2007 and will likely continue until 2012. All spikedace and loach minnow stocked were Aravaipa Creek lineage from Bubbling Ponds. Gila topminnow stocked were Sharp Spring lineage from DNFH, although some were held at Bubbling Ponds before being stocked. Razorback sucker stocked were of Lake Mohave lineage, raised at either the Hualapai Indian Reservation or Bubbling Ponds National Fish Hatchery. Longfin dace originated from Tangle Creek, a Verde River tributary.

During the reporting period, 2,128 loach minnow and 725 spikedace were stocked into Fossil Creek. On November 2, 2007 125 spikedace and 124 loach minnow were stocked into Fossil Creek upstream of Fossil Springs dam (AZGFD 2008a). All fish survived the transport, but one loach minnow died during the tempering process. On March 7, 2008 we stocked an additional 500 loach minnow into Fossil Creek above the diversion dam (Carter 2008a). On May 21, 2008, we stocked 504 loach minnow between the old Irving power plant and the Fossil Springs dam. The reach upstream of Fossil Springs dam was surveyed on June 27, 2008; five loach minnow were observed while snorkeling, but no spikedace were observed or captured. On November 19, 2008 the reach between High Falls and Fossil Springs dam was surveyed via electrofishing-kick seining; no loach minnow or spikedace were captured. On November 24, 2008 we stocked 1,000 loach minnow into three locations and 600 spikedace into two locations between Fossil Springs Dam and High Falls. On May 13, 2009 the reach upstream of Fossil Springs dam was surveyed

by backpack electrofishing-kick seining and by snorkeling; two loach minnow were observed while snorkeling, but no spikedace were observed or captured. On September 23 and 29, 2009 we monitored, via snorkeling, all reaches that contained spikedace and loach minnow stocking locations; no spikedace or loach minnow were observed. Based on monitoring information it is unclear whether or not loach minnow have established a population in Fossil Creek and we have no evidence that spikedace have established a population or even persist.

Over 14,000 Gila topminnow were stocked into Fossil Creek during the reporting period. On November 28, 2007 we stocked about 3,000 into five locations between Fossil Springs and just downstream of Irving (AZGFD 2008b). The week following the stocking of topminnow, heavy rains occurred in the area, resulting in high flows in Fossil Creek. We conducted the 1-month post-stocking monitoring on January 3, 2008 (Carter 2008b), and did not detect any topminnow; flood debris was noted about 2 - 6 vertical feet above the water surface at the various stocking sites. No topminnow were observed and captured during a second round of monitoring in June 2008 or a third round in November 2008 (Robinson 2009b). Gila topminnow were stocked a second time on November 24, 2008; approximately 2,000 individuals were stocked into three locations between Fossil Springs dam and High Falls. During monitoring in May 2009, one Gila topminnow was captured, between Fossil Springs dam and High Falls. On July 2, 2009 4,663 more Gila topminnow were stocked, into seven locations between Fossil Springs dam and just downstream of Irving. During monitoring in September 2009, 493 Gila topminnow were captured, and hundreds observed between Fossil Springs dam and the Irving area. On October 22, 2009 4,535 additional Gila topminnow were stocked into two locations between Fossil Springs and Fossil Springs dam. Gila topminnow may be establishing a population in Fossil Creek, but we do not yet know whether or not they can persist after stochastic events such as winter flooding.

We collected longfin dace from Tangle Creek and sent them to a laboratory for a fish health assessment. The results of the assessment indicated that no parasites or pathogens of concern were present. On February 12, 2008 we collected 306 longfin dace from Tangle Creek and stocked them into Fossil Creek (Carter 2008c; Robinson 2009b). On May 27, 2009 we stocked an additional 636 longfin dace into Fossil Creek about 1.2 km upstream of the first stocking location. On September 25 and 29, 2009, reaches containing both stocking locations were monitored; 72 longfin dace were observed. Longfin dace may be establishing a population in Fossil Creek.

Razorback sucker were stocked into Fossil Creek twice during the reporting period (Robinson 2009b). Ninety-nine razorback suckers from Bubbling Ponds were stocked near the lowest road access point, upstream of the fish barrier, on April 15, 2008. A 1-km reach encompassing the stocking site was surveyed on October 28, 2008; two razorback suckers were observed. On December 4, 2008, 480 razorback suckers were stocked into Fossil Creek near the lowest road access point; at Bubbling Ponds half of the razorback suckers had been conditioned to flowing water and the other half had not. On September 24, 2009 all pools from the upper stocking location down to the fish barrier were surveyed by snorkeling; no razorback suckers were observed. The goal of the razorback sucker program is for the fish to grow out in Fossil Creek, and then migrate into the Verde River, however, it is possible that razorback sucker could also establish in Fossil Creek. So far, it is unclear whether or not razorback sucker are persisting in Fossil Creek.

Desert pupfish have not been stocked, and we are still discussing with the USFS and the Service whether or not they will be stocked. A Fossil Creek Native Fishes Working Group meeting was held on September 29, 2008 to discuss group processes and future stockings; the group suggested that the Department continue stocking of all species that have been stocked to date. The Working Group met again in March 2009 to discuss stockings and monitoring planned for 2009.

### **Meda/Tiaroga Data Assembly**

Status: Ongoing.

Description: Loach minnow and spikedace are two federally-listed (threatened) minnows endemic to the Gila River basin that have continued to decline since their Endangered Species Act (ESA) listing in 1986. The Service has determined that up-listing to endangered status is warranted, but currently precluded because of other priorities. Despite their status, few on-the-ground conservation or recovery activities have been undertaken for either species (with exception of Section 7 ESA consultations). Development and implementation of activities designed to improve status of either require, in part, better definition of current distribution and qualitative population status assessment. A fair amount of this information is among scattered articles, documents, and files (e.g., field notes, collecting permit reports, museum records, and memoranda) that have accumulated since the species were listed. Assembling these data into a single document would facilitate development of management actions and aid agencies involved in ESA Section 7 consultations. Tasks for the Department were to assemble the disparate state and federal documents, literature, and data relevant to conservation and recovery of loach minnow and spikedace in Arizona. The information was to be collated and summarized in a coherent report that could be used by management agencies for reference to easily determine the extent and character of the information available.

Results: We acquired data for historical statewide distribution of spikedace and loach minnow from SONFISHES, Department HDMS, Department regional fish survey reports, U.S. Fish and Wildlife Reports, NMDGF, Paul Marsh of Arizona State University, and a 2002 report to Reclamation by Brian Bagley of loach minnow surveys in the Verde River Drainage. We also contacted Dr. Rinne at Rocky Mountain Research Station in Flagstaff, but he thought that most of his location information was included in Department permit database (HDMS). Data is in different formats; Microsoft Excel, Microsoft Access, Microsoft Word, Adobe pdf, and in written documents. Most of the location data has been put into one Microsoft Excel workbook, with separate spreadsheets for each data set. Any future data of spikedace and loach minnow in Arizona will be added as records occur. A report still needs to be drafted.

### **Mineral Creek Repatriations**

Status: Ongoing.

Description: Until very recently, Mineral Creek supported a population of Gila chub and longfin dace, and at one time was considered a good source to obtain stock for repatriation attempts to other streams in the middle Gila River watershed (e.g., Martinez Creek). Devils Canyon, its tributary, also supported longfin dace in the portion immediately upstream from the confluence. The populations showed signs of decline in 2000 and 2001, and since 2002, neither species have been detected in either stream despite several attempts by several researchers.



Although nonnative green sunfish and fathead minnow were detected in some locations since the last observations of native fishes, the most recent surveys of the upper portion of Mineral Creek (upstream of Big Box Dam reservoir) found the stream to be fishless. The reason(s) for this condition are undetermined. The Department was tasked to complete its internal EAC, acquire suitable stocks to serve as sources for the repatriations, and stock Gila chub and longfin dace to Mineral Creek. In addition, opportunity for repatriation of additional native species such as loach minnow, Gila topminnow, desert pupfish, spikedace, desert sucker, Sonora sucker, and speckled dace should be pursued as appropriate. All sources of stock should adhere to the “closest geographic neighbor” criterion whenever possible. This project will likely be expanded based on survey results (see below).

Results: Early in 2006, Department staff wrote an EAC to stock longfin dace from Aravaipa Creek into Mineral Creek between Big Box Dam reservoir and Government Springs Ranch. ASARCO Ray Mine and the owner of Government Springs Ranch were supportive of the proposed longfin dace stocking. Department personnel stocked longfin dace in August and October 2006. During October 2006, numerous young-of-year longfin dace were observed. During a February 2007 survey of Box Dam Reservoir and an approximately 1 mile portion of Mineral Creek immediately upstream of the reservoir, green sunfish and longfin dace were observed in the creek; three dead sunfish and two dead fathead minnow were observed in the reservoir. During a April 2007 survey of Big Box Reservoir 243 green sunfish and 64 fathead minnow were captured; no other species were captured (Robinson 2007). Green sunfish were also observed upstream in Devils Canyon, as they were during a 2002 survey of Devils Canyon. During April 21-22, 2008, we conducted a survey of upper Mineral Creek from the reservoir upstream to Government Springs Ranch (Robinson 2008b). Green sunfish and longfin dace were limited to downstream of several waterfalls approximately 1.3 km upstream from the reservoir. Longfin dace were found above and below those waterfalls, but were very abundant (thousands of fish of all sizes observed) above the waterfalls and up to a waterfall approximately 0.2 km downstream from Lyon Canyon (within Government Springs Ranch). No Gila chub were captured or observed. Gila chub could be repatriated to Mineral Creek without any renovation. However, before they are, a survey of Mineral Creek between Big Box Dam and the tunnel should be conducted (records indicate that Gila chub were collected in this vicinity), as well as a survey of the Devils Canyon drainage to further confirm that Gila chub have been extirpated from the system. A helicopter flight over the Devils Canyon drainage was done on August 18, 2008 to identify perennial waters to be surveyed (Robinson 2008d).

Surveys of fish in the portion of Mineral Creek between Big Box dam and the ASARCO Ray Mine tunnel and in the Devils Canyon drainage were done in 2009 (Robinson et al. 2010). No Gila chub were found in Mineral Creek or any of the five perennial reaches of Devils Canyon surveyed. Green sunfish were the most abundant species captured throughout, but mosquitofish were also captured in upper Devils Canyon, and fathead minnow were captured in the segment of Mineral Creek sampled. So we have no evidence that Gila chub still persist in the Mineral Creek drainage; if there are any persisting they are extremely rare.

The entire drainage above Big Box Dam reservoir could be managed as a native fishery, or certain portions of the drainage could be managed for native fish. If the entire drainage is targeted for native fish management, then Big Box Dam reservoir, Devils Canyon, and the

portion of Mineral Creek inhabited by green sunfish would need to be renovated. This would be a large endeavor. A step-wise approach could also be taken. A first and probably easiest step would be to re-establish Gila chub into upper Mineral Creek, as no renovation would be required because a series of small waterfalls currently limit the upstream movement of green sunfish and fathead minnow, and only longfin dace are found upstream of the waterfalls. In addition, only three landowners would be involved, all of which were agreeable to the past repatriation of longfin dace.

### **Transfer Gila Chub and Gila Topminnow to New Mexico to Stock in Burro Cienega and Gila Topminnow into The Nature Conservancy Gila River Farm**

Status: Ongoing.

Description: Only one population of Gila chub, and no populations of Gila topminnow, exists in New Mexico. Stocking Gila chub and Gila topminnow within historical range are recovery actions. New Mexico Department of Game and Fish requested the Department provide them with Gila chub and Gila topminnow to be stocked into Burro Cienega, a fishless stream that drains south out of the Big Burro Mountains into a closed basin near Lordsburg, NM. They also requested that the Department provide them with Gila topminnow to be stocked into a pond at TNC Gila River Farm, near Cliff, New Mexico. The Department agreed to provide New Mexico with the Gila chub and Gila topminnow after completing the necessary compliance.

Results: Department staff completed an EAC. The Department and TNC staff collected Gila topminnow from the TNC Lower San Pedro Preserve ponds near Dudleyville on November 5, 2007 and transferred them to NMDGF; the fish were stocked into Burro Cienega, east of Lordsburg, NM. No topminnow were observed during monitoring in early April 2008, but water temperatures were still relatively cold. On June 12, 2008, Department and NMDGF staff collected 578 Gila topminnow from the east TNC pond at Dudleyville. Staff from NMDGF transported the fish and stocked them (minus 25 mortalities) into Burro Cienega. Late in July 2008, the rancher observed fish throughout the area stocked. The rancher also reported to NMDGF that the topminnow were doing well in summer 2009.

Originally, the source of Gila chub agreed upon by the various agencies involved (Department, NMDGF, USFWS, and USBLM) was Bonita Creek. The second choice was Dix Creek, and the third choice was Harden Cienega Creek. We collected Gila chub from Bonita Creek for a health assessment at the end of March 2007, and Asian tapeworm were present in most of the individuals sent to the Washington Animal Disease Diagnostic Laboratory. Because of the presence of Asian tapeworm, we will either have to hold and treat the Bonita Creek Gila chub before transportation to New Mexico, or use another donor population (Dix Creek or Harden Cienega Creek). In addition, the Gila chub in Bonita Creek putatively have an admixture of roundtail chub or headwater chub genes (Dowling et al. 2008), so one of the other two populations may be more desirable for repatriation to New Mexico. If the decision is made to use Gila chub from Dix Creek or Harden Cienega Creek, then health of fish from those populations will be assessed prior to any translocation. Alternatively, fish may be collected, quarantined and treated for parasites and then transferred to NMDGF. New Mexico Department of Game and fish decided to hold off stocking Gila chub until after Gila topminnow become established in Burro Cienega; probably not until summer or autumn 2010.

## **Repatriation of Native Fishes to Morgan City Wash and Chalky Spring**

Status: Ongoing.

Description: Morgan City Wash is a tributary to the Agua Fria River just downstream of New Waddell Dam (Lake Pleasant), and Chalky Spring is a tributary to Morgan City Wash approximately 4.2 km upstream of the confluence with the Agua Fria River. Approximately 600 m upstream of the Morgan City Wash confluence with the Agua Fria River is a meter high weir that has prevented nonnative fishes from moving upstream; only longfin dace is found above the weir. Instream habitat in Morgan City Wash is thought suitable for repatriation of Gila chub, desert pupfish, Gila topminnow, and possibly loach minnow and spikedace (Robinson and Carter 2007). Chalky Spring has habitat suitable for Gila topminnow. Repatriation of native fishes was identified in Phase 1, Task #7, of an April 2003 Riparian Habitat Restoration Plan for portions of Lake Pleasant Regional Park. Morgan City Wash was also recommended for stocking of Gila topminnow in the 2003 AZGFD report on the status of Gila topminnow and desert pupfish. Choice of stocks will be based on recovery plans, current genetic information, or nearest geographic neighbor criteria. The Department was to complete their internal environmental compliance checklist, acquire suitable stocks to serve as sources for the repatriations, and stock listed native fishes to both Morgan City Wash and Chalky Spring.

Service personnel visited Morgan City Wash in February 2008 and determined that not enough habitat was available upstream of the weir for Gila chub. Therefore, Gila chub were removed from the list of species to stock upstream of the weir.

Results: Reclamation and BLM, with input from Department personnel, drafted and submitted a Biological Assessment for the effects of operation of New Waddell dam on translocations of federally-listed fishes to Morgan City Wash to the Service in August 2008. The Service issued a Biological Opinion on May 13, 2009. The Department coordinated with BLM, Reclamation, the Service, and Maricopa County Parks to schedule the translocations. On June 30, 2009, Department staff collected 57 desert pupfish from Deer Valley High School and 67 desert pupfish from Desert Botanical Garden and stocked them into a large pool Morgan City Wash; pupfish were of the Santa Clara Slough lineage. Typical handling and stocking protocols were followed. Fish did not move much for about 5 minutes after release. Longfin dace were observed chasing a few of the smaller pupfish that we stocked. About 1 hour after release one pupfish was observed lying on its side at the bottom of the pool, and was presumed to be dead. On July 1, 2009, we stocked 1,331 Gila topminnow (Sharp Spring lineage from DNFH) into Morgan City Wash upstream of the weir; two dead pupfish were observed. On the same day 597 Gila topminnow were stocked into Chalky Spring. Topminnow behaved normally upon release at both sites.

On August 11, 2009 we visually surveyed both Morgan City Wash and Chalky Spring for the presence of the stocked species. Gila topminnow but no desert pupfish were observed in Morgan City Wash. Gila topminnow were also observed in Chalky Spring.

On October 7, 2009, Department personnel stocked more Gila topminnow and desert pupfish into Morgan City Wash and Gila topminnow into Chalky Springs. The Gila topminnow and

desert pupfish were the same lineages previously stocked but were from Bubbling Ponds (originated from DNFH). At Morgan City Wash, we completed the tempering process and stocked 205 desert pupfish and 1,061 Gila topminnow into three locations. Five desert pupfish and one Gila topminnow died during the transport-tempering process. At Chalky Spring, 608 Gila topminnow were stocked, 406 at the spring location and 202 45 m downstream. Fish behaved normally upon release and no fish died during the transport-tempering process. Before stocking fish, Gila topminnow were observed in both Chalky Spring and Morgan City Wash; desert pupfish were not observed in Morgan City Wash.

### **Fresno Canyon Renovation**

Status: Ongoing.

Description: Fresno Canyon is a major tributary to Sonoita Creek which is a major tributary of the Santa Cruz River about 15 miles northeast of Nogales Arizona. Fresno Canyon is within the Sonoita Creek State Natural Area and is managed by Arizona State Parks. The canyon contains Gila topminnow, Sonora mud turtles *Kinosternon sonoriense*, and canyon treefrogs *Hyla arenicolor* in an approximately 600-m long perennial section. Non native species found within the canyon include green sunfish, bullfrogs *Rana catesbeiana* and crayfish. In an effort to remove non native aquatic species from the drainage, The Department was to chemically renovate Fresno Canyon, and if necessary stock Gila topminnow; if they didn't naturally disperse from Coal Mine Canyon. The renovated stream might also present an opportunity to stock Gila chub.

Results: The Department completed compliance (EAC) to renovate Fresno Canyon to remove green sunfish, and conducted all necessary pre-renovation surveys. Approximately 1,200 Gila topminnow were salvaged from Fresno Canyon on June 18, 2007 and the salvaged fish stocked into Coal Mine Spring. Fresno Canyon was renovated on June 19, 2007, and again on June 20, 2007 (Mitchell 2007). The renovation was a success; no living fish were observed on June 21. Arizona State Parks conducted a visual survey of the renovated stream on September 8, 2007 and reported that a few Gila topminnow had re-colonized (likely transported downstream from Coal Mine Canyon during a flood event). During the 6-month post-renovation monitoring on November 5, 2007, no green sunfish were seen or captured, and three Gila topminnow were captured (Ehret 2007b). On April 1, 2008, Department personnel translocated approximately 1,000 Gila topminnow and 75 longfin dace from Coal Mine Canyon and stocked them into Fresno Canyon below the confluence with Coal Mine Canyon. During the stocking, no green sunfish were observed in Fresno Canyon, but two adult longfin dace were seen. A total of 30 longfin dace and 150 Gila topminnow were observed during the first post-stocking monitoring on May 1, 2008. A second round of monitoring, this time using collapsible minnow traps, was completed in October 2008 (Ehret 2009); 21 traps were set for approximately 3 hours and 2,209 Gila topminnow, 58 longfin dace, 12 Sonora mud turtles, 33 virile crayfish, and 22 bullfrog tadpoles were captured. During monitoring in October 2009 (Ehret 2009), a total of 960 Gila topminnow, 353 longfin dace, 12 Sonora mud turtle, 33 virile crayfish, and 11 bullfrog tadpoles were captured; traps were set in the same fixed locations. Gila topminnow and longfin dace are tentatively considered established. Department staff amended the EAC to include stocking of Gila chub, and may stock Gila chub (Sheehy Spring lineage) later in 2010. Department staff drafted and finalized a report summarizing the renovation (Mitchell 2007).

## **Bonita Creek Renovation**

Status: Ongoing.

Description: Bonita Creek is a tributary to the Gila River, near Safford in Graham County, Arizona. Bonita Creek drains south off of the San Carlos Reservation and the lower portion is within the Gila Box. Perennial flow begins at about 4,270 feet elevation (18 miles upstream from the mouth), although intermittency is common downstream. In 1939, Safford completed installation of an infiltration gallery (gallery) and associated transmission pipeline on Bonita Creek to supply municipal water for Safford and the surrounding communities. The gallery system is located approximately 3.5 miles above the mouth of Bonita Creek. A small portion of the stream below the infiltration gallery dike is typically dry.

Except for fathead minnow, nonnative fishes are limited to downstream of the infiltration gallery. Nonnative species present include green sunfish, smallmouth bass *Micropterus dolomieu*, channel catfish, black bullhead *Ameiurus melas*, yellow bullhead *Ameiurus natalis*, fathead minnow, red shiner, common carp, and mosquitofish. Native fish species present in Bonita Creek include Gila chub, longfin dace, speckled dace, Sonora sucker, and desert sucker. In addition, approximately 4,000 razorback sucker were stocked in 1987, but none have been observed since 1991.

A Reclamation funded fish barrier was proposed and constructed in the lower reach of Bonita Creek, about 1.3 miles upstream from the Gila River confluence. Tasks for the Department were to chemically treat (renovate) the 1.7 mile perennial reach between the barrier and the infiltration gallery dike to remove all fishes. Before treatment, individuals of each native species were to be salvaged from the stream and held on site or nearby in aerated tanks during the renovation. After determining the success of the renovation, salvaged native fishes were to be returned to the stream near their point of capture. Additional native species considered for repatriation included razorback sucker, spikedace, loach minnow, desert pupfish, and Gila topminnow.

Results: Department staff wrote an EAC for the renovation and subsequent stocking of native fish. We coordinated with other agencies regarding the renovation and repatriation of native fishes. We collected Gila chub from Bonita Creek for a fish health assessment. The chub were infected with Asian tapeworm. We collected speckled dace from the Blue River (potential donor site for loach minnow) at the end of March 2008, and sent them to a laboratory for a fish health assessment; no pathogens or parasites of concern were detected. A pre-renovation survey was done in early June 2008 and a renovation plan (AZGFD 2008c) was written and distributed for internal and external review. The Reclamation funded barrier was built in summer 2008.

The stream between the infiltration gallery and the new barrier was renovated twice, once on October 8 and again on October 9, 2008 (Robinson et al. 2009). Native fish (desert sucker, Sonora sucker, speckled dace, longfin dace, and Gila chub) were salvaged from the stream October 5-8, 2008 and held on-site in portable tanks. After the renovation, the stream was thoroughly electrofished and baited hoop nets set for three nights; no non-native fishes or any fishes were captured, so the renovation was considered a success. The salvaged native fishes, and 448 spikedace (Gila Birding Area lineage) and 678 loach minnow (Blue River lineage) were stocked into the renovated reach on October 15, 2008. The spikedace and loach minnow were all

F1 generation fish produced at Bubbling Ponds. On October 31, 2008, 975 Gila topminnow and 147 desert pupfish were stocked into Bonita Creek; fish originated from TNC Lower San Pedro River Preserve ponds. Bureau of Land Management staff monitored the fish populations in Bonita Creek over the next several months. In February 2008 Sonora sucker, desert pupfish, spikedace, loach minnow, speckled dace, longfin dace, and Gila topminnow were observed. In March 2009, spikedace, loach minnow, Gila chub and Sonora sucker were captured and Gila topminnow observed; unfortunately mosquitofish were also captured. Department staff conducted 6-month post-stocking monitoring for Gila topminnow and desert pupfish on May 7-8, 2009; gears used included minnow traps and seines. Forty-one Gila topminnow, 631 unidentified cyprinids, 44 unidentified catostomids, 1 Gila chub, and 3 mosquitofish were captured; no desert pupfish were captured or observed. On June 11, 2009, BLM personnel observed some fish that appeared to be centrarchids. On August 6, 2009 a multi-agency crew observed more green sunfish, and on the following day captured green sunfish. In August-September 2009 a multi-agency effort to monitor Bonita Creek was completed. Of the species stocked after the renovation (including the salvaged resident species and the newly repatriated species), all were captured except desert sucker and desert pupfish. In addition to the native species, 312 green sunfish and 530 mosquitofish were also captured. Bureau of Land Management staff led a number of green sunfish removal efforts. Another renovation is necessary; planning is underway. A report was written summarizing the salvage, renovation, and return of native aquatic species to Bonita Creek (Robinson et al. 2009).

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