

ARIZONA NATIVE FISH RECOVERY AND NONNATIVE FISH CONTROL

FWS Agreement No. 201816J808

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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 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, razorback sucker, Gila topminnow, Gila chub, and loach minnow.

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 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 spinedace to Bubbling Ponds Hatchery Research Facility.
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 spikedace
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.

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, because the program could not be immediately staffed, bureaucratic processes within the Department and within the various cooperating agencies take time, and because the metric of success defined in the statement of work in the cooperative agreement is population establishment, which must be confirmed by periodic, post-project monitoring (the Scope of Work, Part VI.B.1.f indicates that the Department is responsible for monitoring the repatriated populations at 1 year post-stocking). Population establishment can require more than one stocking; if abundance of fish is low or absent during post-stocking monitoring, then an additional stocking(s) will be 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.

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 former 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 on their lands. Fish will be transported alive to the Department's Bubbling Ponds Hatchery Research Facility.

Results: We acquired data on spikedace and loach minnow locations from SONFISHES (Arizona State University), Arizona Game and Fish Department HDMS, New Mexico Department of Game and Fish, U.S. Fish and Wildlife Service, and several university professors. Spikedace are found in eight localities, representing five populations: within Arizona are Eagle Creek, Aravaipa Creek and tributaries and the middle Gila River-Lower San Pedro River (may be an artifact of fish washing down from Aravaipa Creek during flood events), and the Verde River, and within New Mexico the upper Gila River, and the Gila River Forks (including Middle, West, and East Forks) (Desert Fishes Team 2003, USFWS 2007, Paroz and Propst 2007). However, in Arizona the species is only consistently found at one (Aravaipa Creek) of the locations; spikedace were last captured in 1999 in the Verde River, 1991 in the middle Gila River between Hayden-Ashurst Dam to confluence with the San Pedro River, and in 1989 in Eagle Creek. In New Mexico spikedace remain abundant in the upper Gila River in the Gila Birding Area, but are rare in the Gila River forks area; were last captured in the Middle Fork Gila during 1995.

Loach minnow have eight extant populations: Aravaipa Creek and tributaries, East Fork Black River-North Fork East Fork Black River-Boneyard Creek, Blue River and its tributaries (including the portion in New Mexico), Eagle Creek, White River and its tributaries East Fork White River and North Fork White River, and within New Mexico in the San Francisco River and its tributaries, the upper Gila River, and the Gila River forks (including Middle, East, and West forks) (Desert Fishes Team 2003, USFWS 2007, Paroz and Propst 2007). However, loach minnow in the Blue River may actually be two distinct populations; the upper Blue and lower Blue (Tibbets and Dowling 1996). In Arizona, loach minnow are only consistently captured in two (Aravaipa Creek and Blue River) locations (the status of the population(s) in the White River drainage on the White Mountain Apache Reservation are unknown); they were last captured in 1997 in Eagle Creek, and in the last extensive survey in the North Fork East Fork Black River during 2004, only two fish were captured.

We produced a draft study plan for the project. Also, in collaboration with US Forest Service, U.S Bureau of Reclamation, and U.S. Fish and Wildlife Service we developed priorities for holding and propagating spikedace and loach minnow at Bubbling Ponds Research Facility. The

two main goals for Bubbling Ponds Research Facility are to provide refuge for rare populations of spokedace and loach minnow, and to propagate the populations in need of replication. The populations in most need of refuge are those that are the rarest: spokedace 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 spokedace from Aravaipa Creek, the upper Gila River, and the Gila River forks presently have the highest priority for propagation.

As of April 1, 2008, we have acquired spokedace from two of the four metapopulations, and loach minnow from two of the eight metapopulations. We acquired both spokedace and loach minnow from Aravaipa Creek and are holding and propagating both species at Bubbling Ponds Research Facility. We acquired loach minnow from the Blue River during June 2007 and March 2008, and are holding them and propagating them. We acquired spokedace and loach minnow from the upper Gila River (Birding Area) in June 2007 and are holding and propagating spokedace at Bubbling Ponds; all of the loach minnow were lost due to an Ich (*Ichthyophthirius multifiliis*) outbreak soon after acquisition. We began communications to acquire White River loach minnow from the White Mountain Apache Tribe. On our behalf, U.S. Fish and Wildlife Fishery Resource 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. We also sent the Director of the White Mountain Apache Tribe Wildlife and Outdoor Recreation Department a letter requesting loach minnow. During 2008 or 2009, New Mexico Game and Fish Department will supply us with spokedace and loach minnow collected from the Gila River Forks area, for refuge and propagation at Bubbling Ponds Research Facility.

Using our study plan and location information from the datasets, we surveyed the Verde River, Eagle Creek, and North Fork East Fork of Black River during spring-summer 2007. In Eagle Creek, we surveyed reaches not targeted by Paul Marsh of Arizona State University, who sampled his fixed sites. No spokedace or loach minnow were captured in any of the streams surveyed. We surveyed the Verde River again during June 2008, the North Fork East Fork Black during July and August 2008, and Eagle Creek during July and August 2008. No spokedace or loach minnow were captured in any of the targeted streams. In addition, we have requested permission (a formal letter, plus verbally) from the San Carlos Apache Tribe to survey the portion of Eagle Creek on their lands, and to bring any loach minnow or spokedace captured back to Bubbling Ponds Hatchery 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.

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 *Gila intermedia* (last encountered in 1991), and likely Sonora sucker

Catostomus insignis and desert sucker *Pantosteus clarki*, but there have been no recent collections of these native species and the stream is presumed fishless. The dace and suckers are declining range-wide but 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 and restore its population of Gila chub, and an opportunity now exists to replicate that population into Turkey Creek. This opportunity is especially attractive because non-native fishes are absent from Turkey Creek (subsequent to the writing of this proposal, nonnative fish were found during surveys in 2007 and 2008) and a native fish assemblage thus can be restored without threats of alien fishes. Attributes that help prevent reinvasions by non-natives include relative isolation from O'Donnell Creek and Babocomari River by many miles of normally dry streambed. Following a survey to confirm fishless status, evaluate potential for emplacement of a fish barrier, and compliance with appropriate environmental regulations, it is proposed that appropriate numbers of Gila chub be captured from O'Donnell Creek and translocated to Turkey Creek. It also is recommended that longfin dace, Sonora sucker, and desert sucker from suitable source populations be repatriated to the stream.

Results: 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 from Research Branch and Region 5 surveyed Turkey Creek and O'Donnell Creek; other reaches of O'Donnell Creek were surveyed by U.S. Bureau of 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. The decision was made to write a new Environmental Assessment Checklist which would include 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 of Region 5 drafted the EAC, but it has yet to be fully signed. Region 5 staff surveyed Turkey Creek again in November 2007 and found three green sunfish and numerous longfin dace. Region 5, Research Branch, and US Bureau of Reclamation personnel surveyed Turkey Creek on May 7 2008 and found green sunfish and largemouth bass. 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.

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 *Gila intermedia*. However, downstream in O'Donnell Canyon, longfin dace *Agosia chrysogaster* and Sonora sucker *Catostomus insignis* were present until very recently. Several other native fishes, such as desert sucker *Pantosteus clarki*, 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 and Freeman Springs Canyons, 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. Following a survey to confirm fishless status and compliance with appropriate environmental regulations, it is proposed that appropriate numbers of Gila chub be captured from O'Donnell Creek and translocated to Post Canyon. It is also recommended that longfin dace, Sonora sucker, and desert sucker from suitable source populations be repatriated to the stream.

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. 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 Region 5 and Research Branch Personnel surveyed below the two dams and between the two dams. 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 AZGFD.

Ash Creek repatriations.

Status: Complete.

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, roundtail chub, Sonora sucker, and desert sucker. The dace and suckers are declining range-wide but still relatively widespread and common, while roundtail chub is biologically imperiled but is not listed as threatened or endangered nor is it a candidate species. There also are no records of non-native fish species from upper Ash Creek, and that reach of the stream is presumed fishless. An opportunity exists to replicate populations of roundtail chub and associated native fishes in upper Ash Creek. This opportunity is especially attractive because non-native fishes are absent from upper Ash Creek and a native fish assemblage thus can 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 represent barriers to upstream movement by fishes. Following a survey to confirm fishless status and compliance with appropriate environmental regulations, it is proposed that appropriate numbers of roundtail chub be captured from Cherry Creek or other suitable source and translocated to upper Ash Creek. It also is recommended that longfin dace, speckled dace, Sonora sucker, and desert sucker from suitable source populations be repatriated to the stream.

Results: After the U.S. Fish and Wildlife Service determined that listing roundtail chub was not warranted, all of the proposed fish species to be stocked into Ash Creek were non-listed species. Therefore, CAP funds were not expended on the project. Repatriations of native fishes to Ash Creek were contentious for a couple of allotment lessees. Regardless, the Arizona Game and Fish Commission approved of the project in April 2007. In September 2007, native fish (longfin dace, speckled dace, desert sucker, Sonora sucker and roundtail chub) were repatriated to Ash Creek. Post-stocking surveys of non-listed species were completed by Region 6 staff on November 27, 2007. All five species stocked were found. The Department probably will not attempt to stock any listed-fish species for as long as the permittees oppose it, and that action will be proposed as a new 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 some level of 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.

Results: Gila topminnow were stocked into ten sites. *One and two:* On June 12, 2007, 103 Gila topminnow (Boyce Thompson Arboretum mixed lineage) were collected from Ayer Lake at Boyce Thompson Arboretum and stocked into one of the four ponds at Mud Springs (site #18); this augmented the existing population in Mud Springs. Topminnow were abundant during the 1-month and 6-month post-stocking monitoring. On July 15, 2008, Gila topminnow from Boyce Thompson Arboretum were stocked into the middle-north pond of Mud Springs and desert

pupfish were stocked into the north pond; desert pupfish were stocked into the middle-south pond on June 12, 2008. *Three through six:* On October 4, 2007, Gila topminnow (Bylas lineage from ASU) were stocked into three locations on the Muleshoe Ecosystem (250 into Sheep Spring, 250 into Cherry Spring, and 500 into Secret Spring). At the 1-month and 6-month and 1-year post-stocking monitoring events, topminnow were observed at all locations. During the 1-year post stocking monitoring (September 15-16, 2008), over 1,000 Gila topminnow (adults and juveniles) were captured in Secret Spring, and both juveniles and adults were captured in Swamp Springs Canyon and Cherry Canyon, although in the latter, only 8 individuals were captured. The Cherry Spring and Swamp Spring populations were augmented with 250 Gila topminnow and 250 desert pupfish on September 17, 2008; in Swamp Springs Canyon fish were stocked into a reach upstream of the 2007 stocking site, whereas in Cherry Spring Canyon fish were stocked in the same stocking reach and immediately downstream. On the same day, a new site on the Muleshoe Ecosystem, Headquarters Spring, was stocked with 250 Gila topminnow and 250 desert pupfish, because it was determined that the Secret Spring population was doing very well and was not yet in need of augmentation. *Seven:* Department personnel and The Nature Conservancy personnel collected Gila topminnow (Bylas lineage) from the Dudleyville pond on November 5, 2007 and transferred them to Yvette Paroz of New Mexico Game and Fish Department; the fish were stocked into Burro Cienega east of Lordsburg, NM. No fish were detected in visual survey April 2008, but water was cold. On June 12, 2008, we collected 578 Gila topminnow from TNC Dudleyville pond and Yvette Paroz of NMDGF transported and stocked them (25 mortalities) into Burro Cienega. *Eight:* We acquired Sharp Springs lineage of Gila topminnow from Dexter National Fish Hatchery on November 27, 2007 and stocked approximately 2,500 into Fossil Creek, near Fossil Springs on November 28, 2007. Several flood events occurred immediately after stocking, and no fish were observed during the 1-month or 6-month post-stocking monitoring. *Nine:* Region 5 personnel, with help from Nongame and Research personnel, renovated Fresno Canyon during June 2007, and by November 2007, three topminnow were observed by Region 5 personnel (assumed dispersed from Coal Mine Canyon). Region 5 personnel stocked Fresno Canyon with 1,000 Gila topminnow from Coal Mine Canyon (lower Sonoita Creek lineage) on April 1, 2008. *Ten:* On August 29, 2008, AZGFD and Tonto National Forest Service personnel collected 200 Gila topminnow from Boyce Thompson Arboretum's Ayer Lake and transported them and stocked them into Cottonwood Spring in the Goldfield Mountains. *Others not funded by CAP:* Two other sites were stocked with Gila topminnow by the nongame program of AZGFD. On September 18, 2008 approximately 250 Gila topminnow and 250 desert pupfish were collected from the TNC pond at Dudleyville, and transported and stocked into Oak Grove Canyon, a tributary to Aravaipa Creek. On September 4, 2008, 259 Gila topminnow were stocked into Timbucktwo Tank under the statewide Safe Harbor Agreement.

Many sites identified in the draft recovery plan (Weedman 1998) and in Voeltz and Bettaso (2003) as potential sites to stock Gila topminnow were visited and evaluated and will be stocked during 2008. Howard and Posey wells in the San Simon Valley southeast of Safford were evaluated by Bureau of Land Management, Suzy Ehret of Region 5 completed internal compliance (signatures by upper management are needed). Howard Well was stocked with desert pupfish by AZGFD and BLM personnel on July 1, 2008, but at that time habitat improvements still needed to be completed at Posey Well. Gila topminnow will likely be stocked into Howard Well during 2009, after it is determined that desert pupfish have

established. Eight sites on Tonto National Forest were visited, compliance is nearly complete or is complete, and will be stocked during 2008: Cottonwood Spring in the Goldfield Mountains, the three other ponds at Mud Springs, site #18, Rock Springs near Sunflower, Cottonwood Artesian (site #77), Walnut Springs (site #392), Walnut Spring (site #20), and Mud Spring north of Roosevelt Lake. Arnett Creek (see project description below) will be stocked with topminnow during 2008 once the U.S. Forest Service completes a Biological Assessment and Evaluation and Section 7 Consultation. Six sites within Maricopa County Parks were evaluated, internal compliance is complete or near complete, will be signed on to the Safe Harbor Agreement for Topminnow and Pupfish in Arizona, and hopefully stocked in 2008. Morgan City Wash and Chalky Spring in Lake Pleasant Regional Park were evaluated and the park approved of the planned stockings of native fish. Willow Spring in White Tank Regional Park was evaluated and the park approved of the planned stockings of native fish. Nursery Tank and Pemberton Pond in McDowell Mountain Regional Park were evaluated and the park approved of the planned stockings of native fishes. The pond at Spur Cross Preserve was evaluated and the park approved of the plan to stock native fishes. Maricopa County Parks still needs to be signed onto the Safe Harbor Agreement before any of the aforementioned sites on their lands are stocked. Five ponds within Robbins Butte Wildlife Area (Arizona Game and Fish Department) were evaluated, but compliance still needs to be completed as does signing on to the Safe Harbor Agreement.

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, Gila trout (also present in New Mexico), chubs of the genus *Gila*, speckled dace, loach minnow, spikedeace, 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 be those known or expected to have occurred historically in target watersheds, and

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: So far only non-listed species have been repatriated; loach minnow are the only listed-species planned for repatriation in the Black River Watershed. For speckled dace and desert suckers, health assessments of fishes from donor streams (Black River at Wildcat Crossing, and West Fork Black River immediately downstream of the barriers) were completed. Based on results of our fish health assessments, we decided to use the West Fork Black River as the source of speckled dace and desert suckers to be repatriated to most Black River Basin streams. Speckled dace were repatriated into three or more locations in each of the following streams: Home Creek (150 fish among three locations), Hayground Creek (144 fish among three locations), Double Cienega Creek (160 fish among three locations), Corduroy Creek (171 fish among three locations), and Fish Creek (300 fish among six locations).

A letter to the Apache-Sitgreaves National Forest Supervisor was drafted seeking permission to sample for loach minnow on North Fork East Fork Black River, and to either bring fish to Bubbling Ponds Research Facility, or to translocate them directly into West Fork Black River, Bear Wallow Creek, and Fish Creek. After discussions with the Forest Service and U.S. Fish and Wildlife 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 Forest Service also requested that we draft a study plan, which we did. North Fork East Fork Black River was surveyed in 2007, but no loach minnow were found. We will make another attempt to acquire loach minnow in 2008. 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 will be evaluated to assess the presence and extent of habitat for loach minnow.

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 *Poeciliopsis occidentalis*. Other native fishes recorded from the drainage include desert sucker *Pantosteus clarki*, longfin dace *Agosia chrysogaster*, and speckled dace *Rhinichthys osculus*. 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 has now nearly eliminated the population of Gila topminnow. Several other nonnative species have been recorded in Redrock Canyon, including largemouth bass and bluegill, 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. Although the proposed constructed barrier site is only approximately one mile downstream from a natural barrier ("the falls"), the reach between has historically sustained Gila topminnow (including Oak Grove drainage) and represents valuable additional habitat worth protecting in this extremely dry watershed. Funds have been identified for construction of this barrier from a different funding source.

Funds were provided to the Department to complete National Environmental Policy Act 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 will obtain stock of desert sucker, longfin dace, and possibly speckled dace from lower Redrock Canyon or Sonoita Creek and of 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: Only coordination activities have been done on this project. A Biological Assessment of construction of a barrier, chemically treating the stream with piscicides, and repatriation of native fishes was drafted by US Bureau of Reclamation and a final decision notice was issued in June 2008, and went through the 45-day appeal period. The barrier is scheduled to be completed by autumn 2008. The stream will be renovated during a low-flow period following barrier construction. After it is determined that all non-native fish have been exterminated, native fish, including Gila topminnow, will be repatriated.

Repatriation of native fishes into Arnett Creek

Status: Ongoing.

Description: Arnett Creek and its tributary Telegraph Canyon are located on the Tonto National Forest, 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: Research and Region 6 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 Research, Nongame Branch, Region 6, and U.S. Fish and Wildlife personnel electrofished and measured habitat in Telegraph Canyon and Arnett Creek on March 15, 2007; revised estimate of perennial water to 730 m. No fish were captured or observed, but crayfish were observed in Arnett Creek. 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. Personnel from Research Branch, U. S. Forest Service, and U.S. Fish and Wildlife Service met with the Superior Allotment lessee to discuss introductions 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 6 months, so there is really 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), but it still needs to be approved by upper management and the U. S. Fish and Wildlife Service needs to draft an associated BO before we stock listed-fish. Once the BO is completed, we will stock Gila topminnow into Telegraph Canyon and Arnett Creek. We will monitor the stocked fish to determine if they establish themselves. If they and longfin dace (see below) establish, then we will consider stocking Gila chub. If longfin do not establish, we probably will not move forward with stocking Gila chub or Gila topminnow.

We did move forward with stocking non-listed species. On July 7, 2007 Research, Nongame, and Region 6 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, Region 6 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, Region 6 personnel visited Arnett Creek, but only observed or dip-netted two longfin dace, but the water was turbid. Region 6 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 one-year post-stocking survey was conducted by Research personnel on July 23, 2008.

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. The habitat was assessed to still be suitable for Gila topminnow, but the habitat for Gila chub had decreased in quality.

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, Gila trout, razorback sucker, flannelmouth sucker, Gila topminnow, woundfin, desert pupfish, Colorado squawfish, and roundtail chub 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 is 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 (U.S. Fish and Wildlife Service, New Mexico Department of Game and Fish, and U.S. Forest Service), 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 downstream neighbors to Blue River, and number of individuals removed should not obviously deplete the source. Multiple stockings should be performed successively at three-year 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.

Results: Research, Nongame, and Region 1 Department personnel met with U.S. Forest Service, Bureau of Reclamation, and U. S. Fish and Wildlife Service on April 10, 2007 to discuss the Blue River project. The Forest Service 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, but now the barrier construction has been approved. Bureau of Reclamation indicates that the barrier construction contract will be awarded in FY2009. In addition, nonnative fish may be further upstream than suspected. Bureau of Reclamation surveyed the Blue River in April 2008 to assess the distribution of nonnative fishes in the upper reach; the only nonnative fishes captured were rainbow trout and brown trout, both only from the reach above Lower Ranch. The local community is developing a fisheries management plan in

collaboration with the U.S. Fish and Wildlife Service. Stocking of listed species (spikedace) will not occur until after the barrier has been constructed; probably not until 2009 or 2010.

Boyce-Thompson Renovation

Status: Considered terminated.

Description: Ayers 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 Ayers Lake populations have been used to establish new populations of these two species throughout the Gila River Basin. However, periodically, the pond is contaminated with nonnative species and has to be renovated. It was last renovated in 1983. During 1986 monitoring, nonnative fathead minnow *Pimephales promelas* were discovered in the pond, and have been present ever since. Red swamp crayfish *Procambrus clarkia*, another nonnative species, was first observed during 1976 monitoring, and it continues to inhabit Ayers Lake. Prior to 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 Dexter National Fish Hatchery. 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 Research and Region 6 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. 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 Springs Canyon, and Secret Spring)

Status: Ongoing.

Description: Note, the original project description only included Hot Springs Canyon. A high priority of the CAP Fund Transfer Program to conserve and recover native fishes of the Gila

River basin is to replicate remaining populations of federally-threatened loach minnow and spikedace into suitable protected streams. 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 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 5+ 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. Following compliance with appropriate environmental regulations, it is proposed that appropriate numbers of loach minnow and spikedace from Aravaipa Creek be captured and translocated to Hot Springs Canyon. The Department will develop translocation protocols (including post-translocation monitoring needs), accomplish necessary environmental compliance, and undertake the actual translocations and monitoring.

Results: This task was one of the biggest success stories of the program. The stockings occurred on October 4, 2007, utilizing staff from multiple agencies and volunteers. Spikedace 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 location). Gila topminnow (Bylas Spring lineage from ASU) were brought to The Nature Conservancy 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 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. Pupfish may be more active and hence easier to catch during the one-year post-stocking monitoring. One-year post-stocking monitoring of fishes was done on September 15 and 16. 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 spikedace (all adults) were captured. In Redfield Canyon, 12 spikedace (ten adults and two juveniles) and one loach minnow (an adult) were captured. Augmentation stockings of each species into all sites except Secret Spring were done on September 17, 2008: 1000 loach minnow and 500 spikedace 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 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 first green sunfish removal (multi-agency, but The Nature Conservancy has the CAP contract) after the stocking of loach minnow and spikedace occurred on April 8, 2008; only four green sunfish were captured and removed. Another green sunfish removal event is scheduled for June 2008.

San Pedro Pond Stockings

Status: Ongoing.

Description: To mitigate impacts of operations of modified Roosevelt Dam on endangered southwestern willow flycatcher *Empidonax traillii extimus*, Reclamation provided funds to The Nature Conservancy (TNC) in 1996 to acquire an 820 acre parcel of riparian land along the lower San Pedro River near Dudleyville, AZ. Two groundwater-supplied ponds on that property (TNC's Lower San Pedro River Preserve) were rehabilitated for use as native fish and waterfowl habitat, and since 2000 Reclamation has used the larger pond (~3 surface acres, west of the smaller pond) as a grow-out and refuge facility for razorback sucker. The large pond has further potential as a refuge for roundtail chub from Aravaipa Creek, and both ponds can be used similarly for desert pupfish and Gila topminnow. The purpose of this project is to acquire and stock individuals of Gila chub, desert pupfish, and Gila topminnow into the refuge ponds. The Department will undertake necessary environmental compliance, and identify, acquire, and stock from appropriate sources Gila chub, desert pupfish, and Gila topminnow into ponds on the Lower San Pedro River Preserve. Gila chub will come from extant San Pedro River basin populations (e.g. Hot Springs Canyon), while suitable source stocks of pupfish and topminnow have not been specifically determined. Reclamation will conduct annual post-stocking monitoring of the repatriations.

Results: 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, Rob Bettaso (AGFD), Scott Gurtin (AGFD), Dean Foster (AGFD), Rob Clarkson (USBR), Paul Marsh (ASU), Doug Sprouse (TNC), and Jeremy Voeltz (AGFD) stocked approximately 750 desert pupfish (from USFWS Cibola National Wildlife Refuge Headquarters refuge pond) into the west pond; desert pupfish were subsequently stocked into the east pond. On July 13, 2006, Robert Burton (TNC), Charlie Allen (TNC), Jeremy Voeltz (USFWS), Karen Franco (AGFD), and Amanda Spencer (AGFD) stocked approximately 200 Gila topminnow (from Bylas Spring, San Carlos Apache Reservation) into the east pond. 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 Dexter National Fish Hatchery 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 USBR and fish were in good condition with multiple age classes observed. However, when the pond was being drawn down for improvements in September 2008, all razorback suckers suffered mortality. We need to coordinate with the various stakeholders (USBR, USFWS, and TNC) to

determine if it is desirable to stock Gila chub into the east pond and roundtail chub into the west pond.

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 the facilities and return full flows to Fossil Creek. A fish barrier was constructed in 2004 to prevent upstream migration 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. Species to stock included: highest priority species are spikedace, loach minnow, and longfin dace, middle priority species are desert pupfish, Gila topminnow, and razorback sucker, low priority species are woundfin and Colorado pikeminnow.

Results: Two multi-agency meetings were held to discuss the project. The group decided on species to stock, and priorities for the stockings. Codey Carter wrote the Department EAC which was signed. We conducted habitat surveys in October, and then developed a plan on where to stock which species. Recommendations as to where to stock each species were presented to the multi-agency team and accepted. On November 2, 2007 125 spikedace and 125 loach minnow (Aravaipa lineage for both species) were transported from Bubbling Ponds Hatchery and stocked into Fossil Creek. All fish survived the transport, but one loach minnow died during the tempering process. Both spikedace and loach minnow were released above the dam. On November 27, we acquired Gila topminnow (Sharp Springs lineage) from Dexter National Fish Hatchery, and stocked approximately 3,000 into the upper reach of Fossil Creek on November 28. 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, and did not detect any topminnow; flood debris was noted about 2 - 6 vertical feet above the water surface at the various stocking sites. We collected longfin dace from Tangle Creek and sent them to a laboratory for a fish health assessment (longfin from Tangle were to be stocked into Fossil). 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. On March 7, 2008 we stocked an additional 500 loach minnow from Bubbling Ponds Hatchery Research Facility (Aravaipa Creek stock) into Fossil Creek above the diversion dam. On May 21, 2008, we stocked an additional 504 loach minnow between the old Irving power plant and the decommissioned diversion dam. Additional spikedace will be stocked when we have enough available, probably during late summer 2008. We were going to stock razorback sucker that were being held in a pond on the Hualapai Reservation, but the stocking was postponed until a multi-agency PIT tag monitoring system is deployed. Ninety-nine razorback sucker from the Bubbling Ponds Research Facility were stocked near the lowest road access point, upstream of the fish barrier, on April 15, 2008. Desert pupfish have not been stocked, and we are still discussing with the US Forest Service whether or not they will be stocked. A Fossil Creek Native Fishes Working Group meeting was held on September 29, 2008 at AZGFD to discuss group processes and future stockings; the group agreed to continue stocking of all species that have been stocked to date.

Meda/Tiaroga data assembly

Status: Complete.

Description: Could not find a description of this task. However, the title seems self evident. The task is to acquire historical location records of spokedace and loach minnow from university, museum, agency, and other sources and assemble them into an electronic form, possibly into one database. The data assembled will be used to target sites to sample within streams where the species are now rare (e.g., Eagle Creek and Verde River).

Results: Acquired data for historical statewide distribution of spokedace and loach minnow from SONFISHES, AZGFD Heritage Management Database System, AZGFD regional fish survey reports, U.S. Fish and Wildlife Reports, New Mexico Department of Game and Fish, Paul Marsh of Arizona State University, and a 2002 report to Bureau of Reclamation by Brian Bagley of loach minnow surveys in the Verde River Drainage. I also contacted Dr. Rinne at Rocky Mountain Research Station in Flagstaff, but he thought that most of his location information was included in AZGFD 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 spokedace and loach minnow in Arizona will be added as records occur.

Mineral Creek repatriations.

Status: Ongoing.

Description: Could not find a description for this task. Mineral Creek is a tributary to the Gila River, southeast of Superior, in Pinal County, Arizona. Mineral Creek originates in the Dripping Springs Mountains and Pinal Mountains on Tonto National Forest, and flows southwest across private and state lands until it meets the Gila River. Immediately downstream of the confluence with Devils Canyon, Mineral Creek is dammed (Big Box Dam), creating a small reservoir (the reservoir, dam and reach downstream are owned by ASARCO Ray Mine). Perennial water in Mineral Creek begins just downstream of Government Springs Ranch (private land) and extends downstream approximately 3.6 miles to about 0.25 miles above Big Box Dam. Another reach of perennial water exists immediately downstream of the dam, after which flows are diverted through a tunnel around the ASARCO Ray Mine.

Historical survey data from 1993 and 2000 indicates that Mineral Creek was occupied by Gila chub, longfin dace, green sunfish, fathead minnow, and mosquitofish. Although not recorded, it is possible that other native species such as desert sucker and Sonora sucker occurred in Mineral Creek because of the size and complexity of the system, and its connectedness with the Gila River. Mineral Creek was listed as critical habitat for Gila chub in November 2005, but they were last captured in the stream during 2000 (longfin dace and green sunfish were also captured). No fish were found in surveys during March 2002, September 2002, and March 2006; so the stream was assumed to be fishless. Because the stream was deemed fishless, it presented an opportunity for re-establishment of the native fish species, as opposed to a source for Gila chub translocations. Proposed species to stock into Mineral Creek included longfin dace and Gila chub.

Results: Early in 2006, Region 6 personnel 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. Region 6 and Nongame 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. Green sunfish were also observed upstream in Devils Canyon, as they were during a 2002 survey of Devils Canyon. During April 21-22, 2008, conducted a survey of upper Mineral Creek from the reservoir upstream to Government Springs Ranch. 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. The entire drainage above Big Box Dam reservoir could be managed as a native fishery if Big Box Dam Reservoir, Devils Canyon, and the portion of Mineral Creek inhabited by green sunfish are renovated. We have notified ASARCO Ray Mine of our desire to renovate the above mentioned waters. A helicopter flight over the Devils Canyon drainage was done on August 18, 2008 to identify perennial waters to be surveyed. Surveys within the Devils Canyon drainage will be done during autumn 2008 or spring 2009.

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 state of Arizona 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 The Nature Conservancy's Gila River Farm, near Cliff New Mexico. Arizona Game and Fish Department agreed to provide New Mexico with the Gila chub and Gila topminnow after completing the necessary compliance.

Results: An EAC was drafted by Tony Robinson and signed. Tony Robinson, Ross Timmons, and Codey Carter, with help from The Nature Conservancy staff, collected Gila topminnow from The Nature Conservancy Lower San Pedro Preserve ponds near Dudleyville on November 5, 2007 and transferred them to Yvette Paroz of New Mexico Game and Fish Department; the fish

were stocked into Burro Cienega, east of Lordsburg, NM. No topminnow were observed during an early April 2008, but water temperatures were still relatively cold. On June 12, 2008 Tony Robinson, Jesse Bahm, Tina Tudor and Chris Weller of AZGFD and Yvette Paroz of NMDGF collected 578 Gila topminnow from the east TNC pond at Dudleyville. Yvette 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 source of Gila chub agreed upon by the various agencies involved (AZGFD, 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). 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. 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 2009.

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, and canyon treefrogs in an approximately 600-m long perennial section. Non native species found within the canyon include green sunfish, bullfrogs and crayfish. In an effort to remove non native aquatic species from the drainage, Arizona Game and Fish Department (AZGFD) in cooperation with Arizona State Parks plans a chemical renovation of the canyon to restore aquatic habitat to conditions suitable for native species conservation. If Gila topminnow do not naturally disperse from Coal Mine Canyon, then they will be translocated. The renovated stream might also present an opportunity to stock Gila chub.

Results: Region 6 personnel 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. The renovation was a success; no living fish were observed on June 21. Steve Haas of 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 Fresno Canyon (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; these fish had likely dispersed downstream from Coal Mine Canyon during a flood event. On April 1, 2008, Region 6 personnel stocked approximately 1,000 Gila topminnow (from Coal Mine Canyon) and 75 longfin dace into Fresno Canyon below the confluence with Coal Mine Canyon. No green sunfish were observed in Fresno Canyon, but two adult longfin dace were seen. Post-stocking monitoring still needs to be done to ensure that

the stocked topminnow establish. Region 6 personnel have amended the EAC to include stocking of Gila chub, and plan to stock Gila chub (Sheehy Spring lineage) later in 2008.

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.

Nonnative fishes are limited to downstream of the infiltration gallery; only native fish are present upstream of the gallery. Nonnative species present include green sunfish, smallmouth bass, channel catfish, black bullhead, yellow bullhead, 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 razorback suckers have not been observed since 1991.

A fish barrier is proposed to be constructed in the lower reach of Bonita Creek, about 1.3 miles upstream from the Gila River confluence, within the Gila Box RNCA. The 1.7 mile perennial reach between the barrier and the infiltration gallery dike will be treated (renovated) with rotenone to remove all fishes. Prior to treatment, individuals of each native species will 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 will be returned to the stream near their point of capture. Additional native species considered for repatriation include razorback sucker, spikedace, loach minnow, desert pupfish, and Gila topminnow.

Results: The EAC for the renovation and subsequent stocking of native fish was written and approved. 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 have sent them to a laboratory for a fish health assessment. A pre-renovation survey was done in early June and a renovation plan was written and distributed for internal and external review. A barrier was built in summer 2008 by a BOR contractor.

The stream between the infiltration gallery and the new barrier was renovated twice, once on October 8 and the second on October 9, 2008. 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 spokedace and loach minnow were all F1 generation fish produced at Bubbling Ponds Hatchery Research Facility. Gila topminnow, desert sucker, and razorback sucker will probably be stocked during spring 2009, and additional spokedace and loach minnow will be stocked in autumn 2009.

REFERENCES

Desert Fishes Team. 2003. Status of federal- and state-listed fishes of the Gila River Basin, with recommendations for management. Desert Fishes Team, Report Number 1, 19 pp.

Paroz, Y. M., D. L. Propst. 2007. Distribution of spokedace, loach minnow, and chub species in the Gila River Basin, New Mexico, 1908-2007. Final report of New Mexico Department of Game and Fish, Conservation Services Division, submitted to U.S. Fish and Wildlife Service, Ecological Services, Tucson, AZ and U.S. Bureau of Reclamation, Phoenix, AZ.

Tibbets, C. A., and T. E. Dowling. 1996. Effects of intrinsic and extrinsic factors on population fragmentation in three species of North American minnows (Teleostei: Cyprinidae). *Evolution* 50:1280-1292.

USFWS. 2007. Designation of critical habitat for spokedace and loach minnow—final rule. Federal Register: March 21, 2007, Volume 72, Number 54, pages 13355-13422.

Voeltz, J. B., and R. H. Bettaso. 2003. 2003 status of the Gila topminnow and desert pupfish in Arizona. Nongame and Endangered Wildlife Program Technical Report 226. Arizona Game and Fish Department, Phoenix, Arizona.

Weedman, D. A. 1999. Draft Gila topminnow, *Poeciliopsis occidentalis occidentalis*, revised recovery plan. Prepared by Arizona Game and Fish Department for U. S. Fish and Wildlife Service, Albuquerque, New Mexico, 83 pp.