

2020

Gila River Basin Native Fish Conservation  
Program Budget and Work Plan



# Table of Contents

- New Mexico Work Plan* ..... 3**
  - Project 1: NM-2006-1 - Removal of nonnative fishes from West Fork Gila River .....3
  - Project 2: NM-2002-1 - New Mexico T&E fish repatriations and monitoring.....5
  - Project 3: NM-2017-2 - Remote Site Inventory .....7
  - Project 4: NM-2020-1 - Gila Permanent Site Monitoring .....9
- Arizona Work Plan* ..... 11**
  - Project 5: AZ-2003-2 - Acquire Spikedace, Loach Minnow and rare populations of other native fish ...11
  - Project 6: AZ-2003-1 - Muleshoe ecosystem stream and spring repatriations .....13
  - Project 7: AZ-2020-1 – Sweetwater dam nonnative removal.....15
  - Project 8: AZ-2002-1 - Gila Topminnow stockings .....18
  - Project 9: AZ-2013-1 - Spring Creek (Oak Creek tributary) repatriations .....20
  - Project 10: AZ-2002-3 - Blue River native fish restoration .....22
  - Project 11: AZ-2008-1 - Assess potential repatriation waters .....24
  - Project 12: AZ-2014-1 - Expand Roudtail Chub population in Harden Cienega Creek .....25
  - Project 13: AZ-2018-1 - Eagle Creek repatriations.....26
  - Project 14: AZ-2016-2 - Red Tank Draw native fish restoration .....28
  - Project 15: AZ-2016-3 - Sharp Spring native fish restoration .....30
  - Project 16: AZ-2000-1 - Boyce Thompson Ayer Lake native fish restoration.....32
  - Project 17: AZ-2020-2 - Upper Verde River native fish restoration .....34
  - Project 18: AZ-2009-1 - Nonnative fish removal from Bonita and Aravaipa Creeks .....35
- Hatchery Workplan* ..... 37**
  - Project 19: HA-2006-2 - Aquatic Reasearch and Conservation Center O&M .....37
  - Project 20: HA-1998-1 - ASU topminnow holding.....39
- Project Ranking*..... 40**
- FY18-FY20 Budget* ..... 41**

# New Mexico Work Plan

## Project 1

Task ID: NM-2006-1

**Project Title:** Removal of Nonnative Fishes from West Fork Gila River

**Implementing Entity:** New Mexico Department of Game and Fish (Department), US Fish and Wildlife Service (USFWS), US Forest Service (USFS)

**Start Year:** 2006

**Location(s):** Upper Gila River Drainage: West Fork Gila River

**Species Protected:** Loach Minnow, Spikedace, Roundtail Chub, Gila Trout, Desert Sucker, Sonora Sucker, Speckled Dace, Longfin Dace.

### Project Description:

The West Fork Gila River near the confluence of the Middle and East forks supports a largely intact native fish assemblage, including one of two surviving Spikedace populations in New Mexico. Nonnative fishes are the primary threat to native fishes in the Gila forks area. Since 2006, the GRBNFCP has provided funding to the Department, USFS, and USFWS to systematically remove nonnative fishes from an approximately 4 km reach of the West Fork Gila River. These efforts have reduced numbers of some nonnatives as well as benefitted native fish species (Propst et al. 2014). The Department, USFWS, and USFS wish to continue systematic removals of nonnative fishes from the Heart Bar reach of the West Fork Gila River in 2020. Backpack electrofishers and seines will be used to collect fishes. Nonnative removal efforts will occur at least once per year, most likely in June. Additional removal efforts may be conducted as necessary if piscivorous nonnative fish are prevalent. Annual reports using appropriate analytical techniques that describe the effect of nonnative fish removal on native fish populations will be submitted. Data collected from this project also aids in monitoring critical Spikedace and Loach Minnow populations and contributes to repatriation efforts by providing an indicator of how many fish can safely be translocated in the wild or sent to the hatchery.

### Strategic Plan Goals:

- Build the scientific foundation for recovery efforts
  - Goal 1. Investigate novel methods to control nonnative aquatic biota.
  - Goal 2. Update and assemble existing knowledge of life history needs and ecology of Gila River basin native fishes.
- Prevent extinction and manage toward recovery
  - Goal 3. Protect native fish populations from nonnative fish invasions.
  - Goal 4. Remove nonnative aquatic species threats.
  - Goal 9. Monitor to quantitatively measure and evaluate project success in improving the status of target species and their habitats.

### Recovery goals:

- Loach Minnow Recovery Plan (1991)
  - Task 2.5 (priority 1): Monitor community composition including range of natural variation
  - Task 3.1-2 (priority 2): Identify nature and significance of interaction with non-native fishes
- Spikedace Recovery Plan (1991)
  - Task 2.5 (priority 1): Monitor community composition including range of natural variation
  - Task 3.1-2 (priority 2): Identify nature and significance of interaction with non-native fishes

**Estimated Cost: \$38,100**

- New Mexico Department of Game and Fish: \$16,400
- USFWS: \$10,300
- USFS: \$11,400

**Project 2**  
**Task ID: NM-2002-1**

**Project Title:** New Mexico T&E Fish Repatriations and Monitoring

**Implementing Entity:** New Mexico Department of Game and Fish, US Fish and Wildlife Service, US Forest Service

**Start Year:** 2002

**Location(s):**

- San Francisco River Drainage: Upper San Francisco River, Saliz Canyon, Mule Creek
- Upper Gila River Drainage: Little Creek
- Blue River Drainage: Dry Blue Creek
- Other locations as needed for evaluation

**Species Protected:** Loach Minnow, Spikedace, Roundtail Chub, Gila Topminnow

**Project Description:**

This project will identify potential repatriation streams, evaluate potential donor populations and repatriation sites, conduct repatriation of identified streams, monitor streams post-repatriation, and work with hatchery populations as needed. Potential repatriation sites will be evaluated for habitat, water quality, and fish disease. Multiple stockings into each repatriation stream will be performed successively for 3-5 consecutive years or until the desired populations are established or considered unsustainable. Monitoring of repatriated streams will continue until the population appears to be established or considered unsustainable. Established streams will then be surveyed at least once every five years. Streams where repatriation stockings are scheduled to continue in 2020 are Saliz Canyon (Loach Minnow) and the San Francisco River (Spikedace). San Francisco River (Loach Minnow), and Little Creek (Loach Minnow) were stocked previously and annual post stocking monitoring is scheduled for 2020. Additional streams have been identified as potential repatriation sites and more will be evaluated going forward. Post-repatriation monitoring is a necessary component of any repatriation effort to evaluate effectiveness. This task is intended to encompass all NM streams within the Gila, San Francisco, and Blue River basins that might undergo repatriation attempts in the future. Repatriation stockings can be direct transfers of fish from a wild population or stocking from a hatchery such as Arizona's Aquatic Research and Conservation Center (ARCC). This task encompasses collecting live fish for the purposes of direct stocking, quarantine at ARCC, or development and maintenance of brood stock at ARCC.

**Strategic Plan Goals:**

- Build the scientific foundation for recovery efforts
  - Goal 2. Update and assemble existing knowledge of life history needs and ecology of Gila River basin native fishes.
  - Goal 5. Investigate new stocking strategies to improve survival of repatriated fish.
- Prevent extinction and manage toward recovery
  - Goal 1. Identify critical streams and populations in need of protection and potential replication.

- Goal 2. Maintain and operate ASU topminnow holding facility and the Aquatic Research and Conservation Center (ARCC) to support the Program's recovery efforts for imperiled fishes in the Gila River Basin through the establishment of refuge populations of genetically distinctive stocks as insurance against extinction in the wild, captive propagation for repatriation, and applied research.
- Goal 5. Replicate populations and their associated native fish community into protected streams and other surface waters.
- Goal 9. Monitor to quantitatively measure and evaluate project success in improving the status of species and their habitats.

**Recovery goals:**

- Loach Minnow Recovery Plan (1991)
  - Task 6.2 (priority 3): Identify and prepare sites for reintroduction
  - Task 6.3-4 (priority 3): Reintroduce into selected reaches and monitor
  - Task 6.5-6 (priority 3): Determine reasons for success/failure and rectify as necessary
  - Task 8.2 (priority 3): Collect hatchery stocks
- Spikedace Recovery Plan (1991)
  - Task 6.2 (priority 3): Identify and prepare sites for reintroduction
  - Task 6.3-4 (priority 3): Reintroduce into selected reaches and monitor
  - Task 6.5-6 (priority 3): Determine reasons for success/failure and rectify as necessary
  - Task 8.2 (priority 3): Collect hatchery stocks
- Gila Topminnow Recovery Plan (1999 Draft)
  - Task 1.1 (priority 1): Maintain refugia populations of natural populations
  - Task 2.2 (priority 1): Reestablish into suitable habitats

**Estimated Cost: \$54,200**

- New Mexico Department of Game and Fish: \$20,900
- USFWS: \$17,400
- USFS: \$15,900

**Project 3**  
**Task ID: NM-2017-2**

**Project Title:** Remote Site Inventory and Assessment

**Implementing Entity:** New Mexico Department of Game and Fish, US Fish and Wildlife Service, US Forest Service

**Start Year:** 2017

**Location(s):**

- Gila River Drainage: East Fork, West Fork, Gila River (canyon bound)
- San Francisco Drainage: San Francisco River

**Species Protected:** Loach Minnow, Spikedace, Roundtail Chub, Gila Trout, Speckled Dace, Longfin Dace, Desert Sucker, Sonora Sucker

**Project Description:**

Much of the Gila River Drainage in New Mexico is extremely remote and thus difficult and costly to sample. The system is dynamic and there have been significant changes in the Gila and San Francisco rivers since the GRBNFCP funded an inventory of the Gila River forks from 2005-2008. The most significant change was the Whitewater-Baldy Fire that burned large portions of the upper Gila and upper San Francisco watershed in 2012 and the resultant post-fire flooding. This fire and flooding eliminated nonnative fishes from at least one tributary (Willow Creek) of the Middle Fork Gila River and may have created opportunities for native fish protection in other locations. The upper San Francisco has not been extensively sampled and the upper sites that have been surveyed have not been surveyed post fire. The lower Middle Fork Gila River was surveyed in the summer of 2017 and the upper reaches were surveyed in the summer of 2018 under this agreement. We would like to continue this inventory to other remote sites that haven't been recently surveyed. Proposed sampling includes establishing representative 100 meter sites in difficult to access remote areas including the Gila forks, canyon bound Gila reaches, upper San Francisco River, and all perennial tributaries. Sampling will be conducted using backpack electrofishers and seines appropriate to habitat type. The remote nature of sampling will require pack stock for most sampling. All fish collected will be identified and enumerated by habitat. Morphometric data will be collected on fish over 100mm total length. The inventory will indicate what additional measures may be needed to remove nonnative fishes, show the current status of native fishes, and identify potential repatriation sites. It is likely no more than one system can be completed per year. In 2020 we anticipate completing East Fork Gila River surveys or beginning West Fork Gila River surveys, dependent on work completed in 2019.

**Strategic Plan Goals:**

- Build the scientific foundation for recovery efforts
  - Goal 2. Update and assemble existing knowledge of life history needs and ecology of Gila River basin native fishes.
- Prevent extinction and manage toward recovery
  - Goal 1. Identify critical streams and populations in need of protection and potential replication.

- Goal 9. Monitor to quantitatively measure and evaluate project success in improving the status of target species and their habitats.

**Recovery goals:**

- Loach Minnow Recovery Plan (1991)
  - Task 1.1 (priority 1): Identify all populations and determine level of protection
  - Task 2.5 (priority 1): Monitor community composition including range of natural variation
  - Task 3.1-2 (priority 2): Identify nature and significance of interaction with nonnative fishes
  - Task 6.2 (priority 3): Identify and prepare sites for reintroduction
- Spikedace Recovery Plan (1991)
  - Task 1.1 (priority 1): Identify all populations and determine level of protection
  - Task 2.5 (priority 1): Monitor community composition including range of natural variation
  - Task 3.1-2 (priority 2): Identify nature and significance of interaction with nonnative fishes
  - Task 6.2 (priority 3): Identify and prepare sites for reintroduction

**Estimated Cost: \$55,200**

- New Mexico Department of Game and Fish: \$18,800
- USFWS: \$16,700
- USFS: \$19,700



**Project 4**  
**Task ID: NM-2020-1**

**Project Title:** Gila Permanent Site Monitoring

**Implementing Entity:** New Mexico Department of Game and Fish, US Fish and Wildlife Service, US Forest Service, Bureau of Land Management

**Start Year:** 2020

**Location(s):**

- Gila River Drainage: East Fork, West Fork, Middle Fork, Gila River
- San Francisco Drainage: San Francisco River, Tularosa River

**Species Protected:** Loach Minnow, Spikedace, Roundtail Chub, Speckled Dace, Longfin Dace, Desert Sucker, Sonora Sucker

**Project Description:**

The Gila River Basin is dynamic and critical native fish populations fluctuate throughout the basin. Since 1988, several permanent sites have been monitored throughout the basin in New Mexico. Over time, some sites have been added and some shifted, currently there are nine permanent sites sampled annually. Annual sampling provides a baseline for status of native fish populations throughout the Gila Basin and also assesses nonnative fish populations. Data gathered from this sampling informs recovery actions for listed species including Spikedace, Loach Minnow, and Roundtail Chub. Knowledge of the current status of Spikedace and Loach Minnow populations aids with decisions for repatriation, including supplementing hatchery broodstock or translocation of fishes. This long term data set is used to document the status, trends, and habitat use of fish assemblages in the Gila River Basin. All fish collected during sampling will be identified and enumerated by habitat. Morphometric data will be collected on fish over 100 mm total length. Habitat data is collected and shifts in habitat are documented. Annual reports summarizing the data and highlighting unique findings will be submitted by the New Mexico Department of Game and Fish.

**Strategic Plan Goals:**

- Build the scientific foundation for recovery efforts
  - Goal 2. Update and assemble existing knowledge of life history needs and ecology of Gila River basin native fishes.
- Prevent extinction and manage toward recovery
  - Goal 9. Monitor to quantitatively measure and evaluate project success in improving the status of target species and their habitats.

**Recovery goals:**

- Loach Minnow Recovery Plan (1991)
  - Task 1.1 (priority 1): Identify all populations and determine level of protection
  - Task 2.5 (priority 1): Monitor community composition including range of natural variation
  - Task 3.1-2 (priority 2): Identify nature and significance of interaction with nonnative fishes
  - Task 6.2 (priority 3): Identify and prepare sites for reintroduction

- Spikedace Recovery Plan (1991)
  - Task 1.1 (priority 1): Identify all populations and determine level of protection
  - Task 2.5 (priority 1): Monitor community composition including range of natural variation
  - Task 3.1-2 (priority 2): Identify nature and significance of interaction with nonnative fishes
  - Task 6.2 (priority 3): Identify and prepare sites for reintroduction

**Estimated Cost: \$22,020**

- New Mexico Department of Game and Fish: \$8,136
- USFWS: \$2,910
- USFS: \$4,124
- BLM: \$6,850

# Arizona Work Plan

## Project 5

Task ID: AZ-2003-2

**Project Title:** Acquire Spikedace, Loach Minnow and rare populations of other native fish

**Implementing Entity:** Arizona Game and Fish Department (Department)

**Start Year:** 2003

**Location(s):** Aravaipa Creek, Blue River, and upper Verde River in Arizona; San Francisco River, upper Gila River and Gila River Forks in New Mexico

**Species Protected:** Spikedace, Loach Minnow, Roundtail Chub<sup>1</sup>, and possibly Gila Topminnow

### Project Description:

The purpose of this project is to acquire Spikedace and Loach Minnow from all extant lineages and bring them to the Department's Aquatic Research and Conservation Center (ARCC), or another facility, for propagation and to establish refuge populations. The goal is to have 500 adults on station for each lineage. The number of fish to remove from a given population is a coordinated decision between U. S. Fish and Wildlife Service and state wildlife agencies, and is usually based on estimated numbers determined from annual monitoring data. Populations of Roundtail Chub<sup>1</sup> or Gila Topminnow will be brought into ARCC as needed.

In 2020, Department staff will continue to collect Spikedace and Loach Minnow from remnant populations, with goals to minimize impact on remnant population while acquiring the number of fish necessary to maintain refuge populations of at least 500 adults for each lineage at ARCC. A fish health assessment from each donor sites will be completed. Department staff will also bring more Sheehy Spring Roundtail Chub<sup>2</sup> on station, for refuge and propagation.

### Strategic Plan Goals:

- Preventing Extinction and Managing Toward Recovery
  - Goal 2c. Augment hatchery populations as outlined in broodstock management plans.

### Recovery Goals:

- Spikedace recovery plan (1991); Loach Minnow recovery plan (1991)
  - Task 8.1 (priority 3) Select stocks to be used for hatchery brood stock
  - Task 8.2 (priority 3) Collect hatchery stocks
- Gila Topminnow draft revised recovery plan (1999)
  - Task 1.1 (priority 1) Maintain refugia populations of natural populations
- Gila Chub draft Recovery plan (2014)
  - Task 4 (priority 2) Establish and maintain refuge populations in protected ponds or

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<sup>1</sup> Including populations previously classified as Gila Chub.

<sup>2</sup> Chub in Sheehy Spring were previously classified as Gila Chub.

hatcheries as appropriate

**Estimated Cost:** \$13,300

**Project 6**  
**Task ID: AZ-2003-1**

**Project Title:** Muleshoe ecosystem stream and spring repatriations

**Implementing Entity:** Arizona Game and Fish Department

**Start Year:** 2003

**Location(s):** Muleshoe Ranch Cooperative Management Area (CMA) waters: Bass Canyon, Hot Springs Canyon, Redfield Canyon, Mint Spring, and Double R Canyon

**Species Protected:** Spikedace, Loach Minnow, Roundtail Chub<sup>1</sup>, Gila Topminnow, and Desert Pupfish

**Project Description:**

The purpose of this project is to establish Spikedace, Loach Minnow, Gila Topminnow, and Desert Pupfish into various waters on the Muleshoe Ranch Cooperative Management Area. The Muleshoe CMA is located on the western slopes of the Winchester and Galiuro mountains. Fish stockings began in 2007. To date, Spikedace and Loach Minnow were stocked into Redfield Canyon and Hot Springs Canyon, but only persist in Hot Springs Canyon. Roundtail Chub<sup>1</sup>, Sonora Sucker, and Speckled Dace were translocated upstream of a waterfall in Redfield Canyon to expand their range in that system, and have established in the upstream reach. Gila Topminnow were stocked into Swamp Springs Canyon, Cherry Spring Canyon, Secret Spring, Headquarters Spring, Wildcat Canyon, Bass Canyon, and Double R Canyon; and established in all locations except Cherry Spring Canyon, and likely will establish in Double R Canyon. Desert Pupfish were stocked into Swamp Springs Canyon, Cherry Spring Canyon, Headquarters Spring, Secret Spring, Larry & Charlie Tank, and Mint Spring; but only persisted in the latter three.

In addition, the Department and The Nature Conservancy (TNC) have been performing annual removals to control the Green Sunfish population in Redfield Canyon.

In 2020, Department staff will monitor for Gila Topminnow in Bass Canyon and Double R Canyon,. Gila Topminnow and augmentations may occur if deemed necessary. Department staff will also conduct Green Sunfish removals in Redfield Canyon. The proposed barrier in Redfield Canyon has been canceled; therefore the Department will perform multiple removals in an attempt to eradicate Green Sunfish upstream of Swamp Springs Canyon and to greatly reduce the Green Sunfish population at the western end of the Wilderness. If the Department can get landowner permission to access the private land west of the Wilderness, we will also perform multiple removals there.

**Strategic Plan Goals:**

- Preventing Extinction and Managing Toward Recovery
  - Goal 1a. Identify critical streams and populations in need of protection and replication
  - Goal 5a. Replicate Gila topminnow stocks into a minimum of 10 surface waters.

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<sup>1</sup> Chub in Redfield and Hot Springs canyons were previously classified as Gil Chub.

- Goal 5b. Replication each of the other priority species into a minimum of one surface water.
- Goal 9b. Develop/identify monitoring standards as necessary to adequately evaluate fish barrier function, success and failure of eradications, and success and failure of repatriations.

**Recovery Goals:**

- Spikedace recovery plan (1991); Loach Minnow recovery plan (1991)
  - Task 6.3-6.4 (priority 3) Reintroduce into selected reaches and monitor
- Gila Topminnow draft revised recovery plan (1999)
  - Task 2.2 (priority 1) Reestablish into suitable habitats
  - Task 3 (priority 1) Monitor natural and reestablished populations and their habitats
- Desert Pupfish recovery plan (1993)
  - Task 2 (priority 2) Re-establish Desert Pupfish populations
  - Task 5 (priority 1) Monitor and maintain natural, re-established, and refugium populations
- Gila Chub draft Recovery plan (2014)
  - Task 1.3.1 (priority 1) Eliminate or control problematic nonnative aquatic organisms
  - Task 2.2 (priority 1) Repatriate Gila chub to new protected streams
  - Task 3.2 (priority 2) Conduct monitoring

**Estimated Cost:** \$26,500

**Project 7**  
**Task ID: AZ-2020-1**

**Project Title:** Sweetwater Dam Pond Nonnative Removal to Protect Cienega Creek

**Implementing Entity:** Arizona Game and Fish Department

**Start Year:** 2020

**Location(s):** Sweetwater Dam Pond; Gardner Canyon drainage

**Species Protected:** Cienega Creek remnant populations of Gila Topminnow, Roundtail Chub<sup>1</sup> (previously classified as Gila Chub in this location), Longfin Dace

**Project Description:**

*Background* – This is an ongoing project that has not yet been funded by GRBNFCP. In 2010 Goldfish and Mosquitofish were detected in Sweetwater Dam pond. In 2015 Mosquitofish were detected in Sweetwater Dam pond. In 2018, Department herpetologists detected Mosquitofish downstream of the pond in isolated pools in Cave Creek and in East Sawmill Canyon a tributary to Cave Creek. Later the same year, Department fisheries biologist surveyed the sites to confirm the locations with nonnative fish. During spring of 2019, Coronado National Forest staff pumped dry the several downstream pools in Cave Creek where mosquitofish were previously detected. Later in the spring, Coronado National Forest and Arizona Game and Fish Department (Department) staff used several trash pumps to draw the pond down and in an attempt to dry it. To minimize transport of the nonnative fish, the intake hoses had large mesh screens and the out-take hoses discharged into bag seines directly into the streambed below the dam. The ponds were drawn down to the surface of the saturated silt and organic matter, but unfortunately the pumps were unable to pump out the water-saturated silt at the bottom of the pond, so both nonnative species remained. After the pond was pumped down, Department personnel seined and dip netted all habitat that could be sampled downstream of the dam to where the water went subsurface (about 370 m upstream of the East Sawmill Canyon confluence) and did not capture or observe any fish. After the pond drawdown, Coronado National Forest purchased a diaphragm pump which is capable of pumping out the slurry.

If either Mosquitofish or Goldfish made their way into Cienega Creek, they would pose a serious threat to the continued existence of the Cienega Creek remnant populations of Gila Topminnow and Roundtail Chub<sup>1</sup>. Removals in Cienega Creek would likely cost hundreds of thousands of dollars to over a million dollars.

*Geographical Area* -- Sweetwater Dam Pond is located in the Gardner Canyon drainage of Cienega Creek (Figure 1). The pond and isolated pools downstream in Cave Creek and East Sawmill Canyon are the only locations where Mosquitofish have been detected in the entire Cienega Creek drainage upstream of Interstate 10. The reach of Gardner Canyon from the Cave Creek and Gardner Canyon confluence to the confluence with Cienega Creek is about 20 km, and is completely ephemeral (dry except during long and heavy rain events). The Cienega Creek watershed (USGS 10 digit HUC) is 413 mi<sup>2</sup>. Note that on a private ranch, there are also two isolated well-fed ponds, on a bench above Cave Creek near the confluence with

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<sup>1</sup> Chub in Cienega Creek were previously classified as Gila Chub.

East Sawmill Canyon that contain Largemouth Bass, Green Sunfish, and crayfish.

*Methodologies* – During March-April 2020 the Department will survey the Cave Creek drainage upstream of Apache Spring Ranch to make sure Mosquitofish are not present in Aliso Spring the one stock tank and previous locations where mosquitofish were documented. The vast majority of the drainage is dry, so where there is enough water staff will use standard fish sampling gear (likely seining or dip netting), making multiple passes, to assess presence of fish. Coordinates and dimensions of habitat with any nonnative fish will be recorded, to facilitate potential future removals.

During May-June the Department and Coronado National Forest will work collaboratively to pump Sweetwater Dam pond dry. Two to three trash pumps and 1-2 diaphragm pump(s) will be used with intake hoses screened to minimize the chance that nonnative fish are transported out of the pond. To further minimize chance that fish are transported out of the pond, each output hose will discharge into its own 3-mm mesh bag seine positioned below the dam; water will thus discharge into the streambed below the dam. The pond will be pumped down until there is no longer any surface water, and as much slurry as possible is pump out. After the pond is pumped down, the Department will survey the stream downstream to ensure that no nonnative fish escaped. Gear type used will be seines and dip nets, unless there is sufficient water to electrofish or set traps. Based on the 2019 drawdown, if the system dries, it is likely that visual surveys augmented with seining and dip netting any remaining pools will be sufficient. Any nonnative fish captured will be removed. A total of five nonnative free passes will be completed before concluding that fish are absent from the stream sections.

The pond bottom will be examined after it has been drawn down to assess if any nonnative fish remain alive. If fish are found alive, they will be physically removed if feasible. If fish are found alive and further removal is unfeasible, the project will be placed on hold to assess other eradication strategies.

As the pond naturally refills (July-August), the Department will survey the pond to ensure all fish are absent. The Department will set minnow traps and gill nets dispersed throughout the pond; the number set will depend on the size of the pond, but traps will be spaced about 3 m apart. Shallow areas will be seined with a fine meshed seine where logistically possible. If no fish are found in five consecutive sampling efforts, they will be considered eradicated from the pond. If fish are found after refilling, the next phases of the project will be postponed, and instead the pond will be pumped dry again. A re-drying of the pond would best be done during the driest time of year, which would be May-June of 2021.

### **Program Priorities**

This project will protect remnant populations of Gila Topminnow, Roundtail Chub<sup>1</sup>, and Longfin Dace in Cienega Creek by removing nonnative Mosquitofish and Goldfish from Sweetwater Dam pond and the nearby Cave Creek drainage to prevent them from dispersing into Cienega Creek.

This project will replicate the populations of Cienega Creek Gila Topminnow and Roundtail Chub<sup>3</sup> into Sweetwater Dam pond.

This is part of a larger project to decrease the distribution of Mosquitofish in Arizona.

There will be immediate on the ground benefits because existing threats to native fish in Cienega

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<sup>1</sup> Chub in Cienega Creek were previously classified as Gila Chub.



creek will be removed. And once that is accomplished, replicate populations of Gila Topminnow and Roundtail Chub<sup>3</sup> will be established. Both of these actions will contribute to the recovery of these species.

### **Partnerships**

U.S. Forest Service and the Department are partnering in this project; U.S. Fish and Wildlife Service and volunteers may help implement this project.

The project was started by USFS in 2019 with assistance from the Department when they attempted to pump dry Sweetwater Dam pond. This project has not yet been funded by GRBNFCP, but would build upon the Gila Topminnow Stocking project and would address the nonnative fish control conservation measure.

### **Strategic Plan Goals:**

- Preventing Extinction and Managing Toward Recovery
  - Goal 1a. Identify critical streams and populations in need of protection and replication
  - Goal 4a. Eradicate nonnative aquatic species from a minimum of five surface waters to prepare them for repatriations of native fishes.
  - Goal 5b. Replication each of the other priority species into a minimum of one surface water.
  - Goal 9b. Develop/identify monitoring standards as necessary to adequately evaluate fish barrier function, success and failure of eradications, and success and failure of repatriations.

### **Recovery Goals:**

- Gila Topminnow draft revised recovery plan (1999)
  - Task 2.2 (priority 1) Reestablish into suitable habitats
  - Task 2.4 (priority 1) Protect suitable reestablishment habitats from detrimental nonnative aquatic species.
  - Task 3 (priority 1) Monitor natural and reestablished populations and their habitats
- Gila Chub draft Recovery plan (2014)
  - Task 1.3.1 (priority 1) Eliminate or control problematic nonnative aquatic organisms
  - Task 2.2 (priority 1) Repatriate Gila chub to new protected streams
  - Task 3.2 (priority 2) Conduct monitoring

### **Estimated Time and Cost:**

- Cost: \$45,100
- Urgency: failure to act could lead to invasion of Mosquitofish and Goldfish into Cienega Creek, where removal would be far more costly and logistically challenging.
- Readiness: The USFS has already begun implementing this project. The Department will complete an Environmental Assessment Checklist in January-February 2020 so that they can become more complete implementation partners.
- Matching Funds: The USFS has and will continue to provide in-kind match in the form of staff time (biologist and fire-fighting crew) and equipment (pumps and associated equipment). The Department previously provided in-kind match in the form of staff time and use of fish survey equipment. The Department is not proposing any in-kind match if funded by GBNFRP.

**Project 8**  
**Task ID: AZ-2002-1**

**Project Title:** Gila Topminnow Stockings

**Implementing Entity:** Arizona Game and Fish Department

**Start Year:** 2002

**Location(s):** Agua Fria River drainage, Salt River drainage, San Francisco River drainage, Gila River drainage, Verde River drainage, San Pedro River drainage and the Santa Cruz River drainage.

**Species Protected:** Gila Topminnow and Desert Pupfish

**Project Description:**

The purpose of this project is to establish new populations of Gila Topminnow within historic range; Desert pupfish are stocked into some of the same sites if habitat is deemed suitable. To date, 27 Gila Topminnow populations and 18 Desert Pupfish populations have been established under the GRBNFCP.

In 2020, Department staff plan to stock Gila Topminnow into at least 6 new sites. Potential sites include Indian Creek, Little Sycamore Creek, Sycamore Creek, in the Agua Fria River drainage; Cottonwood Creek, Kayler Spring, Reavis Creek, and Mule Spring in the Salt River drainage; Dix Creek in the San Francisco River drainage; Mescal Creek, Mescal Warm Springs and Sands Draw in the Gila River drainage; Rarick Canyon in the Verde River drainage, Buehman Canyon in the San Pedro River drainage, and Oil Well Tank and Maternity Well in the Santa Cruz Drainage.

Each site stocked will be monitored 6 months after stocking and then annually thereafter for three years after the last stocking event. If they are considered established after the third post-stocking monitoring, then the monitoring responsibilities are passed on to other Department programs or other agencies. Mescal Creek, Mescal Warm Spring, are on BLM lands, and still need environmental compliance before stockings. Before Gila Topminnow are stocked on USFS lands the Forest Service would need Endangered Species Act section 7 consultation with USFWS relative to ongoing actions, because stocking of Gila Topminnow is a change in condition.

Department staff will also continue to monitor previously stocked Gila Topminnow and Desert Pupfish sites where establishment is still to be determined. Sites to be monitored will include Double R Canyon, Murray Spring and Mud Spring in the San Pedro River drainage; Bill's Wildlife Pond, Springwater Wetland, Peterson Ranch Pond, and Sabino Canyon in the Santa Cruz River drainage; West Fork Pinto Creek, Tortilla Creek, and Charlebois Spring in the Salt River Drainage; Arnett Creek in the Gila River drainage, and Black Canyon City Heritage Park Pond in the Agua Fria drainage. Any new sites stocked during 2019 will also be monitored. Health assessments of fish from donor sites will be completed prior to any translocation.

**Strategic Plan Goals:**

- Preventing Extinction and Managing Toward Recovery

- Goal 1a. Identify critical streams and populations in need of protection and replication
- Goal 5a. Replicate Gila topminnow stocks into a minimum of 10 surface waters.
- Goal 9b. Develop/identify monitoring standards as necessary to adequately evaluate fish barrier function, success and failure of eradications, and success and failure of repatriations.

**Recovery Goals:**

- Gila Topminnow draft revised recovery plan (1999)
  - Task 2.2 (priority 1) Reestablish into suitable habitats
  - Task 3 (priority 1) Monitor natural and reestablished populations and their habitats
- Desert Pupfish recovery plan (1993)
  - Task 2 (priority 2) Re-establish Desert Pupfish populations
  - Task 5 (priority 1) Monitor and maintain natural, re-established, and refugium populations

**Estimated Cost:** \$59,700

**Project 9**  
**Task ID: AZ-2013-1**

**Project Title:** Spring Creek (Oak Creek tributary) repatriations

**Implementing Entity:** Arizona Game and Fish Department

**Start Year:** 2013

**Location(s):** Spring Creek

**Species Protected:** Spikedace, Roundtail Chub<sup>1</sup>, and Gila Topminnow

**Project Description:**

Spring Creek is a tributary to Oak Creek in the Verde River drainage, and contains Roundtail Chub<sup>1</sup>, Speckled Dace, Longfin Dace, Sonora Sucker, Desert Sucker, and Northern Mexican Gartersnake. Reclamation finished construction of a fish barrier about 1.1 km upstream from the Verde River in April 2015. Green Sunfish were detected below the old diversion dam in 2011, and in May 2014, Green Sunfish were captured 2.5 km above the dam. Department staff began removal efforts immediately and completed 7 removals in June and July 2014, after which the Department's CAMP staff assumed responsibility of the removal efforts.

The purpose of this project is to protect the existing Spring Creek population of Roundtail Chub<sup>1</sup> and other native aquatic species against possible future upstream incursion of nonnative fishes from Oak Creek and the Verde River, and to attempt to establish Spikedace, Gila Topminnow, and possibly Loach Minnow. Spikedace and Gila Topminnow were stocked in Spring Creek in 2015 and 2016. Additional Spikedace were stocked in February 2018.

In 2020, Department staff will monitor for Spikedace in Spring Creek.

**Strategic Plan Goals:**

- Preventing Extinction and Managing Toward Recovery
  - Goal 1a. Identify critical streams and populations in need of protection and replication
  - Goal 5b. Replication each of the other priority species into a minimum of one surface water.
  - Goal 9b. Develop/identify monitoring standards as necessary to adequately evaluate fish barrier function, success and failure of eradications, and success and failure of repatriations.

**Recovery Goals:**

- Spikedace recovery plan (1991); Loach Minnow recovery plan (1991)
  - Task 6.3-6.4 (priority 3) Reintroduce into selected reaches and monitor
- Gila Topminnow draft revised recovery plan (1999)

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<sup>1</sup> Chub in Spring Creek were previously classified as Gila Chub.

- Task 2.2 (priority 1) Reestablish into suitable habitats
- Task 2.4 (priority 1) Protect suitable reestablishment habitats from detrimental nonnative aquatic species.
- Task 3 (priority 1) Monitor natural and reestablished populations and their habitats
- Gila Chub draft Recovery plan (2014)
  - Task 1.3.1 (priority 1) Eliminate or control problematic nonnative aquatic organisms
  - Task 3.2 (priority 2) Conduct monitoring

**Estimated Cost:** \$8,000

**Project 10**  
**Task ID: AZ-2002-3**

**Project Title:** Blue River native fish restoration

**Implementing Entity:** Arizona Game and Fish Department

**Start Year:** 2002

**Location(s):** Blue River

**Species Protected:** Spikedace, Loach Minnow, and Roundtail Chub

**Project Description:**

The Blue River Native Fish Restoration Project is a multi-agency effort focused on protecting and restoring the native fish assemblage within the Blue River drainage in eastern Arizona. The project was initially focused on the lower 19 km of the Blue River, from Fritz Ranch to its confluence with the San Francisco, and consisted of three main components: construction of a fish barrier (completed in 2012), mechanical removal of nonnative piscivorous fishes, and repatriation and monitoring of federally listed warm-water fishes. As of 2017, large-bodied piscivorous fish have not been detected in the lower Blue River for four years and Green Sunfish have not been detected for one year. Spikedace and Roundtail Chub (stocked in 2012 and 2015) have established self-sustaining populations, and Loach Minnow (augmented in 2012 and 2016) abundance appears to be increasing following the 2011 Wallow Fire. Due to successes in the lower Blue River, restoration efforts have expanded upstream to include the middle Blue River between The Box and McKittrick Creek. Roundtail Chub and Spikedace were stocked into the middle Blue River in 2016 and 2017, respectively, in efforts to expand the range of these species in the river.

In 2020, Department staff will continue nonnative removal efforts in the lower Blue River. Our efforts to eradicate catfish see to have succeeded (none detected since 2013), but Green Sunfish were last detected in 2016, so snorkeling removal efforts should probably continue until there are at least 5 consecutive years (2021) of non-detection. Both Spikedace and Roundtail Chub are considered established, so another Department branch or another entity could complete the monitoring, rather than the Department's GRB program. Department staff will monitor for Spikedace and Roundtail Chub in the middle Blue River. Additional Loach Minnow, Spikedace, and Roundtail Chub augmentations may occur if deemed necessary, and Roundtail Chub and Spikedace will be translocated upstream of The Box. If ESA consultations between USFS and USFWS regarding ongoing actions are complete, the Department will stock one or all of the three species into selected Blue River tributaries in an attempt to further expand distributions in the drainage. If fish are to be translocated from outside the drainage, health assessments of fish from donor sites will be completed prior to any translocation. Additionally staff will work with Reclamation to coordinate a Blue River watershed meeting with appropriate staff from AZGFD, BOR, USFWS, and USFS to discuss and coordinate ongoing activities.

**Strategic Plan Goals:**

- Preventing Extinction and Managing Toward Recovery

- Goal 1a. Identify critical streams and populations in need of protection and replication
- Goal 4a. Eradicate nonnative aquatic species from a minimum of five surface waters to prepare them for repatriations of native fishes.
- Goal 5b. Replication each of the other priority species into a minimum of one surface water.
- Goal 9b. Develop/identify monitoring standards as necessary to adequately evaluate fish barrier function, success and failure of eradications, and success and failure of repatriations.

**Recovery Goals:**

- Spikedace recovery plan (1991); Loach Minnow recovery plan (1991)
  - Task 6.3-6.4 (priority 3) Reintroduce into selected reaches and monitor

**Estimated Cost:** \$35,800

**Project 11**  
**Task ID: AZ-2008-1**

**Project Title:** Assess potential repatriation waters

**Implementing Entity:** Arizona Game and Fish Department

**Start Year:** 2008

**Location(s):** Agua Fria River drainage, Salt River drainage, Verde River drainage, Santa Cruz River drainage and the Blue River drainage.

**Species Protected:** Gila Topminnow and Desert Pupfish

**Species Protected:** Spikedace, Loach Minnow, Gila Topminnow, Roundtail Chub<sup>1</sup>, and other native fishes

**Project Description:**

The purpose of this project is to assess waters in the Gila River Basin to determine if they are suitable for repatriations of Spikedace, Loach Minnow, Gila Topminnow, Roundtail Chub<sup>1</sup>, or other native fishes. Fifty-six waters were assessed between 2014 and 2018, some of which were subsequently stocked with fish.

In 2020, Department staff will assess several waters in the Gila River Basin for native fish suitability. Potential sites include Cherry Creek, in the Salt River drainage; Houston Creek and West Fork Oak Creek in the Verde River drainage; Canada de Oro, La Milagrosa Canyon and George Weiss Spring in the Santa Cruz drainage, .

**Strategic Plan Goals:**

- Preventing Extinction and Managing Toward Recovery
  - Goal 1a. Identify critical streams and populations in need of protection and replication

**Recovery Goals:**

- Spikedace recovery plan (1991); Loach Minnow recovery plan (1991)
  - Task 6.2 (priority 3) Identify and prepare sites for reintroductions
- Gila Topminnow draft revised recovery plan (1999)
  - Task 2.1 (priority 1) Identify habitats suitable for reintroduction of Gila Topminnow
- Gila Chub draft recovery plan (2014)
  - Task 2.1 (priority 3) Prepare and protect streams appropriate for replications

**Estimated Cost:** \$8,000

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<sup>1</sup> Both Roundtail Chub and the form previously classified as Gila Chub.



**Project 12**  
**Task ID: AZ-2014-1**

**Project Title:** Expand Roundtail Chub<sup>1</sup> population in Harden Cienega Creek

**Implementing Entity:** Arizona Game and Fish Department

**Start Year:** 2014

**Location(s):** Harden Cienega Creek

**Species Protected:** Roundtail Chub

**Project Description:**

During the course of the Transfer of Gila Chub and Gila Topminnow to New Mexico Project, Roundtail Chub<sup>1</sup> were surveyed and collected from Harden Cienega Creek. During the surveys, a waterfall was discovered, above which no chub occurred. In April 2013, Department staff surveyed above the waterfall and only detected Speckled Dace, and determined that there was about 1.4 km of perennial water above the waterfall. Department staff recommended that chub be moved above the waterfall to expand their distribution in Harden Cienega Creek. On April 9, 2015, Department staff translocated 102 Roundtail Chub from lower Harden Cienega Creek to above the waterfall. Department staff monitored upper Harden Cienega Creek in 2017 and 2018, and captured 391 and 304 respectively. Also in 2018, they moved an additional five chub from below to above the waterfall. Also during the monitoring they detected and removed one Green Sunfish in 2017 and two in 2018.

Green Sunfish were detected in 2019, therefore in 2020 Department staff will begin a more concerted removal effort to eradicate them including a survey of all upstream cattle tanks in the drainage. However, the source of sunfish is likely in tanks upstream in New Mexico, so cooperation with New Mexico Game and Fish Department and the landowner will be necessary. The Department will develop a removal plan and begin implementing it.

**Strategic Plan Goals:**

- Preventing Extinction and Managing Toward Recovery
  - Goal 1a. Identify critical streams and populations in need of protection and replication
  - Goal 5b. Replication each of the other priority species into a minimum of one surface water.
  - Goal 9b. Develop/identify monitoring standards as necessary to adequately evaluate fish barrier function, success and failure of eradications, and success and failure of repatriations.

**Recovery Goals:**

- Gila Chub draft Recovery plan (2014)
  - Task 2.2 (priority 1) Repatriate Gila chub to new protected streams
  - Task 3.2 (priority 2) Conduct monitoring

**Estimated Cost:** \$55,700

**Project 13**  
**Task ID: AZ-2018-1**

**Project Title:** Eagle Creek repatriations

**Implementing Entity:** Arizona Game and Fish Department

**Start Year:** 2018

**Location(s):** Eagle Creek

**Species Protected:** Spikedace, Loach Minnow, Roundtail Chub<sup>1</sup>, and other native fishes

**Project Description:**

Eagle Creek is a tributary to the Gila River near Clifton Arizona, and flows across U. S. Forest Service, San Carlos Apache Tribe, and private lands. Native fish documented from Eagle Creek include Spikedace, Loach Minnow, Roundtail Chub<sup>1</sup>, Speckled Dace, Longfin Dace, Desert Sucker, Sonora Sucker, and Gila Trout. Spikedace were last recorded in Eagle Creek in 1989 and Loach Minnow in 1997. Various nonnative fish species occupy Eagle Creek but the upper reach above Willow Creek confluence is now occupied by only native species. Freeport McMoran pumps water from the Black River into Eagle Creek for use at the Morenci Mine; nonnative fish from the Black River are thus transmitted into the Eagle Creek drainage. In a management plan, Freeport McMoran committed to building a barrier on upper Eagle Creek above the Willow Creek confluence. Bureau of Reclamation indicated that the barrier would likely not be constructed until 2020. Once the barrier is in place, the Department will repatriate Spikedace and Loach Minnow upstream.

In 2020, if the barrier is complete, the Department will conduct one pre-stocking monitoring of fishes above the barrier location, and then stock Spikedace and Loach Minnow upstream of the barrier. If Spikedace and Loach Minnow are stocked early in the year, the Department will conduct the first post-stocking monitoring (electrofishing transects) in early autumn 2020. If barrier is not constructed...

**Strategic Plan Goals:**

- Preventing Extinction and Managing Toward Recovery
  - Goal 1a. Identify critical streams and populations in need of protection and replication
  - Goal 5b. Replication each of the other priority species into a minimum of one surface water.
  - Goal 9b. Develop/identify monitoring standards as necessary to adequately evaluate fish barrier function, success and failure of eradications, and success and failure of repatriations.

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<sup>1</sup> Both Roundtail Chub and the form previously classified as Gila Chub are documented in Eagle Creek.

**Recovery Goals:**

- Spikedace recovery plan (1991); Loach Minnow recovery plan (1991)
  - Task 6.3-6.4 (priority 3) Reintroduce into selected reaches and monitor

**Estimated Cost:** \$13,300

**Project 14**  
**Task ID: AZ-2016-2**

**Project Title:** Red Tank Draw native fish restoration

**Implementing Entity:** Arizona Game and Fish Department

**Start Year:** 2016

**Location(s):** Red Tank Draw (Rarick Canyon and Mullican Canyon)

**Species Protected:** Roundtail Chub<sup>1</sup>, Gila Topminnow, and other native fishes

**Project Description:**

Red Tank Draw is a tributary to Wet Beaver Creek in Coconino National Forest. It is occupied by Roundtail Chub<sup>1</sup>, Longfin Dace, Desert Sucker, Sonora Sucker, and several nonnative species, including Green Sunfish, Black Bullhead, Fathead Minnow, and Northern Crayfish. Roundtail Chub<sup>1</sup> occupies a perennially interrupted reach between the USGS gage and Mullican Canyon. Most of the rest of the drainage is dry, but perennial pools persist in some locations. There are no natural barriers in the 7.6 km between Wet Beaver Creek upstream in Red Tank Draw to the chub occupied portion; however, most of the distance is dry which may restrict upstream movement of nonnative fish. The purpose of this project is to remove Green Sunfish and Black Bullhead from the Roundtail Chub<sup>1</sup> occupied reach, and if possible the entire drainage above the chub occupied reach if possible. Once nonnative fish are removed, Roundtail Chub can be moved into upstream perennial pools to expand their range. In addition, Gila Topminnow will be stocked into suitable habitat.

In 2020, the Department staff will continue to conduct nonnative removal efforts in Red Tank Draw. Roundtail Chub translocated into Rarick Canyon in 2019 will be monitored. Additional Roundtail Chub will be translocated to the remaining perennial pools if sufficient numbers exist in Red Tank Draw. Gila Topminnow will be stocked into the same reach in Rarick Canyon pending Coconino National Forest approval. Efforts will be made to initiate discussions with the Bruce Place Tank landowner concerning the removal of nonnative fishes from Bruce Place Tank.

**Strategic Plan Goals:**

- Preventing Extinction and Managing Toward Recovery
  - Goal 1a. Identify critical streams and populations in need of protection and replication
  - Goal 4a. Eradicate nonnative aquatic species from a minimum of five surface waters to prepare them for repatriations of native fishes.
  - Goal 5b. Replication each of the other priority species into a minimum of one surface water.

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<sup>1</sup> Chub in Red Tank Draw were previously classified as Gila Chub.

- Goal 9b. Develop/identify monitoring standards as necessary to adequately evaluate fish barrier function, success and failure of eradications, and success and failure of repatriations.

**Recovery Goals:**

- Gila Topminnow draft revised recovery plan (1999)
  - Task 2.2 (priority 1) Reestablish into suitable habitats
  - Task 2.4 (priority 1) Protect suitable reestablishment habitats from detrimental nonnative aquatic species
  - Task 3 (priority 1) Monitor natural and reestablished populations and their habitats
- Gila Chub draft Recovery plan (2014)
  - Task 1.3.1 (priority 1) Eliminate or control problematic nonnative aquatic organisms
  - Task 2.2 (priority 1) Repatriate Gila chub to new protected streams
  - Task 3.2 (priority 2) Conduct monitoring

**Estimated Cost:** \$33,200

**Project 15**  
**Task ID: AZ-2016-3**

**Project Title:** Sharp Spring native fish restoration

**Implementing Entity:** Arizona Game and Fish Department

**Start Year:** 2016

**Location(s):** Sharp Spring

**Species Protected:** Gila Topminnow and Roundtail Chub<sup>1</sup>

**Project Description:**

Sharp Spring is a tributary to the Santa Cruz River in the San Rafael State Natural Area (Arizona State Parks), about 2 km from the United States – Mexico border. It is a perennial spring which forms a series of pools in cienega-like habitat. Sharp Springs was historically occupied by Gila Topminnow; however, nonnative Western Mosquitofish was introduced into Sharp Springs in 1979 which resulted in the extirpation of Gila Topminnow from this site by 1999. The purpose of this project is to eradicate Western Mosquitofish from Sharp Spring, and then repatriate Gila Topminnow and Roundtail Chub<sup>1</sup>. The Sharp Springs lineage of Gila Topminnow would be translocated from one or more of the replicate populations in the state. Roundtail Chub<sup>1</sup> from the nearby Sheehy Spring (or other refuge site) would be translocated into Sharp Spring. In January 2017, Department and Arizona State Parks staff met to discuss the potential project and potential methods of nonnative fish control. Arizona State Park staff indicated they would draft a proposal for approval by their executive staff. As of the end of 2018, Arizona State Parks had not communicated a decision to the Department.

In 2020, Department staff may implement removal of Western Mosquitofish from Sharp Spring pending approval by Arizona State Parks and Arizona Game and Fish Commission (if a piscicide treatment is selected as the method of control).

**Strategic Plan Goals:**

- Preventing Extinction and Managing Toward Recovery
  - Goal 1a. Identify critical streams and populations in need of protection and replication
  - Goal 4a. Eradicate nonnative aquatic species from a minimum of five surface waters to prepare them for repatriations of native fishes.
  - Goal 5a. Replicate Gila topminnow stocks into a minimum of 10 surface waters.
  - Goal 5b. Replication each of the other priority species into a minimum of one surface water.
  - Goal 9b. Develop/identify monitoring standards as necessary to adequately evaluate fish barrier function, success and failure of eradications, and success and failure of repatriations.

<sup>1</sup>Chub in Sheehy Spring to be repatriated into Sharp Spring were previously classified as Gila Chub.

**Recovery Goals:**

- Gila Topminnow draft revised recovery plan (1999)
  - Task 2.2 (priority 1) Reestablish into suitable habitats
  - Task 2.4 (priority 1) Protect suitable reestablishment habitats from detrimental nonnative aquatic species.
  - Task 3. (priority 1) Monitor natural and reestablished populations and their habitats
- Gila Chub draft Recovery plan (2014)
  - Task 1.3.1 (priority 1) Eliminate or control problematic nonnative aquatic organisms
  - Task 2.2 (priority 1) Repatriate Gila chub to new protected streams
  - Task 3.2 (priority 2) Conduct monitoring

**Estimated Cost:** \$13,300

**Project 16**  
**Task ID: AZ-2000-1**

**Project Title:** Boyce Thompson Ayer Lake native fish restoration

**Implementing Entity:** Arizona Game and Fish Department

**Start Year:** 2016

**Location(s):** Ayer Lake at Boyce Thompson Arboretum

**Species Protected:** Gila Topminnow and Desert Pupfish

**Project 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 for over 30 years. However, periodically, the pond is contaminated with nonnative species and they need to be eradicated. It was last treated with piscicides in 1983. Currently, Western Mosquitofish and Fathead Minnow are present in the pond and are outcompeting Gila Topminnow and Desert Pupfish. The invasion of Western Mosquitofish rendered the pond unsuitable as a source for Gila Topminnow translocations. Therefore, eradication of nonnative fish from the pond is necessary so that Gila Topminnow and Desert Pupfish can be restored. Gila Chub may also be stocked into the pond once the nonnatives are eradicated and topminnow and pupfish re-establish.

In 2020, Department will continue to plan for eradication of nonnative fish from Ayer Lake at Boyce Thompson Arboretum. If plans are completed the eradication will be implemented.

**Strategic Plan Goals:**

- Preventing Extinction and Managing Toward Recovery
  - Goal 1a. Identify critical streams and populations in need of protection and replication
  - Goal 4a. Eradicate nonnative aquatic species from a minimum of five surface waters to prepare them for repatriations of native fishes.
  - Goal 5b. Replication each of the other priority species into a minimum of one surface water.
  - Goal 9b. Develop/identify monitoring standards as necessary to adequately evaluate fish barrier function, success and failure of eradications, and success and failure of repatriations.

**Recovery Goals:**

- Gila Topminnow draft revised recovery plan (1999)
  - Task 2.2 (priority 1) Reestablish into suitable habitats



- Task 2.4 (priority 1) Protect suitable reestablishment habitats from detrimental nonnative aquatic species.
  - Task 3 (priority 1) Monitor natural and reestablished populations and their habitats
- Desert Pupfish recovery plan (1993)
  - Task 2 (priority 2) Re-establish Desert Pupfish populations
  - Task 5 (priority 1) Monitor and maintain natural, re-established, and refugium populations

**Estimated Cost:** \$13,300

**Project 17**  
**Task ID: AZ-2020-2**

**Project Title:** Upper Verde River native fish restoration

**Implementing Entity:** Arizona Game and Fish Department

**Start Year:** 2020

**Location(s):** Verde River

**Species Protected:** Spikedace, Loach Minnow, Gila Topminnow, and Roundtail Chub

**Project Description:**

The upper Verde River Native Fish Restoration Project is a multi-agency effort focused on protecting and restoring the native fish assemblage within the upper Verde River drainage in central Arizona. The project consists of three main components: construction of two fish barriers, control of nonnative fishes, and repatriation and monitoring of federally listed warm-water fishes. The upper barrier may be built by the end of 2021 and the lower by the end of 2022. Nonnative control could commence afterwards.

During 2020, Department staff will plan, and collect field data to assist in determining if nonnative fish removal in the upper Verde River and adjacent drainage is feasible and which type of removal would be most effective.

**Strategic Plan Goals:**

- Preventing Extinction and Managing Toward Recovery
  - Goal 1a. Identify critical streams and populations in need of protection and replication
  - Goal 4a. Eradicate nonnative aquatic species from a minimum of five surface waters to prepare them for repatriations of native fishes.
  - Goal 5a. Replicate Gila topminnow stocks into a minimum of 10 surface waters.
  - Goal 5b. Replication each of the other priority species into a minimum of one surface water.
  - Goal 9b. Develop/identify monitoring standards as necessary to adequately evaluate fish barrier function, success and failure of eradications, and success and failure of repatriations.

**Recovery Goals:**

- Spikedace recovery plan (1991); Loach Minnow recovery plan (1991)
  - Task 6.3-6.4 (priority 3) Reintroduce into selected reaches and monitor
- Gila Topminnow draft revised recovery plan (1999)
  - Task 2.2 (priority 1) Reestablish into suitable habitats
  - Task 2.4 (priority 1) Protect suitable reestablishment habitats from detrimental nonnative aquatic species.
  - Task 3 (priority 1) Monitor natural and reestablished populations and their habitats

**Estimated Cost:** \$6,600

**Project 18**  
**Task ID: AZ-2009-1**

**Project Title:** Nonnative fish removal from Bonita and Aravaipa Creeks

**Implementing Entity:** Bureau of Land Management, Safford Field Office

**Start Year:** 2009 for Bonita Creek and 2016 for Aravaipa Creek

**Location(s):** Bonita Creek, Graham County and Aravaipa Creek, Graham and Pinal Counties.

**Species Protected:** Gila Chub, Loach Minnow, Spikedace, Gila Topminnow, Longfin Dace, Speckled Dace, Roundtail Chub, Sonora Sucker, and Desert Sucker

**Project Description:**

The project area includes the Gila Box Riparian National Conservation Area (RNCA), specifically Bonita Creek, and the Aravaipa Ecosystem Management Area, specifically Aravaipa Creek. Bonita and Aravaipa Creeks are unique in that they still support intact native fish assemblages, in spite of nonnative fishes, and exceptional riparian and aquatic values.

Bureau of Land Management, Safford Field Office plans to continue their removal efforts of nonnative fish species from three-miles of Bonita creek and 17-miles of Aravaipa Creek. The effort is collaborative, ongoing, and is required to protect the native fish assemblages in both creeks. Mechanical removal using Gee metal minnow traps, collapsible traps, seines, and backpack electrofishers will continue to be implemented due to their proven effectiveness in these streams. Chemical renovation of either creek is not feasible due to lack of public support, habitat complexity, and adverse impacts to threatened and endangered fish species. Six nonnative removal trips will be scheduled for Bonita Creek in 2020 and six for Aravaipa Creek. All fish collected will be identified, and released if native or euthanized if nonnative. Length measurements will be taken of Green Sunfish and Yellow Bullhead and sexed if gametes are expressed. A final report will be provided that details methods, results, discussion, and conservation and management recommendations.

Bureau of Land Management (BLM), Safford Field Office, United States Fish and Wildlife Service, Arizona Game and Fish Department, and Bureau of Reclamation (BOR) recognize the value of both creeks as native fisheries and the importance of eliminating or reducing nonnative fishes. Partners have invested over \$5,000,000 through the installation of fish barriers, chemical and mechanical removal treatments, repatriations, and monitoring on these two systems to prevent the movement and introduction of additional nonnative fishes from downstream reaches of the Gila and San Pedro Rivers.

**Strategic Plan Goals:**

- Preventing Extinction and Managing Toward Recovery

- Goal 4a. Eradicate nonnative aquatic species from a minimum of five surface waters to prepare them for repatriations of native fishes.
- Goal 5b. Replication each of the other priority species into a minimum of one surface water.
- Goal 7a. Restore habitats in locations with existing populations and in location planned for repatriations.
- Goal 9b. Develop/identify monitoring standards as necessary to adequately evaluate fish barrier function, success and failure of eradications, and success and failure of repatriations.

**Recovery goals:**

- Spikedace recovery plan (1991); Loach Minnow recover plan (1991)
  - Task 5.1-5.2 (priority 2) Identify management areas and determine necessary habitat improvement.
  - Task 5.3 (priority 3) Implement habitat improvement.
- Gila Topminnow draft revised recovery plan (1999)
  - Task 2.1-2.4 (priority 1) Reestablish and protect populations throughout historical range.
  - Task 2.4 (priority 1) Protect suitable reestablishment habitats from detrimental nonnative aquatic species.
- Gila Chub draft recovery plan (2014)
  - Task 1.3.1 (priority 1) Eliminate or control problematic nonnative aquatic organisms.

**Estimated Cost:** \$25,000.00

# Hatchery Workplan

## Project 19

Task ID: HA-2006-2

**Project Title:** Aquatic Research and Conservation Center O&M

**Implementing Entity:** Arizona Game and Fish Department (Department)

**Start Year:** 2006

**Location(s):** Aquatic Research and Conservation Center

**Species Protected:** Spikedace, Loach Minnow, Gila Topminnow, Desert Pupfish, and Roundtail Chub<sup>1</sup>

### Project Description:

Bureau of Reclamation funded construction of a native fish conservation facility on the grounds of the Department's Bubbling Ponds Hatchery. The main purposes of the facility were to develop propagation techniques for Loach Minnow and Spikedace, to establish refuge populations of all of the lineages, and to propagate fish for repatriations. The facility was originally named Bubbling Ponds Native Fish Conservation Facility, but in 2015 was renamed the Aquatic Research and Conservation Center (ARCC). Beginning in 2014, Bureau of Reclamation began providing funds (through U. S. Fish and Wildlife Service) for a variety of improvements to ARCC, including a new outdoor building to hold more tanks, a new quarantine building, and new ponds.

In 2020, ARCC staff will focus on propagating lineages of Spikedace and Loach Minnow that are planned to be repatriated that year, including Aravaipa Spikedace, upper Gila River Spikedace, Blue River Loach Minnow, and any lineages that New Mexico Department of Game and Fish plan to stock. Staff will also focus some time on propagating chub from Sheehy Spring so that the progeny can be stocked into Fresno Canyon or other appropriate locations. Staff will also focus on research to improve propagation and success, and survival of stocked fish. Health assessments of fish from donor sites will be completed prior to any translocation to ARCC, and an annual health assessment of fish at ARCC will be performed before any fish from ARCC are stocked.

### Strategic Plan Goals:

- Scientific Foundations
  - Goal 2a. As opportunities arise, initiate ecological/life history studies of native biota where such understanding can assist with conservation goals of the Program.
  - Goal 3a. At a minimum, identify and implement at least one research project aimed at improving propagation.
- Preventing Extinction and Managing Toward Recovery
  - Goal 2b. Develop broodstock management plans for captive populations.

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<sup>1</sup> Both Roundtail Chub and the form previously classified as Gila Chub.

- Goal 2e. Ensure ARCC has the staff support and supplies necessary to improve propagation of Spikedace and Loach Minnow by 25% from previous 5 years provided wild fish are available.
- Goal 2f. Develop a hatchery management plan for ARCC.

**Recovery Goals:**

- Spikedace recovery plan (1991); Loach Minnow recovery plan (1991)
  - Task 8.3 (priority 3) Hold and maintain stocks in a hatchery
  - Task 8.4-8.5 (priority 3) Evaluate and assess propagation techniques and life-cycle requirements
- Gila Topminnow draft revised recovery plan (1999)
  - Task 1.1 (priority 1) Maintain refugia populations of natural populations
- Desert Pupfish recovery plan (1993)
  - Task 2 (priority 2) Re-establish Desert Pupfish populations
  - Task 5 (priority 1) Monitor and maintain natural, re-established, and refugium populations
- Gila Chub draft Recovery plan (2014)
  - Task 4 (priority 2) Establish and maintain refuge populations in protected ponds or hatcheries as appropriate

**Estimated Cost:** \$112,400

**Project 20**  
**Task ID: HA-1998-1**

**Project Title:** ASU Topminnow Holding

**Implementing Entity:** Arizona State University

**Start Year:** 1998

**Location(s):** ASU Campus, Tempe, Arizona

**Species Protected:** Gila topminnow *Poeciliopsis occidentalis*, Sonora topminnow *Poeciliopsis sonoriensis*

**Project Description:**

Maintain captive stocks of Gila topminnow and Sonoran topminnow; acquire additional individuals bi-annually as available from remaining natural populations to maintain genetic diversity of captive stocks; produce excess fish and provide individuals as available for management actions by Arizona Game and Fish Department and/or U.S. Fish and Wildlife Service; provide material for genetic studies being conducted by U.S. Fish and Wildlife Service.

**Strategic Plan Goals:**

- Preventing Extinction and Managing Toward Recovery.
  - Goal 2b. Ensure ASU has the staff support and supplies necessary to maintain genetically viable refuge populations of Gila Topminnow.

**Recovery goals:**

- Gila Topminnow draft revised recovery plan (1999)
  - Task 1.1 (priority 1) Maintain refugia populations of natural populations
  - Task 2.2 (priority 1) Reestablish into suitable habitats
  - Task 4.1 (priority 2) Facilitate genetic exchange among reestablished populations as needed
  - Task 4.2 (priority 2) Conduct additional genetic studies of POOC populations

**Estimated Cost:** \$20,800

## Project Ranking

Table 1. Results of project prioritization scoring. Projects were scored using the Program scoring form by each technical and affiliate committee member. The projects below the red line (also shaded) exceed the \$550,000 threshold committed by Reclamation.

Project #	Project Name	Rank Mean	Scoring Mean	Project cost	Subtotal
18	Nonnative removal from Bonita and Aravaipa	1	41.4	\$25,000	\$25,000
6	Muleshoe ecosystem repatriations	2	40	\$26,500	\$51,500
19	ARCC O&M	3	40	\$112,400	\$163,900
2	NM -T&E repatriations and monitoring	4	39.3	\$54,200	\$218,100
7	Sweetwater Dam nonnative removal	5	38.5	\$45,100	\$263,200
8	Gila Topminnow stockings	6	38.1	\$59,700	\$322,900
13	Eagle Creek repatriations	7	37.7	\$13,300	\$336,200
10	Blue River native fish restoration	8	37.7	\$35,800	\$372,000
9	Spring Creek (Oak) repatriations	9	35.4	\$8,000	\$380,000
1	West Fork Gila River Mechanical Removal	10	36.9	\$38,100	\$418,100
20	ASU Gila Topminnow holding	11	36.4	\$20,800	\$438,900
17	Upper Verde River native fish restoration	12	36.2	\$6,600	\$445,500
4	NM - Gila Permanent site monitoring	13	35.4	\$22,020	\$467,520
5	AZ - Acquire SD, LM, and other native fish	14	35.1	\$13,300	\$480,820
14	Red Tank Draw removals	15	34	\$33,200	\$514,020
3	NM - Remote site inventory	16	34.7	\$55,200	\$569,220
11	Assess potential repatriation waters	17	34.3	\$8,000	\$577,220
12	Expand RTC in Harden Cienega Creek	18	30	\$55,700	\$632,920
15	Sharp Spring native fish restoration	19	29.3	\$13,300	\$646,220
16	Boyce Thompson native fish restoration	20	30.7	\$13,300	\$659,520

**Proj #** - is the project number assigned in the 2020 work plan.

**Project name** - Short description of the project title as written in the 2020 work plan.

**Rank Mean** - this is a ranking based on the mean rank (as ranked by committee members) for each project.

**Scoring Mean** - the mean score for each project based on results from scoring form. Maximum points possible is 45.

**Project Cost** - estimated cost of each project.

**Subtotal** - running total of project costs. Reclamation committed \$550,000 per year conservation projects.



## **FY18-FY20 Budget**

		2018					
Task ID	Start Year	Task Name					Total
	1994	<b>BARRIERS/Tier 2</b>					<b>1,600,000</b>
	2011	<b>NATIVE FISH MONITORING</b>					<b>124,000</b>
	1994	<b>INFORMATION AND EDUCATION</b>					
		Website update					<b>\$68,000</b>
		<b>RECOVERY AND NONNATIVE CONTROL</b>					
		<b>New Mexico Recovery Actions</b>	NMGF	FWS	USFS	BLM	
NM-2002-1	2002	T&E Fish Repatriations and Monitoring	\$14,600	\$5,990	\$6,118		\$26,708
NM-2006-1	2006	West Fork Gila River Mechanical Removal	\$21,175	\$11,448	\$14,375		\$46,998
NM-2017-1	2017	Middle Fork Gila River Inventory and Assessment	\$16,100	\$19,035	\$17,681		\$52,816
NM-2014-2	2014	Survey on BLM Lands				\$15,000	\$15,000
		<b>Arizona Recovery Actions</b>	AZGFD	BLM			
		<i>AZGFD Actions</i>	\$328,960				\$328,960
AZ-2002-1	2002	Gila Topminnow Stocking and Monitoring					
Az-2002-2	2002	Arnett Creek Repatriations					
AZ-2002-3	2002	Blue River Native Fish Restoration					
AZ-2003-1	2003	Muleshoe Ecosystem Stream and Spring Repatriations					
AZ-2003-2	2003	Acquisition of Spikedace and Loach Minnow					
AZ-2004-1	2004	Miscellaneous stock tank surveys					
AZ-2006-1	2006	Fresno Canyon Repatriations					
AZ-2007-2	2007	Bonita Creek Repatriations					
AZ-2008-1	2008	Assessment of Potential Repatriation Waters					



		<b>New Mexico Recovery Actions</b>	NMGF	FWS	USFS	BLM	
NM-2006-1	2006	West Fork Gila River Mechanical Removal	\$16,400	\$10,300	\$11,400		\$38,100
NM-2002-1	2002	T&E Fish Repatriations and Monitoring	\$20,900	\$17,400	\$15,900		\$54,200
NM-2017-1	2017	Remote Site Inventory and Assessment (Previously Middle Fork Gila Inventory & Assessment)	\$18,800	\$16,700	\$19,700		\$55,200
NM-2014-1	2014	Survey on BLM Lands				\$15,000	\$15,000
		<b>Arizona Recovery Actions</b>	AZGFD	FWS	BLM		
AZ-2003-2	2003	Acquisition of Spikedace, Loach Minnow, and rare populations of other native fish	\$12,900				\$12,900
AZ-2003-1	2003	Muleshoe ecosystem stream and spring repatriations	\$21,900				\$21,900
AZ-2006-1	2006	Fresno Canyon repatriations	\$32,200				\$32,200
AZ-2002-1	2002	Gila Topminnow Stockings	\$55,400				\$55,400
AZ-2013-1	2013	Spring Creek (Oak) repatriations	\$12,900				\$12,900
AZ-2002-3	2002	Blue River native fish restoration	\$38,600				\$38,600
AZ-2004-1	2004	Miscellaneous stock tank surveys	\$55,200				\$55,200
AZ-2008-1	2008	Assessment of Potential Repatriation Waters	\$21,900				\$21,900
AZ-2014-1	2014	Expand Roundtail Chub populations in Harden Cienega Creek	\$12,900				\$12,900
AZ-2018-1	2018	Eagle Creek Repatriation	\$12,900				\$12,900
AZ-2016-2	2016	Red Tank Draw removals	\$32,200				\$32,200
AZ-2016-3	2016	Sharp Spring native fish restoration	\$12,900				\$12,900
AZ-2000-1	2016	Boyce Thompson Ayer Lake native fish restoration	\$6,400				\$6,400
AZ-2019-1	2019	Sweetwater Dam Pond Restoration	\$6,400				\$6,400
AZ-2009-1	2009	Nonnative fish removal from Bonita and Aravaipa Creeks			\$0		\$0
AZ-2019-2	2019	Eagle Creek Spikedace and Loach Minnow eDNA Survey		\$27,000			\$27,000
		<b>Hatchery Actions</b>	AZGFD	ASU			

HA-2006-2	2006	ARCC O&M	\$109,000				\$109,400
HA-1998-1	1998	Topminnow Stock Maintenance		\$16,800			\$16,800
		<b>Recovery and Nonnative Control Total</b>					<b>\$650,000</b>
<b>Total</b>							<b>\$2,444,000</b>
		<b>2020</b>					
<b>Task ID</b>	<b>Start Year</b>	<b>Task Name</b>					<b>Total</b>
	1994	<b>BARRIERS/Tier 2</b>					<b>1,600,000</b>
	2011	<b>NATIVE FISH MONITORING</b>					<b>126,000</b>
	1994	<b>INFORMATION AND EDUCATION</b>					
		Website update					\$58,000
		Native Fish in the classroom					\$10,000
							<b>\$68,000</b>
		<b>RECOVERY AND NONNATIVE CONTROL</b>					
		<b>New Mexico Recovery Actions</b>	NMGF	FWS	USFS	BLM	
NM-2006-1	2006	West Fork Gila River Mechanical Removal	\$16,400	\$10,300	\$11,400		\$38,100
NM-2002-1	2002	T&E Fish Repatriations and Monitoring	\$20,900	\$17,400	\$15,900		\$54,200
NM-2017-1	2017	Remote Site Inventory and Assessment (Previously Middle Fork Gila Inventory & Assessment)	\$18,800	\$16,700	\$19,700		\$55,200
NM-2020-1	2020	Gila Permanent Site Monitoring	\$8,136	\$2,910	\$4,124	6,850	\$22,020
		<b>Arizona Recovery Actions</b>	AZGFD	FWS	BLM		
AZ-2003-2	2003	Acquisition of Spikedace, Loach Minnow, and rare populations of other native fish	\$13,300				\$13,300
AZ-2003-1	2003	Muleshoe ecosystem stream and spring repatriations	\$26,500				\$26,500
AZ-2020-1	2020	Sweetwater Dam Pond Removals	\$45,100				\$45,100

AZ-2002-1	2002	Gila Topminnow Stockings	\$59,700				\$59,700
AZ-2013-1	2013	Spring Creek (Oak) repatriations	\$8,000				\$8,000
AZ-2002-3	2002	Blue River native fish restoration	\$35,800				\$35,800
AZ-2008-1	2008	Assessment of Potential Repatriation Waters	\$8,000				\$8,000
AZ-2014-1	2014	Expand Roundtail Chub populations in Harden Cienega Creek	\$55,700				\$55,700
AZ-2018-1	2018	Eagle Creek Repatriation	\$13,300				\$13,300
AZ-2016-2	2016	Red Tank Draw removals	\$33,200				\$33,200
AZ-2016-3	2016	Sharp Spring native fish restoration	\$13,300				\$13,300
AZ-2000-1	2016	Boyce Thompson Ayer Lake native fish restoration	\$13,300				\$13,300
AZ-2020-2	2020	Upper Verde River native fish restoration	\$6,600				\$6,600
AZ-2009-1	2009	Nonnative fish removal from Bonita and Aravaipa Creeks			\$25,000		\$25,000
		<b>Hatchery Actions</b>	AZGFD	ASU			
HA-2006-2	2006	ARCC O&M	\$112,400				\$112,400
HA-1998-1	1998	Topminnow Stock Maintenance		\$20,800			\$20,800
		<b>Recovery and Nonnative Control Total</b>					<b>\$659,620</b>
<b>Total</b>							<b>\$2,453,620</b>