Gila River Basin Native Fishes Conservation Program

Annual Budget and Work Plan (FY19)

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Budget Summary

2017							
Task ID	**Start Year**	**Task Name**					**Total**
	1994	**BARRIERS/Tier 2**					**1,591,000**
	2011	**NATIVE FISH MONITORING**					**146,000**
	1994	**INFORMATION AND EDUCATION**					
		Update website					**$4,385**
		RECOVERY AND NONNATIVE CONTROL					
		New Mexico Recovery Actions	NMGF	FWS	USFS	BLM	
NM-2002-1	2002	T&E Fish Repatriations and Monitoring	$17,993	$4,491	$5,651		$28,135
NM-2006-1	2006	West Fork Gila River Mechanical Removal	$18,212	$12,165	$11,448		$41,825
NM-2014-1	2014	Turkey Creek Tributary Surveys/Mechanical Removal					$0
NM-2017-1	2017	Middle Fork Gila River Inventory and Assessment	$18,911	$11,420	$19,790		$50,121
NM-2014-2	2014	Survey on BLM lands				$15,000	$15,000
		Arizona Recovery Actions	AZGFD	BLM			
		AZGFD Actions	$319,600				$319,600
AZ-2000-1	2000	Boyce Thompson Arboretum					
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-2007-1	2007	Mineral Creek Drainage Native Fish Restoration					
AZ-2007-2	2007	Bonita Creek Repatriations					
AZ-2008-1	2008	Assessment of Potential Repatriation Waters					
AZ-2013-1	2013	Spring Creek (Oak) Native Fish Restoration					
AZ-2014-1	2014	Expand Roundtail Chub populations in Harden Cienega Creek					

AZ-2014-2	2014	Fish Health Assessments					
AZ-2016-1	2016	West Fork Pinto Native Fish Repatriations					
AZ-2016-2	2016	Red Tank Draw Removals					
AZ-2016-3	2016	Sharp Spring Native Fish Restoration					
AZ-2009-1	2009	Bonita and Aravaipa Creek Mechanical Removal		$18,000			$18,000
		Hatchery Actions	ASU	AZGFD			
HA-1998-1	1998	Topminnow Stock Maintenance	$13,820				$13,820
HA-2006-2	2006	ARCC O & M		$104,000			$104,000
		Recovery and Nonnative Control Total					**$590,501**
Total							**$2,331,886**
		2018					
Task ID	**Start Year**	**Task Name**					**Total**
	1994	**BARRIERS/Teir 2**					**1,600,000**
	2011	**NATIVE FISH MONITORING**					**124,000**
	1994	**INFORMATION AND EDUCATION**					
		Website update					**$68,000**
		RECOVERY AND NONNATIVE CONTROL					
		New Mexico Recovery Actions	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
		Arizona Recovery Actions	AZGFD	BLM			
		AZGFD Actions	$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					
AZ-2013-1	2013	Spring Creek (Oak) Native Fish Restoration					
AZ-2014-1	2014	Expand Roundtail Chub populations in Harden Cienega Creek					
AZ-2014-2	2014	Fish Health Assessments					
AZ-2016-2	2016	Red Tank Draw Removals					
AZ-2016-3	2016	Sharp Spring Native Fish Restoration					
AZ-2018-1	2018	Eagle Creek Repatriations					
AZ-2009-1	2009	Bonita and Aravaipa Creek Mechanical Removal (if necessary)		$18,000			$18,000
		Hatchery Actions	AZGFD	ASU			
HA-1998-1	1998	Topminnow Stock Maintenance		$13,820			$13,820
HA-2006-1	2006	ARCC O&M	$107,000				$107,000
HA-2017-1	2017	Develop ARCC operations and broodstock plan					
		Recovery and Nonnative Control Total					**$609,302**
Total							**$2,401,302**
		2019					
Task ID	**Start Year**	**Task Name**					**Total**
	1994	**BARRIERS/Tier 2**					**1,600,000**
	2011	**NATIVE FISH MONITORING**					**126,000**
	1994	**INFORMATION AND EDUCATION**					
		Website update					$58,000
		Native Fish in the classroom					$10,000
							$68,000
		RECOVERY AND NONNATIVE CONTROL					
		New Mexico Recovery Actions	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
		Arizona Recovery Actions	AZGFD	FWS	BLM		

AZ-2003-2	2003	Acquisition of Spikedace, Loach Minnow, and rare populations of other native fish	$13300				$13300
AZ-2003-1	2003	Muleshoe ecosystem stream and spring repatriations	$22500				$22500
AZ-2006-1	2006	Fresno Canyon repatriations	$33100				$33100
AZ-2002-1	2002	Gila Topminnow Stockings	$57000				$57000
AZ-2013-1	2013	Spring Creek (Oak) repatriations	$13300				$13300
AZ-2002-3	2002	Blue River native fish restoration	$39800				$39800
AZ-2004-1	2004	Miscellaneous stock tank surveys	$19900				$19900
AZ-2008-1	2008	Assessment of Potential Repatriation Waters	$13300				$13300
AZ-2014-1	2014	Expand Roundtail Chub populations in Harden Cienega Creek	$13300				$13300
AZ-2018-1	2018	Eagle Creek Repatriation	$13300				$13300
AZ-2016-2	2016	Red Tank Draw removals	$53000				$53000
AZ-2016-3	2016	Sharp Spring native fish restoration	$13300				$13300
AZ-2000-1	2016	Boyce Thompson Ayer Lake native fish restoration	$13300				$13300
AZ-2019-1	2019	Sweetwater Dam Pond Restoration	$13300				$13300
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
		Hatchery Actions	AZGFD	ASU			
HA-2006-2	2006	ARCC O&M	$112,400				$109,400
HA-1998-1	1998	Topminnow Stock Maintenance		$16,800			$16,800
		Recovery and Nonnative Control Total					**$650,000**
Total							**$2,444,000**

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 in the vicinity of 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 persistence of 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 2019. Backpack electrofishing 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:

- Prevent extinction of rare populations and species
    - Goal 5. Chemically and/or mechanically renovate streams and other surface waters identified under the previous Recovery Need (1) to remove nonnative fishes.

Recovery goals:

- Spikedace Recovery Plan (1991); 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

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[1], 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. NEPA compliance will be ensured before stocking. 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 2019 are Saliz Canyon (Loach Minnow) and the San Francisco River (Spikedace). Mule Creek (Roundtail Chub[1]), San Francisco River (Loach Minnow), and Little Creek (Loach Minnow) were stocked previously and annual post stocking monitoring is scheduled for 2019. 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 efforts 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 1. Identify critical streams and populations in need of protection and replication
- Prevent extinction of rare populations and species

[1] Chub in Mule Creek were previously classified as Gila Chub.

    - Goal 1. Acquire and maintain hatchery/pond stocks of critically endangered populations as insurance against extinction in the wild and to provide sources for population replications
    - Goal 6. Replicate rare populations and their associated native fish community into protected streams and other surface waters
- Manage Toward recovery
    - Goal 4. Continue and expand repatriations of native fish communities.
    - Goal 7. Monitor on-the-ground activities to quantitatively measure and evaluate programmatic success in improving the status of target species and their habitats.
    - Goal 9. Periodically evaluate the success of species repatriations and surface water renovations.

Recovery goals:

- Spikedace Recovery Plan (1991); 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
- 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
- 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: $54,200

- New Mexico Department of Game and Fish: $20,900
- USFWS: $17,400
- USFS: $15, 900
- Total: $54,200

Project 3
Task ID: NM-2017-1

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 are scheduled to be surveyed in the summer of 2018 under this agreement. We would like to expand this Middle Fork 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, beginning with the East Fork inventory in 2019.

Strategic Plan Goals:

- Build the scientific foundation for recovery efforts
    - Goal 1. Identify critical streams and populations in need of protection and replication
    - Goal 5. Survey poorly-studied stream systems to document existing fish communities.

Recovery goals:

- Spikedace Recovery Plan (1991); 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

Estimated Cost: $55,200

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

Project 4
Task ID: NM-2014-1

Project Title: Gila River mainstem and tributaries monitoring

Implementing Entity: Bureau of Land Management – Las Cruces District Office (LCDO)

Start Year: 2014

Location(s):
- Gila River Mainstem
- Gila River Drainage: Blue Creek, Apache Creek

Species Protected: Spikedace, Loach minnow, Roundtail Chub[1]

Project Description:
BLM LCDO staff plan to continue long-term monitoring surveys of Spikedace, Loach minnow and Roundtail Chub[1] populations on the Gila River mainstem. Additionally, surveys will continue on Blue Creek from the confluence with the Gila mainstem to the upper portions of public lands. If access is granted to private lands further upstream, then surveys will continue there, as well. Additionally, Apache Creek and Blue Creek currently have HOBO brand data loggers installed, collecting water temperature and intermittency. Funding would support continuing all of these efforts.

Strategic Plan Goals:
- Goal 5 - Survey poorly-studied stream systems to document existing fish communities.
    - Objective 5 - Investigate fish distributions in the upper Gila River watershed in New Mexico that have not recently been surveyed.

Recovery Goals:
- Spikedace Recovery Plan (1991); Loach Minnow Recovery Plan (1991)
    - Task 2.5 (priority 1): Monitor community composition including range of natural variation
- Gila Chub draft Recovery plan (2014)
    - Task 3.2 (priority 2) Conduct monitoring

Estimated Cost: $15,000

[1] Chub in the Gila River mainstem were previously classified as Gila Chub.

Arizona Workplan

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[1], 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[1] or Gila Topminnow will be brought into ARCC as needed.

In 2019, 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.

Strategic Plan Goals:

- Prevent extinction of rare populations and species
    - Goal 1. Acquire and maintain hatchery/pond stocks of critically endangered populations as insurance against extinction in the wild and to provide sources for population replications.

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

[1] Including populations previously classified as Gila Chub.

- Gila Chub draft Recovery plan (2014)
    - Task 4 (priority 2) Establish and maintain refuge populations in protected ponds or 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[1], 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[1], 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. If Reclamation is able to get a barrier installed in Redfield Canyon in 2019, then at least one Green Sunfish removal per month will be implemented after the barrier is installed.

In 2019, Department staff will monitor for Loach Minnow and Spikedace in Hot Springs Canyon, Gila Topminnow in Bass Canyon and Double R Canyon, and Desert Pupfish in Mint Spring. Gila Topminnow and Desert Pupfish augmentations may occur if deemed necessary. Department staff will also conduct annual Green Sunfish removals in Redfield Canyon.

Strategic Plan Goals:

- Prevent extinction of rare populations and species
    - Goal 5. Chemically and/or mechanically renovate streams and other surface waters identified under the previous Recovery Need (1) to remove nonnative fishes

[1] Chub in Redfield Canyon and Hot Spring Canyon drainages were previously classified as Gila Chub.

    - Goal 6. Replicate rare populations and their associated native fish community into protected streams and other surface waters
- Manage Toward Recovery
    - Goal 4. Continue and expand repatriations of native fish communities.
    - Goal 7. Monitor on-the-ground activities to quantitatively measure and evaluate programmatic success in improving the status of target species and their habitats
    - Goal 9. Periodically evaluate the success of species repatriations and surface water renovations

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: $22,500

Project 7
Task ID: AZ-2006-1

Project Title: Fresno Canyon repatriations

Implementing Entity: Arizona Game and Fish Department

Start Year: 2006

Location(s): Fresno Canyon and Sheehy Spring

Species Protected: Roundtail Chub[1] and Gila Topminnow

Project Description:
The purpose of this project is to establish Gila Topminnow and Roundtail Chub[1] into Fresno Canyon. Gila Topminnow is already established. The plan was to replicate the Sheehy Spring lineage of Roundtail Chub[1] into Fresno Canyon, but that was delayed until after a Habitat Conservation Plan could be completed for the private land on which Sheehy Spring is located. The Habitat Conservation Plan was completed in late 2016, after which planning to acquire chub from Sheehy Spring resumed. Fewer than 90 chub have been captured for the last seven years, so the population size may be less than 100 individuals, and thus at risk of extirpation.

In 2019, Department will acquire Roundtail Chub[1] from Sheehy Spring and bring them into ARCC for propagation. Progeny produced will be stocked into Fresno Canyon, which will require helicopter support. Some progeny may also be stocked into Pasture 9 Tank on San Rafael Cattle Company Ranch or back into Sheehy Spring. Staff may remove vegetation from around Sheehy Spring to improve habitat there. A fish health assessment will be completed for Sheehy Spring before any translocation to ARCC, and at ARCC before any progeny are translocated to Fresno Canyon.

Strategic Plan Goals:

- Prevent extinction of rare populations and species
    - Goal 5. Chemically and/or mechanically renovate streams and other surface waters identified under the previous Recovery Need (1) to remove nonnative fishes
    - Goal 6. Replicate rare populations and their associated native fish community into protected streams and other surface waters
- Manage Toward Recovery
    - Goal 4. Continue and expand repatriations of native fish communities.
    - Goal 7. Monitor on-the-ground activities to quantitatively measure and evaluate programmatic success in improving the status of target species and their habitats
    - Goal 9. Periodically evaluate the success of species repatriations and surface water renovations

[1] Chub to be repatriated 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 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: $33,100

Project 8
Task ID: AZ-2002-1

Project Title: Gila Topminnow Stockings

Implementing Entity: Arizona Game and Fish Department

Start Year: 2002

Location(s): Salt River drainage: Haunted Canyon Reavis Canyon, and Tucker Box (Armer Gulch); San Francisco River drainage: Dix Creek and Harden Cienega Creek; Gila River drainage: Mescal Creek and Mescal Warm Spring; San Pedro River drainage: Buehman Canyon, Youtcy Canyon, and Edgar Canyon

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 2019, Department staff plan to stock Gila Topminnow into 12 new sites. Potential sites include Haunted Canyon Reavis Canyon, and Tucker Box (Armer Gulch) in the Salt River drainage; Dix Creek and Harden Cienega Creek in the San Francisco River Drainage; Mescal Creek and Mescal Warm Spring in the Gila River drainage; and Buehman, Youtcy, and Edgar canyons in the San Pedro River drainage. Each of these will be monitored 6-months after being stocked 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 and Mescal Warm are on BLM lands, and they need to complete environmental compliance before stockings. Buehman, Bullock, Youtcy, and Edgar Canyons are on Pima County property and the county indicated they will be done with their management plan in early 2019, so the Department will be able to stock those sites that year. Youtcy and Edgar first need to be evaluated to determine if they are suitable for Gila Topminnow. The other sites are on USFS lands, and because stocking of Gila Topminnow is a change in condition, they need to complete Endangered Species Act section 7 consultation with USFWS relative to ongoing actions, before or after Gila Topminnow are stocked. Health assessments of fish from donor sites will be completed before any translocations.

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 Bass Canyon, Double R Canyon, Murray Spring, and Mud Spring pond in the San Pedro River drainage; Pasture 9 Tank, Bill's Wildlife Pond, Clyne Tank and Sabino Canyon, Peterson Ranch pond, and International Wildlife Museum pond in the Santa Cruz River drainage; West Fork Pinto Creek, Tortilla Creek, Charlebois Spring, and Hidden

Water Spring in the Salt River Drainage; Sheepshead Canyon and Spring Creek in the Verde 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 2018 will also be monitored.

Strategic Plan Goals:

- Prevent extinction of rare populations and species
    - Goal 6. Replicate rare populations and their associated native fish community into protected streams and other surface waters
- Manage Toward Recovery
    - Goal 4. Continue and expand repatriations of native fish communities.
    - Goal 7. Monitor on-the-ground activities to quantitatively measure and evaluate programmatic success in improving the status of target species and their habitats
    - Goal 9. Periodically evaluate the success of species repatriations and surface water renovations

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: $57,000

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[1], and Gila Topminnow

Project Description:
Spring Creek is a tributary to Oak Creek in the Verde River drainage, and contains Roundtail Chub[1], 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[1] 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. There are plans to stock additional Spikedace in spring 2018.

In 2019, Department staff will monitor for Gila Topminnow and Spikedace in Spring Creek and will assist the Department's CAMP staff with Green Sunfish removal efforts. Additional Gila Topminnow and Spikedace augmentations may occur if deemed necessary. Health assessments of fish from donor sites will be completed prior to any translocation.

Strategic Plan Goals:

- Prevent extinction of rare populations and species
    - Goal 5. Chemically and/or mechanically renovate streams and other surface waters identified under the previous Recovery Need (1) to remove nonnative fishes
    - Goal 6. Replicate rare populations and their associated native fish community into protected streams and other surface waters
- Manage Toward Recovery
    - Goal 4. Continue and expand repatriations of native fish communities.

[1] Chub in Spring Creek were previously classified as Gila Chub.

- Goal 7. Monitor on-the-ground activities to quantitatively measure and evaluate programmatic success in improving the status of target species and their habitats
- Goal 9. Periodically evaluate the success of species repatriations and surface water renovations

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
- 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: $13,300

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 2019, Department staff will continue to monitor for Spikedace, Loach Minnow, and Roundtail Chub and conduct nonnative removal efforts in the lower Blue River. Department staff will also monitor for Spikedace and Roundtail Chub in the middle Blue River. Additional Loach Minnow, Spikedace, and Roundtail Chub augmentations may occur if deemed necessary. 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.

Strategic Plan Goals:

- Prevent extinction of rare populations and species
    - Goal 5. Chemically and/or mechanically renovate streams and other surface waters identified under the previous Recovery Need (1) to remove nonnative fishes
    - Goal 6. Replicate rare populations and their associated native fish community into protected streams and other surface waters
- Manage Toward Recovery
    - Goal 4. Continue and expand repatriations of native fish communities.

- Goal 7. Monitor on-the-ground activities to quantitatively measure and evaluate programmatic success in improving the status of target species and their habitats

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: $39,800

Project 11
Task ID: AZ-2004-1

Project Title: Miscellaneous stock tank surveys

Implementing Entity: Arizona Game and Fish Department

Start Year: 2004

Location(s): Upper Verde River drainage

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

Project Description:
The purpose of this project is to survey all stock tanks in stream systems where nonnative fish removal efforts and fish barriers are planned, to determine the sources of nonnative fishes. Stock tank surveys have been completed in the O'Donnell Creek drainage, Mineral Creek drainage, Blue River drainage, Grapevine Canyon drainage (New River), most of the Sonoita Creek drainage, and the Red Tank Draw drainage. These surveys were typically completed by making several hauls of a large bag seine across the ponds. Note that beginning with the FY2020 plan, stock tank surveys will be moved into specific nonnative removal projects, as they are part of the overall action to eradicate nonnative fish from drainages.

During 2018, Reclamation conferred with USFS and determined it can move forward with planning for construction of one or more barriers on the upper Verde River. In 2019, Department staff will draft a plan to survey stock tanks in the upper Verde River drainage. The Department acquired GIS layers of all tanks in the upper Verde drainage in 2018. Using these GIS layers and NAIP imagery, tanks that go dry will be eliminated from the survey list. Also, isolated pools in tributaries will be identified and targeted for surveys to determine presence of nonnative fish. One or more buffer zones on each side of the river will be identified and wetted tanks or isolated pools in the zone(s) closest to the river will be targeted for surveys. Tanks with fish records will be given highest priority for surveys. Surveys will commence after the planning for the proposed Verde Project is complete.

Strategic Plan Goals:

- Prevent extinction of rare populations and species
    - Goal 4. Survey stock tanks and other surface waters in drainages identified for native fish protection under the previous Recovery Need (1), and salvage native fishes in advance of renovations

Recovery Goals:

- Spikedace recovery plan (1991); Loach Minnow recovery plan (1991)
    - Task 6.2.3 (priority 3) Assess status of non-native fishes in the watershed.
- Gila Topminnow draft revised recovery plan (1999)

    - 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: $19,900

Project 12
Task ID: AZ-2008-1

Project Title: Assess potential repatriation waters

Implementing Entity: Arizona Game and Fish Department

Start Year: 2008

Location(s): Salt River drainage: Reavis Canyon and Fish Canyon; Verde River drainage: Dutchman Grave Spring and Lower Mine Spring; Blue River drainage: Blue River tributaries; Santa Cruz drainage: George Weiss Spring; San Pedro River drainage: Youtcy Canyon and Edgar Canyon

Species Protected: Spikedace, Loach Minnow, Gila Topminnow, Roundtail Chub[1], 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[1], or other native fishes. Forty-four streams were assessed between 2014 and 2017, some of which were subsequently stocked with fish.

In 2019, Department staff will assess waters in the Gila River Basin for native fish suitability. Potential sites include Reavis and Fish canyons in the Salt River drainage; tributaries in the Blue River drainage; George Weiss Spring in the Santa Cruz drainage; Youtcy Canyon and Edgar Canyon in the San Pedro River drainage.

Strategic Plan Goals:

- Build the scientific foundation for recovery efforts
    - 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: $13,300

[1] Both Roundtail Chub and the form previously classified as Gila Chub.

Project 13
Task ID: AZ-2014-1

Project Title: Expand Roundtail Chub[1] 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[1] 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.

In 2019, Department staff will continue to monitor for Gila Chub in Harden Cienega Creek. Additional Gila Chub translocations may occur if deemed necessary. After 2019 this project can possibly be considered complete, and monitoring can shift from the Department's GRB program to another branch or entity. However, if Green Sunfish become more abundant, this should project evolve to a nonnative fish removal project.

Strategic Plan Goals:

- Prevent extinction of rare populations and species
    - Goal 6. Replicate rare populations and their associated native fish community into protected streams and other surface waters
- Manage Toward Recovery
    - Goal 4. Continue and expand repatriations of native fish communities.
    - Goal 7. Monitor on-the-ground activities to quantitatively measure and evaluate programmatic success in improving the status of target species and their habitats
    - Goal 9. Periodically evaluate the success of species repatriations and surface water renovations

Recovery Goals:

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

[1] Chub in Harden Cienega Creek were previously classified as Gila Chub.

- Task 3.2 (priority 2) Conduct monitoring

Estimated Cost: $13,300

Project 14
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[1], 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[1], 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 2019. Once the barrier is in place, the Department will repatriate Spikedace and Loach Minnow upstream.

In 2019, the Department will conduct additional eDNA surveys and electrofishing surveys for Loach Minnow and Spikedace in upper Eagle Creek, to further confirm that the two species are absent upstream of Willow Creek confluence. A pre-barrier fish survey will be completed, following the same monitoring plan that will be used after the barrier is complete and Spikedace and Loach Minnow are stocked. The Department will also assess habitat in the upper portion of East Fork Eagle Creek to determine if it is suitable for native fish stockings. If the barrier construction is completed, Spikedace and Loach Minnow may be stocked into Eagle Creek in 2019.

Strategic Plan Goals:

- Prevent extinction of rare populations and species
    - Goal 2. Scope, design, and install low-head fish barriers to prevent upstream movements of nonnative biota
    - Goal 6. Replicate rare populations and their associated native fish community into protected streams and other surface waters
- Manage Toward Recovery
    - Goal 1. Plan, scoped, design, and install additional fish barriers

[1] Both Roundtail Chub and the form previously classified as Gila Chub are documented in Eagle Creek.

- Goal 4. Continue and expand repatriations of native fish communities.
- Goal 7. Monitor on-the-ground activities to quantitatively measure and evaluate programmatic success in improving the status of target species and their habitats

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 15
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[1], 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[1], Longfin Dace, Desert Sucker, Sonora Sucker, and several nonnative species, including Green Sunfish, Black Bullhead, Fathead Minnow, and Northern Crayfish. Roundtail Chub[1] 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[1] 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 2019, Department staff will continue to conduct nonnative removal efforts in Red Tank Draw. The Department will initiate plans to remove nonnative fish from Rarick Canyon above the lowermost waterfall (upstream of the confluence with Mullican Canyon), and if the plans are finalized, will implement the removal efforts. If the removal efforts are completed (unlikely), the Department staff may also translocate Roundtail Chub from the chub occupied reach upstream into Rarick Canyon, and may stock Gila Topminnow into the same reach.

Strategic Plan Goals:

- Prevent extinction of rare populations and species
    - Goal 5. Chemically and/or mechanically renovate streams and other surface waters identified under the previous Recovery Need (1) to remove nonnative fishes
    - Goal 6. Replicate rare populations and their associated native fish community into protected streams and other surface waters
- Manage Toward Recovery
    - Goal 4. Continue and expand repatriations of native fish communities.

[1] Chub in Red Tank Draw were previously classified as Gila Chub.

- Goal 7. Monitor on-the-ground activities to quantitatively measure and evaluate programmatic success in improving the status of target species and their habitats
- Goal 9. Periodically evaluate the success of species repatriations and surface water renovations

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: $53,000

Project 16
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[1]

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 were 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[1]. The Sharp Springs lineage of Gila Topminnow would be translocated from one or more of the replicate populations in the state. Roundtail Chub[1] 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. After the meeting, Arizona State Park staff were to 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 2019, Department staff may plan a rotenone treatment to remove Western Mosquitofish from Sharp Spring pending approval by Arizona State Parks.

Strategic Plan Goals:

- Prevent extinction of rare populations and species
    - Goal 5. Chemically and/or mechanically renovate streams and other surface waters identified under the previous Recovery Need (1) to remove nonnative fishes
    - Goal 6. Replicate rare populations and their associated native fish community into protected streams and other surface waters
- Manage Toward Recovery
    - Goal 4. Continue and expand repatriations of native fish communities.
    - Goal 7. Monitor on-the-ground activities to quantitatively measure and evaluate programmatic success in improving the status of target species and their habitats
    - Goal 9. Periodically evaluate the success of species repatriations and surface water renovations

[1] 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 17
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 has to be renovated. It was last renovated 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 2019, Department staff will coordinate with Boyce Thompson Arboretum staff to plan for nonnative fish eradication in Ayer Lake.

Strategic Plan Goals:

- Prevent extinction of rare populations and species
    - Goal 5. Chemically and/or mechanically renovate streams and other surface waters identified under the previous Recovery Need (1) to remove nonnative fishes
    - Goal 6. Replicate rare populations and their associated native fish community into protected streams and other surface waters
- Manage Toward Recovery
    - Goal 4. Continue and expand repatriations of native fish communities.
    - Goal 7. Monitor on-the-ground activities to quantitatively measure and evaluate programmatic success in improving the status of target species and their habitats
    - Goal 9. Periodically evaluate the success of species repatriations and surface water renovations

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 18
Task ID: AZ-2019-1

Project Title: Sweetwater Dam Pond Restoration

Implementing Entity: Arizona Game and Fish Department

Start Year: 2019

Location(s): Sweetwater Dam Pond

Species Protected: Gila Topminnow and Roundtail Chub[1]

Project Description:
Sweetwater Dam Pond is located in an unnamed tributary to Cave Creek about 740 m upstream of Sweetwater Spring and about 5.4 km upstream from the confluence of Cave Creek and Gardner Canyon. The pond is on the Nogales Ranger District of Coronado National Forest. Department herpetological staff surveyed the pond in early 2018 and reported Mosquitofish and Goldfish. Department aquatic wildlife staff thereafter visited the pond and confirmed the presence of Mosquitofish and Goldfish. The pond was considered large enough to establish Roundtail Chub and Gila Topminnow if the nonnatives could be eradicated. The purpose of this project is to eradicate Western Mosquitofish and Goldfish from Sweetwater Dam Pond, and then repatriate Gila Topminnow and Roundtail Chub[1]. The Cienega Creek lineage of Gila Topminnow would be translocated from Cienega Creek. Roundtail Chub[1] would also be acquired from Cienega Creek. At a December 27, 2018 coordination meeting between the Department and Coronado National Forest, Sweetwater Dam was brought up but not fully discussed because the Nogales District Wildlife Biologist was not present.

In 2019, Department staff will coordinate with Coronado National forest and develop a plan to eradicate Western Mosquitofish and Goldfish from Sweetwater Dam Pond. If pumping of the pond gets approved, the Department will attempt to pump the pond dry in early June 2019. The pond should be very low at that time, plus the mud in the pond could fully dry before monsoons begin in July.

Strategic Plan Goals:
- Prevent extinction of rare populations and species
    - Goal 5. Chemically and/or mechanically renovate streams and other surface waters identified under the previous Recovery Need (1) to remove nonnative fishes
    - Goal 6. Replicate rare populations and their associated native fish community into protected streams and other surface waters
- Manage Toward Recovery
    - Goal 4. Continue and expand repatriations of native fish communities.
    - Goal 7. Monitor on-the-ground activities to quantitatively measure and evaluate programmatic success in improving the status of target species and their habitats
    - Goal 9. Periodically evaluate the success of species repatriations and surface water renovations

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 19
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[1], 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. Twelve nonnative removal trips will be scheduled for Bonita Creek in 2019 and four 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, Safford Field Office, United States Fish and Wildlife Service, Arizona Game and Fish Department, and Bureau of Reclamation 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:
- Prevent extinction of rare populations and species
    - Goal 5. Chemically and/or mechanically, renovate streams and other surface waters identified under the previous Recovery Need (1) to remove nonnative fishes.
    - Goal 9. Restore degraded aquatic habitats to use for native fish.

[1] Chub in Bonita Creek were previously classified as Gila Chub.

- Manage Toward Recovery
    - Goal 6. Inform and educate the public about the conservation status and values of native fishes and the problems nonnative fishes create for them.
    - Goal 7. Monitor on-the-ground activities to quantitatively measure and evaluate programmatic success in improving the status of target species and their habitats.

Recovery goals:

- Spikedace recovery plan (1991); Loach Minnow recovery 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: $18,000.00

Project 20
Task ID: AZ-2019-2

Project Title: Eagle Creek Spikedace and Loach Minnow eDNA Survey

Implementing Entity: US Fish and Wildlife Service, San Carlos Apache Tribe

Start Year: 2019

Location(s): Eagle Creek and Wet Prong Creek

Species Protected: Loach Minnow and Spikedace

Project Description:
Spikedace were encountered in the lower 60 km of Eagle Creek during surveys in the late 1980s. They were found most abundant in the 32 km reach extending from Sheep Wash to P-Bar Ranch, a section primarily comprised of San Carlos Apache Tribe lands, where they represented 24.7% of the sample (Marsh et al. 1990). Loach Minnow were encountered near Sheep Wash in the 1950s and upstream approximately 20 km near Honeymoon Campground in the mid-1990s. Spikedace and Loach Minnow were last collected from Eagle Creek in 1989 and 1997, respectively. While habitat for both species is thought to exist, few surveys have been completed between Sheep Wash and P-Bar Ranch since 1987 due to remoteness and limited land owner access. Thus it remains unclear whether the two species remain in this section of Eagle Creek.

Few perennial tributaries occur within the Eagle Creek watershed with existing or potential habitat for Spikedace and Loach Minnow. San Carlos Apache Tribe biologists have highlighted a perennial tributary, Wet Prong Creek, as having habitat for Spikedace and possibly Loach Minnow. There are no known surveys of Wet Prong Creek.

We propose: 1) An eDNA survey in Eagle Creek below Sheep Wash on San Carlos Tribal lands (approx. 25 km). Filtered water samples will be collected at 1 km intervals, preserved and transported to xxx for analysis; and, 2) A fishery survey of Wet Prong Creek. A reconnaissance trip will be conducted to determine access and appropriate fishery survey techniques. A Survey will be conducted using backpack electrofishers, seines, hoopnets, or other passive or active collection gear conducive to sampling Wet Prong Creek. A report of findings will be assembled, coordinated with San Carlos Tribe, and distributed to GRBNFCP.

Strategic Plan Goals:
- Scientific Foundation
    - Goal 2. Update and assemble existing knowledge of life history needs and ecology of Gila River basin native fishes.
- Prevent Extinction & Recovery Management

- 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:

- Spikedace Recovery Plan (1991); Loach Minnow Recovery Plan (1991)
  - Task 1.1 (priority 1) Identify extent of existing populations and determine level of protection
  - Task 1.2 (priority 2) Prioritize existing populations as to need or imminent need for protection
  - Task 6.1 (priority 3) Identify stocks amenable to use for reintroduction
  - Task 6.2 (priority 3) Identify river or stream systems for reintroduction

Estimated Cost: $27,000

Hatchery Workplan

Project 21
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[1]

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 2019, ARCC staff will focus on propagating lineages of Spikedace and Loach Minnow that are planned to be repatriated that year, including Aravaipa Spikedace, Blue River Loach Minnow, and any lineages that New Mexico Department of Game and Fish plan to stock. Staff will also focus on research to improve propagation success, as well as completing the Hatchery Management Plan if it is not finished in 2018. Department staff will hold and attempt to spawn Roundtail Chub from Sheehy Spring. Any fish propagated will be stocked into Fresno Canyon, but some may also go into Pasture 9 Tank, or back into Sheehy Spring. Health assessments of fish from donor sites will be completed prior to any translocation to ARCC.

Strategic Plan Goals:

- Build the scientific foundation for recovery efforts
    - Goal 3. Update and assemble existing knowledge of life history needs and ecology of Gila River basin native fishes
- Prevent extinction of rare populations and species
    - Goal 1. Acquire and maintain hatchery/pond stocks of critically endangered populations as insurance against extinction in the wild and to provide sources for population replications.

[1] Both Roundtail Chub and the form previously classified as Gila Chub.

- Manage Toward Recovery
    - Goal 2. Maintain and operate the Bubbling Ponds Native Fishes Conservation Facility through the course of the Program

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: $112,4004

Project 22
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:

- Recovery Need: Prevent extinction of rare populations and species
    - Goal 1. Acquire and maintain hatchery/pond stocks of critically endangered populations as insurance against extinction in the wild and to provide sources for population replications.
    - Goal 6. Replicate rare populations and their associated native fish community into protected streams and other surface waters.

- Recovery Need: Manage Toward Recovery
    - Goal 4. Continue and expand repatriations of native fish communities.

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: $16,800