Gila River Basin Native Fishes Conservation Program
Policy Committee Meeting

Monday, June 10, 2024
12:00 PM – 2:00 PM (AZT)
Microsoft Teams Meeting Link: ***Click HERE to join the meeting!***

Meeting Notes

Attendees: Dominic Graziani, Kent Mosher, Betsy Grube (USBR), Scott Richardson (USFWS; Representing Heather Whitlaw), Heidi Blasius (BLM), Julie Carter, Brian Hickerson (AZGFD), Jill Wick, Kirk Patten (NMDGF)

Meeting Objectives:

- Review work completed by the Program in the last year.
- Finalize recommendations for FY2025 Work Plan.
- Provide relevant updates on projects, contracts, and species recovery.

12:00 PM Welcome

Dominic Graziani, Bureau of Reclamation

- Dominic introduces himself, as he took over as USBR's GRBNFCP Policy Committee Member from Sean Heath, this past year.

12:05 PM Introductions and Agenda Review

Kent Mosher, Bureau of Reclamation

- Review of agenda and meeting objectives.

12:15 PM Program Update

Reclamation and USFWS

- Personnel Updates - Committee Members and Species Leads
  - Policy Committee Representatives – Dominic Graziani (USBR), Julie Carter (AZGFD), Kirk Patten (NMDGF), Heather Whitlaw (USFWS; Represented today by Scott Richardson).
  - Technical Committee Members – Kent Mosher (USBR), Scott Richardson (USFWS), Brian Hickerson (AZGFD), Jill Wick (NMDGF).
  - Spikedace/Loach Minnow has a new USFWS lead, Jill Morrow.
  - Gila Topminnow/Desert Pupfish USFWS lead is currently open/posted.
  - AZGFD will have new biologist – Alex Cameron working in Gila River Basin Program starting 6/10/2024.
- Program Status Update (Year in Review; See Presentation **HERE**)
  - Kirk asked for clarification on the Gila chub suitability study completed by Kelsie Field and what sites were suitable in New Mexico.
- CAP Consultation Update
  - USBR has met with tech/policy members to discuss funding status and changes to key conservation measures.
  - Scott updated all on ongoing BO. Writing is ongoing and USFWS is hopeful to have a draft completed by late July. Final BO anticipated for late August.

- Julie indicated she appreciated USBR meeting to discuss changes to funding. AZGFD has been meeting internally to plan for funding/staffing needs. This short notice has been difficult for AZGFD. All positions are supported by other funding, however, AZGFD operates on 2-year funding cycle for other sources and this funding decrease was not anticipated in the 2-year cycle. Decreases were not expected until 2026. As projects are selected annually, it is going to be difficult for AZGFD to accommodate this current funding process and anticipate funding needs from other sources.
- Dominic asked for clarification for how past funding was handled.
- Brian/Julie described this being the first year funding did not meet the full amount in possible for the agreement. They are 5-year agreements.
- Kent suggested planning for 2026 funding this year.
- Scott reiterates that there will be a 15-year schedule in the upcoming BO. Federal budgets are also difficult with CRs. Scott also highlighted administrative funds that are now a part of the budget since USBR has been covering managing these agreements in place of USFWS for many years.
- Julie asks for clarification on administration funds.
- Kent clarifies that USBR is funding FY2025 at a rate of 450k with 100k going towards salaries managing agreements/contracts. For FY2026 – FY2029, there will be the expected 400k and 150k split for conservation actions and administrative funds.
- Julie describes frustration with meeting internally to determine staffing needs when funding is project by project. Positions will need to be cut or reduced if AZGFD cannot feel confident in funding. Brian has been working to close funding gap at AZGFD but there has been limited time to deal with this big change.
- Dominic describes upcoming deadlines for fiscal year and limited options for FY25. He proposes evaluating projects earlier in the year.
- Julie indicates how that may help. AZGFD has been doing the work with this contract for many years and they are evaluating how to continue this program and financially plan when USBR's funding no longer is sufficient. Brian clarifies that timing is not as big of an issue as certainty for funds and the practical constraints of how AZGFD can handle the contract work. This funding was anticipated through 2027, and even with warnings, it is hard to plan through multiple contingencies.
- Dominic expresses understanding for the difficult situation and would appreciate any solution or recommendation for consideration on how to improve the funding/timing/certainty concerns of AZGFD.

- Next Steps - Strategic Plan (2023 – 2027)/Proposal Evaluation Revisions
  - Narrow-headed gartersnake (NHGS) and northern Mexican gartersnake (NMGS) will need to be addressed in GRBNFCP goals and proposal evaluation forms. Revised Strategic plan and proposal evaluation forms will need to be completed by November. Once there is a final BO USBR will reach out to Tech Committee and species leads for discussions related to drafting of documents. Drafts will be reviewed by Policy.
  - Kirk asked for clarification of funding reducing with increase species. Kent discussed proposed changes in USBR's BA as they relate to Conservation Measures, species covered, and funding commitments.
  - Scott describes FWS stance on evaluating the CAP. It's unfair to require USBR to fund native species at this rate when they have met all previous funding commitments. Funding is continuing due to addition of species and administrative changes.

12:45 PM FY2025 Work Plan

Kent Mosher, Bureau of Reclamation

- Review of Project Proposals (Kent; see Work Plan **HERE**)
    - Project leads for each project reviewed projects proposed for FY2025.
    - Funding based on project ranking is presented at a funding rate of $448,228.
    - 2025 funding will be dispersed from 2024 funds and recipients will see it in their accounts by the end of this fiscal year.
- Technical Committee Clarifications
    - None
- Policy Committee Recommendation
    - Julie, Kirk, Heather (represented by Scott), and Dominic are all in support of 2025 Work Plan. The 2025 Work Plan is approved.

1:10 PM **Updates**

All

- Species Status Updates (Scott)
    - Ryan Gordon is species lead for Gila chub and there has been no movement on complex. Gila chub are still recognized by USFWS.
    - Scott is acting lead for Gila topminnow; SSA ongoing. 5 Year Review and Recovery plan revision is next.
    - Dan Levit is lead for razorback suckers; downlisting petitioned in 2021.
    - Jill Morrow is lead on spikedace and loach minnow. Recovery Plans in progress
    - NHGS and NMGS lead is Jeff Servoss; SSA for NHGS is ongoing. Recovery plan for NHGS is next. NMGS will start after NHGS is complete.
    - Scott is acting lead for desert pupfish; 5-year review is upcoming in 2025.
- Fish Barriers (Kent; See Presentation **HERE**)
    - Julie requests a meeting to update all partners on the Verde River barriers.
    - Action Item: Kent will set up meeting with all relevant partners on the Verde River fish barrier project to provide updates.
- Fish Monitoring (Betsy; See Presentation **HERE**)
    - Julie asked for funding clarification related to the long-term monitoring vs conservation project funding.
    - Monitoring is covered by the CAP (State of Arizona); how long they will be funding the monitoring is unknown.
- Information and Education (Betsy; See Presentation **HERE**)
- Annual Reporting/Technical Committee Meeting Date
    - Will be held in Tucson, AZ on December 10-11, 2024.

2:00 PM **Adjourn**

BUREAU OF RECLAMATION

GILA RIVER BASIN NATIVE FISHES CONSERVATION PROGRAM

Year in Review (2023)

5 Year Strategic Plan (2023 – 2027): Scientific Foundation

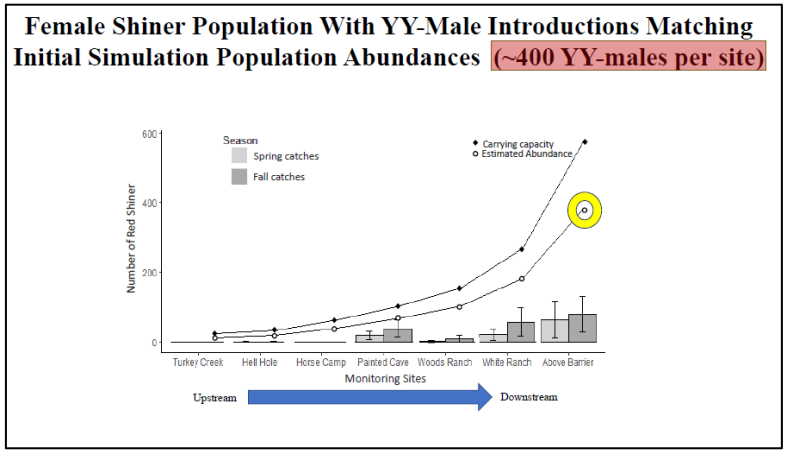
Scientific Foundation		
No	**Goal**	**Objective**
1	Investigate novel methods to control nonnative aquatic biota.	a) Seek at least one opportunity to partner or fund new control methods or improvements upon existing methods.
2	Update and assemble existing knowledge of life history needs and ecology of Gila River basin native fishes.	a) As opportunities arise, initiate ecological/life history studies of native biota where such understanding can assist with conservation goals of the Program.
3	Improve propagation techniques for spikedace and loach minnow.	a) At a minimum, identify and implement at least one research project aimed at improving propagation.
4	Complete genetic management plans for priority species.	a) Develop genetic management plans for spikedace, loach minnow, and Gila topminnow.
5	Investigate new stocking strategies to improve survival of repatriated fish.	a) At a minimum, document existing stocking strategies, identify locations with poor survival, and identify likely causes of poor survival.

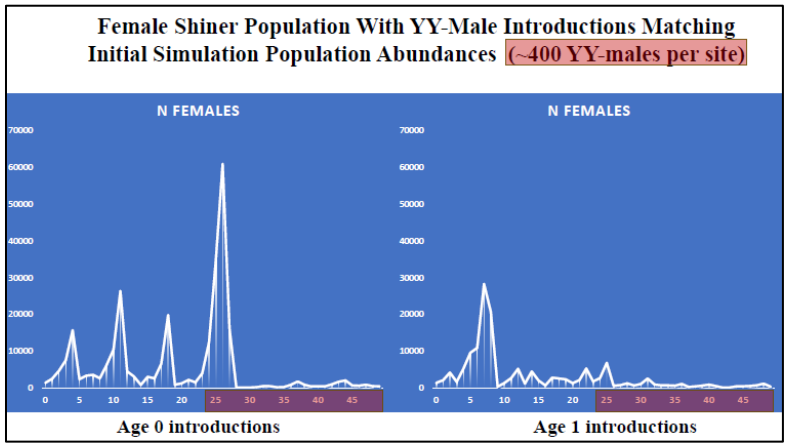
Goal #1:
Investigate novel methods to control nonnative aquatic biota.

Mechanical Control Investigation Using YY Fish (Red Shiner) IN PROGRESS

Work Completed in 2023:

- Obtained estimates of red shiner populations in Aravaipa Creek.
- Conducted initial population modeling and simulations.
- Recruited MS student to continue project.





Chad Teal
(Principal Investigator)

Phil Saporito
(Masters Student)

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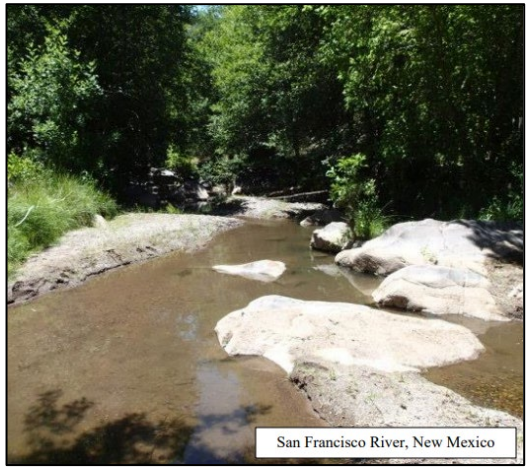
Goal #2:
Update and assemble existing knowledge of life history needs.

Habitat Suitability and Predictive Analytics for Informing the Translocation of Gila Chub in the San Francisco River, NM

COMPLETED

Work Completed in 2023:

- Kelsie Field successfully defended thesis in Spring 2023.
- NMDGF Permanent site was most suitable for Gila chub.
- Hot Springs site was as suitable for Gila chub; however, nonnative fish are present.
- The Box site had lowest suitability due to high elevation, low median temperature, low discharge, and nonnative fish.
- Luna site did not meet the biological needs of Gila chub.


San Francisco River, New Mexico

Site Name	Average Gila Chub Abundance (Standard Error, Range)
Bonita Creek, Arizona	82.3 (34.2, 33 – 178)
Hot Springs, New Mexico⸸*	29.0 (3.5, 14.2 – 37.7)
NMDGF Permanent, New Mexico⸸*	26.4 (1.6, 24.8 – 29.7)
The Box, New Mexico (with outlier)⸸*	18.6 (7.0, 9.9 – 53.5)
Dix Creek, Arizona⸸	15.1 (12.1, 0 – 87)
The Box, New Mexico (without outlier)⸸*	11.6 (0.8, 9.9 – 14.0)
Harden Ciénega Creek, Arizona⸸	8.4 (3.9, 0 – 27)
Mule Creek, New Mexico⸸	1.3 (0.5, 0 – 4)
Eagle Creek, Arizona	0.1 (0.1, 0 – 1)

⸸ indicates sites in the San Francisco River drainage
* indicates translocation sites


Colleen Caldwell
(Principal Investigator)


Kelsie Field
(Masters Student)

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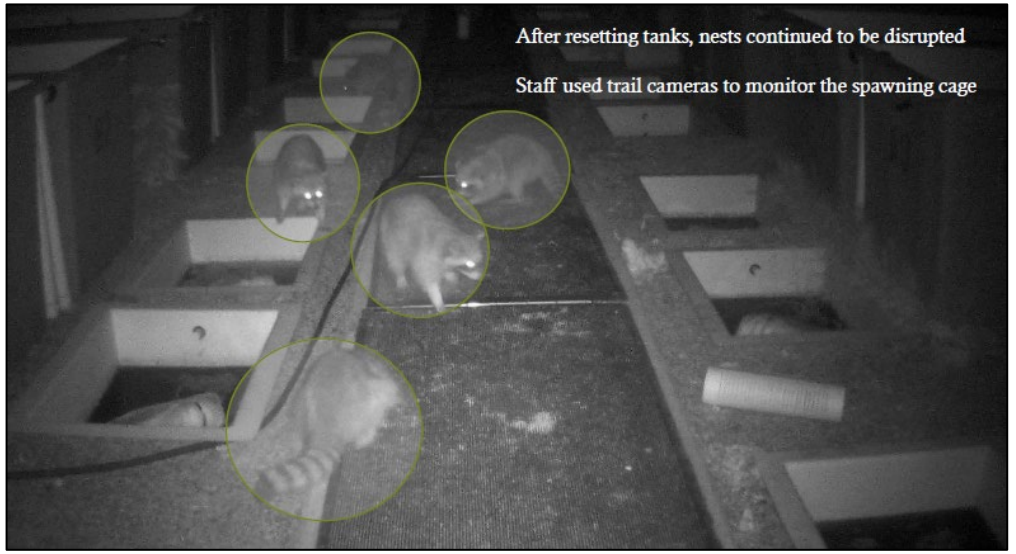
Goal #3:
Improve propagation techniques for spikedace and loach minnow.

Aquatic Research and Conservation Center (ARCC)
Loach Minnow Nest Spacing Study

IN PROGRESS

Work Completed in 2023:

- Three nest spacings (25.4, 38.0, and 50.8 cm were established in tanks utilizing Blue River loach minnow.
- Unfortunately, raccoon activity resulted in broken nest structures and missing fish and all spawning tanks were dismantled shortly.
- No loach minnow were produced in 2023.



Joshua Walters

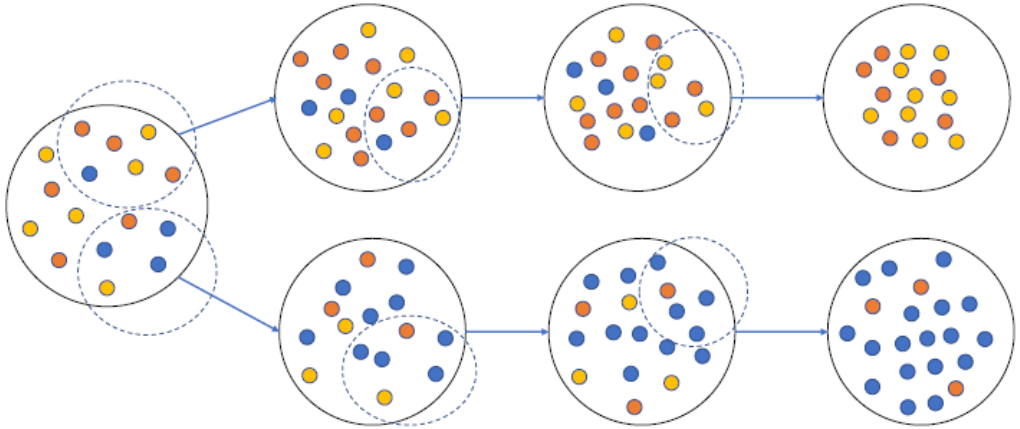
Hudman Evans

Goal #4:
Develop genetic management plans for priority species.

Gila Topminnow Genetic Management Plan COMPLETED
Loach Minnow and Spikedace Genetic Management Plan IN PROGRESS

Work Completed in 2023:

- Gila Topminnow
  - Genetic Management Plan finalized. For a copy, please email Brian Hickerson, Wade Wilson, or Kent Mosher.
  - Additional genetic research being conducted on Mexico populations (Texas A&M).
- Loach Minnow and Spikedace
  - Initial drafts developed for both species.
  - Expect to have draft plans for review in winter 2024.



Wade Wilson
(Principal Investigator)

Steve Mussmann
(Gila Topminnow GMP)

Kin-Lan Han
(Loach Minnow and Spikedace GMP)

Goal #5:
Investigate new stocking strategies to improve survival of repatriated fish.

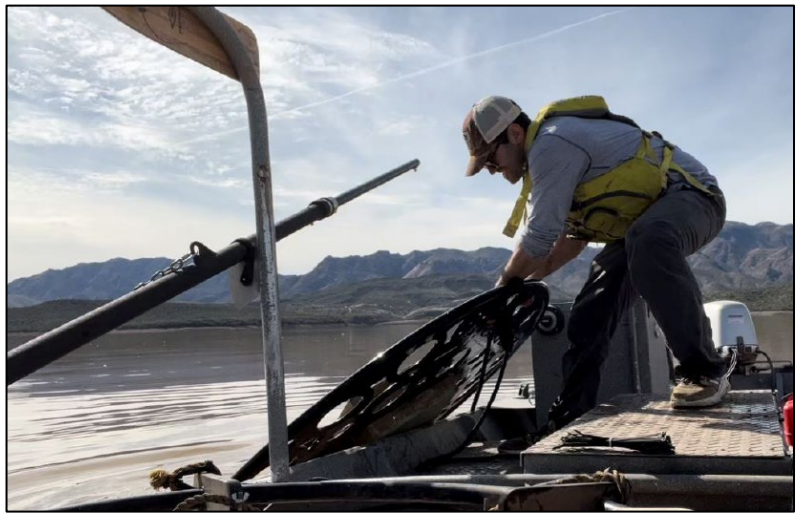
Razorback Sucker Post-Stocking Survival Study in the Lower Verde River and Horseshoe Reservoir

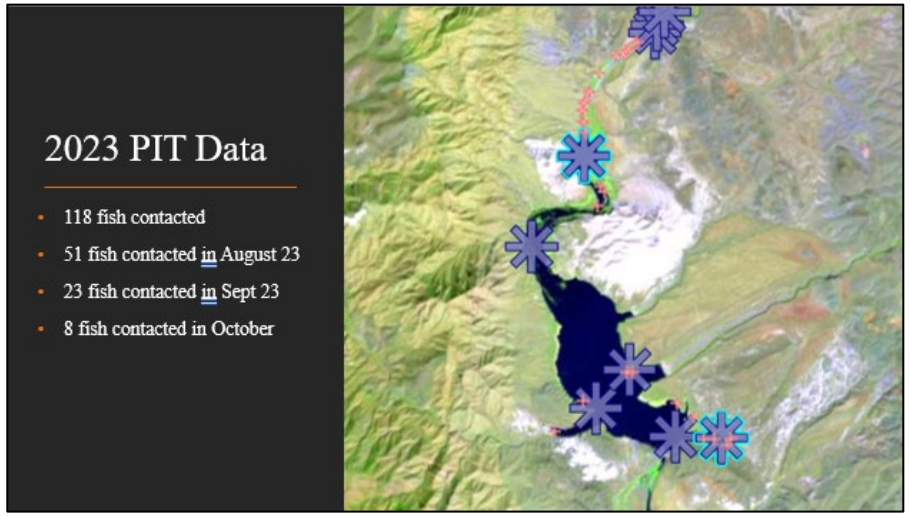
IN PROGRESS

Work Completed in 2023:

- 2022 Stocking Conditions: low reservoir elevation with moderate instream flow
- 2022 Results: very low survival, river-stocked fish moved downstream, and fish passed through Horseshoe Dam.

- 2023 Stocking conditions: high reservoir elevation and low instream flow.
- 2,274 razorback sucker stocked on May 2, 2023.





Scott Bonar
(Principal Investigator)

Chris Jenney
(PhD Candidate)

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ARIZONA

5 Year Strategic Plan (2023 – 2027): Preventing Extinction and Managing Towards Recovery

Preventing Extinction and Managing Toward Recovery		
No	**Goal**	**Objective**
1	Maintain the Aquatic Research and Conservation Center (ARCC) and explore alternative locations for establishment of hatchery stocks of upper Gila and San Francisco River lineages of spikedace and loach minnow.	a) Use genetic management plans for development of brood stock management plan.
		b) Augment hatchery populations as outlined in broodstock management plans.
		c) Ensure the Aquatic Research and Conservation Center (ARCC) has the staff support and supplies necessary to maintain propagation of spikedace and loach minnow at a level needed to meet stocking demands provided wild fish are available.
		d) Determine start up and O&M costs for New Mexico hatchery stocks of spikedace and loach minnow.
2	Protect native fish populations from nonnative fish invasions.	a) Complete the scoping, environmental compliance, and design of two additional fish barriers, and initiate their construction.
3	Remove nonnative aquatic species threats.	a) Eradicate or suppress nonnative aquatic species from a minimum of five surface waters to prepare them for repatriations of native fishes.
4	Replicate populations and their associated native fish community into protected streams and other surface waters.	a) Replicate Gila topminnow stocks into a minimum of 10 surface waters.
		b) Replicate each of the other priority species into a minimum of one surface water.
5	Protect, maintain, and restore degraded aquatic habitats to use for native fish.	a) Restore habitats in a minimum of one location with existing populations or in a location planned for repatriations.
		b) Acquire or work with other programs to acquire easements, land, or water rights to protect key surface water.
6	Inform and educate the public about the conservation status and values of native fishes and the problems nonnative fishes create for them.	a) Implement a minimum of one I&E opportunity per year.
		b) Update Program website at least twice per calendar year.
7	Monitor to quantitatively measure and evaluate project success in improving the status of target species and their habitats.	a) Implement and report on Long-Term Monitoring Plan for Native Fish Populations in the Gila River Basin.
		b) Develop/identify monitoring standards as necessary to adequately evaluate fish barrier function, success and failure of nonnative fish species eradications/suppression, and success and failure of repatriations of 5 priority species.
		c) Incorporate eDNA monitoring techniques and/or other emerging technologies into monitoring practices.
8	Maintain accurate Program tracking records.	a) Continue to develop annual workplans and reports to track program accomplishments.

Goal #1:
Maintain ARCC and explore alternative locations for establishment of hatchery stocks of upper Gila and San Francisco River lineages of spikedace/loach minnow.

IN PROGRESS

Work Completed in 2023:

- Funding provided to ARCC in 2023.
- ARCC augmentations
  - 55 loach minnow (Blue River)
  - 56 loach minnow and 67 spikedace (Aravaipa Creek)
- ARCC stockings
  - 41 loach minnow (Bear Cr.) restocked in Bear Creek.
  - 205 loach minnow (San Francisco R.) stocked in Saliz Canyon.
  - 650 spikedace (Gila R.) and 2,096 Roundtail chub (Eagle Cr.) stocked in lower Blue River.
  - 1,017 spikedace (Gila R.) and 4,544 Roundtail chub (Eagle Cr.) stocked in upper Blue River and ponds.
- No loach minnow and spikedace produced in 2023.
- Meetings held to discuss ARCC issues/concerns, and status of hatchery and brood stock management plans.

Objective
a) Use genetic management plans for development of brood stock management plan.
b) Augment hatchery populations as outlined in broodstock management plans.
c) Ensure the Aquatic Research and Conservation Center (ARCC) has the staff support and supplies necessary to maintain propagation of spikedace and loach minnow at a level needed to meet stocking demands provided wild fish are available.
d) Determine start up and O&M costs for New Mexico hatchery stocks of spikedace and loach minnow.

Goal #2:
Protect native fish populations from nonnative fish invasions.

IN PROGRESS

Proposed/Investigating:

- Eagle Creek
- Verde River (2 barriers)
- San Francisco River (NM)

Constructed:

- Aravaipa Creek
  - 2023 O&M - graffiti removal.
- Blue River
- Bonita Creek
- Cottonwood Spring
- Fossil Creek
- Hot Springs Canyon
- Spring Creek (Oak)
  - 2023 O&M - installed rock gabions for erosion control.
- West Fork Black River

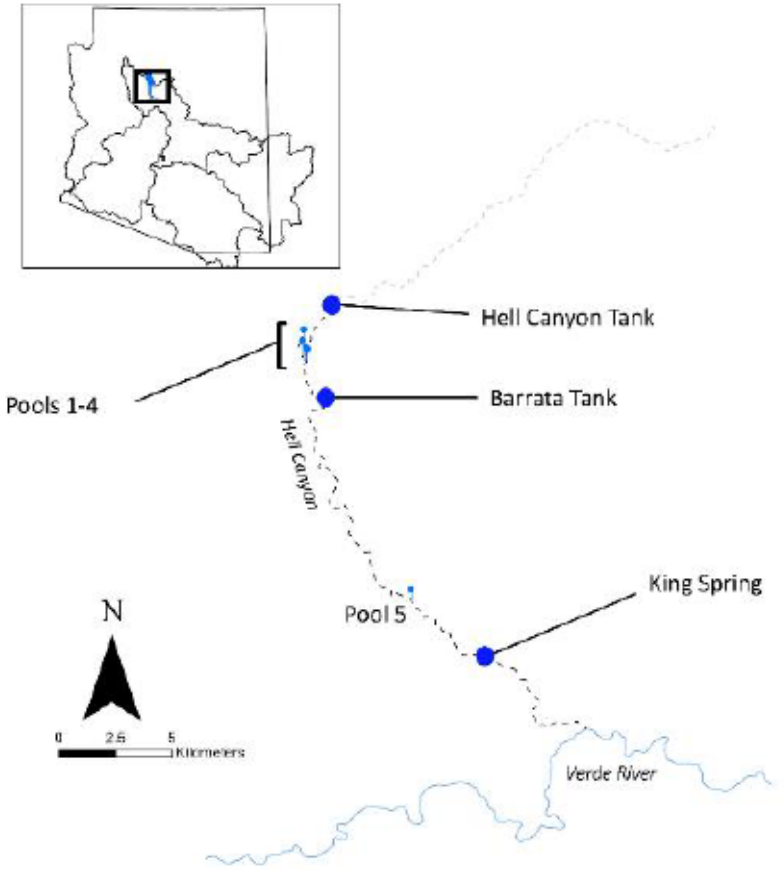
Goal #3:
Remove nonnative aquatic species threats.

IN PROGRESS

Work Completed in 2023:

- Arizona:
  - Harden Cienega
  - Redfield Canyon
  - Aravaipa Creek
  - Bonita Creek
  - Upper Verde River (investigations)
  - West Fork Black River (WMAT lands)
    - Funded under BIL in 2024 and 2025
    - Stocked 3,783 YY Brook Trout

- New Mexico:
  - West Fork Gila River



Goal #4:
Replicate populations and their associated native fish community into protected streams and other surface waters.

IN PROGRESS

Work Completed in 2023:

- Stockings:
  - Sharp Spring (Gila topminnow)
  - Maternity Wildlife Pond (Gila topminnow)
  - Spring Creek (Gila topminnow, spikedace)
  - Blue River (spikedace, roundtail chub):
  - Saliz Canyon (loach minnow)
  - Bear Creek (loach minnow)

- Post-stocking Monitoring
  - Maternity Wildlife Pond (Gila topminnow)
  - Unnamed Drainage #68b (Gila topminnow)
  - Aravaipa Creek (Gila topminnow)
  - Telegraph Canyon (Gila topminnow)
  - Sharp Spring (Gila topminnow)
  - Rarick Canyon (Gila topminnow, Gila chub)
  - Harden Cienega Creek (Gila topminnow)
  - Sabino Canyon – upper (Gila topminnow, Gila chub)
  - Blue River (spikedace, roundtail chub)

Goal #5:
Protect, maintain, and restore degraded aquatic habitats to use for native fish.

IN PROGRESS

Work Completed in 2023:

- Reclamation/GRBNFCP provided letter of support for AGFD and The Nature Conservancy's funding proposal for *Sonoita Creek Headwaters and Springs Protection.*
- This project was selected for funding under the Recovery Land Acquisition Grants Program.

Objective
a) Restore habitats in a minimum of one location with existing populations or in a location planned for repatriations.
b) Acquire or work with other programs to acquire easements, land, or water rights to protect key surface water.

Goal #6:
Inform and educate the public about the conservation status and values of native fishes and the problems nonnative fishes create for them.

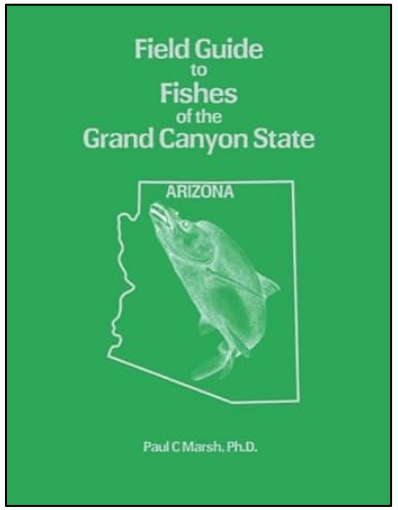
IN PROGRESS

Work Completed in 2023:

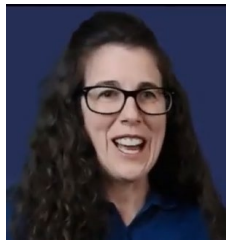
- Field Guide to Fishes of the Grand Canyon State
  - Released April 15, 2024

- Sharing Tails
  - Reached 19 schools in 6 Phoenix Metro and 4 non-Phoenix Metro school districts.
  - Reached 1,221 students in kindergarten, first and second grades, and 61 teachers.
  - Program ended May 2023 (15 years).

- Gila River Basin Native Fish Conservation Film Project
  - Ongoing filming/photography in 2023.



Paul Marsh
(Marsh & Associates)



Carol Pacey
(Marsh Education)

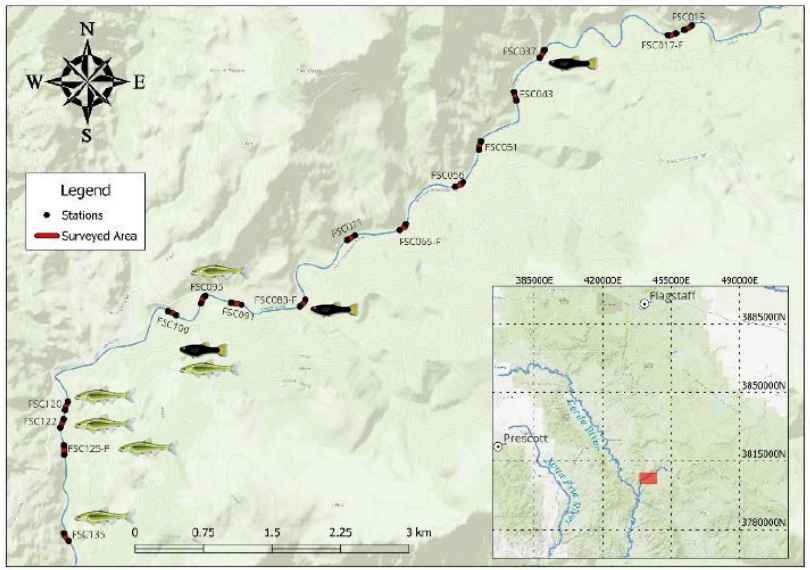
Jeremy Monroe
(Freshwaters Illustrated

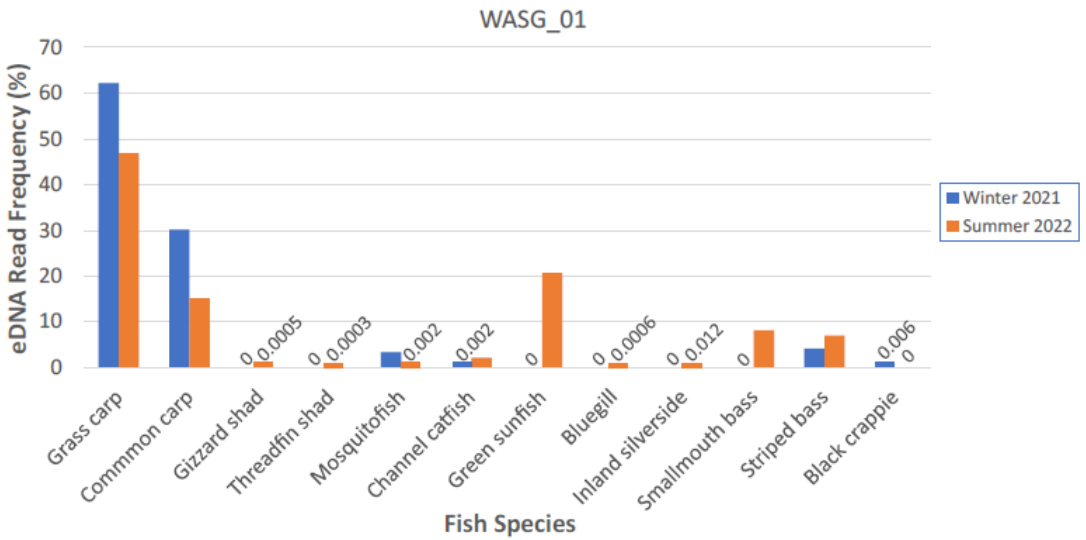
Goal #7:
Monitor to quantitatively measure and evaluate project success in improving the status of target species and their habitats.

IN PROGRESS

Work Completed in 2023:

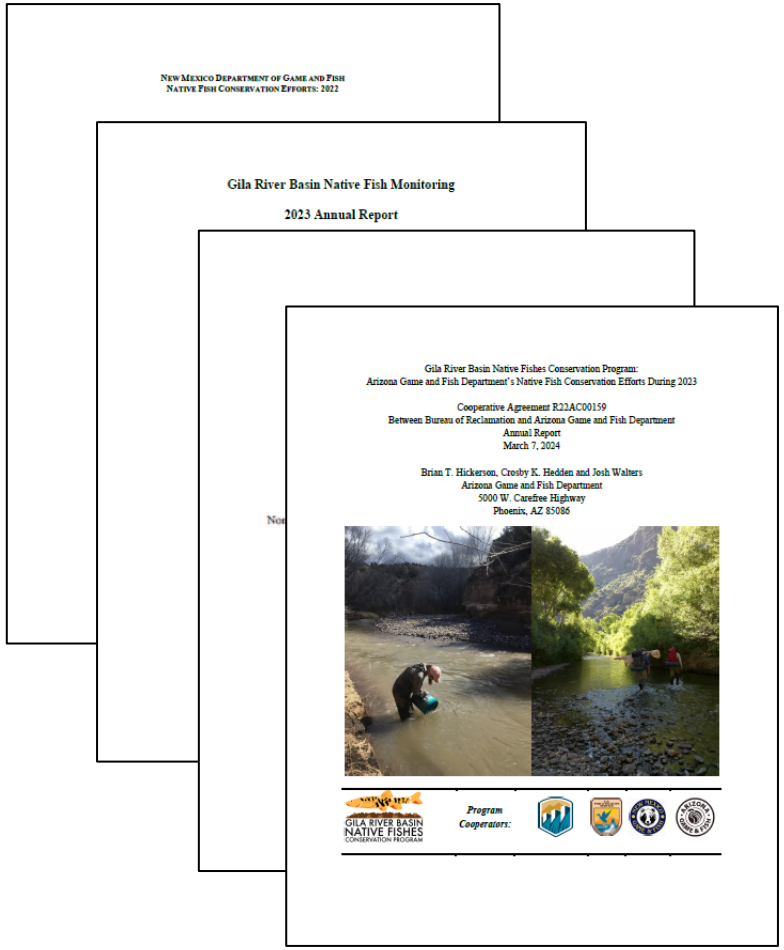
- Continued long-term monitoring of native fish in the Gila River basin (Marsh & Associates).
- Continued to support and utilize eDNA sampling.
  - Incorporated eDNA into long-term monitoring (e.g., Gila topminnow in Fossil Creek)
  - eDNA metabarcoding of fish in the CAP during water releases from Lake Pleasant
  - Species prioritization for Gila River basin HT-qPCR Biochip

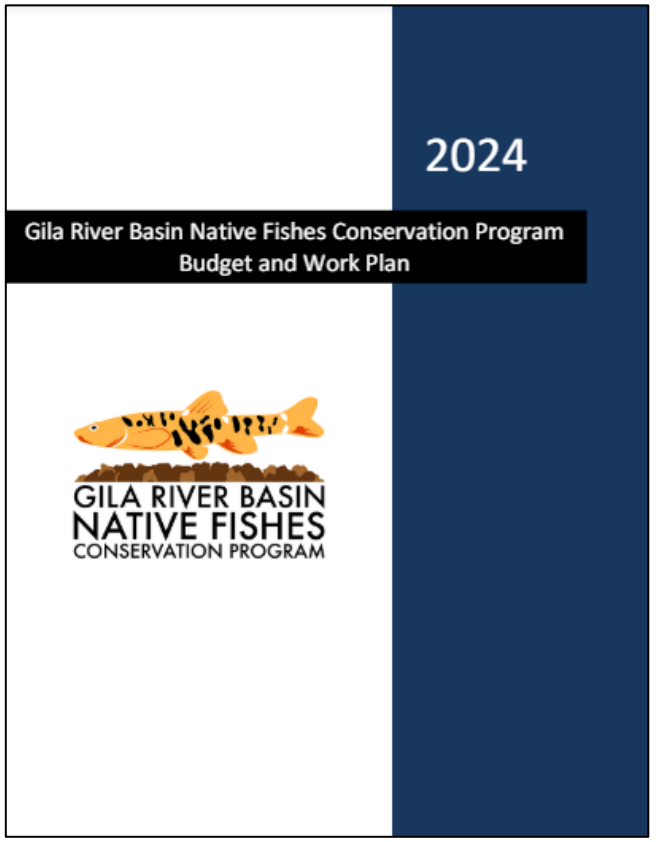




Goal #8:
Maintain accurate Program tracking records.

IN PROGRESS





BUREAU OF RECLAMATION

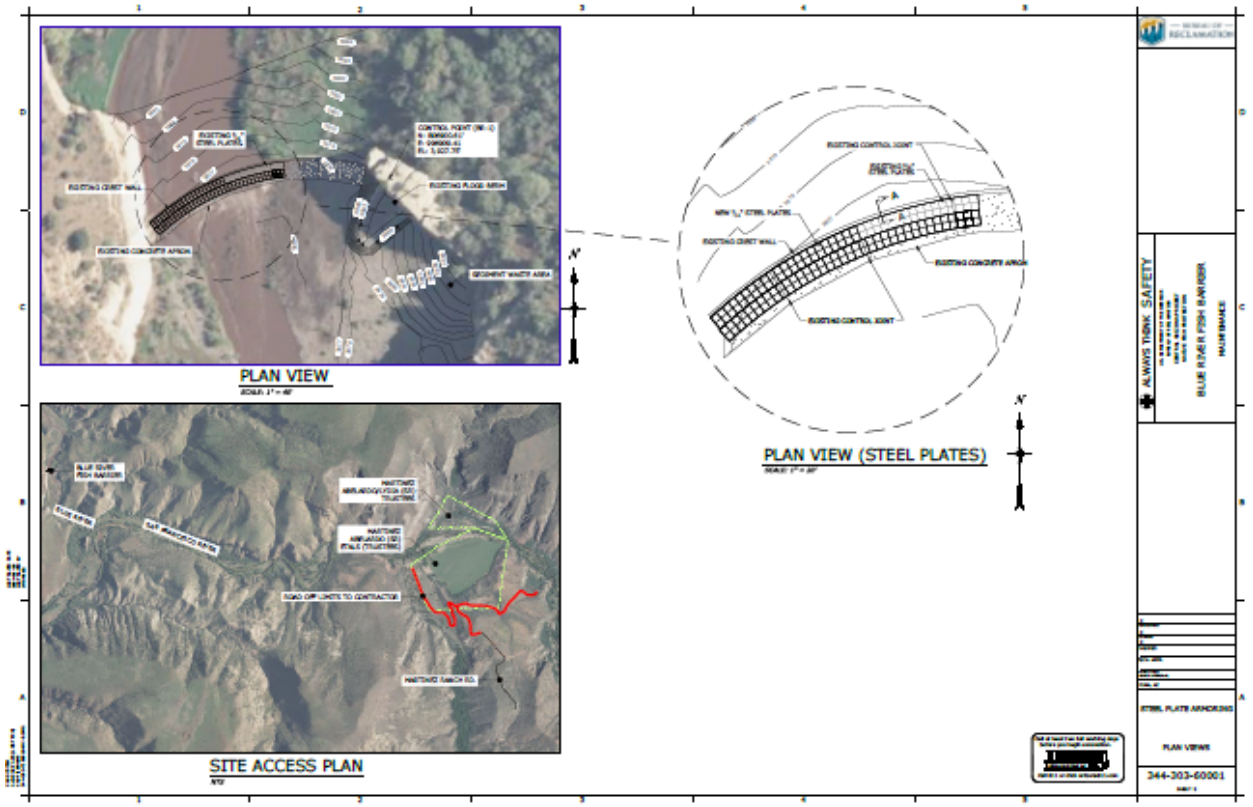
GILA RIVER BASIN
NATIVE FISHES
CONSERVATION PROGRAM

Fish Barriers

Blue River (O&M)

Operation and Maintenance Activities:

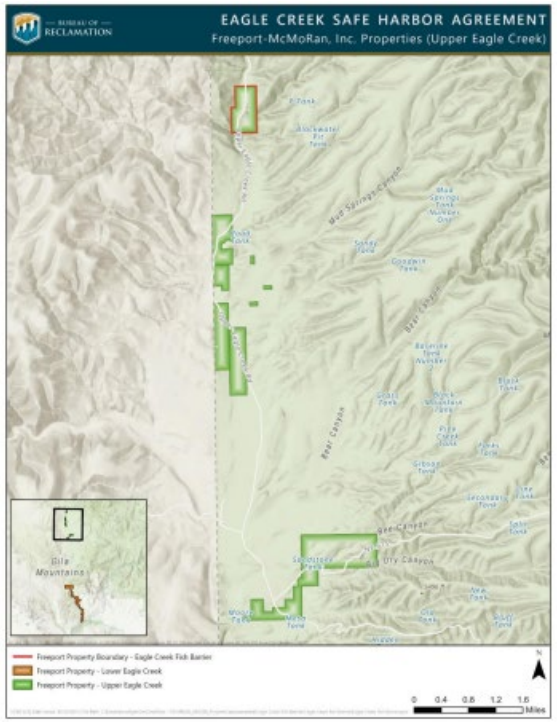
- Steel plate armoring of fish barrier.
- Repair and install of steel plates, steel angles, and grout repair.

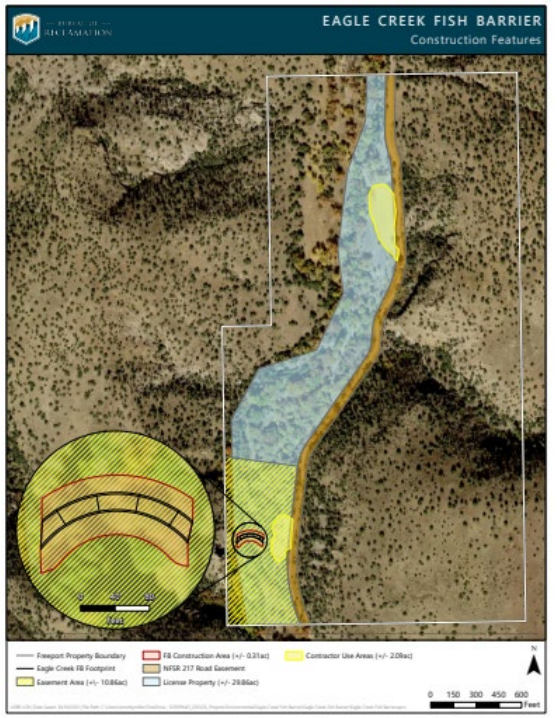


Eagle Creek

Status:

- Drafting barrier-related agreements (e.g., Conservation Benefit Agreement, Contract and Grant of Easement)
- Engineering and design work ongoing.
- Reclamation and USFWS drafting EA and Section 7 compliance documents. Notice of Public Scoping for EA released April 8, 2024.
- Earliest construction in October 2025.

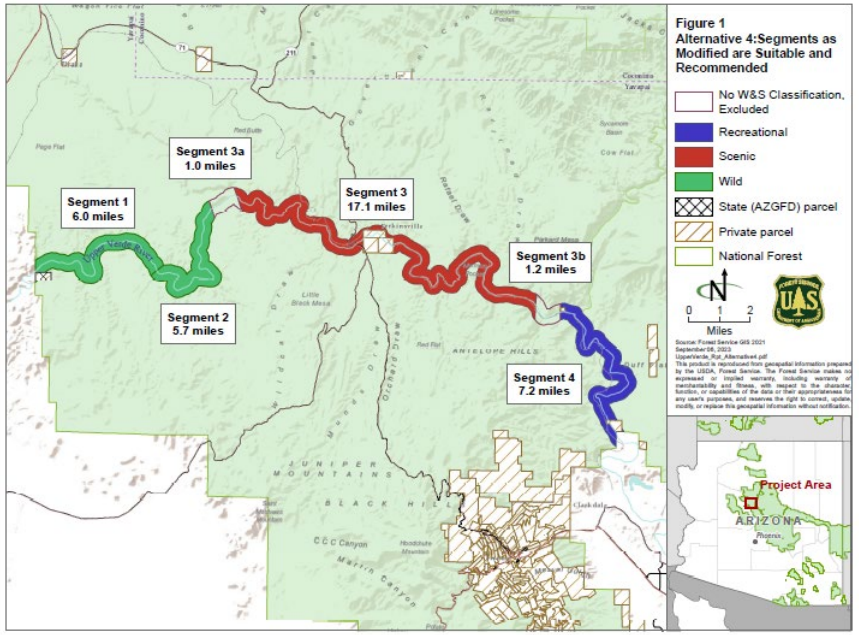


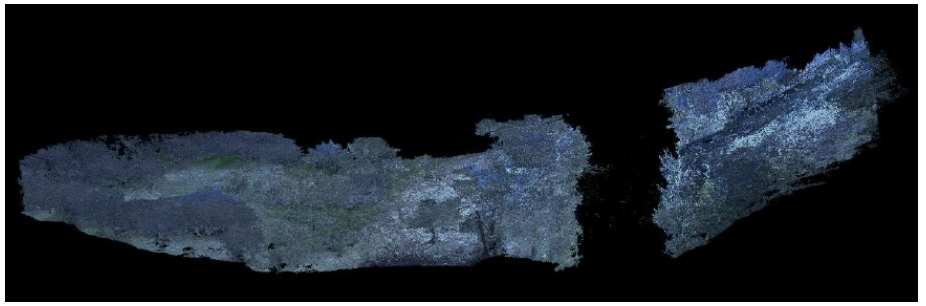


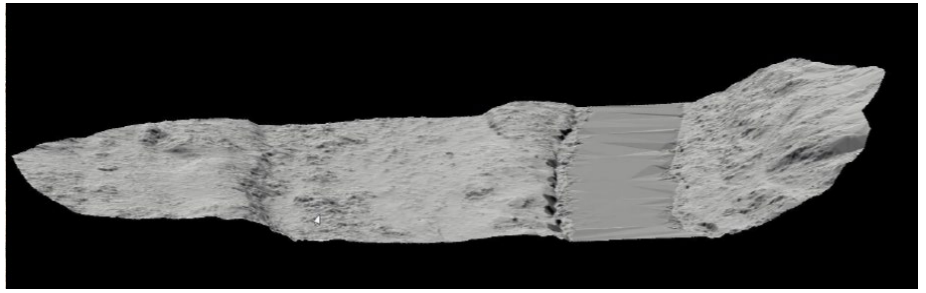
Verde River (2 Barriers)

Status:

- Final EA, FONSI, and draft Decision Notice for Wild and Scenic River Suitability Study issue September 25, 2023.
- Final Decision Notice signed November 15, 2023.
- Upper Verde River Habitat Analysis (USFS RMRS and NAU) report finalized on April 8, 2024.
- In 2024, Yellow-billed Cuckoo and Southwestern Willow Flycatcher Surveys to be conducted at lower barrier site.
- Geotechnical investigation at lower barrier site to be scheduled for 2025.







San Francisco River (Pleasanton Diversion)

Status:

- Site visit in April 2023 to meet landowner and conduct initial land survey (high flows prevented full survey).
- Engineers completed land survey in December 2023.
- In 2024, engineers to model to determine potential upstream affects of raising the height of the division.


BUREAU OF
RECLAMATION

BUREAU OF RECLAMATION

GRBNFCP
Long-term Monitoring

Native Fish Monitoring (2023)

Stream	AGCH	CAIN	GAAF	GIIN	GIRO	MEFU	ONAP	ONMY	PACL	POOC	RHOS	SATR	TICO
Burro Cienega	-	-	-	-	-	-	-	-	-	-	-	-	-
Campbell Blue Creek	187	10	-	-	-	-	-	-	181	-	926	13	32
Charlesbois Spring	-	-	-	-	-	-	-	-	-	24	-	-	-
Cienega Creek	1173	-	-	-	-	-	-	-	-	-	-	-	-
Coal Mine Canyon	1	-	-	-	-	-	-	-	-	231	-	-	-
Cottonwood Spring	-	-	-	-	-	-	-	-	-	173	-	-	-
Dry Blue Creek	23	-	-	-	-	-	-	-	-	-	419	8	-
Fossil Creek*	82	100	-	-	2835	6	-	-	329	-	345	-	-
Fresno Canyon	374	-	-	-	-	-	-	-	-	1016	-	-	-
Grant Creek	3	1	-	-	-	-	90	-	31	-	175	3	-
Headquarters Spring	-	-	-	-	-	-	-	-	-	1945	-	-	-
Hidden Water Spring	81	-	-	-	-	-	-	-	-	-	-	-	-
Hot Springs Canyon	1254	11	-	150	-	-	-	-	81	-	912	-	25
KP Creek	3	8	-	-	-	-	-	-	92	-	193	13	-
La Barge Creek	-	-	-	-	-	-	-	-	-	42	-	-	-
Little Sycamore Creek	8	-	-	12	-	-	-	-	-	-	-	-	-
Lower Blue River	1128	763	-	-	471	188	-	-	1729	-	1068	-	-
Lower Tortilla Creek	-	-	-	-	-	-	-	-	-	7	-	-	-
Mesquite Creek	-	-	-	-	-	-	-	-	-	35	-	-	-
Monkey Spring	-	-	-	-	-	-	-	-	-	103	-	-	-
Sheehy Spring	-	-	16	61	-	-	-	-	-	-	-	-	-
Spring Creek	505	-	-	325	-	-	-	-	1	166	293	-	-
Sycamore Creek	-	2	-	68	-	-	-	2	-	-	-	-	-
Upper Tortilla Creek	-	-	-	-	-	-	-	-	-	17	-	-	-
Walker Canyon	-	-	-	83	-	-	-	-	13	-	80	-	-
Wildcat Canyon	-	-	-	-	-	-	-	-	-	393	-	-	-
Total	4822	895	16	699	3306	194	90	2	2457	4152	4411	37	57

Native Fish Monitoring (2024)

Start Date	End Date	Site #1	Site #2	Site #3	Site #4
April 8, 2024	April 10, 2024	Cottonwood Spring	Monkey Spring	Coal Mine Canyon	Fresno Canyon
April 22, 2024	April 23, 2024	Sheehy Spring			
May 6, 2024	May 8, 2024	AD Wash	Buckhorn Spring	Tule Creek	Morgan City Wash
June 10, 2024	June 14, 2024	Middle Blue River			
August 5, 2024	August 8, 2024	KP Creek	Grant Creek		
August 19, 2024	August 22, 2024	Dix Creek	Harden Cienega		
September 10, 2024	-	Cienega Creek			
September 16, 2024	September 19, 2024	Hot Springs Canyon	Bass Canyon		
September 24, 2024	-	Spring Creek			
October 7, 2024	October 10, 2024	Lower Blue River			
October 21, 2024	October 24, 2024	Lower Turkey Creek	Bear Creek		
November 4, 2024	November 7, 2024	Romero Canyon	Sabino Canyon	Bear Canyon	

Focal Species Key
Gila Topminnow
Gila Chub
Loach Minnow
Gila Topminnow/Gila Chub
Spikedace/Loach Minnow
Gila Chub, Loach Minnow, Spikedace

Non-Native Fish Monitoring (2024/2025)

Canal	Reach	Station Name
CAP Canal	Hayden-Rhodes Aqueduct	Bouse Hills Pumping Plant
		Little Harquahala Pumping Plant
		Hassayampa Pumping Plant
	Fannin-McFarland Aqueduct	Salt-Gila Pumping Plant
	Tucson Aqueduct	Brady Pumping Plant
		Red Rock Pumping Plant
		San Xavier Pumping Plant
Florence-Casa Grande Canal	Ashurst-Hayden Dam to Pima	Above China Wash fish barrier
		Below China Wash fish barrier
	lateral feeder canal	Pima lateral turnout
SRP Arizona (North) Canal	Granite Reef Dam to electrical fish barrier	Above fish barrier (census)
	Electrical fish barrier to Indian Bend Wash	Below fish barrier (opportunistic)
SRP South Canal	Granite Reef Dam to electrical fish barrier	Above fish barrier (census)
	Electrical fish barrier to terminus	Below fish barrier (opportunistic)

Non-Native Fish Monitoring (2024/2025)

Stream	Reach	Fixed Station Name
San Pedro River	US-Mexico boundary to Fairbank	Hereford
		Lewis Springs
		Charleston
	Fairbank to Redington	Hughes Ranch
		Three Links
	Redington to Gila River	Aravaipa Creek
		Dudleyville
		Mouth
Gila River	Coolidge Dam to Porphyry Gulch	Coolidge Dam
		Hook & Line Ranch
	Porphyry Gulch to Winkleman	Dripping Springs
		Christmas
		O'Carroll Canyon
	Winkleman to Mineral Creek	San Pedro River
		Kearny
		Kelvin
	Mineral Creek to Ashurst-Hayden Dam	A-Diamond Ranch
		Cochran
		Box Canyon
Salt River	Stewart Mtn. Dam to Granite Reef Dam	Stewart Montain Dam
		Goldfield Administrative Site
		Granite Reef Dam
Cienega Creek	Pantano to Vail	Head Cut
		Three Bridges

BUREAU OF RECLAMATION

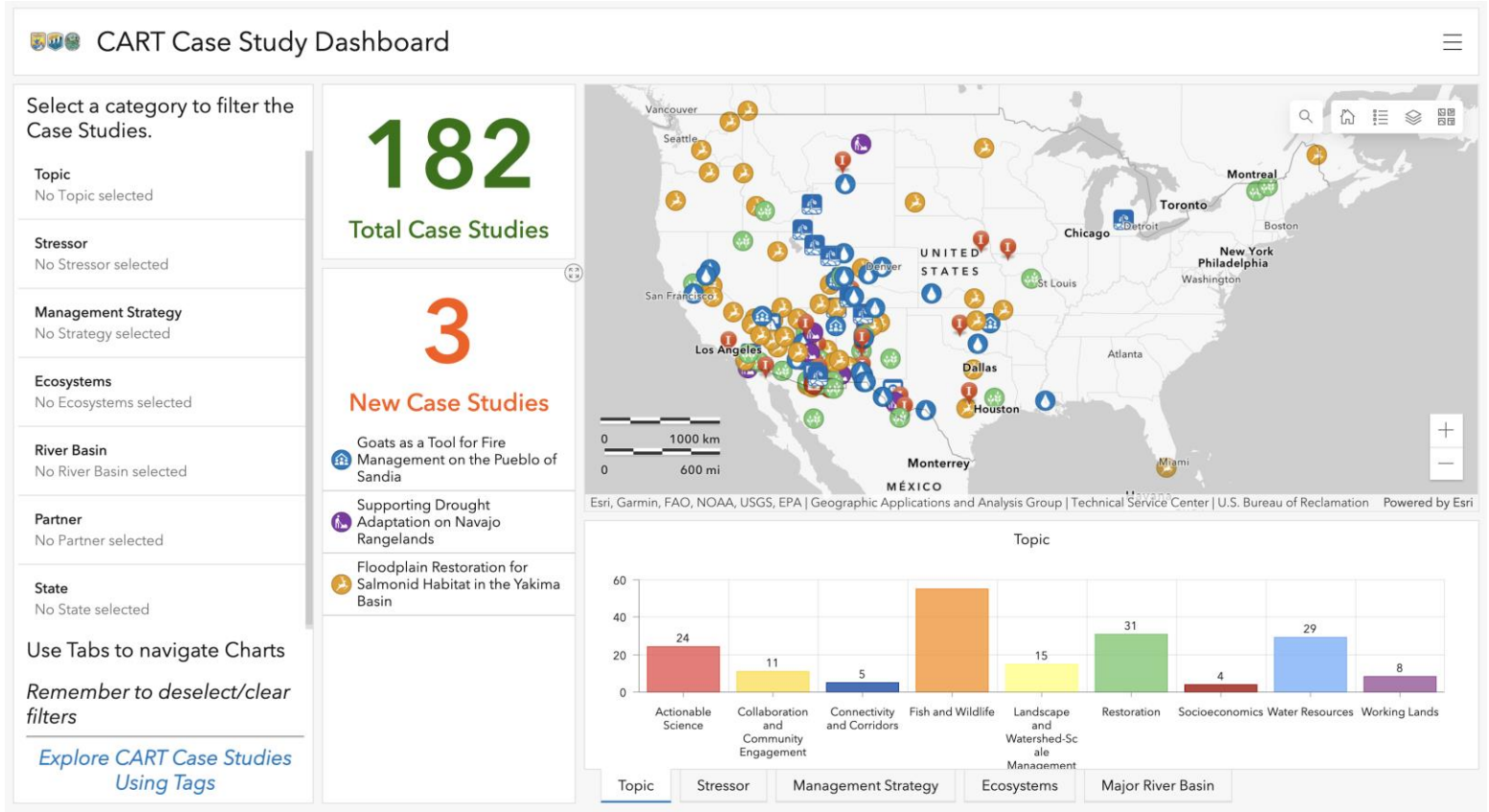
GRBNFCP
Information and Education

Gila River Basin Film Project (2024)

- Agreement modified in 2024 - Project extended to March 2026
  - 6 – 10 minute short film on the Gila River Basin
  - 1 -2 minute video (social media posts)
  - 48 – 62 images
  - 3 min of B-roll footage

FRESHWATERS ILLUSTRATED

Conservation and Adaptation Resources Toolbox (CART)



U.S. FISH & WILDLIFE SERVICE

CONSERVATION & ADAPTATION RESOURCES TOOLBOX

LakeCountryTrail Map

e Easy ■ More Difficult ♦ Most Difficult rl Wheelchair Friendly

Search for a Trail

Apex Trail

This natural parkland trail climbs gently from Shornlino 0rivo to Apex Drive, through native seasonal vegotation.

® More Info

Arrowleaf Trail — 2.3 km

This main trailconnects the UppC!r Lakes trailhead to *the* GrandOvorlook Junction where Tower and Paint Brush Trails meet.

® More Info

Benchlands Trail — 1.5 km

This beautiful trail with expansive Okc1nagan Lake V'ews connectsOkanagan Centre Road West to 8onchlJ:nds Drive and the Grind Trail.

® More Info

Camp-Seaton Trail — 110m

Connector trail linking Jack Sc.Jton Parktrails with Camp Road

® More Info

Chase Trail — 455 m

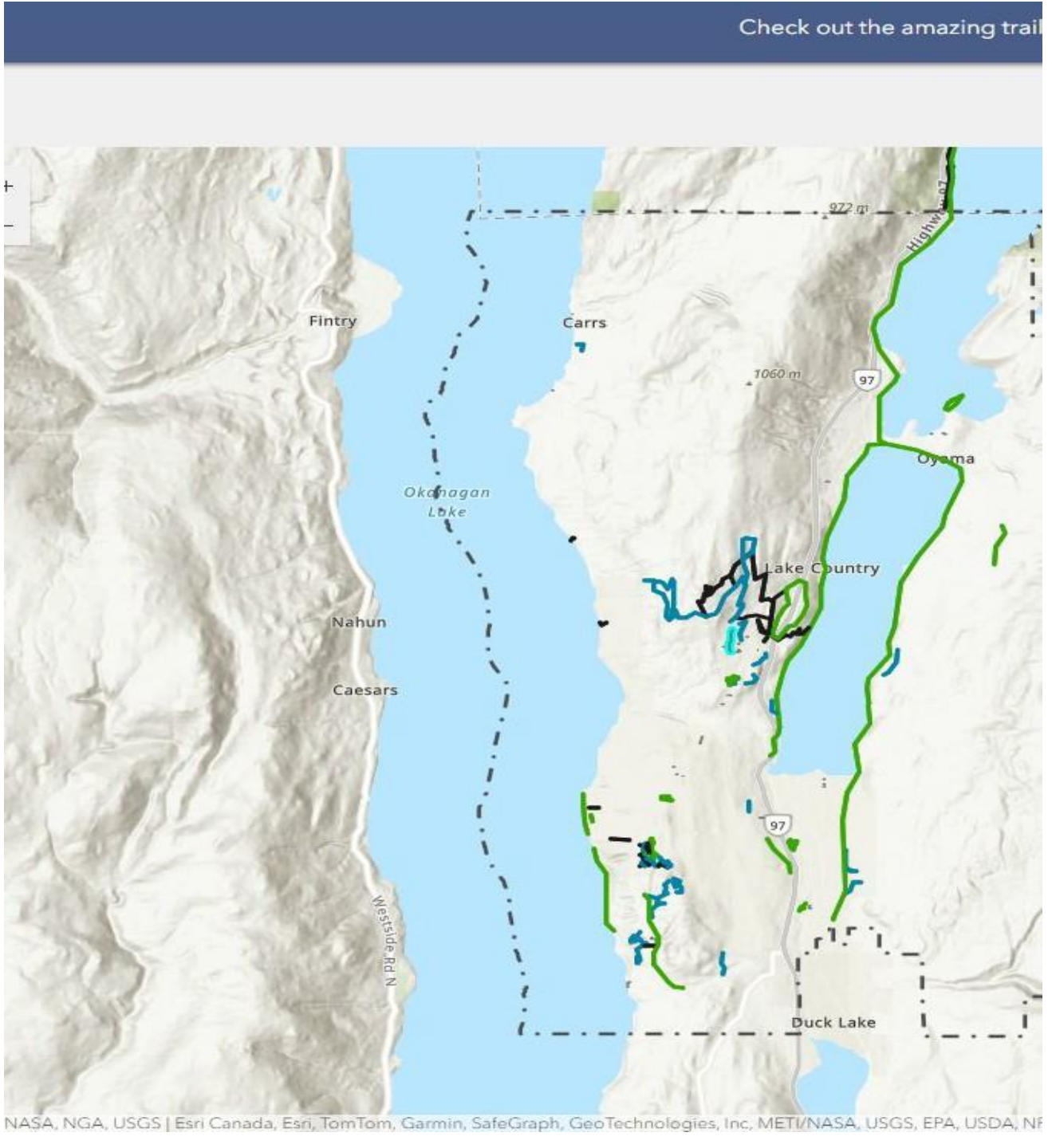
Thts very short, narrow trail connectsChase Road and Okan.Jgan Centre Road West.

® More Info

Clearwater Trail — 425 m

This wido, gravel forest trail connects Sherman Dnvo at PeterGreer Elementary School with the Okanagan Rail Trail.

® More Info



Arrowleaf Trail

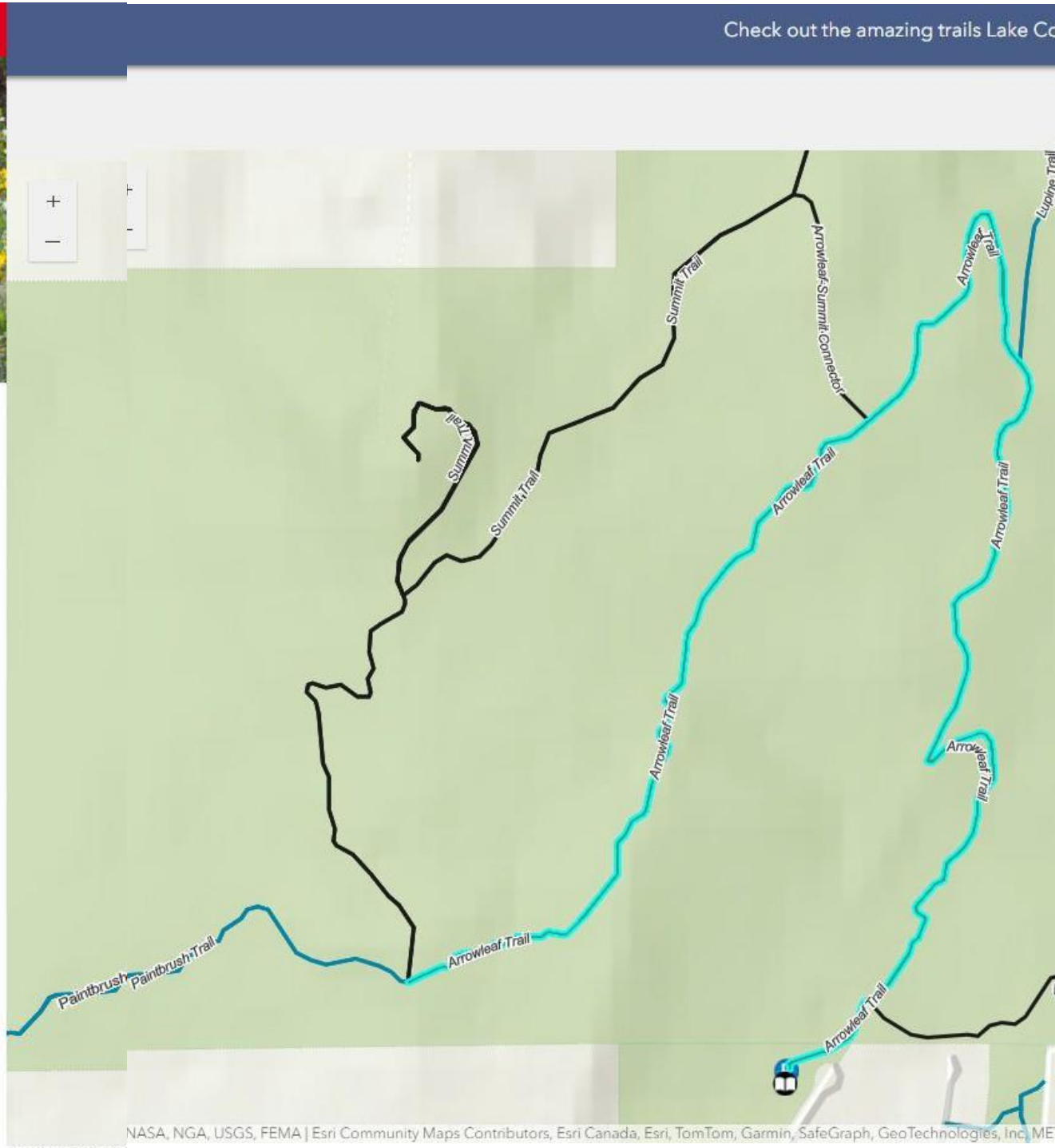
More Difficult 2.3 km

This main trail connects the Upper Lakes Trailhead to the Grand Overlook Junction where Tower and Paint Brush Trails meet. Enjoy expanding panoramic views of the valley as you climb, including Wood, Duck and Okanagan Lakes, Little White, Knox, Bear and Terrace Mountains, and the Oyama benchlands. The trail is named for its magnificent spring displays of arrowleaf balsamroot. Watch in season for saskatoon bushes, small patches of the rare chocolate lilies, lupines, and other flowering gems. Heritage horse logging trails are still evident today showing where the horses dragged the logs down to Wood Lake. These unmaintained trails are on Crown Land – use at your own risk.

Trail Use: Pedestrian and bike shared-use,
Surface Material: Natural
Trail Features: Stunning views and a hand-crafted wood log bench at the Grand Overlook, Viewpoint Park with seasonal water tap
Land Manager: Government of BC Crown Land **Report an Issue**
Trail Access: Parking at the Upper Lakes Trailhead

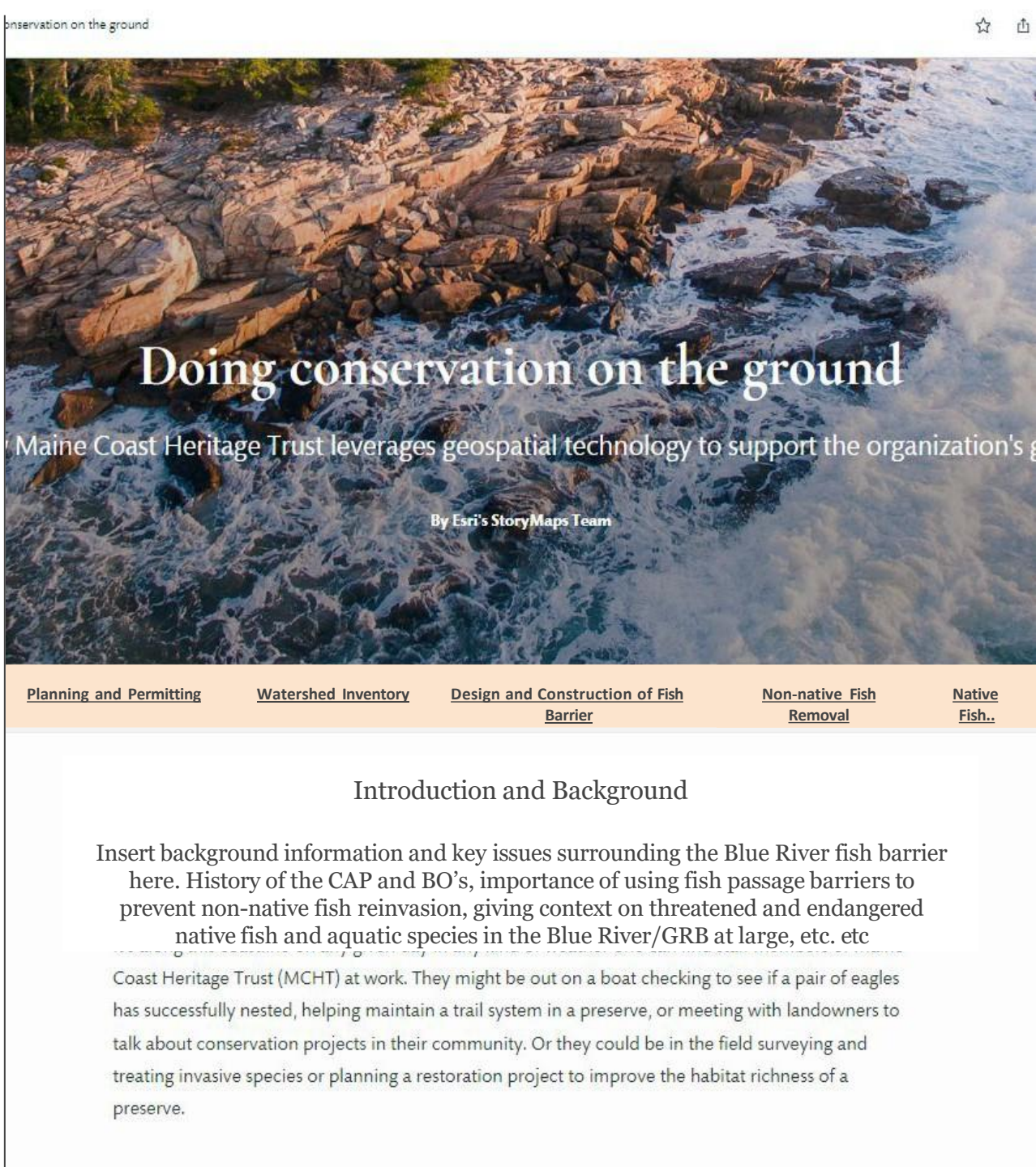
Directions

Trail Map



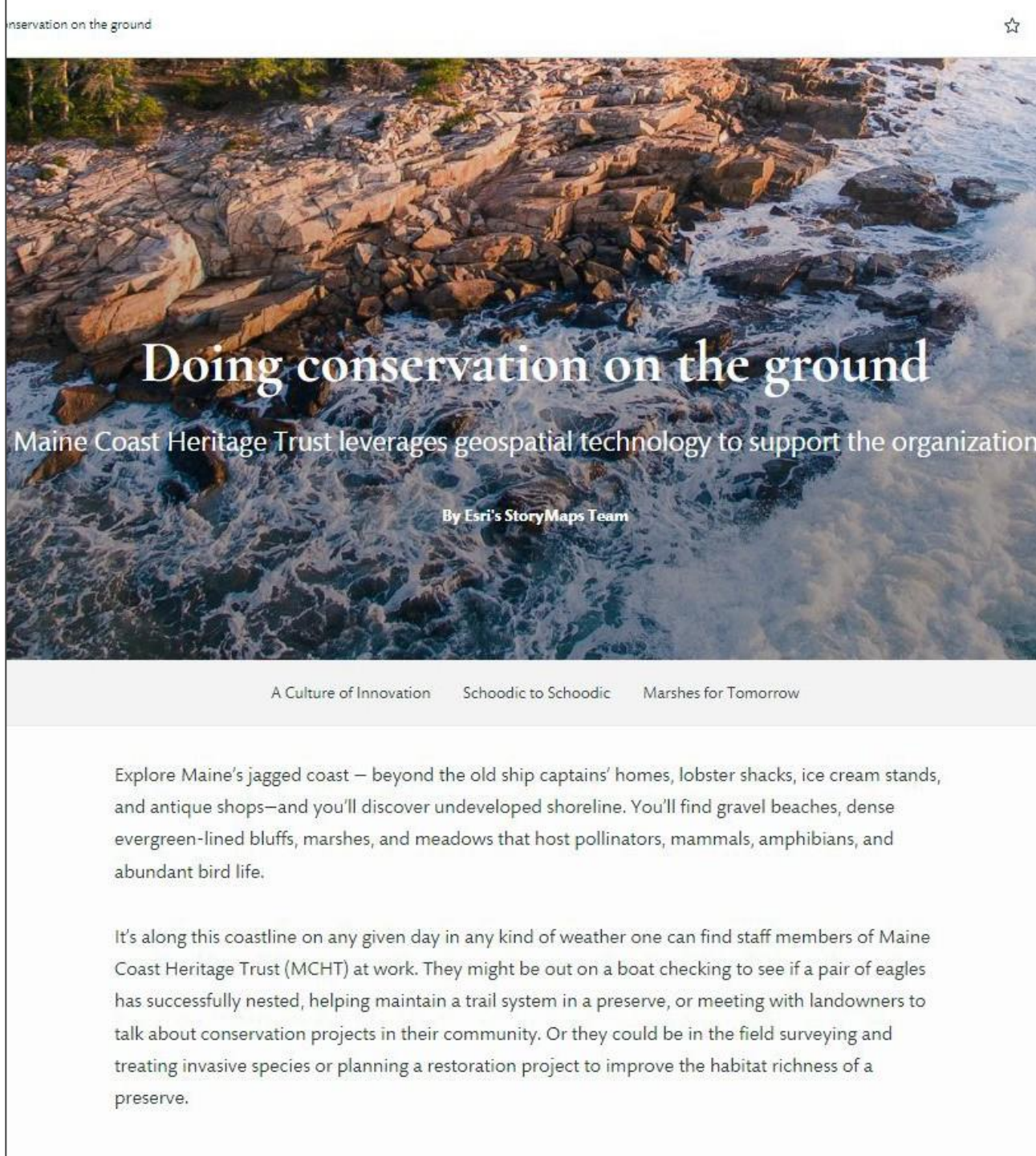
INFORMATION FOR PRACTITIONERS

- Embedded StoryMap
- Same format/layout as public info
  - More detailed information on planning process, methods, etc.
- Introduction and Key Issues Addressed at top of page/standalone text
- Info separated into tabs
  - Planning and Permitting
  - Watershed Inventory
  - Design, Construction, Operation and Maintenance of barrier
    - Should these be separated into two tabs?
  - Non-Native Fish Removal
  - Native Fish Translocation
  - Monitoring
  - Next Steps
- Each tab will have Objectives, Methods, Results and Impacts, and Discussion/Lessons Learned subsections



INFORMATION FOR MEMBERS OF PUBLIC

- Embedded StoryMap
- More focus on planning, scientific rationale for conservation actions, etc. than the practitioner information
- Introduction and Key Issues Addressed to fish barrier at top of page
- Potential info separated into categorical tabs
  - Watershed planning
  - Barrier construction
  - Non-Native Fish removal
  - Native Fish translocation
  - Monitoring
  - Additional information?
- Need BOR input on vision and goals for public information section




BUREAU OF
RECLAMATION

2025

Gila River Basin Native Fishes Conservation Program Budget and Work Plan

GILA RIVER BASIN
NATIVE FISHES
CONSERVATION PROGRAM

Table of Contents

New Mexico Work Plan

Project 1: Removal of Nonnative Fishes from West Fork Gila River
(Task ID: NM-2006-1)

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): West Fork Gila River
Species Protected: Loach Minnow, Spikedace, Roundtail Chub, Gila Trout, Desert Sucker, Longfin Dace, Sonora Sucker, Speckled Dace

Project Description:
Background: The West Fork Gila River supports an intact native fish assemblage, including Federally Endangered and Gila River Basin Native Fishes Conservation Program (GRBNFCP) priority species Loach Minnow *Tiaroga cobitis* and Spikedace *Meda fulgida*. Nonnative fishes including Brown Trout *Salmo trutta*, Flathead Catfish *Pylodictis olivaris*, Smallmouth Bass *Micropterus dolomieu*, and Yellow Bullhead *Ameiurus natalis* are the primary threat to the continued persistence of endangered and other native species in the West Fork Gila River. Since 2006, the Department, US Forest Service, and US Fish and Wildlife Service have annually removed nonnative fishes in an approximately 4 km reach of the West Fork Gila River located on the Department's Heart Bar Wildlife Management Area. The goal of this project is to suppress nonnative species within this reach to benefit Loach Minnow, Spikedace, and other native species. Although this reach of the West Fork Gila River is not protected from reinvasion by nonnatives, continued suppression is thought to provide benefit to native species occupying the reach.

Geographical Area: The project area is 4 km of the West Fork Gila River between the confluences of Little Creek and the Middle Fork Gila River. This project affects one population of Spikedace and Loach Minnow but it is part of one of New Mexico's largest interconnected population of both species. The project takes place on the Department-owned Heart Bar Wildlife Management Area.

Methodologies: Nonnative removal occurs once per year in early- to mid-June. The 4-km removal reach is split into 20 200-m reaches that will be surveyed using two-pass depletion methods. Actual reach lengths will vary slightly to ensure that a reach ends at a defined habitat break (i.e., downstream end of a riffle). A single block net will be used at the top or bottom of a reach to provide a break if a defined habitat break is not present within an adequate distance (~ 25 m) of the end of the reach. Sampling will be conducted using two backpack electrofishers, moving abreast upstream to ensure the entire width of the channel is sampled. All fish will be captured with dipnets. Nine people are required to complete sampling, with six people on electrofishing crews and three people on the fish processing/habitat crew.

The entire fish community will be monitored in 6 of the 20 reaches (30% of entire reach, hereafter Monitoring Reaches). Monitoring Reaches are sampled each year. Within each Monitoring Reach, all fish will be captured, identified to species, and enumerated. All priority species (i.e., Loach Minnow and Spikedace) will be measured for total length (TL, nearest mm) and all Roundtail Chub will be measured for TL and weighed (nearest g). Up to 60 common native small-bodied fish of each species (e.g., Longfin Dace

and Speckled Dace) will be measured for TL and up to 120 native large-bodied fish of each species (e.g., Desert Sucker and Sonora Sucker) will be measured for TL and weighed. Once the total number of required measurements are taken for each species, common species will be enumerated by life stage (i.e., juvenile, subadult, and adult; Pilger et al. 2010). All nonnative species will be measured for TL and weighed. All native fish captured during the first pass will be held in a live car(s) during the second pass. Native fish will be released after the second pass and all nonnative species removed from the river.

In the remaining 14 reaches (hereafter Removal Reaches), only nonnative species will be captured. All nonnative species captured in Removal Reaches will be identified, measured for TL, and weighed. Given their rarity, any Roundtail Chub encountered will also be captured, measured for TL, and weighed. Other native species encountered in Removal Reaches will be moved out of the area where sampling is occurring to decrease any potential deleterious effects of electrofishing. All captured nonnative species will be removed from the river.

The length of each Monitoring and Removal reach will be measured (nearest 0.1 m) as well as 10 width measurements (nearest 0.1 m) at equally spaced intervals within each reach. Effort (sec) is recorded for each pass. Water quality measurements (i.e., dissolved oxygen, turbidity) will be measured at the first and last reach sampled each day. Length of all pools, riffles, and runs will be measured within each reach to determine the proportion of each habitat. Discharge will be measured on the last day or recorded from the USGS gage located on the West Fork Gila River below the Middle Fork Gila River confluence (Gage 09430020).

Program Priorities:
This project protects existing populations of Loach Minnow and Spikedace through removal of nonnative fish within the project area. 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 be translocated to other streams or sent to the hatchery. Other species that may benefit include Desert Sucker, Gila Trout, Longfin Dace, Roundtail Chub, Sonora Sucker, and Speckled Dace.

Partnerships:
This project is a multi-agency collaborative effort between the Department, USFWS, and USFS. This project is a continuation of a project currently funded by the GRBNFCP.

Strategic Plan Goals:

- Preventing Extinction and Managing Toward Recovery
    - Goal 2. Protect native fish populations from nonnative fish invasions.
    - Goal 3. Remove nonnative aquatic species threats.
    - Goal 7. Monitor to quantitatively measure and evaluate project success in improving the status of target species and their habitats.

Recovery Objectives:

- 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 nonnative 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 nonnative fishes

Estimated Time and Cost:

- Total Cost: $57,600
    - New Mexico Department of Game and Fish: $28,950
    - USFWS: $17,250
    - USFS: $11,400
- Urgency: The nonnative fish community in the West Fork Gila River appears to be increasing making removal of nonnatives in this area urgent.
- Readiness: The project is ongoing and ready to implement immediately.
- In-kind or Matching Funds: No

Project 2: New Mexico T&E Fish Repatriations and Monitoring
(Task ID: NM-2002-1)

Implementing Entity: New Mexico Department of Game and Fish (Department), US Fish and Wildlife Service (USFWS), US Forest Service (USFS)
Start Year: 2002
Location(s):

- San Francisco River Drainage: Saliz Canyon, Tularosa River
- Upper Gila River Drainage: Bear Creek
- Animas Valley Drainage: Burro Cienega
- Other locations as needed for evaluation

Species Protected: Loach Minnow, Spikedace, Roundtail Chub (formerly Gila Chub), Gila Topminnow

Project Description:
Background: The objective of this project is to identify potential repatriation streams and sites, evaluate potential donor populations, conduct repatriation of identified streams, and monitor streams post-repatriation. This project also covers fish salvages and collections for transfer to Arizona Department of Game and Fish (AZDGF) Aquatic Research and Conservation Center (ARCC) for broodstock and refuge population maintenance. This is an ongoing project that needs to be continued across the Gila Basin until species are recovered.

Geographical Area: This project covers the entire Gila River Basin in New Mexico, and all existing and potential future populations of the priority species in New Mexico. The project area is on federal, state, local government, and private lands. Repatriation locations will likely be those that are free of and secure from invasion of nonnative fishes, or have low abundances of nonnative fishes. Specific locations to be assessed or stocked in 2025 are listed below.

Saliz Canyon
Saliz Canyon was stocked with Loach Minnow in 2016, 2017, and 2019. Subsequent surveys indicated that the species is present in the stream, but has yet to expand from the original stocking location near Cottonwood Campground. An additional stocking location upstream of Cottonwood Campground was identified in 2022. Stocking of Loach Minnow at this site occurred 2023, will occur in 2024, and will continue in 2025. Surveys will be conducted in 2026 to assess the success of this stocking effort.

Tularosa River
The Tularosa River currently supports Loach Minnow but not Spikedace. However, recent work by Crosby (2020) indicated that the river is suitable for the species. Spikedace are planned to be stocked in the Tularosa River at suitable locations in 2024. Stocking will continue in 2025 and 2026. Surveys will be completed in 2027 to assess the success of the stocking effort.

Methodologies:
Potential repatriation sites
Potential repatriation sites are determined by maps, aerial photographs, and professional opinions of people familiar with the area. Once determined, locations will be visually evaluated for habitat and water

quality parameters will be measured. Surveys of the current fish community will be conducted by a single pass using backpack electrofishers and seines. The particular method used to obtain specimens depends upon mesohabitat being sampled. Broad shallow runs, and similar mesohabitats with smooth substrates, are sampled with drag seines (normally 3.0 x 1.2 m, 3.2 mm mesh). A battery-powered backpack electrofisher is used to stun fishes in cobble-bottomed runs, debris pools, and similar mesohabitats, and specimens are then collected with dip nets. A seine and backpack electrofisher are used in tandem to collect fishes from rapid-velocity habitats (e.g., riffles and chutes).

Stocking

Multiple stockings into each repatriation stream will be performed successively for 3 to 5 years or until the desired population is established or is considered unsustainable. Repatriation stockings can be direct transfers of fish from a wild population or stocking from ARCC.

Monitoring

Annual surveys will begin after the last year of stocking. Fish surveys will be conducted by a single pass using backpack electrofishers and seines. The particular method used to obtain specimens depends upon the type of mesohabitat being sampled. Broad shallow runs, and similar mesohabitats with smooth substrates, are sampled with drag seines (normally 3.0 x 1.2 m, 3.2 mm mesh). A battery-powered backpack electrofisher is used to stun fishes in cobble-bottomed runs, debris pools, and similar mesohabitats, and specimens are then collected with dip nets. A seine and backpack electrofisher are used in tandem to collect fishes from rapid-velocity habitats (e.g., riffles and chutes). Minnow traps, trammel nets, seins, or a battery-powered backpack electrofisher are used to collect fishes from lentic water bodies such as ponds and the gear used varies depending on the water body's depth, substrate, and cover. A population is considered established when recruitment is documented, there are increases in abundance, expansion of distribution, or some combination of those factors. Once established, the population will be surveyed at least once every five years using the same methods as above.

Program Priorities:

This project increases the resiliency and redundancy of priority species by replicating populations of Spikedace, Loach Minnow, and Gila Chub in the wild. In addition, captive production of priority species is benefited by supplementing hatchery brood stock with wild fish. It can provide immediate benefits on the ground if new populations are successfully established. The project is part of a larger action to establish and maintain refuge populations at ARCC, and to replicate the priority species in wild locations across their historic ranges.

Partnerships:

This project is a collaborative effort between the Department, USFS, and USFWS. It directly addresses recovery plan goals for GRBNFCP priority species and is an ongoing GRBNFCP project.

Strategic Plan Goals:

- Preventing Extinction and Managing Toward Recovery
    - Goal 1. Maintain the Aquatic Research and Conservation Center (ARCC) and explore alternative locations for establishment of hatchery stocks of upper Gila and San Francisco River lineages of spikedace and loach minnow.

- Goal 4. Replicate populations and their associated native fish community into protected streams and other surface waters.
- Goal 7. Monitor to quantitatively measure and evaluate project success in improving the status target of species and their habitats.

Recovery Objectives:

- 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 Time and Cost:

- Total Cost: $81,167
  - New Mexico Department of Game and Fish: $40,604
  - USFWS: $24,663
  - USFS: $15,900
- Urgency: This project works directly towards recovery plan goals and work needs to be completed on an annual basis to achieve those goals.
- Readiness: A basin wide stocking Section 7 Biological Evaluation has been completed for stocking Loach Minnow, Spikedace, Gila Chub, and Gila Topminnow from ARCC in New Mexico. Some stocking projects are ongoing and ready to implement, while others require preliminary approval. Several projects are in the monitoring phase of repatriation.
- In-kind or Matching Funds: No

Arizona Work Plan

Project 3: Muleshoe Ecosystem Stream and Spring Repatriations

(Task ID: AZ-2003-1)

Implementing Entity: Arizona Game and Fish Department
Start Year: 2003
Location(s): Redfield Canyon
Species Protected:

- Gila Topminnow: one of nine wild replicated populations of the Bylas management unit (MU).
- Gila Chub[1]: one remnant population not replicated elsewhere.
- Other native species: one population each of Speckled Dace, Longfin Dace, Desert Sucker, Sonora Sucker.

Project Description:

Redfield Canyon

Background: This is an ongoing project with conservation efforts beginning in 2007. The initial objectives of this project were to establish Spikedace and Loach Minnow in Redfield Canyon and to suppress Green Sunfish to benefit the native fish community. Spikedace and Loach Minnow were stocked into Redfield Canyon in 2007, 2008 and 2010, but failed to establish. In 2007, Gila Chub, Sonora Sucker, and Speckled Dace were translocated upstream of a waterfall in Redfield Canyon to expand their range. Gila Topminnow (Bylas lineage and MU) have dispersed downstream from Swamp Springs Canyon (where they were stocked in 2008 and 2009), and have become established in Redfield Canyon. One Green Sunfish removal occurred each year since 2007, with two removals occurring in 2010, 2012, and 2020-2021. These removals focused on the upper perennial reach that extends upstream from about 1 km below Swamp Springs Canyon (referred to as reaches 1 and 2). In 2012, Green Sunfish were discovered in large pools on BLM land near the western wilderness boundary with private land, in what was referred to as the lower perennial reach, or reach 3. Beginning in 2014, one removal pass, in May or June, was completed in each reach. Green Sunfish captures in reaches 1 and 2 fluctuated from year to year, but generally declined from 2010 through 2023 (58, 33, 12, 48, 17, 0, 2, 1, 15, 20, 4, 0, 6 and 6 captured in each respective year; Hickerson et al. 2023). Green Sunfish do not appear to be established in reaches 1 and 2, and it is unlikely that the Green Sunfish are sufficiently abundant to negatively influence native fish abundance in the upper reach. Green Sunfish may be able to disperse upstream from reach 3 to reaches 1 and 2 during periods of sufficient flow.

Permission to access and conduct removals on the private land in reach 3 has not been granted. The Green Sunfish population in reach 3 is well established. A barrier was planned, but postponed indefinitely in 2018. As a result, upstream movement of Green Sunfish cannot be prevented. The private landowner was contacted multiple times in 2019 and 2020 and provided a short outline of proposed Green Sunfish removal work in an attempt to gain access to their property. After initial phone conversations with the

[1] In 2016, the American Fisheries Society and the American Society of Ichthyologists and Herpetologists reclassified and merged Roundtail Chub *Gila robusta*, Gila Chub *Gila intermedia*, and Headwater Chub *Gila nigra* into one species, the Roundtail Chub.

landowner, they have not replied to any further phone messages or emails as of the end of 2023. If the private landowner continues to deny access to their property for removals, the objective of the project will remain suppression of Green Sunfish in reaches 1 and 2 (see methodologies section for targets). Work planned for FY2025 includes a removal trip with multiple passes in May or June. Removals will continue for as long as suppression is considered a priority. If the private landowner grants permission for removals on their property, we will request a modification to this work plan and the goal will shift to eradication and the area of removals and number of removal trips will be increased to attempt eradication. Removals will continue until Green Sunfish are considered eradicated (see methodologies).

Geographical Area: The project area for Redfield Canyon currently includes Redfield Canyon from the upper waterfall barrier (UTM 12S 563858/3589841) downstream to the wilderness boundary (559591/3589178). The project area is occupied by Gila Chub, Gila Topminnow, Longfin Dace, Speckled Dace, Sonora Sucker, and Desert Sucker. The current project area is divided into three reaches. Reach 1 is the most upstream reach and extends from the sunfish barrier to the confluence with Swamp Springs Canyon and is mostly perennial. Reach 2 extends from the confluence with Swamp Springs Canyon downstream to the confluence with Rock House tributary and is mostly intermittent with surface water in June limited to just a few hundred meters downstream of Swamp Spring Canyon. Reach 3 extends from the Rock House tributary downstream to the wilderness boundary and is mostly intermittent except for the most downstream several hundred meters. Reach 3 is dominated by Green Sunfish. Currently, movement of nonnative fishes from the San Pedro River into Redfield Canyon is only prevented by an ephemeral reach approximately 11.5 km in length. Land ownership within the project area includes BLM, State Trust land, TNC, and private land. Land management agencies and TNC are supportive of ongoing native fish conservation efforts.

Methodologies: If the private landowner does not grant access to their property to conduct removals, the objective will be suppression of Green Sunfish in reaches 1 and 2. Typically, a single pass of backpack electrofishing with a three-person crew is carried out each May or June through all surface water present in reaches 1 and 2. Removals occur in late May through June when water levels are lowest with the assumption that capture probability of Green Sunfish is highest. If more than 10 Green Sunfish are captured, additional electrofishing passes will be carried out until none are captured. A successful annual suppression effort in reaches 1 and 2 will be characterized by the absence of Green Sunfish after all removal passes are completed and the absence of juvenile Green Sunfish in any of the passes.

The goal of removals in reach 3 is also to suppress the number of Green Sunfish so that fewer fish are able to disperse upstream into reaches 1 and 2. There are pools too deep to capture sunfish with backpack electrofishing equipment in reach 3, so baited mini-hoop nets and angling are used together. Ten to 15 mini-hoop nets will be dispersed throughout deeper water in reach 3, and set for 2-24 hours. Each set of traps will be considered one pass. For a given trip, a minimum of three passes will be completed or until fewer than 100 Green Sunfish are captured in the final pass. All Green Sunfish captured will be removed and measured to the nearest millimeter in total length (mm TL). Native fish will be counted and returned alive to the stream. Catch per unit effort (CPUE) will also be calculated to assess trends in relative abundance of sunfish. Increasing CPUE or presence of juvenile size classes will indicate that current effort is not sufficient for effective suppression. A successful annual suppression effort in reach 3 will be characterized by 100 or fewer Green Sunfish on the final pass.

If the private landowner grants permission for removals on their property, we will request that the work plan be amended, and the goal will shift to eradication of Green Sunfish. Removals will be completed in all surface water on both private and public land. The number of passes completed each year will be increased to achieve eradication. Results, analysis, discussion of results, and recommendations for future work will be presented in the annual report.

Program Priorities:
This project stabilizes an existing wild replicate population of Gila Topminnow and a remnant population of Gila Chub in Redfield Canyon through mechanical removal of nonnative Green Sunfish. Existing populations of Speckled Dace, Longfin Dace, Sonora Sucker and Desert Sucker in Redfield Canyon may also benefit from Green Sunfish removals (Marks 2009, Propst et al 2014). This project provides immediate benefit to Gila Topminnow, Gila Chub, Longfin Dace, Speckled Dace, Desert Sucker and Sonora Sucker by suppressing or possibly eradicating nonnative Green Sunfish which prey on and compete with native fishes.

Partnerships:
This project has been implemented as part of a larger cooperative effort between the Department, TNC, BLM, USFWS, and Reclamation. This project builds upon work already funded within the Muleshoe Cooperative Management Area, including past nonnative fish removals in Redfield Canyon, and the establishment efforts for Spikedace, Loach Minnow, and Gila Topminnow in Redfield Canyon.

Strategic Plan Goals:
- Preventing Extinction and Managing Toward Recovery
    - Goal 3. Remove nonnative aquatic species threats.
        - Objective 3a. Eradicate or suppress nonnative aquatic species from a minimum of five surface waters to prepare them for repatriations of native fishes.
    - Goal 4. Replicate populations and their associated native fish community into protected streams and other surface waters.
        - Objective 4a. Replicate Gila Topminnow stocks into a minimum of 10 surface waters.

Recovery Goals:
- Gila Topminnow recovery plan (1999 draft)
    - Task 2.2 (priority 1): Reestablish into suitable habitats.
    - Task 2.4 (priority 1): Protect suitable reestablishment habitats from detrimental nonnative aquatic species.
- Gila Chub draft Recovery plan (2015)
    - Task 1.3.1 (priority 1) Eliminate or control problematic nonnative aquatic organisms

Estimated Time and Cost:
- Cost: The estimated cost of this project for FY2025 is $9,641.
- Urgency: This project is urgent. A lapse in Green Sunfish removals may allow Green Sunfish to recolonize and increase in abundance within reaches 1 and 2 of Redfield Canyon.
- Readiness: All necessary compliance has been completed for all partners involved.

- In-Kind or Matching Funds: This project has in-kind match in the form of salaries of TNC staff.

Literature Cited:

Hickerson, B. T., C. K. Hedden, and J. Walters. 2023. Gila River Basin Native Fishes Conservation Program: Arizona Game and Fish Department's native fish conservation efforts during 2022. An Arizona Game and Fish Department Annual Report for Cooperative Agreement No. R22AC00159 submitted to U.S. Bureau of Reclamation, Phoenix Area Office. Arizona Game and Fish Department, Aquatic Wildlife Branch, Phoenix.

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Propst, D. L., K. B. Gido, J. E. Whitney, E. I. Gilbert, T. J. Pilger, A. M. Monie, Y. M. Paroz, J. M. Wick, J. A Monzingo, and D. M. Myers. 2014. Efficacy of mechanically removing nonnative predators from a desert stream. River Research and Applications 31:692-703.

Project 4: Gila Topminnow and Gila Chub Stockings

(Task ID: AZ-2002-1)

Implementing Entity: Arizona Game and Fish Department
Start Year: 2002
Location(s): Aravaipa Canyon, Telegraph Canyon, Rarick Canyon, Unnamed Drainage 68B, Sycamore Creek and locations stocked in 2024 or proposed to be stocked in 2025, which may include (but is not necessarily limited to): Mule Spring, Sands Draw, San Pedro River at Three Links, and Boyce Thompson Arboretum.
Species Protected:

- Gila Topminnow
    - Three existing replicate populations: Lower Santa Cruz MU, Monkey and Cottonwood Spring MU, and Bylas MU.
- Gila Chub[2]
    - One replicate population in Rarick Canyon of Red Tank Draw.
    - One replicate population in Sycamore Creek.

Project Description:
The objective of this project is to establish new viable populations of Gila Topminnow within historic range; Desert Pupfish and Gila Chub are stocked into some of the same sites if habitat is deemed suitable. Methodologies are generally consistent across subprojects and are only described once for the overall project. Fish will be collected from potential donor locations for health assessments before stockings take place.

Aravaipa Creek
Background: The purpose of this subproject is to establish Gila Topminnow in Aravaipa Creek. Department staff stocked 484 Gila Topminnow (Bylas Lineage, Bylas MU) into a spring fed side channel of Aravaipa Creek in April, 2022. A total of 98 topminnow were captured during the first post-stocking monitoring effort in September, 2022, following substantial flooding throughout the monsoon season. The number of fish captured increased to 229 individuals in 2023. Gila Topminnow have also been detected at downstream monitoring locations in Aravaipa Creek during University of Arizona monitoring each of the last two years. Work planned for FY2025 includes the final post-stocking monitoring and a final genetic augmentation. The subproject will be complete by 2025 if additional establishment stockings do not occur.

Geographical Area: Aravaipa Creek is a tributary to the San Pedro River about 17 km south of the confluence of the Gila and San Pedro Rivers. It drains the east and north end of the Galuiro Mountains, the southwest portion of the Pinalenos, and the southern portion of the Santa Teresa Mountains. The creek becomes perennial at Aravaipa Spring near Stowe Gulch and flows west approximately 35 km to the San Pedro River. Reclamation constructed two fish barriers at the west end of the creek that prevent upstream movement of nonnative fishes. However, nonnative Green Sunfish, Yellow Bullhead, and Red Shiner were present in the creek before the barriers were constructed. Ongoing nonnative removals led

[2] In 2016, the American Fisheries Society and the American Society of Ichthyologists and Herpetologists reclassified and merged Roundtail Chub *Gila robusta*, Gila Chub *Gila intermedia*, and Headwater Chub *Gila nigra* into one species, the Roundtail Chub.

by BLM have largely eliminated Green Sunfish, but Yellow Bullhead were still common as of 2022. Topminnow are currently not present in the stream, although there was an attempt to establish populations in 1969 and 1977 (Weedman 1999). If the topminnow population establishes in Aravaipa Creek, it would represent one of the longer occupied reaches upstream of a fish barrier and would have substantial conservation value.

Landownership is a combination of private, federal, and tribal lands. The two primary landowners for the perennial portion of the stream are BLM and TNC, both of which are supportive of the subproject, and the latter initially recommended pursuing this subproject. All necessary compliance and coordination for stocking on TNC property has been completed. Department and TNC staff contacted private landowners throughout the canyon, and only received supportive responses to the subproject proposal.

Telegraph Canyon

Background: The purpose of this subproject is to establish Gila Topminnow in Telegraph Canyon. In May, 2021 Department staff stocked 389 Gila Topminnow (Redrock Canyon lineage, Lower Santa Cruz MU) in Telegraph Canyon. A total of 563 topminnow were captured during annual monitoring in 2021, with the catch decreasing to 165 following a more severe than usual monsoon season and potentially some post-Telegraph Fire impacts in 2022. Total catch of topminnow in Telegraph Canyon declined to 145 individuals in 2023. Gila Topminnow were also detected downstream in Arnett Creek each year from 2021-2023, with 212 captured in 2023. Work planned for FY2025 includes the final post-stocking monitoring in Telegraph Canyon and Arnett Creek and a final genetic augmentation, if additional establishment stockings do not occur.

Geographical Area: Telegraph Canyon is a tributary to Arnett Creek and drains from the north side of Picketpost Mountain. Telegraph Canyon and Arnett Creek are protected from upstream invasion of nonnative fishes from Queen Creek by a constructed fish passage barrier. The stream is located entirely on Tonto National Forest Lands. The Forest is supportive of the subproject and have completed all necessary consultation.

Rarick Canyon

Background: The purpose of this subproject is to establish Gila Topminnow and Gila Chub in Rarick Canyon. Rarick Canyon was previously included under the 'Red Tank Draw removals' project. The removal component was not prioritized for funding in FY2022, and the proposed subproject better aligns with the 'Gila Topminnow Stockings' project. A survey of isolated pools in the Rarick Canyon drainage from 2017 to 2018 detected Black Bullhead. Intensive mechanical removals efforts in 2019 resulted in the eradication of Black Bullhead from the Rarick Canyon drainage. Additional surveys of tanks in the Rarick Canyon drainage that supported Fathead Minnow in 2017 confirmed that Black Bullhead were no longer present in upstream tanks. Gila Chub from Red Tank Draw were translocated above a natural barrier into three isolated pools in the Rarick Canyon drainage in 2019 and augmented in 2020 and 2021. Gila Topminnow (Redrock Canyon lineage, Lower Santa Cruz MU) were also translocated to one of the same isolated pools above the barrier in April, 2020. No topminnow were captured during annual monitoring from 2021 to 2023. Work planned for FY2025 includes post-stocking monitoring of Gila Chub and Gila Topminnow. The subproject will be complete by 2026 if additional establishment stockings do not occur.

Geographical Area: The subproject area includes isolated perennial pools in Rarick Canyon. A waterfall barrier (~10 meters high) in Rarick Canyon prevents upstream movement of nonnative fishes from the perennial reach of Red Tank Draw. Red Tank Draw and Rarick Canyon are managed by the Coconino National Forest which is supportive of native fish conservation activities and has completed all necessary compliance.

Unnamed Drainage #68B

Background: Gila Topminnow were discovered in Unnamed Drainage #68B in 1985 as a result of dispersal from Mesquite Tank #2 (Site #68A) which was stocked in 1982 from Boyce Thompson Arboretum (Monkey Spring lineage, Monkey and Cottonwood Spring MU). Gila Topminnow persisted in the drainage until 2020 when surveys in March and December by Marsh and Associates failed to detect any fish after severe flooding in fall 2019. In October 2021 Department and Reclamation staff verified the extirpation of Gila Topminnow in Unnamed Drainage #68B and evaluated the site for restocking. The Gila Topminnow population persisted in the canyon for at least 35 years without augmentation before the flooding event. Severe flooding is a continuing concern for restocking this population, however, the population persisted for so long it is valuable to try and establish this population again. Department staff stocked a total of 393 Gila Topminnow from two donor locations in April, 2022. A total of 990 Gila Topminnow were captured during the initial monitoring effort in October, 2022. Catch during annual monitoring in 2023 increased to 1,434 individuals. Work planned for FY2025 includes the final post stocking monitoring and a final genetic augmentation. The subproject will be complete by 2025 if additional establishment stockings do not occur.

Geographic Area: Unnamed Drainage #68B is located on the Tonto National Forest and is a tributary to Mesquite Creek, which flows into Tortilla Creek, just upstream of Canyon Lake. At the time of the last survey, at least three isolated pools and 248 meters of connected water were documented in the canyon between the confluence with Mesquite Creek and where the west prong becomes impassible. In the east prong there is an additional 35 meters of water before the prong becomes impassible. Past reports indicated similar lengths with about 200 m of perennial water. The upstream watershed is relatively small, with only 0.21 km^2 above Mesquite Tank, which likely allowed the population to persist for so long in the canyon. Mesquite Creek is located on Tonto National Forest lands and the Forest is supportive of ongoing native fish conservation efforts.

Sycamore Creek

Background: The purpose of this subproject is to extend the current distribution of Roundtail (Gila) Chub in Sycamore Canyon. A natural waterfall barrier (Double T Ranch Falls) exists downstream of Double T Ranch, which prevents upstream movement of all fish species. Translocation of these fish upstream of the falls would extend their range in the system and increase the resilience of this chub lineage to disturbances. Sycamore Creek was evaluated in November, 2022 and determined to be too cold to support Gila Topminnow translocations. Wet-dry mapping and a snorkel census in June, 2023 found that the chub population downstream of Double T Falls was robust enough to support the translocation of some individuals upstream of Double T Falls. Work planned for FY2025 includes potential translocation of chub upstream of the barrier if translocation do not occur in FY2024. Translocations are contingent on Prescott National Forest Staff completing necessary compliance to account for ongoing activities within the proposed range extension. Augmentation of the chub population may occur if necessary. The subproject will be complete by 2028 if additional stockings do not occur.

Geographic Area: Sycamore Creek is located on the Prescott National Forest and is a tributary to the Agua Fria River. Populations of Roundtail Chub occupy three isolated sections of the stream; Rock Bottom Box, Middle Box, and Double T Box. These populations are currently isolated from populations of nonnative fish that exist downstream near the townsite of Dugas by the presence of several natural fish barriers. A small population of Rainbow Trout exists mostly upstream of Double T Ranch Falls, with some individuals persisting with the chub population downstream of the falls.

Tentative Locations

The following locations still need more coordination, planning, and possibly environmental compliance, before implementation. Funding is not currently allocated for these locations and the Department will recommend revisions to the work plan if implementation occurs in 2024 or 2025. Tentative Gila Topminnow stocking locations include, but are not limited to: Mule Spring, Sands Draw, San Pedro River at Three Links, and Boyce Thompson Arboretum. Additional proposed locations that require further assessment will be evaluated under the auspices of this subproject.

Methodologies: The Department typically coordinates with USFWS to select stocking locations, donor populations, and appropriate lineages of fish for each stocking. Fish for translocations will be collected, transported, and stocked according to Department fish collection, transport, and stocking protocols (best management practice #4; AGFD 2011), and Hazard Analysis and Critical Control Point (HACCP) practices. Fish will be collected using gear appropriate for the given water and typically includes seines, minnow traps, or dip nets. Collected fish will be placed into aerated 5-gallon buckets from which they will be sorted to confirm species identity and assess condition. Fish will then be transferred into transport coolers (100 qt. minimum) equipped with aerators and filled with well water treated with salt and Amquel®. At the translocation site, fish will be transferred from the transport cooler back to aerated 5-gallon buckets and carried to the stocking location. Water quality characteristics in the buckets and the stocking location will be measured. Conductivity (µS), salinity (mg/L), total dissolved solids (mg/L), pH, and water temperature (°C), will be measured using a Hach® Combo meter, and dissolved oxygen (mg/L) using a Sper Scientific® dissolved oxygen meter. Fish will be acclimated to stocking site conditions by exchanging 25 to 50% of transport bucket water with stream water, about every 10 minutes, until bucket temperatures are within two degrees of the receiving water. Fish will be sorted a final time to verify species identity, assess condition, and determine a final count before being released into the stream.

The Department's sampling approach for Gila Topminnow consists of setting at least 10 baited collapsible minnow traps for a minimum soak time of two hours (Robinson and Hickerson 2018). Opportunistic seining and dip netting is carried out when stream conditions and time allow. Captured fish are counted by size class and released alive. Relative abundance (fish per hour), population size structure and dispersal (when possible) are evaluated each year to determine establishment. Gila Topminnow are monitored for three years before determining population establishment or failure. The minimum target for a viable population is 500 over-wintering adults (Weedman 1999). If fewer than 100 topminnow are captured during annual monitoring, additional topminnow may be stocked to help the population establish. This threshold is based on the assumption that capture probability for minnow traps is typically low. Results, analysis, discussion of results, and recommendations for future work will be presented in the annual report.

Program Priorities:
This project will replicate at least four populations of Gila Topminnow and three populations of Gila Chub in the wild. This project will provide immediate on the ground benefits by establishing multiple new Gila Topminnow and Gila Chub populations within the Gila River basin.

Partnerships:
This project is in partnership with the U. S. Forest Service, Bureau of Land Management, U. S. Fish and Wildlife Service, and Reclamation. This project is part of a larger collaborative effort to restore Gila Topminnow to suitable habitats within the historical range. This project builds upon previously funded work by monitoring topminnow at previously stocked locations and attempting to establish populations at locations where habitat assessments were completed.

Strategic Plan Goals:
- Preventing Extinction and Managing Toward Recovery
    - Goal 4. Replicate populations and their associated native fish community into protected streams and other surface waters.
        - Objective 4a. Replicate Gila Topminnow stocks into a minimum of 10 surface waters.
        - Objective 4b. Replicate each of the other priority species into a minimum of one surface water.

Recovery Goals:
- Gila Topminnow recovery plan (1999 draft)
    - Task 2.2 (priority 1): Reestablish into suitable habitats
    - Task 3.1 (priority 1): Develop standardized population and habitat monitoring protocols and implement them
- Gila Chub draft Recovery plan (2015)
    - Task 2.2 (priority 1): Repatriate Gila Chub to new protected streams
    - Task 3.2 (priority 2): Conduct monitoring

Estimated Time and Cost:
- Cost: The estimated cost of this project in FY2025 is $40,856.
- Urgency: This project is urgent. Failure to regularly monitor translocation sites would delay determinations of population establishment. Postponement of translocations at new sites would delay progress toward meeting recovery goals for the species.
- Readiness: Compliance for this project is dependent on location. Locations where topminnow have previously been stocked have all required compliance completed. Many of the tentative locations still require some compliance to be completed before stockings can occur. Modifications to the work plan will be requested should any of the tentative sites become ready to stock during FY2024.
- In-Kind or Matching Funds: This project does not have matching or in-kind funds.

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Project 5: Blue River Native Fish Restoration
(Task ID: AZ-2002-3)

Implementing Entity: Arizona Game and Fish Department
Start Year: 2002
Location(s): Blue River
Species Protected:

- Spikedace: one of two replicates of upper Gila River lineage.
- Loach Minnow: remnant population, with two attempted replicates.
- Roundtail Chub: the only wild replicate of the Eagle Creek lineage.
- Other native fish species: Longfin Dace, Speckled Dace, Sonora Sucker, Desert Sucker.

Project Description:
Background: The Blue River Native Fish Restoration Project is an ongoing project. The project has consisted of multiple phases, starting with the construction of a Reclamation funded fish barrier in 2012, followed by a combination of mechanical removal of nonnative fish and stocking of native fish in the lower 19 km. Nonnative fish have been eradicated from the lower Blue River above the fish barrier since 2017. Spikedace and Roundtail Chub were successfully established in the lower Blue River and monitoring efforts were transferred to the Reclamation monitoring contract in 2020, prior to the Bringham and Cow Canyon Fires. Conservation efforts continued upstream in a reach known as the middle Blue River near the confluence with KP Creek in 2016. Roundtail Chub were stocked in 2016, 2019 and 2023 and Spikedace in 2017, 2018 and 2023. Roundtail Chub and Spikedace were salvaged from the lower Blue River following the Brigham Fire, and translocated to the upper Blue River near Bobcat Flat and Upper Blue Campground respectively in 2020. Additional translocation of Spikedace and Roundtail Chub occurred in 2023. Work planned for FY2025 includes annual monitoring of Spikedace and Roundtail Chub in the middle Blue River, annual monitoring of Spikedace and Roundtail Chub in the upper Blue River, and additional translocations to the upper Blue River as necessary. Additional translocations to the middle Blue River may occur if monitoring data continues to demonstrate that the Spikedace and Roundtail Chub populations are struggling to establish.

Project Timeline.
FY2009: First nonnative removal effort above planned barrier location.
FY2012: Completion of Reclamation funded fish barrier. First nonnative removal effort after barrier construction. First stocking of Roundtail Chub, Spikedace and Loach Minnow. First annual monitoring.
FY2013: Annual monitoring. Continuation of nonnative removal efforts.
FY2014: Annual monitoring. Continuation of nonnative removal efforts.
FY2015: Annual monitoring. Continuation of nonnative removal efforts.
FY2016: Annual monitoring. Translocation of additional Spikedace and Roundtail Chub. Continuation of nonnative removal efforts.
FY2017: Annual monitoring. Translocation of additional Loach Minnow. Stocking of Roundtail Chub in Middle Blue River. Continuation of nonnative removal efforts in the lower Blue River.
FY2018: Annual monitoring in lower Blue River. Stocking of Spikedace in Middle Blue River. First annual monitoring of Roundtail Chub in Middle Blue River. Continuation of nonnative removal efforts.

FY2019: Annual monitoring in lower Blue and middle Blue. Translocation of additional Spikedace to the middle Blue River. Continuation of nonnative removal efforts.
FY2020: Annual monitoring in middle Blue River. Translocation of additional Roundtail Chub to middle Blue River. Salvage of Roundtail Chub, Spikedace and Loach Minnow and translocation to the upper Blue River at Bobcat Flat, upper Blue River at Upper Blue Campground, and Campbell Blue Creek respectively.
FY2021: Annual monitoring in middle Blue River. First annual monitoring of upper Blue River. Additional translocations to upper reach, and if necessary to middle reach. Final nonnative removal effort in lower Blue River. Verification of eradication of nonnative fishes in the lower Blue River using eDNA.
FY2022: Annual monitoring in the middle Blue River and upper Blue River. Spikedace translocation to lower Blue River. Additional translocations to upper Blue River as necessary.
FY2023: Annual monitoring in the middle Blue River and upper Blue River. Additional translocations of Spikedace and Roundtail Chub to the upper, middle and lower Blue River.
FY2024: Annual monitoring in the middle Blue River. Annual monitoring in the upper Blue River. Additional translocations of Spikedace to the upper Blue River as necessary.
FY2025: Final annual monitoring in the middle Blue River. Annual monitoring in the upper Blue River.
FY2026: Annual monitoring in the upper Blue River.
FY2027: Final annual monitoring in the upper Blue River.
Estimated project completion date: FY2027

Geographical Area: The project area includes three distinct reaches of the Blue River. The lower Blue River extends from the Reclamation funded barrier upstream to near XXX Ranch. The lower Blue River is protected from threats by the Reclamation funded barrier downstream. The entire lower Blue River is on Apache-Sitgreaves National Forest Lands, and the Forest is supportive of ongoing native fish conservation actions. The Middle Blue River extends from the confluence with McKittrick Creek upstream to The Box (near confluence with Horse Canyon). The middle Blue River is protected from upstream invasion of nonnative fishes by the Reclamation funded fish barrier, but Brown Trout from upstream tributaries are occasionally captured within this reach. Populations of Spikedace, Roundtail Chub, and Loach Minnow are located within this reach, with additional populations of Loach Minnow in tributaries. Landownership is a combination of Apache-Sitgreaves National Forest and private lands. The Forest is supportive of native fish conservation activities within this reach. The upper Blue River reach extends from Blue Crossing campground upstream to the New Mexico border. A waterfall at The Box (just below Horse Canyon) acts as a barrier to upstream movement of fish into the upper Blue River during base flows. A remnant population of Loach Minnow exists within this reach along with newly introduced populations of Roundtail Chub and Spikedace. Land ownership is a combination of Apache-Sitgreaves National Forest and private lands. The Forest is supportive of conservation of Roundtail Chub and Spikedace in the upper Blue River. Some private landowners are supportive of native fish conservation in the upper Blue River.

Methodologies: The Department coordinates with USFWS and USFS about locations to stock and quotas of Spikedace and Loach Minnow to acquire for ARRC or collect from the wild for translocations. Fish for augmentations will be stocked into the same locations that fish were originally stocked unless locations with better habitat are detected during monitoring. Fish for translocations will be collected, transported, and stocked according to Department fish collection, transport, and stocking protocols (best management practice #4; AGFD 2011), and Hazard Analysis and Critical Control Point (HACCP) practices. Fish will be collected using seines or backpack electrofishing. Collected fish will be placed into aerated 5-gallon

buckets from which they will be sorted to confirm species identity and assess condition. Fish will then be transferred into transport coolers (100 qt. minimum) equipped with aerators and filled with well water treated with salt and Amquel®. At the translocation site, fish will be transferred from the transport cooler back to aerated 5-gallon buckets and carried to the stocking location. Water quality characteristics in the buckets and the stocking location will be measured. Conductivity (µS), salinity (mg/L), total dissolved solids (mg/L), pH, and water temperature (°C), will be measured using a Hach® Combo meter, and dissolved oxygen (mg/L) using a Sper Scientific® dissolved oxygen meter. Fish will be acclimated to stocking site conditions by exchanging 25 to 50% of transport bucket water with stream water, about every 10 minutes, until bucket temperatures were within two degrees of the stream. Fish will be sorted a final time to verify species identity, assess condition, and determine a final count before being released into the stream.

The Roundtail Chub and Spikedace populations in the middle Blue River are monitored by a backpack electrofishing crew of 3 to 4 people making a single pass through 10 randomly selected 100 meter long sub-reaches, and three passes through the two fixed sub-reaches located in two of the three monitoring reaches. Total length of all Roundtail Chub and Spikedace captured is measured to the nearest mm TL. Sampling is carried out in late September each year. Success is measured by an annual increase in mean CPUE (fish per hour) and evidence of recruitment in successive years with multiple age classes present. A similar monitoring strategy is utilized for evaluating translocation success in the upper Blue River: three monitoring reaches, with three fixed 100 meter sub-reaches, and 12 random sub-reaches. Results, analysis, discussion of results, and recommendations for future work will be presented in the annual report.

Program Priorities:
The nonnative removal portion of the project helped secure the existing Loach Minnow population and facilitated the establishment of Spikedace and Roundtail Chub populations above the fish passage barrier built by Reclamation. This project created one of two replicates of the upper Gila River Spikedace lineage, and created the first wild replicate of the Eagle Creek lineage of Roundtail Chub. This project expanded the range of the Spikedace and Roundtail Chub populations such that they are dispersed throughout the entire 83 km river system. This project also benefits other native fish species: Longfin Dace, Speckled Dace, Sonora Sucker, and Desert Sucker. This project has immediate on-the-ground benefits by establishing and securing wild populations of Spikedace and Roundtail Chub above a barrier and expanding their range within an 83 km long river system.

Partnerships:
This project has been carried out in partnership with Apache-Sitgreaves National Forest and private landowners. This project builds on the work funded by the GRBNFCP in the lower Blue River by continuing to expand the range of Spikedace and Roundtail Chub upstream of the Reclamation funded fish barrier. This project is part of larger collaborative efforts to conserve Roundtail Chub populations (Six Species Conservation Agreement) and to replicate Spikedace throughout the species historical range.

Strategic Plan Goals:
- Preventing Extinction and Managing Toward Recovery
    - Goal 3. Remove nonnative aquatic species threats.

        - Objective 3a. Eradicate or suppress nonnative aquatic species from a minimum of five surface waters to prepare them for repatriations of native fishes.
    - Goal 4. Replicate populations and their associated native fish community into protected streams and other surface waters.
        - Objective 4b. Replicate each of the other priority species into a minimum of one surface water.

Recovery Goals:

- Spikedace and Loach Minnow recovery plans (1991)
    - Task 6.2.5 (priority 3) Reclaim as necessary to remove nonnative fishes
    - Task 6.3-6.4 (priority 3) Reintroduce into selected reaches and monitor

Estimated Time and Cost:

- Cost: The estimated cost of this project for FY2025 is $36,974.
- Urgency: This project is urgent because failure to translocate additional fish or monitor populations in the Blue River will postpone any determination of establishment success.
- Readiness: All necessary compliance has been completed for all partners involved in the Middle Blue and upper Blue.
- In-Kind or Matching Funds: This project does not have matching or in-kind funds

Literature Cited:

Arizona Game and Fish Department. 2011. Fish Collection, transport, and stocking protocol: best management practice (BMP #4). Arizona Game and Fish Department, Phoenix.

Project 6: Upper Verde River Native Fish Restoration

(Task ID: AZ-2020-2)

Implementing Entity: Arizona Game and Fish Department
Start Year: 2020
Location(s): Verde River, tributaries to Verde River, stock tanks within the upper Verde River drainage
Species Protected:

- Spikedace: possible replicate population (lineage TBD), if nonnative fishes are eradicated from the river.
- Loach Minnow: possible replicate population (lineage TBD), if nonnative fishes are eradicated from the river.
- Gila Topminnow: possible replicate population (lineage TBD), if nonnative fishes are eradicated from the river.
- Other native fish species: one population each of the existing lineages of Roundtail Chub, Longfin Dace, Speckled Dace, Desert Sucker, Sonora Sucker.

Project Description:

Background: 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 Verde River historically supported populations of Spikedace, Loach Minnow, Speckled Dace, Longfin Dace, Roundtail Chub, Colorado Pikeminnow, Desert Sucker, Sonora Sucker, and Razorback Sucker, but currently supports a species assemblage dominated by nonnative fishes. The project consists of three main components: construction of two fish barriers, control of nonnative fishes, and reintroduction of Spikedace, Loach Minnow, and Gila Topminnow. Extensive planning for the nonnative control and species reintroduction components is necessary before implementation. All stock tanks in the drainage need to be evaluated, to identify those with water, those that harbor nonnative fish, and which tanks pose the highest risk of being sources of nonnative fish to the Verde River.

Project Timeline.

FY2019: Stock tank survey plan drafted, identification of tanks most likely to support populations of nonnative fishes.

FY2020: Department staff participation in planning meetings.

FY2021: Department staff began stock tanks surveys in the Upper Verde River drainage for presence of nonnative fishes. Department staff participation in planning meetings.

FY2022: Department staff completed nearly all stock tank surveys. Department staff participation in planning meetings.

FY2023: Department staff surveyed Hell Canyon downstream of Hell Canyon Tank and detected a few ephemeral and perennial pools containing Green Sunfish, Yellow Bullhead and Red Shiner. Department staff also surveyed portions of Big Chino Wash and Williamson Valley Wash near their confluence and detected Green Sunfish in Big Chino Wash and Fathead Minnow in Williamson Valley Wash.

FY2024: Department staff will continue to survey drainages downstream of stock tanks with nonnative fishes to determine distribution and abundance of nonnative fish in tributary streams. Specific streams to be targeted in FY2024 include MC Canyon, Grindstone Wash, and Potentially Bear Canyon.
FY2025: Department staff will continue to survey drainages downstream of stock tanks with nonnative fishes to determine distribution and abundance of nonnative fish in tributary streams. Specific streams to be targeted in FY2025 include the upper portions of Hell Canyon and MC Canyon.
FY2026 and beyond: Additional work is dependent upon approval of the Department's piscicide treatment planning and procedures process. If the Department is unable to move forward on this subproject, GRBNFCP funds can be reprioritized to lower priority projects pending approval of technical and or policy committees.

Geographical Area: The riverine portion of the project area includes the Verde River and tributaries from Sullivan Lake downstream to the proposed lower barrier location near Sycamore Canyon. This reach of the Verde River will be protected from upstream invasion of nonnative fishes by a series of two barriers built by Reclamation. This reach of the Verde River is mostly owned by Prescott National Forest with some small inholdings of Department and private land. Prescott National Forest is supportive of the Verde River native fish restoration project. The project area also includes all tanks within the Verde River drainage above Sycamore Canyon that are potential sources of nonnative fish to the Verde River. There are about 1,266 stock tanks within the upper Verde River watershed, but only 146 of those are likely perennial and within 30 km of the Verde River. Before treatment of the Verde River, these 146 stock tanks within the upper Verde River drainage will be surveyed for presence of nonnative fishes. The stock tanks are on Prescott National Forest, Kaibab National Forest, state trust, and private lands. The Forests are supportive of the surveys, but the private landowners need to grant permission before tanks on their properties can be surveyed. Prescott National Forest completed NEPA for nonnative removals from the stock tanks on its lands. The Kaibab National Forest is still working through NEPA compliance for nonnative fish removals within tanks on their lands.

Methodologies:
Stock Tank Surveys. The objective of stock tank surveys in the upper Verde drainage is to identify tanks that contain nonnative fishes, which could potentially be dispersal sources to the Verde River downstream. Stock tanks were prioritized for sampling by analyzing national agricultural imagery program (NAIP) imagery for presence of water using normalized difference water index (NWDI) in an automated approach. Previous stocking history and distance to the Verde River were also considered in the prioritization. A total of 146 tanks were identified as high priority for sampling of nonnative fishes. Stock tank surveys began in 2021 during July and August. Department staff will visit all 146 potentially perennial stock tanks within 30 km of the Verde River pending landowner permission. Tanks that have water will be surveyed for fish. For most tanks, a bag seine will be hauled across each tank for a minimum of three passes (unless the entire tank can be seined in one or two hauls, or the tank is too shallow to use a seine). Trammel or gill nets will be set in tanks that are too large or deep to seine and dip nets will be used in tanks that are too shallow to seine. Tanks with undesirable nonnative fish will be identified as targets for nonnative removals. Following tank surveys, crews will walk stream channels downstream of tanks where nonnative fish were detected and document the presence of surface water and nonnative fish downstream to the confluence with the Verde. These surveys will help better understand which stream channels will also need to be targeted for nonnative removals.

Nonnative removals. The first phase of nonnative fish removal efforts will target stocks tanks within the upper Verde River drainage. The purpose of the first phase will be to eliminate high-risk sources of nonnative fish to the Verde River. Utilizing the results from tank surveys, the Department's Region 2, Region 3 and Native Aquatics Program staff will develop a nonnative fish removal plan for the tanks identified as having nonnative fish present and that are considered high risk. All standard methods of fish removal will be evaluated for feasibility. If piscicides are chosen as a removal method, the Department's Region 2, Region 3 and Native Aquatics Program staff will complete all plans and compliance specified in the Department's Piscicide Planning and Treatment Procedures manual. Nonnative fishes will be removed from stock tanks in the upper Verde River drainage before implementation of removals in the Verde River.

The second phase of nonnative fish removal efforts will occur in the Verde River. If piscicides are chosen as the mechanism of nonnative fish removal, the Department's Region 3 and Native Aquatics Program staff will complete all plans and compliance specified in the Department's Piscicide Planning and Treatment Procedures manual. Targets for removal success will be included in the removal plan. This work will be detailed in a future work plan.

Native fish translocations. The Department's Region 3 and Native Aquatic Program staff will develop a plan for native fish translocations, which will be detailed in a future work plan in the proposed year that translocations are initiated.

Post-stocking monitoring. The Department's Region 3 and Native Aquatic Program staff will develop a monitoring plan to evaluate post-stocking establishment of native fishes. The monitoring plan will likely have species specific sampling strategies. Targets for success and planned analyses will also be included. To be consistent with other monitoring plans for Spikedace and Loach Minnow, a stratified-random study design will likely be used, and include several fixed sites at stocking locations or access points. This work will be detailed in a future work plan.

For all methodologies subsections, results, analysis, discussion of results, and recommendations for future work will be presented in the annual report.

Program Priorities:
The upper Verde River native fish restoration project will stabilize existing populations of Roundtail Chub, Speckled Dace, Longfin Dace, Desert Sucker, and Sonora Sucker in the wild through barrier installations and nonnative removals. The project will also replicate populations of Spikedace and Loach Minnow within historically occupied habitat (lineages to be determined). A wild replicate population of Gila Topminnow, lineage to be determined, will also be replicated above the barrier. This project will have immediate on the ground benefits by securing nearly all species of Gila River Basin native fishes upstream of barriers within historically occupied range.

Partnerships:
This project is part of a larger collaborative effort with the Prescott National Forest, U.S. Fish and Wildlife Service, and Reclamation. This project builds upon previously funded work to plan for and construct the barrier.

Strategic Plan Goals:

- Preventing Extinction and Managing Toward Recovery

- Goal 3. Remove nonnative aquatic species threats.
  - Objective 3a. Eradicate or suppress nonnative aquatic species from a minimum of five surface waters to prepare them for repatriations of native fishes.
- Goal 4. Replicate populations and their associated native fish community into protected streams and other surface waters.
  - Objective 4a. Replicate Gila Topminnow stocks into a minimum of 10 surface waters.
  - Objective 4b. Replicate each of the other priority species into a minimum of one surface water.

Recovery Goals:

- Spikedace and Loach Minnow recovery plan (1991)
  - Task 6.3-6.4 (priority 3): Reintroduce into selected reaches and monitor
- Gila Topminnow recovery plan (1999 draft)
  - 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. Monitor natural and reestablished populations and their habitats.

Estimated Time and Cost:

- Cost: The estimated cost of this project in FY2025 is $14,806.
- Urgency: This project is urgent because tank surveys and nonnative removal planning need to occur concurrently with barrier planning efforts.
- Readiness: The stock tank and stream surveys, and planning proposed for FY2024 are ready to execute. The NEPA compliance by the Prescott National Forest for stock tank treatments was completed. This project still requires substantial compliance work to be completed including Wild and Scenic Analysis, NEPA compliance by Reclamation for construction of the fish passage barriers, construction of the barriers, and control of nonnative fishes in the Verde River.
- In-Kind or Matching Funds: The Department will provide in-kind-match in the form of Regional and Headquarters Aquatic Wildlife Program staff salaries.

Project 7: Sharp Spring Native Fish Restoration

(Task ID: AZ-2016-3)

Implementing Entity: Arizona Game and Fish Department
Start Year: 2016
Location(s): Sharp Spring
Species Protected:

- Gila Topminnow: one new wild replicate of the Sharp Spring lineage, of which seven exist.
- Gila Chub[3]: potential replicate of Sheehy Spring lineage.

Project Description:

Background: The Sharp Spring native fish restoration project is ongoing. Sharp Spring was historically occupied by a remnant population of Gila Topminnow until nonnative Western Mosquitofish were detected in 1979. Gila Topminnow were extirpated by 2001, likely as a result of negative interactions with mosquitofish. An attempt was made to eradicate Western Mosquitofish by pumping the pools dry with trash pumps in June, 2013. The effort was ultimately unsuccessful due to the refill rate of the pools and equipment limitations. Communication with Arizona State Parks and Trails starting in 2016 did not lead to any progress towards a rotenone treatment until early 2020. Sharp Spring was treated with rotenone in 2022 and the existing population of Western Mosquitofish was successfully eradicated. Gila Topminnow from three Sharp Spring lineage donor locations were stocked into two of the fifteen pools present in 2022. Fall monitoring in 2022 indicated that the population was persisting at relatively low abundance in one pool and reproduction was occurring. Sharp Spring was augmented with fish from two additional donor locations into a total of four pools in 2023. Fall monitoring in 2023 again detected relatively few individuals in only one of the pools previously stocked. Dissolved oxygen loggers will be deployed in two of the pools in FY2024 to evaluate potential limiting factors for Gila Topminnow, and determine management strategies to improve the probability of establishment success. Planning for potential translocation of Gila Chub to Sharp Spring will occur after Gila Topminnow can persist in a majority of the available pools.

The purpose of this project is to eradicate Western Mosquitofish from Sharp Spring, reintroduce Gila Topminnow and potentially translocate Gila Chub. The Sharp Spring lineage of Gila Topminnow will be translocated from one or more of the replicate populations in the state. Gila Chub from nearby Sheehy Spring could potentially be translocated into Sharp Spring. Sheehy Spring is located on private land and the landowner has expressed concern over the collection of fish from Sheehy Spring to establish a population in Sharp Spring. All proposed work for Gila Chub is contingent on landowner cooperation. Work planned by year is presented below.

Project Timeline.
FY2020: Coordination with AZ State Parks. Drafted AZSP CRPRM application.
FY2021: Completed Stage 1 of Piscicide Treatment Planning Procedures, initiated Stage 2.
FY2022: Completion of Stage 2 and Stage 3. Rotenone treatment and stocking of Gila Topminnow.

[3] In 2016, the American Fisheries Society and the American Society of Ichthyologists and Herpetologists reclassified and merged Roundtail Chub *Gila robusta*, Gila Chub *Gila intermedia*, and Headwater Chub *Gila nigra* into one species, the Roundtail Chub.

FY2023: Initial monitoring of Gila Topminnow, additional translocations as necessary.
FY2024: Annual monitoring of Gila Topminnow. Additional translocations of Gila Topminnow. Deployment and maintenance of dissolved oxygen loggers.
FY2025: Annual monitoring of Gila Topminnow. Additional translocations of Gila Topminnow as necessary.
FY2026: Annual monitoring of Gila Topminnow. Additional translocations of Gila Topminnow as necessary. Potential translocation of Gila Chub.
FY2027: Annual monitoring of Gila Topminnow. Annual monitoring of Gila Chub. Additional translocations of Gila Chub as necessary
FY2028: Annual monitoring of Gila Chub.
Estimated year of completion: FY2028.

Geographical Area: Sharp Spring is a tributary to the Santa Cruz River in San Rafael State Natural Area (Arizona State Parks), about 2 km from the international border with Mexico. It is a perennial spring with approximately 0.3 km of surface water which forms a series of at least 15 pools in cienega-like habitat. Arizona State Parks is supportive of the project.

Methodologies: Following verification of eradication, Gila Topminnow will be stocked into each of the major pools. Translocation procedures, monitoring protocols, establishment criteria and monitoring targets will follow those described in the methodology subsection of the Gila Topminnow Stocking project. Gila Chub will be stocked at least one year after Gila Topminnow are initially stocked to allow for topminnow to increase in abundance prior to the introduction of a potential predator. Gila Chub will be monitored for five years after the final establishment stocking. Results, analysis, discussion of results, and recommendations for future work will be presented in the annual report.

Program Priorities:
This project will allow for the reintroduction of Gila Topminnow to historically occupied habitat. This project will also have the potential to create the only wild replicate of the Sheehy Spring lineage of Gila Chub. This project will have the immediate on the ground benefit of securing a historical location for reintroduction of Gila Topminnow and potential replicate Gila Chub population.

Partnerships:
This project is in partnership with Arizona State Parks, U.S. Fish and Wildlife Service, and Reclamation. The project is part of larger collaborative efforts to conserve chub (Six Species Conservation Agreement) and to replicate populations of Gila Topminnow throughout their range. This project builds upon a previously funded GRBNFCP project that attempted, but failed, to eradicate nonnative fish by pumping down the spring pools.

Strategic Plan Goals:
- Preventing Extinction and Managing Toward Recovery
    - Goal 3. Remove nonnative aquatic species threats.
        - Objective 3a. Eradicate or suppress nonnative aquatic species from a minimum of five surface waters to prepare them for repatriations of native fishes.
    - Goal 4. Replicate populations and their associated native fish community into protected streams and other surface waters.

- Objective 4a. Replicate Gila Topminnow stocks into a minimum of 10 surface waters.
- Objective 4b. Replicate each of the other priority species into a minimum of one surface water.

Recovery Goals:

- Gila Topminnow recovery plan (1999 draft)
  - Task 2.2 (priority 1): Reestablish into suitable habitats
  - Task 2.4 (priority 1): Protect suitable reestablishment habitats from detrimental nonnative aquatic species.
  - Task 3.1 (priority 1): Develop standardized population and habitat monitoring protocols and implement them
- Gila Chub draft Recovery plan (2015)
  - 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: The estimated cost of this project in FY2025 is $15,535.
- Urgency: This project is urgent. Failure to regularly monitor would delay determinations of population establishment.
- Readiness: AZSP granted permission to proceed with the project through a CRPRM. Department compliance through the piscicide treatment planning procedures was completed in FY2022.
- In-Kind or Matching Funds: This project does not have matching or in-kind funds.

Project 8: Eagle Creek Spikedace and Loach Minnow Reintroduction

(Task ID: AZ-2018-1)

Implementing Entity: Arizona Game and Fish Department
Start Year: 2018
Location(s): Eagle Creek
Species Protected: Spikedace, Loach Minnow, Gila Chub, Longfin Dace, Speckled Dace, Desert Sucker, Sonora Sucker

Project Description:

Background: Spikedace and Loach Minnow historically occupied Eagle Creek and were last detected in 1989 and 1997 respectively. Neither species was detected in eDNA samples collected in 2019 or 2021. A barrier on Eagle Creek is tentatively planned to be built by Freeport McMoran as part of a Habitat Conservation Plan.

Project Timeline.
2018: Eagle Creek monitoring plan drafted
2019: Habitat assessment and eDNA sample collection within the project area.
2020: Preliminary partial baseline monitoring.
2021: eDNA collection from middle Eagle Creek.
2024: Drafting of monitoring plan for evaluating translocation success and population establishment.
2025: Initial baseline monitoring and habitat mapping.
2026: Translocation of Spikedace and Loach Minnow above the barrier. First annual monitoring of Spikedace and Loach Minnow.Monitoring of Spikedace and Loach Minnow.
2027: Monitoring of Spikedace and Loach Minnow. Additional translocations as necessary.
2028: Monitoring of Spikedace and Loach Minnow. Additional translocations as necessary.
Estimated project completion date: 2028

Geographical Area: The project area includes 11.6 km of Eagle Creek from the proposed barrier location (UTM 12S 640388/3698328) upstream to the confluence of Dry Prong Creek and East Eagle Creek (642203/3707035). This reach is currently occupied by populations of Gila Chub, Longfin Dace, Speckled Dace, Desert Sucker and Sonora Sucker. The project area will be protected from upstream invasion of nonnative fishes following completion of the barrier. The land ownership within the project area is primarily Apache-Sitgreaves National Forest with some parcels of Freeport McMoRan and private lands. The Forest is supportive of native fish conservation efforts. The primary private landowner has been cooperative with and supportive of several previous native fish conservation activities.

Methodologies: Monitoring of Eagle Creek will follow a similar approach to other Spikedace and Loach Minnow monitoring projects, with additional measures to better account for stocking success and track survival, movement, recruitment, and abundance of translocated fishes consistent with a monitoring plan drafted in FY2024. Sampling will occur annually each September. Backpack electrofishing will be carried out within 100-meter long sub-reaches with up to four fixed sub-reaches and the remaining ten sub-

reaches selected randomly. Three-pass depletion electrofishing will be carried out within fixed sub-reaches to estimate abundance and capture probability. Trends in relative abundance (CPUE) and population size structure will be evaluated to determine establishment. An inventory of mesohabitat lengths and locations will be conducted with the initial baseline monitoring to better understand the spatial distribution and composition of mesohabitat types within the project area. The habitat inventory will be replicated every other year to better estimate total population size of Spikedace and Loach Minnow within the entire project area each year.

Program Priorities:
This project will stabilize existing populations of Gila Chub, Longfin Dace, Speckled Dace, Desert Sucker and Sonora Sucker upstream of a fish barrier. This project will also replicate populations of Spikedace and Loach Minnow upstream of the barrier within historically occupied habitat. This project will have an immediate on the ground benefit by providing a secure reach of historically occupied stream for Spikedace and Loach Minnow.

Partnerships:
This project is in partnership with the Apache-Sitgreaves National Forest, USFWS, Reclamation and Freeport McMoRan.

Strategic Plan Goals:
- Preventing Extinction and Managing Toward Recovery
    - Goal 4. Replicate populations and their associated native fish community into protected streams and other surface waters.
        - Objective 4a. Replicate Gila Topminnow stocks into a minimum of 10 surface waters.
        - Objective 4b. Replicate each of the other priority species into a minimum of one surface water.

Recovery Goals:
- Spikedace and Loach Minnow recovery plan (1991)
    - Task 6.3-6.4 (priority 3) Reintroduce into selected reaches and monitor
- Gila Chub draft Recovery plan (2014)
    - Task 3.2 (priority 2) Conduct monitoring

Estimated Time and Cost:
- Cost: The estimated cost of this project for FY25 is $19,880.
- Urgency: This project is urgent because failure to monitor Eagle Creek prior to barrier placement and native fish translocations will preclude the opportunity to better understand changes to existing native fish communities following translocation.
- Readiness: The stocking and monitoring phases of this project are ready to implement following construction of the barrier.
- Matching Funds: This project does not have matching or in-kind funds.

Project 9: Mechanical Removal of Nonnative Fish from Bonita and Aravaipa Creeks

(Task ID: AZ-2009-1)

Implementing Entity: Bureau of Land Management (BLM), Safford Field Office (SFO)
Start Year: 2009 – Bonita Creek; 2010 – Aravaipa Creek. Both projects were implemented prior to receiving funds from the GRBNFCP.
Location(s): Gila Box Riparian National Conservation Area (RNCA) – Bonita Creek; Aravaipa Ecosystem Management Area – Aravaipa Creek (Figures 1 and 2).
Species Protected:

- Bonito Creek
    - Gila Chub, Gila Topminnow, Longfin Dace, Speckled Dace, Sonora Sucker, Desert Sucker, Sonora Mud Turtle
- Aravaipa Creek
    - Loach Minnow, Spikedace, Roundtail Chub, Longfin Dace, Speckled Dace, Sonora Sucker, Desert Sucker, Lowland Leopard Frog

Project Description:
The purpose of this task is to continue mechanical removal of nonnative fishes, specifically Yellow Bullhead, from 1.9-miles of Bonita creek and 17-miles of Aravaipa Creek. Both systems are unique in that they still support intact or relatively intact native fish assemblages, despite the presence of nonnative fishes and they are closed systems as the Bureau of Reclamation (BOR) through their Gila River Basin Native Fish Conservation Program constructed fish barriers across them that prevent nonnatives from moving upstream. These projects are collaborative, ongoing, and are necessary to protect the native fish assemblages in both creeks.

Bonito Creek
Background: In 2008, as part of a multi-agency native fish restoration project, to protect the extant fish fauna including endangered Gila Chub, Longfin Dace, Speckled Dace, Sonora Sucker, and Desert Sucker and to secure habitat for the repatriation of other imperiled Gila basin fish, the BOR constructed a fish barrier across lower Bonita Creek to prevent upstream incursion of nonnative aquatic species from the Gila River into lower and upper segments of Bonita Creek (Figure 1). Additionally, the reach of Bonita Creek between the City of Safford infiltration gallery dike and the fish exclusion barrier was chemically renovated with the piscicide rotenone to eliminate nonnative fishes. Shortly after the chemical treatment, nonnative fishes, Western Mosquitofish (*Gambusia affinis*) and Green Sunfish in 2009, Fathead Minnow (*Pimephales promelas*) in 2010, and Yellow Bullhead in 2011 were discovered in the renovated portion of Bonita Creek. With the discovery of Green Sunfish in 2009, BLM, SFO initiated mechanical removal since retreatment of the stream with piscicides was deemed not feasible due to habitat complexity (which is likely the reason the first treatment failed), public perception, and permitting requirements

Removal of Green Sunfish began August of 2009 with their discovery and by fall of 2018 they were no longer detectable. A total of 23,282 Green Sunfish were removed from a 1.9-mile reach of lower Bonita Creek using a variety of different gear types with Gee metal minnow traps being the most effective (Table 1). Removal effort varied over the years and was largely dependent on funding and personnel availability. In 2016, increased funding from the BLM Washington Office and the Bureau of Reclamation's Gila River Basin Native Fishes Conservation Program allowed for the hiring of a dedicated removal crew that was able to more than double our overall effort in 2016 from 2015. This increased effort reduced Green

Sunfish numbers to a point that recruitment was effectively eliminated. Environmental DNA (eDNA) samples from Bonita Creek were collected from several sites in April 2021 and were negative for Green Sunfish DNA, which further confirms their absence.

The results for Bonita Creek suggest that in systems that are isolated either naturally or with a barrier, nonnative mechanical removal can be effective in either eliminating or reducing the numbers of nonnative fish species. The importance of timing the removal effort to reduce the number of spawning adults is equally as important as the amount of effort expended. Underestimating the effort needed, funding constraints, and lack of personnel are the primary reasons it took nine years to eliminate Green Sunfish from Bonita Creek.

Summary of Past Results: Nine removal trips, totaling 24-days, were conducted from March through October 2023. A total of 2,713 Yellow Bullhead were removed. Adults (n=875) comprised 32.25% and juveniles (n=1,838) comprised 67.75%. Backpack electrofishing captured 2,099 Yellow Bullhead (Table 2), whereas Promar and Gee metal minnow traps captured 578 and 36, respectively (Table 3 and 4). An additional 28 Yellow Bullhead were removed during annual fish monitoring in April and June. Eighteen were collected below the fish barrier and 10 above. Monitoring data is not included in the tables. Zero Green Sunfish were collected or observed above the fish barrier.

Geographical Area: Bonita Creek originates in the Gila Mountains on the San Carlos Apache Indian Reservation and flows southeasterly from its headwaters approximately 46 miles to its confluence with the Gila River. The Bonita Creek watershed drains approximately 236,000 acres (370 square miles) and is a mixture of federal, city, tribal, and private lands. From the reservation boundary downstream, BLM, SFO manages approximately 92% of the lands and the remaining 8% are City of Safford and private holdings. The two managers/landowners, BLM, SFO and City of Safford are supportive of the project.

Species Protected: Nonnative fish removal from Bonita Creek will help secure and protect populations of federally endangered Gila Chub (*Gila intermedia*) and Gila Topminnow (P*oeciliopsis occidentalis occidentalis*). Other species that benefit from continued nonnative fish removal include Longfin Dace, Speckled Dace, Sonora Sucker, Desert Sucker, and Sonora Mud turtle (*Kinosternon sonoriense)*.

Methodology: Removal strategies and gear type follow those successfully used for Green Sunfish removal. To make the removal process more manageable, Bonita Creek will be divided into 15 segments based on the low water road crossings and three reaches, lower, middle, and upper. The lower reach extends from the fish barrier upstream to road crossing 4, middle reach includes road crossing 4 upstream to road crossing 10, and the upper reach includes road crossing 10 upstream to road crossing 15. Removal efforts will focus on the upper reaches of the creek as they appear to support fewer Yellow Bullhead, but more native fish. Suppression efforts will also continue in the lower reaches during this time.

All species collected will be identified and enumerated; nonnative Yellow Bullhead will be measured in millimeters and enumerated. Yellow Bullhead ≥140 mm TL will be classified as adult, whereas <140 TL will be classified as juvenile. Nonnative fish will be humanely euthanized with an overdose of tricaine methanesulfonate (MS-222).

Gear Type: A variety of gears will be used to remove nonnative fish species, including Promar collapsible nets (0.3 m diameter, 0.6 and 0.9 m long, double throat, 1.2 cm mesh), backpack electrofishers (Smith-Root LR-24 or LR-20B), and seines. Traps will be baited with wet or dry dog food. Trap ties will be sprayed with animal repellent to deter wildlife from entering or pulling nets out of water. Traps will be set in

daytime and fished overnight. Time of deployment and retrieval of traps will be recorded, but effort will be summarized as trap sets regardless of the actual time fished. Traps will be set with air-pockets to prevent non-targeted animals from drowning.

All species collected will be identified, classified as either juvenile or adult, and enumerated. Total length (TL) measurements in millimeters (mm) will be recorded for Yellow Bullhead and sexed if gametes expressed. Yellow Bullhead ≥140 mm TL will be classified as adult, whereas <140 TL will be classified as juvenile.

All nonnative fish species will be placed in a bucket and euthanized with an overdose of tricane methanesulfonate (MS-222) and discreetly placed away from the creek and visitors in a debris pile or buried. Non-targeted native species, including Sonora Mud Turtle (*Kinosternon sonoriense*) will be returned to the water immediately at or near the point of capture to minimize impacts to them.

Data Analysis: To assist in data analysis and to track Yellow Bullhead distribution, removal efforts will be recorded by low-water road crossings (n=15), which divide Bonita Creek into 15 segments. Data will be entered and maintained in a Microsoft Access® database to facilitate analysis. Data analysis will include number of each species removed by segment and total number, catch per unit effort (CPUE) by segment, and total CPUE (per trip). Removal and annual fish monitoring data will be used to track presence, absence, and distribution of both native and nonnative fish species. Data will be used to provide relative abundance that could show what effect, if any, removal has on native and nonnative fish species. This information will be provided in a final report along with methods, results, discussion, and conservation and management recommendations.

A minimum of five removals trips will be conducted at Bonita Creek in 2025. Removals prior to June will target Yellow Bullhead prior to spawning (Table 5).

Aravaipa Creek

Background: Considered one of the premiere native fish assemblages in the state, Aravaipa Creek (Figure 2) supports eight populations of native fish species, including Loach Minnow, Spikedace, Gila Topminnow, Roundtail Chub, Speckled Dace, Longfin Dace, Sonora Sucker, and Desert Sucker. Additionally, Gila Topminnow (*Poeciliopsis occidentalis*) was stocked by The Arizona Game and Fish Department in April 2022 on lands owned and managed by The Nature Conservancy, Aravaipa Canyon Preserve. It is unknown at this time whether or not they will persist. Nonnative predatory and competitive fishes, including Yellow Bullhead and Red Shiner (*Cyprinella lutrensis*) inhabit the mainstem of Aravaipa Creek and threaten the native fishes. A third nonnative fish species, Green Sunfish, was successfully removed from Horse Camp Canyon, a tributary to Aravaipa Creek, by BLM, SFO and partners using a variety of gear types, including Promar traps, Gee metal minnow traps, dipnets, seines, and backpack electrofishers from 2010 to 2015. With the elimination of Green Sunfish, the BLM, SFO and partners-initiated removal of Yellow Bullhead from Aravaipa Creek in 2017 as nonnative fish are the greatest threat to the native fish community. Paired fish barriers constructed in 2001 by Bureau of Reclamation protect Aravaipa Creek from future invasions of nonnative fishes from the San Pedro River.

The purpose of this task is to remove nonnative fishes, Yellow Bullhead and Red Shiner from Aravaipa Creek to protect the extant native fish community. Although both species prey upon and compete with the native species, removal efforts will focus primarily on habitats occupied by Yellow Bullhead, which includes pools, backwaters, and streambank margins. By focusing on these habitats, impacts to federally endangered Loach Minnow and Spikedace will be minimal. Red Shiner will not be targeted directly since their habitat preferences tend to overlap with both Loach Minnow and Spikedace.

Summary of Past Results: The BLM, SFO and partners have conducted 47 trips since September 2017 and removed 17,054 Yellow Bullhead. An additional 270 Yellow Bullhead were captured and removed during Loach Minnow and Spikedace hatchery augmentation collections, fish health assessments, and backpack electrofishing demonstrations for a total of 17,324 Yellow Bullhead (Table 6).

Geographical Area: Aravaipa Creek is a tributary to the San Pedro River and is located in southeastern Arizona about 50 miles west of Safford, Arizona, along the border of Graham and Pinal counties (Figure 2). The creek becomes perennial at Aravaipa Spring near Stowe Gulch on lands owned and managed by The Nature Conservancy, Aravaipa Canyon Preserve, and flows west to the San Pedro River approximately 22-miles. The watershed covers 558 square miles (356,984 acres) and includes multiple tributaries, some which contribute flow to the mainstem. Landownership is comingled with private, federal, and tribal inholdings. The two primary managers/landowners, BLM, SFO and The Nature Conservancy are supportive of the project along with private landowners.

Species Protected: Nonnative fish removal from Aravaipa Creek will help secure and protect populations of federally endangered Loach Minnow (*Tiaroga cobitis*) and Spikedace (*Meda fulgida*). Additionally, federally endangered Gila Topminnow (*Poeciliopsis occidentalis*) was stocked by The Arizona Game and Fish Department in April 2022 on lands owned and managed by The Nature Conservancy, Aravaipa Canyon Preserve. Other species that benefit from continued nonnative fish removal include Roundtail Chub (*Gila robusta*), Longfin Dace (*Agosia chrysogaster*), Speckled Dace (*Rhinichthys osculus*), Sonora Sucker (*Catostomus insignis*), Desert Sucker (*Pantosteus clarkii*), and Lowland Leopard Frog (*Rana yavapaiensis*).

Broodstock of the genetic lineages of Aravaipa Creek Loach Minnow and Spikedace are maintained at the Aquatic Research and Conservation Center (ARCC) as refuge stock, for repatriations into appropriate and protected streams within Arizona and New Mexico, and for research. Currently, new broodstock is obtained annually from Aravaipa Creek for both species, which makes it imperative to secure and protect the extant populations by eliminating nonnative predators and competitors from the system.

Methodology: A variety of gear types will be used to remove nonnative fish species, including backpack electrofishers (Smith-Root LR-24 or LR-20B), Promar collapsible traps (0.3 m diameter, 0.6 and 0.9 m long, double throat, 1.2 cm mesh), and seines. Backpack electrofishing will be the primary method used due to its proven effectiveness at Aravaipa Creek. Backpack electrofishing used in conjunction with dip-nets, or seines ("block and shock") will be used in pool, run, and riffle habitats. Seines and traps will be used in deeper pool habitats where electrofishing is not effective. If traps are used, their location will be marked with a UTM coordinate or conspicuously identified if no GPS signal is available, they will be baited with wet or dry dog food and set for a maximum of two hours. Benefits of these removal methods include low impact to non-targeted species and neutral to positive public acceptance. Chemical renovation is not feasible due to lack of public support, habitat complexity, and adverse impacts to threatened and endangered fish species.

Total length measurements in millimeters will be recorded for Yellow Bullhead and Red Shiner and sexed if gametes expressed. All nonnative fish species will be placed in a bucket and euthanized with an overdose of tricane methanesulfonate (MS-222) and discreetly placed away from the creek and visitors in a debris pile or buried. Non-targeted native species, including Lowland Leopard Frog will be returned to the water immediately at or near the point of capture to minimize impacts to them.

Removal efforts, when feasible, will focus on adults prior to spawning (*i.e.,* March) since larger individuals usually have greater fecundity (Birkeland and Dayton, 2005; Danylchuk and Fox, 1994; and Blumer1985)

and during periods of low flow. From mid-May to June sections of Aravaipa Creek near the constructed fish barriers start to dry eliminating habitat and stranding and killing fish in pools. This drying allows for selective removal of nonnatives. Flood events are also exploited as flooding events potentially stress and wash nonnative fish downstream likely temporarily reducing the population. Winter flood events are more likely to fill in pool habitat, reducing preferred habitat for Yellow Bullhead and increasing sampling effectiveness.

A minimum of five removals will be conducted at Aravaipa Creek in 2025. Removals before June will target Yellow Bullhead prior to spawning (Table 7).

Data Analysis: To assist in data analysis and to track Yellow Bullhead distribution, removal efforts will be recorded in discrete 500-meter segments (n=79) along the entirety of the 22-mile target reach. Data will be entered and maintained in a Microsoft Access® database to facilitate analysis. Data analysis will include number of each species removed by site and total number, catch per unit effort (CPUE) by site (500-meter segment) and total CPUE (per trip), and total length-frequency by nonnative species. Removal and bi-annual fish monitoring data will be used to track presence, absence, and distribution of both native and nonnative fish species. Data will be used to provide relative abundance that could show what effect, if any, removal has on native and nonnative fish species. The purposeful avoidance of catching native fish species during electrofishing in Aravaipa Creek will preclude analysis of native fish trends from these data. However, bi-annual sampling conducted on both streams along with trapping conducted during removal efforts will be available for analysis. This information will be provided in a final report along with methods, results, discussion, and conservation and management recommendations.

Program Priorities:
The ongoing effort to remove nonnative fish from Bonita and Aravaipa Creeks, if successful, will stabilize and secure six wild populations of Gila River basin fishes (*i.e.,* BLM Sensitive Speckled Dace, Longfin Dace, Sonora Sucker, and Desert Sucker), including two priority species, Gila Chub and Gila Topminnow in Bonita Creek and eight wild populations of Gila River basin fishes (*i.e.,* BLM Sensitive Roundtail Chub, Speckled Dace, Longfin Dace, Sonora Sucker, and Desert Sucker), including three priority species, Loach Minnow, Spikedace, and Gila Topminnow in Aravaipa Creek.

Immediate, on-the-ground benefits result with each Yellow Bullhead removed as a dietary analysis of 243 Yellow Bullhead collected from Aravaipa Creek from 2005 through 2006 confirmed predation on native fishes and frogs, including federally endangered Loach Minnow. Fifteen native fish and one lowland leopard frog were removed from the intestinal tracts of 14 of the 243 Yellow Bullhead captured (one stomach had two fish, a Desert Sucker and Longfin Dace). In addition, The National Aquatic Monitoring Center identified 93 fish parts from 43 of the Yellow Bullhead intestinal tracts. Predation on native fish ova, larvae, and small juveniles may have escaped detection because early life stages digest rapidly and become unrecognizable among gut contents.

Bureau of Land Management, Safford Field Office, United States Fish and Wildlife Service, Arizona Game and Fish Department, Bureau of Reclamation, and The Nature Conservancy 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 eradicate nonnative fish species, and to prevent future upstream incursions of nonnative fish into these systems.

Partnerships:

The Bonita Creek nonnative fish removal project was initiated by BLM, SFO in 2009 and the Aravaipa Creek nonnative fish removal project in 2010. Both projects have been partially funded through the Gila River Basin Native Fish Conservation Program. Other partners that have worked on these projects over the years include, Arizona Game and Fish Department, US Fish and Wildlife Service, Bureau of Reclamation, The Nature Conservancy, University of Arizona, Gila Watershed Partnership, Arizona-Sonora Desert Museum, United States Forest Service, Arizona and New Mexico, and volunteers.

Strategic Plan Goals:

- Scientific Foundation
    - Goal 1. Investigate novel methods to control nonnative aquatic biota.
        - Objective 1a. Seek at least one opportunity to partner or fund new control methods or improvements upon existing methods.
- Preventing Extinction and Managing Toward Recovery
    - Goal 3. Remove nonnative aquatic species threats.
        - Objective 3a. Eradicate or suppress nonnative aquatic species from a minimum of five surface waters to prepare them for repatriations of native fishes.
    - Goal 7. Monitor to quantitatively measure and evaluate project success in improving the status of target species and their habitats.
        - Objective 7b. Develop/identify monitoring standards as necessary to adequately evaluate fish barrier function, success and failure of nonnative fish species eradications/suppression, and success and failure of repatriations of 5 priority species.

Recovery Goals:

- Loach Minnow and Spikedace recovery plans (1991)
    - Task 5.1 (Priority 2): Identify target areas amenable to management.
    - Task 5.2 (Priority 2): Determine necessary habitat and landscape improvements. This includes removal or other control of nonnative fishes, where they are problematic.
    - Task 5.3 (Priority 3): Implement habitat improvement. This includes repeated management to remove nonnatives.
    - Task 6.2.2 (Priority 3): Enhance habitat as necessary.
    - Task 6.2.3 (Priority 3): Assess status of nonnative fishes in watershed.
    - Task 6.2.5 (Priority 3): Reclaim as necessary to remove nonnative fishes.
- Gila Topminnow draft recovery plan (1999)
    - Task 2.4 (Priority 1): Protect habitats of reestablished or potential populations from detrimental nonnative aquatic species.
    - Task 3.1 (Priority 1): Develop standardized population and habitat monitoring protocols and implement them.
- Gila Chub draft recovery plan (2015)
    - Subtask 1.3.1 (Priority 1): Eliminate or control problematic nonnative aquatic organisms.
    - Task 7 (Priority 3) Monitor remnant, repatriated, and refuge populations to inform adaptive management strategies.

Estimated Time and Cost:

- Cost: BLM, SFO is requesting $25,000 for fiscal year 2025 to supplement ongoing Yellow Bullhead removal from Bonita and Aravaipa Creeks (Table 8).

- Urgency: The native fish communities in Bonita and Aravaipa Creeks have been able to persist with Yellow Bullhead under current conditions. Removal of Yellow Bullhead will increase resiliency of the native fish populations in both streams, which will help them withstand or recover from ongoing and future stressors such as climate change and water withdrawals.
- Readiness: Removal of Yellow Bullhead from Bonita and Aravaipa Creeks is ongoing. No ESA or NEPA compliance documents are required.
- In-Kind or Matching Funds: BLM, SFO covers salary, vehicle, supplies, and equipment for Yellow Bullhead removal at Bonita and Aravaipa Creeks (Table 8).

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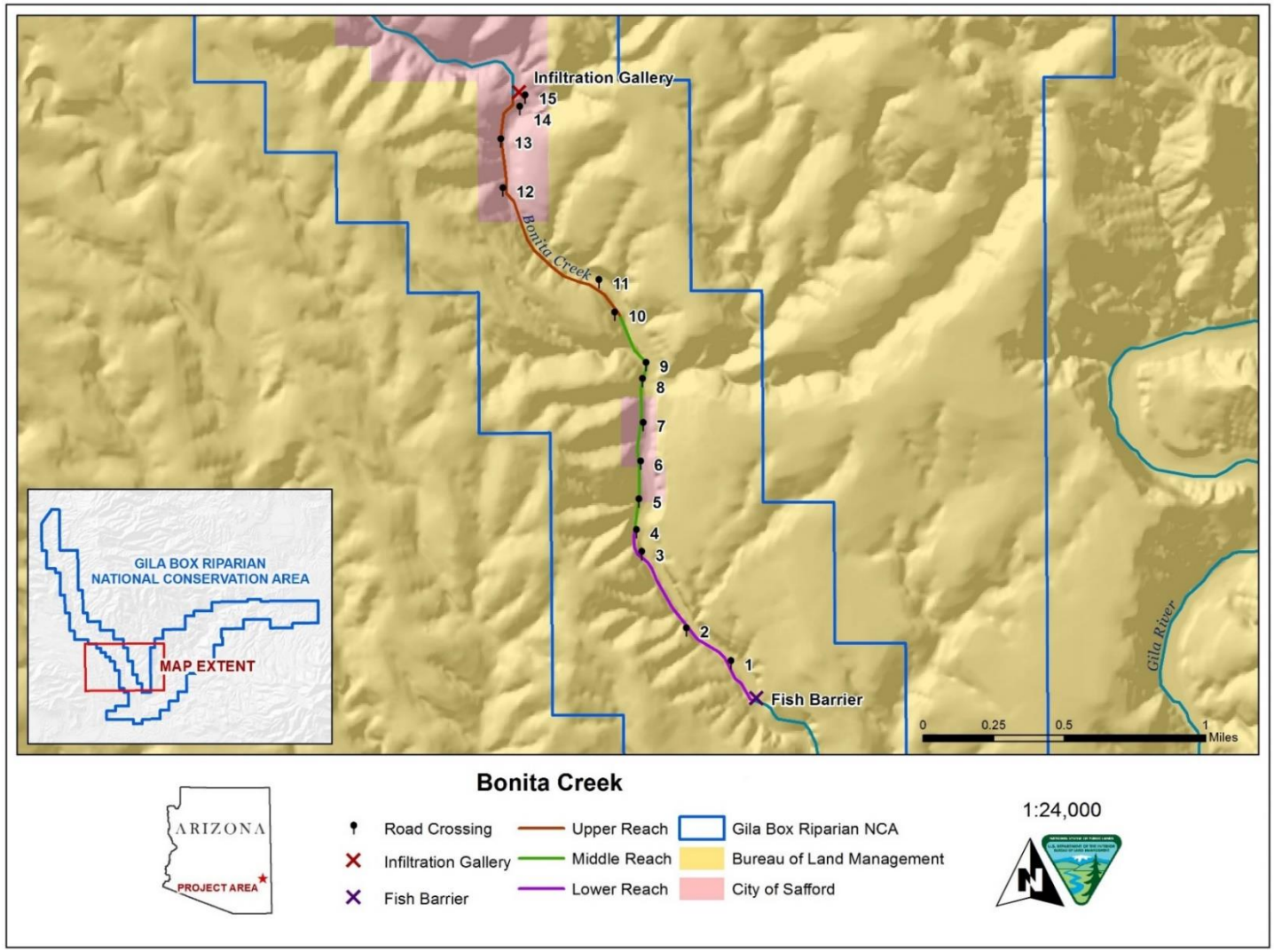

Figure 1. Map of Bonita Creek showing project area, including location of low water road crossings, City of Safford infiltration gallery, fish barrier, and reaches.

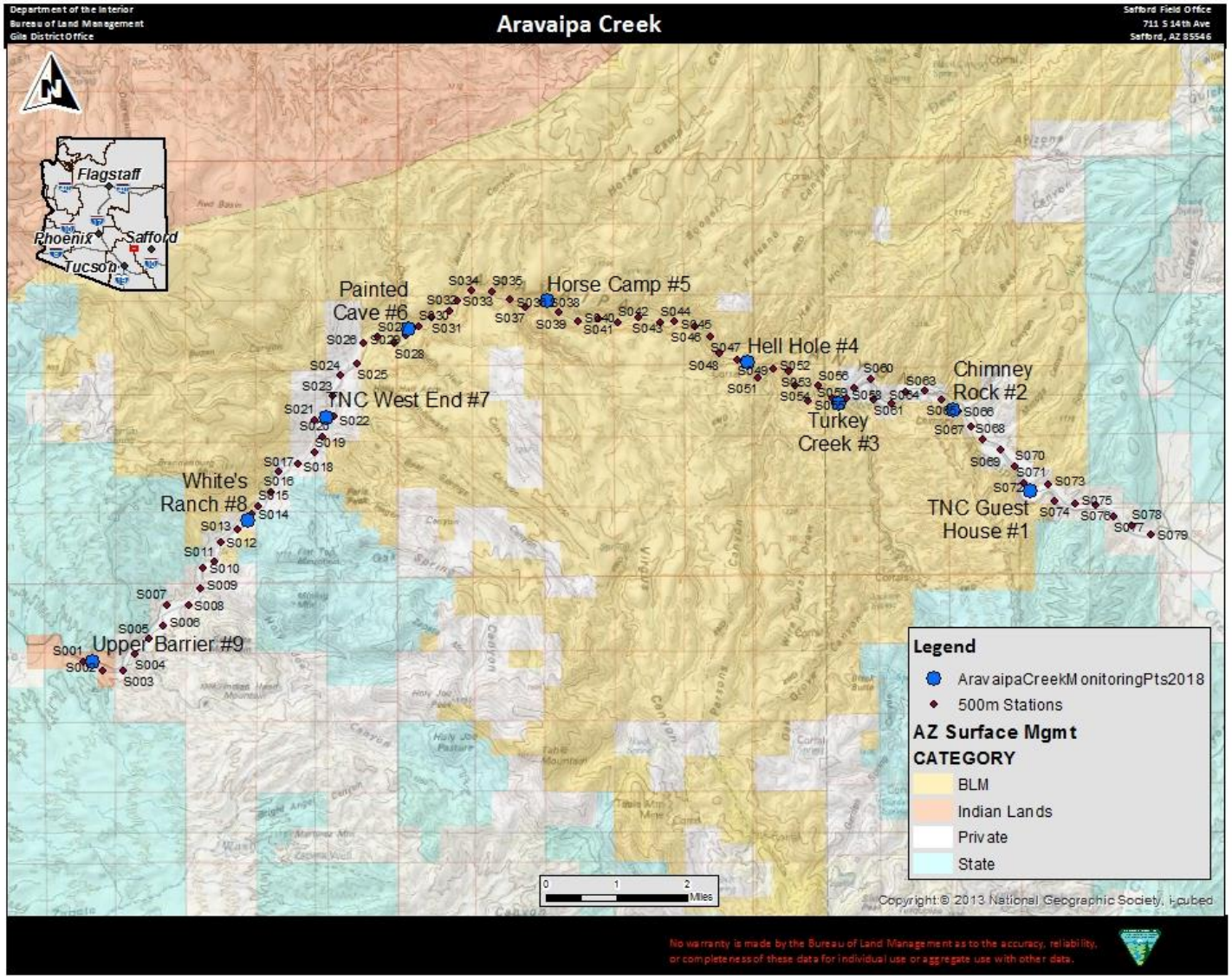

Figure 2. Map of Aravaipa Creek showing land ownership, project area, 500-meter reaches, and permanent fish monitoring sites.

Table 1. Gear type and total number of Green Sunfish removed from Bonita Creek, 2009-2023.

Gear Type	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018-2023	Total
Gee Minnow Trap	350	1,688	2,324	3,701	1,152	2,278	1,329	2,815	2		15,384
Promar Net	614	566	832	1,623	857	521	574	576	5		5,602
Hoop Net			76	224	148	198	204	126			976
Gee and Promar - Combined			756								756
Seine					186			12			371
Seines/Dipnets	173										
Dip Net					93						93
Red Promar	11				4			42			53
Backpack Electrofisher	10	8	10			2					30
Tote Barge Shocker						7					7
Custom Trap						8	1				9
Crab Trap					1						1
Total	1,158	2,262	3,998	5,548	2,441	3,014	2,108	3,571	7	0	24,107

Table 2. Summary of Yellow Bullhead removal by backpack electrofisher from Bonita Creek in 2023.

Removal Date	Location-Road Crossings	Effort Minutes	Number of Yellow Bullhead Removed	CPUE
3/16/2023	3-4	27.17	3	0.11
3/16/2023	4-5	20.38	7	0.34
3/16/2023	5-6	27.92	10	0.36
4/6/2023	5-6	24.05	5	0.21
4/6/2023	6-7	9.12	1	0.11
6/5/2023	0-1	45.38	34	0.75
6/5/2023	1-2	86.93	110	1.27
6/6/2023	2-3	85.67	77	0.90
6/6/2023	3-4	19.62	6	0.31
6/6/2023	4-5	17.85	3	0.17
6/6/2023	5-6	27.43	7	0.26
6/6/2023	6-7	20.15	8	0.40
6/7/2023	7-8	35.52	7	0.20
6/7/2023	10-11	4.02	0	0.00
6/7/2023	11-12	112.15	135	1.20
6/7/2023	12-13	28.72	15	0.52
6/7/2023	13-14	13.68	6	0.44
6/8/2023	1-2	57.70	39	0.68
7/15/2023	0-1	97.45	65	0.67
7/15/2023	1-2	98.68	62	0.63
7/15/2023	2-3	76.12	47	0.62
7/31/2023	0-1	86.70	135	1.56

Table 2. (Continued).

Removal Date	Location-Road Crossings	Effort Minutes	Number of Yellow Bullhead Removed	CPUE
7/31/2023	1-2	48.33	37	0.77
7/31/2023	2-3	34.72	41	1.18
8/1/2023	2-3	65.97	26	0.39
8/1/2023	3-4	21.37	4	0.19
8/1/2023	4-5	18.37	7	0.38
8/1/2023	5-6	27.28	9	0.33
8/1/2023	6-7	20.37	8	0.39
8/1/2023	7-8	22.12	6	0.27
8/2/2023	11-12	103.25	116	1.12
8/2/2023	12-13	36.83	13	0.35
8/2/2023	13-14	15.70	1	0.06
8/3/2023	14-15	1.58	0	0.00
8/14/2023	0-1	68.47	56	0.82
8/14/2023	1-2	89.25	56	0.63
8/14/2023	2-3	114.55	126	1.10
8/14/2023	4-5	32.00	1	0.03
8/14/2023	5-6	36.80	5	0.14
8/14/2023	6-7	28.15	6	0.21
8/14/2023	7-8	16.62	4	0.24
8/14/2023	11-12	88.97	77	0.87
8/14/2023	12-13	28.28	4	0.14
8/14/2023	13-14	15.03	0	0.00
8/15/2023	0-1	101.52	44	0.43
8/15/2023	1-2	105.40	50	0.47
8/15/2023	2-3	142.72	57	0.40
8/15/2023	3-4	22.48	4	0.18
8/15/2023	4-5	17.87	1	0.06
8/15/2023	5-6	29.43	3	0.10
8/15/2023	6-7	18.27	4	0.22
8/15/2023	7-8	15.43	6	0.39
8/15/2023	11-12	132.13	38	0.29
8/15/2023	12-13	39.80	8	0.20
8/15/2023	13-14	18.60	0	0.00
8/16/2023	0-1	110.15	33	0.30

Table 2. (Continued).

Removal Date	Location-Road Crossings	Effort Minutes	Number of Yellow Bullhead Removed	CPUE
8/16/2023	1-2	54.58	23	0.42
8/16/2023	2-3	152.32	67	0.44
8/16/2023	3-4	17.50	2	0.11
8/16/2023	4-5	24.83	0	0.00
8/16/2023	5-6	34.92	2	0.06
8/16/2023	6-7	18.98	0	0.00
8/16/2023	7-8	14.85	3	0.20
8/16/2023	11-12	67.70	1	0.01
8/16/2023	12-13	23.67	0	0.00
8/16/2023	13-14	12.97	1	0.08
8/17/2023	0-1	39.95	8	0.20
8/17/2023	1-2	69.65	43	0.62
8/17/2023	2-3	74.13	44	0.59
8/17/2023	3-4	11.62	0	0.00
8/17/2023	4-5	14.58	1	0.07
8/17/2023	5-6	26.37	1	0.04
8/17/2023	6-7	16.40	1	0.06
8/17/2023	7-8	13.03	5	0.38
8/17/2023	11-12	68.57	19	0.28
8/17/2023	12-13	17.08	0	0.00
8/17/2023	13-14	8.32	0	0.00
10/2/2023	0-1	31.60	6	0.19
10/2/2023	1-2	76.13	65	0.85
10/3/2023	2-3	62.60	46	0.73
10/3/2023	3-4	18.15	8	0.44
10/3/2023	4-5	11.52	2	0.17
10/3/2023	5-6	24.95	11	0.44
10/4/2023	6-7	19.20	3	0.16
10/4/2023	7-8	20.43	4	0.20
10/4/2023	11-12	102.27	59	0.58
10/4/2023	12-13	21.72	0	0.00
10/4/2023	13-14	9.63	0	0.00
10/5/2023	1-2	42.40	34	0.80
10/5/2023	2-3	25.72	7	0.27
Total			**2,099**	

Table 3. Summary of Yellow Bullhead removal by Promar Traps from Bonita Creek in 2023.

Removal Date	Location-Road Crossings	Effort (NN)	Number of Yellow Bullhead Removed	CPUE
6/5-6/2023	0-1	25	54	2.16
6/6-7/2023	0-1	25	17	0.68
6/7-8/2023	11-12	10	19	1.90
8/1-2/2023	0-1	25	48	1.92
8/1-2/2023	1-2	5	12	2.40
8/1-2/2023	2-3	15	43	2.87
8/2-3/2023	0-1	25	20	0.80
8/2-3/2023	1-2	16	37	2.31
8/14-15/2023	0-1	25	11	0.44
8/14-15/2023	4-5	10	5	0.50
8/14-15/2023	5-6	7	8	1.14
8/14-15/2023	6-7	4	5	1.25
8/14-15/2023	11-12	25	18	0.72
8/15-16/2023	0-1	25	8	0.32
8/15-16/2023	3-4	16	8	0.50
8/15-16/2023	5-6	10	5	0.50
8/15-16/2023	6-7	8	4	0.50
8/15-16/2023	7-8	13	32	2.46
8/16-17/2023	0-1	35	21	0.60
8/16-17/2023	2-3	29	46	1.59
8/16-17/2023	3-4	4	8	2.00
8/16-17/2023	5-6	31	15	0.48
8/16-17/2023	6-7	3	3	1.00

8/16-17/2023	7-8	7	6	0.86
8/16-17/2023	11-12	10	34	3.40
8/17-18/2023	3-4	4	1	0.25
8/17-18/2023	4-5	5	3	0.60
8/17-18/2023	5-6	25	5	0.20
8/17-18/2023	6-7	3	4	1.33
8/17-18/2023	7-8	7	7	1.00
8/17-18/2023	11-12	5	3	0.60
8/17-18/2023	12-13	5	10	2.00
8/28-29/2023	12-13	18	3	0.17
8/28-29/2023	13-14	16	15	0.94
9/19-20/2023	11-12	25	22	0.88
10/2-3/2023	11-12	15	8	0.53
10/2-3/2023	12-13	10	0	0.00
10/3-4/2023	11-12	25	6	0.24
10/4-5/2023	11-12	25	4	0.16
Total			**578**	

Table 4. Summary of Yellow Bullhead removal by Gee Metal Traps from Bonita Creek in 2023.

Removal Date	Location-Road Crossings	Effort (NN)	Number of Yellow Bullhead Removed	CPUE
8/14-15/2023	0-1	24	15	0.63
8/15-16/2023	0-1	24	9	0.38
8/16-17/2023	0-1	24	10	0.42
8/16-17/2023	2-3	10	2	0.20

Table 5. Proposed Timeline Yellow Bullhead removal from Bonita Creek for 2025.

Timeline 2025											
January	**February**	**March**	**April**	**May**	**June**	**July**	**August**	**September**	**October**	**November**	**December**
	X	**X**	**X**	**X**	**X**						

Table 6. Summary table of Yellow Bullhead removal from Aravaipa Creek from September 14, 2017, through December 9, 2023.

Removal Date	Location	Distance Covered (river kilometers)	Effort (Seconds)	Number of Yellow Bullhead Removed	Comments
9/14/2017	East & West Ends	18	18,360	284	
10/15/2017	West End	0.5	1,222	27	Collected during a backpack electrofishing demonstration
11/6/2017	East End	0.18	-----	8	Incidental to Loach Minnow and Spikedace hatchery collection
02/26-03/01/2018	East End	13	9,152	89	
3/13/2018	East & West Ends	6.5	17,877	85	
4/15/2018	West End	0.5	1,354	11	Collected during a backpack electrofishing demonstration
04/23-26/2018	East End	3	13,198	48	
11/9-11/2018	East & West Ends			3	
03/4-6/2019	East End	8	19,492	17	
3/25/2019	West End	0.45		12	Incidental to fish health collection
04/8-11/2019	West End	8	12,981	61	
10/18-19/2019	East & West Ends			2	Fall fish monitoring - seine
10/20/2019	West End	-----	-----	3	Collected during a backpack electrofishing demonstration
11/6/2019	West End	1	3,274	40	
1/9/2020	West End	1	882	2	
1/14/2020	West End	4	3,469	21	
2/24-27/2020	West End	7	22,246	184	
2/24-27/2020	West End	-----	-----	2	Caught in Promar® trap
4/16/2020	East End	-----	-----	1	Caught in Promar® trap
4/27-30/2020	East End	12	26,511	163	
5/11-14/2020	East End	12.5	16,229	95	
5/25-28/2020	West End	8	25,407	250	
6/22-25/2020	West End	13	41,098	367	
7/11/2020	West End	5	6,353	94	
7/28-31/2020	East End	12	19,417	453	
10/16-17/2020	East & West Ends	-----	-----	127	Fall fish monitoring - seine
11/9-12/2020	East End	8	31,836	1155	
11/9-12/2020	East End	-----	-----	111	43 seine hauls
3/22-25/2021	West End	9	62,820	243	
3/30-4/1/2021	East & West Ends	23	270,592	1920	
4/9-10/2012	East & West Ends			10	Spring fish monitoring - Seine

Table 6. (Continued).

4/26-29/2021	East End	6	27,605	214	
5/27-30/2021	West End	6	30,859	446	
8/23-26/2021	West End	7.5	27,583	1194	
10/8-9/2021	East & West Ends			13	Fall fish monitoring - seine
4/9/2022	East & West Ends	1.5		3	Spring fish monitoring - Seine
04/26-28/2022	East-end	13	29,640	382	
4/27/2022	East-end	----		11	Seine
7/1/2022	West-end	1	4,119	69	
08/29-09/1/2022	West-end	8	23,537	478	
2/8/2023	West-end	0.5		4	Captured as part of the T&E leads visit.
2/21/2023	East-end	2	2,698	1	
3/27-29/2023	West-end	6.5	14,356	50	
4/1/2023	East-end	0.5		2	Spring fish monitoring - Dipnet
4/12-14/2023	East-end	8	13,833	93	
5/8-10/2023	West-end	8.5	11,861	44	
5/15-16/2023	East-end	4.5	7,746	47	
6/20-22/2023	West-end	5	20,818	186	
07/5-6/2023	West-end	2.5	25,491	566	
7/17/2023	East-end	1	5,141	15	
8/5/2023	West-end	1		80	Dipnet Sweeps
8/12/2023	West-end	2.5		346	Dipnet Sweeps
8/26/2023	West-end	3		319	Dipnet Sweeps
08/28-31/2023	East-end	5.5	33,127	2260	
9/2/2023	West-end	1.5		67	Dipnet Sweeps
9/10/2023	West-end	0.5		19	Dipnet Sweeps
9/16/2023	West-end	1.5		119	Dipnet Sweeps
09/26-29/2023	West-end	4.5	30,332	1930	
10/6-7/2023	West & East Ends	3.5		48	Fall fish monitoring - seine
10/23-26/2023	East-end	9	29,602	361	
10/30-11/2/2023	West-end	5.5	36,011	1982	
11/11/2023	West-end	1		30	Dipnet Sweeps
12/09/2023	West-end	1.2	10,734	57	
Total		296.13	1,008,863	17,324	

Table 7. Proposed timeline for Yellow Bullhead removal from Aravaipa Creek for 2025.

Timeline 2025											
January	**February**	**March**	**April**	**May**	**June**	**July**	**August**	**September**	**October**	**November**	**December**
	X	**X**	**X**	**X**	**X**						

Table 8. Proposed Budget for Yellow Bullhead Removal in 2025.

Budget Categories:	**Rate or Cost Explanation**	**CAP Program to Fund:**	**Applicant Contribution:**	**Total Cost per Category:**
Personnel (Labor)	$40.00*50 hrs. per month on nonnative removal projects.		$24,000	$24,000
Fringe Benefits (ERE)			$7,263	$7,263
Supplies (AOO)	Nets, MS222, field supplies		$1,250	$1,250
Contractual (Professional Outside Services)	$5,500.00*5 removal trips. Technician for individual trips $15.00/hr.*200 hrs.	$25,000	$0.00	$25,000
Other	Vehicle Mileage (2,208 miles *$0.575/mile)		$1,270	$1,270
Total Cost per Year		$25,000	$33,783	**$58,783**

Hatchery Workplan

Project 10: Aquatic Research and Conservation Center Populations
(Task ID: HA-2006-2)

Implementing Entity: Arizona Game and Fish Department
Start Year: 2003 and 2006
Location(s): Aravaipa Creek and Blue River; Aquatic Research and Conservation Center
Species Protected:

- Spikedace: three refuge populations (Aravaipa Creek, Upper Gila River and Gila River Forks), of the two existing, still detected, remnant populations; the latter two are genetically equivalent.
- Loach Minnow: three refuge populations (Aravaipa Creek, Blue River, San Francisco River) of the five existing, still detected, remnant populations.
- Gila Topminnow: one refuge population (Parker Canyon).
- Desert Pupfish: currently no populations.
- Roundtail Chub: one refuge population of the Eagle Creek lineage which is replicated in Blue River.

Project Description:
Background: This project has two major components: 1) acquiring Spikedace and Loach Minnow and other rare species from the wild, and 2) all activities to maintain and propagate populations at the Aquatic Research and Conservation Center (ARCC).

Acquisition of Spikedace and Loach Minnow and other rare species from the wild
This is an ongoing project dating back to 2003. The scope of the project includes all occupied remnant or recently occupied streams with Spikedace and Loach Minnow: Aravaipa Creek, Blue River, East Fork Black River, upper Verde River, and Eagle Creek in Arizona, and the San Francisco River, upper Gila River and Gila River Forks in New Mexico. The scope of the project also includes collections of remnant populations of Roundtail Chub[1] as needed. Chub have previously been collected from Eagle Creek, Dix Creek, and Harden Cienega Creek. Collections of Aravaipa Creek Spikedace and Loach Minnow have occurred annually since 2013 with semi-annual collections dating back to 2007. Collections of Loach Minnow from the Blue River are less consistent with a total of ten collections from 2007-2022. During 2007 through 2015 the Department made multiple unsuccessful attempts to collect Loach Minnow from East Fork Black River, Spikedace from the Verde River, and Spikedace and Loach Minnow from Eagle Creek. Collections from New Mexico were primarily completed by New Mexico Department of Game and Fish (NMDGF), and were sporadic with seven collections of Spikedace and seven collections of Loach Minnow from 2009-2021 from the Gila River Forks. The last Upper Gila River collections for Spikedace occurred in 2009. San Francisco River Loach Minnow were only collected in 2013. Eagle Creek Roundtail Chub were collected in 2010 and 2011. Roundtail Chub[1] were temporarily brought into ARCC from Dix and Harden Cienega Creeks during 2010-2014 before being transferred to NMDGF for stocking into Mule Creek.

Work planned for FY2024 includes collections of Spikedace and Loach Minnow from Aravaipa Creek and collection of Loach Minnow from the Blue River. Collections from other Arizona streams will only be attempted if other biologists detect either species. Collections from all streams will continue annually until there is no longer a need for captive refuge and propagation of Spikedace and Loach Minnow.

[1] Including populations previously classified as Gila Chub.

Aquatic Research and Conservation Center
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 translocations. 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, Reclamation began providing funds (through U. S. Fish and Wildlife Service) for a variety of improvements to ARCC, including new spawning raceways between existing structures, a new quarantine building, and new ponds.

In FY2024, ARCC staff will focus on propagating lineages that are slated for translocations, including Eagle Creek Roundtail Chub, 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 focus on research to improve propagation success, and survival of stocked fish. Health assessments of fish from donor sites will be completed before any translocation to ARCC, and an annual health assessment of fish at ARCC will be performed before any fish from ARCC are stocked.

Coordinated through the GRBNFCP, ARCC facilities may also serve as holding space for the emergency salvage effort, as protection against catastrophic loss in the wild in the event of wildfire or other threats.

Geographical Area:
Acquisition of Spikedace and Loach Minnow and other rare species from the wild
This project primarily occurs within the Aravaipa Creek drainage and the Blue River drainage in Arizona. The target species have not been detected in the other Arizona streams (Eagle Creek, Verde River, and East Fork Black River) in recent decades. Aravaipa Creek supports remnant populations of Spikedace and Loach Minnow above a barrier. Collections are most frequently made near the upstream end of perennial flow where both Spikedace and Loach Minnow are typically abundant. Aravaipa Creek is owned and managed cooperatively by the Bureau of Land Management (BLM) and The Nature Conservancy (TNC), with some smaller parcels of private land. The BLM and TNC are both supportive of ongoing native fish conservation activities.

The Blue River drainage supports a large remnant metapopulation of Loach Minnow above a constructed barrier near the confluence with the San Francisco River. Loach Minnow inhabit the Blue River and its tributaries including Little Blue Creek, Grant Creek, KP Creek, Campbell Blue Creek, Dry Blue Creek, Pace Creek, and Frieborn Creek. Collections have typically been made near the confluence with Campbell Blue Creek (680777/3732393) or downstream near Juan Miller Crossing (668032/3685120). The majority of the Blue River drainage is owned by Apache-Sitgreaves National Forest with some inholdings of private land. The Forest is supportive of ongoing native fish conservation activities.

If Spikedace or Loach Minnow are detected in drainages where they are currently presumed to be extirpated, the Department would likely attempt to collect fish for ARCC. Spikedace were last detected in the upper Verde River in 1999 and in Eagle Creek in 1989. Loach Minnow were last detected in East Fork Black River in 2004 and in Eagle Creek in 1997. Apparent extirpations are most likely due to negative interactions with nonnative aquatic species. All project area locations are on U.S. Forest Service (USFS) property which is supportive of recovery actions.

Aquatic Research and Conservation Center
The ARCC facility is located near Page Springs, Arizona.

Methodologies:

Acquisition of Spikedace and Loach Minnow and other rare species from the wild

ARCC staff determines the target number of wild fish necessary to maintain broodstocks of each lineage at the end of each year. The U.S. Fish and Wildlife Service (USFWS) collaborates with the Department and other partners (BLM and University of Arizona for Aravaipa Creek) to evaluate survey information and determine a quota of fish to be removed from each donor stream without negatively affecting the population. Quotas do not necessarily meet the target number requested by ARCC staff.

A fish health assessment will be carried out each year by collecting 30 individuals of the target species or a closely related surrogate species (Longfin Dace, Speckled Dace) from each donor stream. Fish are typically collected by seining or electrofishing. If parasites or pathogens of concern are not detected during the fish health assessment process, collections of target fish can proceed. Fish are collected from donor populations by seining or electrofishing and transported to ARCC in aerated coolers filled with water treated with salt and Amquel to minimize fish stress during transport. Other species (Gila Topminnow, Roundtail Chub[1], and Desert Pupfish) may be brought on station as needed.

Aquatic Research and Conservation Center

Propagation techniques and study designs can be found in the draft hatchery operation manual developed by ARCC staff.

Program Priorities:

The project helps protect remnant populations of Spikedace and Loach Minnow by maintaining captive refuge populations of each remnant lineage. The project helps to replicate remnant populations of Spikedace and Loach Minnow in the wild by bringing fish to a hatchery setting for propagation, and producing offspring for translocation to wild sites. This project further helps replicate populations by allowing for the development of propagation techniques and other research to improve reintroduction success. This project helps to stabilize existing wild populations by stocking offspring produced at ARCC into existing wild populations. This project has immediate on the ground benefits by providing source populations for future translocations of Spikedace and Loach Minnow.

Partnerships:

This is part of a larger collaborative effort to secure remnant populations and establish new populations of Spikedace and Loach Minnow. Partners include USFWS, NMDGF, BLM, and Reclamation. The NMDGF collects Spikedace and Loach Minnow from the remnant populations in New Mexico and transfers them to ARCC. This is a continuing project that has been funded by GRBNFCP since its inception in 2003. Continuous funding for this project is required to maintain the refuge populations, broodstock, and offspring for research and future translocations. This project builds upon GRBNFCP work by continuing to maintain previously collected broodstocks in a facility funded by the program.

Strategic Plan Goals:

- Scientific Foundation
    - Objective 3a. At a minimum, identify and implement at least one research project aimed at improving propagation.
- Preventing Extinction and Managing Toward Recovery
    - Objective 1b. Augment hatchery populations as outlined in broodstock management plans.

[1] Including populations previously classified as Gila Chub.

- Objective 1c. Ensure the Aquatic Research and Conservation Center (ARCC) has the staff support and supplies necessary to maintain propagation of Spikedace and Loach Minnow at a level needed to meet stocking demands provided wild fish are available.
- Objective 4b. Replicate each of the other priority species into a minimum of one surface water.

Recovery Goals:

- Spikedace and Loach Minnow recovery plans (1991); note these are two separate plans
  - Task 8.1 (priority 3): Select stocks to be used for hatchery brood stock
  - Task 8.2 (priority 3): Collect hatchery stocks
  - 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 recovery plan (1999 draft)
  - Task 1.1 (priority 1) Maintain refugia populations of natural populations
- Gila Chub draft Recovery plan (2015)
  - Task 4 (priority 2) Establish and maintain refuge populations in protected ponds or hatcheries as appropriate

Estimated Time and Cost:

- Cost: The estimated cost of this project in FY2025 is $146,471
  - *Acquisition of Spikedace and Loach Minnow and other rare species from the wild:* $6,702.
  - *Aquatic Research and Conservation Center:* $139,769.
- Urgency: This project is urgent because propagation of the remaining Spikedace and Loach Minnow lineages is of high importance for several planned restoration projects funded by this program. This project is also urgent because wild fish are typically needed each year to maintain broodstocks.
- Readiness: All compliance necessary to implement this project has been completed. Annual fish health assessments need to be completed for each donor location, and for ARCC.
- In-Kind or Matching Funds: This project does not have matching or in-kind funds.

Project Ranking

Projects were scored by each technical and affiliate committee member using the Program's Proposal Evaluation Form (see 2023 – 2027 Strategic Plan). Mean scores for all projects are displayed in the table below. Project evaluation and score ranking is part of the process, but not the only element, to help the Technical and Policy Committees evaluate project merits and provide recommendations.

Under the 2024 CAP Biological Assessment, Reclamation proposes to commit funding of $400,000 towards native fish conservation and non-native fish removal projects in FY2025. However, following project ranking and discussions with the Technical Committee, Reclamation has decided to commit to funding over this $400,000 threshold to support the top ten ranked projects (see table below). Total cost of these projects equals $448,228.

Proposed projects below the red line (also shaded) in the table will not be supported in FY2025 with Program funds. These projects include Spring Creek (Oak Creek tributary) Repatriations (AZ-2013-1), Harden Cienega Creek Native Fish Restoration (AZ-2014-1), Remote Site Inventory and Assessment (NM-2017-2), and George Wise Spring Nonnative Fish Removals (AZ-2023-1). Descriptions for these projects can be found in Appendix A.

Project #	Project Title	Mean Score	Project Cost	Subtotal
9	Mechanical Removal of Nonnative Fish from Bonita and Aravaipa Creeks	40.7	$ 25,000.00	$ 25,000
10	Aquatic Research and Conservation Center Populations	39.4	$ 146,769.00	$ 171,769
6	Upper Verde River Native Fish Restoration	37.1	$ 14,806.00	$ 186,575
4	Gila Topminnow and Gila Chub Stockings	36.3	$ 40,856.00	$ 227,431
7	Sharp Spring Native Fish Restoration	35.6	$ 15,535.00	$ 242,966
2	New Mexico T&E Fish Repatriations and Monitoring	35.5	$ 81,167.00	$ 324,133
3	Muleshoe Ecosystem Stream and Spring Repatriations	35.5	$ 9,641.00	$ 333,774
5	Blue River Native Fish Restoration	35.5	$ 36,974.00	$ 370,748
8	Eagle Creek Spikedace and Loach Minnow Reintroduction	35.5	$ 19,880.00	$ 390,628
1	Removal of Nonnative Fishes from West Fork Gila River	35.1	$ 57,600.00	$ 448,228
	Spring Creek (Oak Creek tributary) Repatriations	33.9	$ 6,632.00	$ 454,860
	Harden Cienega Creek Native Fish Restoration	32.5	$ 34,587.00	$ 489,447
	Remote Site Inventory and Assessment	31.6	$ 70,069.00	$ 559,516
	George Wise Spring Nonnative Fish Removals	28.0	$ 49,045.00	$ 608,561

FY2021 - FY2025 Budget

2021							
Task ID	**Start Year**	**Task Name**					**Total**
		New Mexico Recovery Actions	NMDGF	FWS	USFS	BLM	
NM-2006-1	2006	West Fork Gila River Mechanical Removal	$24,301	$10,300	$11,400		$46,001
NM-2002-1	2002	T&E Fish Repatriations and Monitoring	$34,445	$17,400	$15,900		$67,745
NM-2017-1	2017	Remote Site Inventory and Assessment (Previously Middle Fork Gila Inventory & Assessment)	$26,578	$16,700	$19,700		$62,978
NM-2020-1	2020	Gila Permanent Site Monitoring	$24,759	$2,910	$4,124	$9,850	$41,643
		Arizona Recovery Actions	AZGFD	FWS	BLM		
AZ-2003-1	2003	Muleshoe ecosystem stream and spring repatriations	$28,100				$28,100
AZ-2002-1	2002	Gila Topminnow Stockings	$45,200				$45,200
AZ-2013-1	2013	Spring Creek (Oak) repatriations	$6,800				$6,800
AZ-2002-3	2002	Blue River native fish restoration	$40,600				$40,600
AZ-2014-1	2014	Expand Roundtail Chub populations in Harden Cienega Creek	$41,900				$41,900
AZ-2018-1	2018	Eagle Creek Repatriation	$33,800				$33,800
AZ-2016-2	2016	Red Tank Draw removals	$36,300				$36,300
AZ-2020-2	2020	Upper Verde River native fish restoration	$54,200				$54,200
AZ-2021-1	2021	West Fork Black River Nonnative Fish Removals	$33,800				$33,800
AZ-2009-1	2009	Nonnative fish removal from Bonita and Aravaipa Creeks			$34,733		$34,733
		Hatchery Actions	AZGFD	ASU			
HA-2006-2	2006	ARCC O&M	$123,245				$123,245
HA-1998-1	1998	Topminnow Stock Maintenance		$26,232			$26,232
Total		**Recovery and Nonnative Control Total**					**$723,277**

2022							
Task ID	**Start Year**	**Task Name**					**Total**
		New Mexico Recovery Actions	NMDGF	FWS	USFS	BLM	
NM-2006-1	2006	West Fork Gila River Mechanical Removal	$24,301	$7,955	$11,400		$43,656
NM-2002-1	2002	T&E Fish Repatriations and Monitoring	$33,918	$10,885	$15,900		$60,703
NM-2017-1	2017	Remote Site Inventory and Assessment (Previously Middle Fork Gila Inventory & Assessment)	$26,578	$20,354	$19,700		$66,632
		Arizona Recovery Actions	AZGFD	FWS	BLM		
AZ-2003-1	2003	Muleshoe ecosystem stream and spring repatriations	$13,800				$13,800
AZ-2002-1	2002	Gila Topminnow Stockings	$21,300				$21,300
AZ-2013-1	2013	Spring Creek (Oak) repatriations	$5,000				$5,000
AZ-2002-3	2002	Blue River native fish restoration	$26,400				$26,400
AZ-2014-1	2014	Harden Cienega Creek Native Fish Restoration	$26,400				$26,400
AZ-2016-2	2016	Red Tank Draw removals	$6,300				$6,300
AZ-2020-2	2020	Upper Verde River native fish restoration	$96,600				$96,600
AZ-2016-3	2016	Sharp Spring Native Fish Restoration	$40,200				$40,200
AZ-2009-1	2009	Nonnative fish removal from Bonita and Aravaipa Creeks			$30,000		$30,000
		Hatchery Actions	AZGFD	ASU			
HA-2006-2	2006	ARCC O&M	$117,000				$117,000
Total		**Recovery and Nonnative Control Total**					**$553,991**
2023							
Task ID	**Start Year**	**Task Name**					**Total**
		New Mexico Recovery Actions	NMDGF	FWS	USFS	BLM	
NM-2006-1	2006	West Fork Gila River Mechanical Removal	$25,354	$7,955	$11,400		$44,709
NM-2002-1	2002	T&E Fish Repatriations and Monitoring	$36,136	$10,885	$15,900		$62,921
NM-2017-1	2017	Remote Site Inventory and Assessment (Previously Middle Fork Gila Inventory & Assessment)	$26,857	$20,354	$19,700		$66,911

		Arizona Recovery Actions	AZGFD	FWS	BLM		
AZ-2003-1	2003	Muleshoe ecosystem stream and spring repatriations	$15,000				$15,000
AZ-2002-1	2002	Gila Topminnow Stockings	$38,200				$38,200
AZ-2013-1	2013	Spring Creek (Oak) repatriations	$5,500				$5,500
AZ-2002-3	2002	Blue River native fish restoration	$29,000				$29,000
AZ-2014-1	2014	Harden Cienega Creek Native Fish Restoration	$29,000				$29,000
AZ-2020-2	2020	Upper Verde River native fish restoration	$79,100				$79,100
AZ-2016-3	2016	Sharp Spring Native Fish Restoration	$40,200				$40,200
AZ-2009-1	2009	Nonnative fish removal from Bonita and Aravaipa Creeks			$30,000		$30,000
		Hatchery Actions	AZGFD				
HA-2006-2	2006	ARCC O&M	$117,000				$117,000
Total		**Recovery and Nonnative Control Total**					**$557,541**
2024							
Task ID	**Start Year**	**Task Name**					**Total**
		New Mexico Recovery Actions	NMDGF	FWS	USFS		
NM-2006-1	2006	West Fork Gila River Mechanical Removal	$28,950	$9,851	$11,400		$50,201
NM-2002-1	2002	T&E Fish Repatriations and Monitoring	$40,604	$12,372	$15,900		$68,876
NM-2017-1	2017	Remote Site Inventory and Assessment (Previously Middle Fork Gila Inventory & Assessment)	$30,649	$12,678	$19,700		$63,027
		Arizona Recovery Actions	AZGFD	FWS	BLM		
AZ-2003-1	2003	Muleshoe ecosystem stream and spring repatriations	$11,056				$11,056
AZ-2002-1	2002	Gila Topminnow Stockings	$50,620				$50,620
AZ-2013-1	2013	Spring Creek (Oak) repatriations	$6,370				$6,370
AZ-2002-3	2002	Blue River native fish restoration	$41,645				$41,645
AZ-2014-1	2014	Harden Cienega Creek Native Fish Restoration	$33,277				$33,277
AZ-2020-2	2020	Upper Verde River native fish restoration	$16,944				$16,944
AZ-2016-3	2016	Sharp Spring Native Fish Restoration	$12,178				$12,178

AZ-2023-1	2024	George Wise Spring Nonnative Fish Removals	$25,746				$25,746
AZ-2018-1	2018	Eagle Creek Spikedace and Loach Minnow Reintroduction	$22,402				$22,402
AZ-2009-1	2009	Nonnative fish removal from Bonita and Aravaipa Creeks			$30,000		$30,000
		Hatchery Actions	AZGFD				
HA-2006-2	2006	ARCC O&M	$143,287				$143,287
Total		**Recovery and Nonnative Control Total**					**$575,629**
2025							
Task ID	**Start Year**	**Task Name**					**Total**
		New Mexico Recovery Actions	NMDGF	FWS	USFS		
NM-2006-1	2006	West Fork Gila River Mechanical Removal	$28,950	$17,250	$11,400		$57,600
NM-2002-1	2002	T&E Fish Repatriations and Monitoring	$40,604	$24,663	$15,900		$81,167
		Arizona Recovery Actions	AZGFD	FWS	BLM		
AZ-2003-1	2003	Muleshoe Ecosystem Stream and Spring Repatriations	$9,641				$9,641
AZ-2002-1	2002	Gila Topminnow and Gila Chub Stockings	$40,856				$40,856
AZ-2002-3	2002	Blue River Native Fish Restoration	$36,974				$36,974
AZ-2020-2	2020	Upper Verde River Native Fish Restoration	$14,806				$14,806
AZ-2016-3	2016	Sharp Spring Native Fish Restoration	$15,535				$15,535
AZ-2018-1	2018	Eagle Creek Spikedace and Loach Minnow Reintroduction	$19,880				$19,880
AZ-2009-1	2009	Nonnative Fish Removal from Bonita and Aravaipa Creeks			$25,000		$25,000
		Hatchery Actions	AZGFD				
HA-2006-2	2006	ARCC O&M	$146,769				$146,769
Total		**Recovery and Nonnative Control Total**					**$448,228**

Appendix A.
Proposed Projects Not Selected for Funding in FY2025

Remote Site Inventory and Assessment
(Task ID: NM-2017-2)

Implementing Entity: New Mexico Department of Game and Fish (Department), US Fish and Wildlife Service (USFWS), US Forest Service (USFS)
Start Year: 2017
Location(s): San Francisco River
Species Protected: Loach Minnow, Spikedace, Roundtail Chub, Gila Trout, Desert Sucker, Longfin Dace, Speckled Dace, Sonora Sucker

Project Description:
Background: Much of the Gila River Basin in New Mexico is extremely remote and thus difficult to sample. The distribution of the priority and nonnative species in the remote sections of the Gila River and its forks were last surveyed in the mid-2000s and Department records indicate that the remote lower canyons of the San Francisco River have never been surveyed. The system is dynamic and there have been significant changes in the basin in recent years. Remote surveys in the middle and east forks of the Gila River have been completed with funding from GRBNFCP. The lower Middle Fork Gila River was surveyed in the summer 2017 and the upper reaches were surveyed in the summer 2018. The East Fork Gila River and tributaries, excluding Black Canyon Creek were surveyed in 2019. Black Canyon Creek was surveyed in 2020, West Fork Gila River was surveyed in 2021 and 2022, and the lower San Francisco River was only partially surveyed in 2023 due to high flows which limited accessibility to lower sites. This is an ongoing project with plans to monitor at least one remote site location per year until the assessment is complete, and then update status approximately every ten years.

In 2025, we propose to inventory remote reaches of the upper San Francisco River. Sites in the upper section of the San Francisco River have been sampled a limited amount in the past. However, the distribution of Loach Minnow and Spikedace throughout this section of river is largely unknown. Additional monitoring in this section of the San Francisco River will help to document distribution of priority species and presence of other important natives like Roundtail Chub, and will inform possible repatriation of Loach Minnow and Spikedace in this area.

Geographical Area: This project will take place in the upper section of the San Francisco River, primarily on Forest Service property. Sampling sites will be located within the section of the San Francisco River from the Saliz Canyon confluence north to Reserve, extending upstream to the Arizona border. Tributaries to the San Francisco River including Centerfire, SA, Stone, and Trout creeks will also be surveyed. This project will provide further information on the status and distribution of Loach Minnow and Spikedace populations as well as nonnative species in this section of the San Francisco River.

Methodologies: Sampling will take place in May or June. Representative 100-m sites will be established within the upper section of the San Francisco River. Single pass sampling will be conducted using backpack electrofishers and seines. The particular method used to obtain specimens depends upon mesohabitat being sampled. Broad shallow runs, and similar mesohabitats with smooth substrates, are sampled with drag seines (normally 3.0 x 1.2 m, 3.2 mm mesh). A battery-powered backpack electrofisher is used to stun fishes in cobble-bottomed runs, debris pools, and similar mesohabitats, and specimens are then collected with dip nets. A seine and backpack electrofisher are used in tandem to collect fishes from rapid-velocity habitats

(e.g., riffles and chutes). All fish collected will be identified and enumerated by mesohabitat. Length will be collected on all fish and weight will be collected on fish greater than 99 mm total length. Each mesohabitat is measured for length, average width, average depth, and average velocity, and evaluated for dominant substrate type. The inventory will indicate which nonnative fishes are present and their distribution, describe the current status and distribution of native fishes, and identify potential repatriation sites (within perennial tributaries). It is possible the upper San Francisco River system cannot be completed in 2025 due to logistical constraints. In this case we will request funding to complete any remaining sampling in 2026.

Program Priorities:
This project assesses population status of Loach Minnow and Spikedace in the upper San Francisco River. This project may lead to the identification of new repatriation sites for Loach Minnow, Spikedace, or Roundtail Chub.

Partnerships:
This project is a collaborative effort between the Department, USFS, and USFWS. It builds upon previous GRBNFCP funded projects sampling the Middle Fork Gila River, East Fork Gila River, West Fork Gila River, and San Francisco River, as well as perennial tributaries. This project updates the current distribution of Loach Minnow, Spikedace, and Roundtail Chub within their historic range which is vital information for any species status assessment or recovery criteria.

Strategic Plan Goals:
- Preventing Extinction and Managing Toward Recovery
    - Goal 7. Monitor to quantitatively measure and evaluate project success in improving the status of target species and their habitats.

Recovery Objectives:
- 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 Time and Cost:
- Total Cost: $70,069
    - New Mexico Department of Game and Fish: $30,649
    - USFWS: $19,720
    - USFS: $19,700
- Urgency: The remote portions of the upper San Francisco River have been surveyed a limited amount in the past. However, the distribution of priority species Loach Minnow and Spikedace in this section of river is largely unknown. Additional monitoring in this section of the San Francisco River will help

to document distribution of priority species and presence of other important natives like Roundtail Chub, and will inform possible repatriation of Loach Minnow and Spikedace in this area.

- Readiness: This project is ready to implement.
- In-kind or Matching Funds: No

Spring Creek (Oak Creek tributary) Repatriations

(Task ID: AZ-2013-1)

Implementing Entity: Arizona Game and Fish Department
Start Year: 2013
Location(s): Spring Creek
Species Protected:

- Spikedace: one of two replicates of Aravaipa Creek lineage.
- Gila Topminnow: one of nine wild replicates of Lower Santa Cruz MU.
- Gila Chub[1]: one remnant population not replicated elsewhere.
- Other native species: populations of Speckled Dace, Longfin Dace, Sonora Sucker, Desert Sucker, northern Mexican gartersnake.

Project Description:

Background: The Spring Creek Repatriations project has been ongoing since 2013 with two main components: the eradication of Green Sunfish and the establishment of Spikedace and Gila Topminnow. Eradication was initiated by the Program, but completed by the Department's Conservation and Mitigation Program, in 2015 when Green Sunfish were successfully eradicated. Reclamation constructed a fish barrier in 2015 with Spikedace and Gila Topminnow stocked shortly thereafter. The Gila Topminnow population was augmented in 2016, and was considered established as of 2020 with the species captured during each year of monitoring from 2016-2020. Topminnow were not captured in two successive monitoring efforts following extraordinary flooding during the summer of 2021, and were restocked in 2023. The Spikedace population was augmented in 2016 and 2018 after poor initial monitoring returns. An additional 100 PIT tagged fish were stocked following monitoring in 2020 and 2021 as part of ongoing research of Spikedace survival and movement. A total of 1,717 Spikedace were stocked in March 2022. Work planned for FY2025 includes the annual post-stocking monitoring effort.

Project Timeline.
FY2014: Green Sunfish removals initiated.
FY2015: Barrier completed. Initial Spikedace and Gila Topminnow stockings.
FY2016: Initial annual monitoring effort.
FY2017: Annual monitoring. Augmentation of Spikedace and Gila Topminnow populations.
FY2018: Annual monitoring. Augmentation of Spikedace population.
FY2019: Annual monitoring.
FY2020: Annual monitoring. Topminnow population considered established.
FY2021: Annual monitoring of Spikedace.
FY2022: Annual monitoring of Spikedace. Augmentation of Spikedace population.
FY2023: Annual monitoring of Spikedace. Translocation of Gila Topminnow.
FY2024: Annual monitoring of Spikedace. Augmentation of Spikedace population.

FY2025: Final annual monitoring of Spikedace.

[1] In 2016, the American Fisheries Society and the American Society of Ichthyologists and Herpetologists reclassified and merged Roundtail Chub *Gila robusta*, Gila Chub *Gila intermedia*, and Headwater Chub *Gila nigra* into one species, the Roundtail Chub.

Geographical Area: The geographic extent for this project includes the perennial reach of Spring Creek from the barrier upstream about 4 km to the springs which are the upstream extent of perennial flow. A population of Gila Topminnow is established within the project area. The project area is protected from upstream invasion of nonnative fish by a fish barrier built by Reclamation in 2015. Land ownership is a mixture of Coconino National Forest and private. The Coconino National Forest is supportive of ongoing efforts to conserve native fishes in Spring Creek. The private landowners within the project area do not currently allow access for sampling.

Methodologies: The Spikedace population in Spring Creek is monitored by backpack electrofishing through three 100 meter long sub-reaches in the reach from Willow Point Road downstream to the barrier. A crew of 3 to 5 people performs single-pass backpack electrofishing at two randomly selected sub-reaches. Three-pass backpack electrofishing is utilized at the one fixed sub-reach that encompasses Willow Point Road. All Spikedace captured are measured to the nearest millimeter in total length (TL mm). Sampling is carried out annually in September. Success is measured by an annual increase in mean CPUE (fish per hour) and evidence of recruitment in successive years with multiple age classes present. Results, analysis, discussion of results, and recommendations for future work will be presented in the annual report.

Program Priorities:
This project replicates populations of Spikedace (Aravaipa Creek lineage) and Gila Topminnow (Lower Santa Cruz MU) and protects a remnant population of Gila Chub above a barrier built by Reclamation. This project has immediate on the ground benefits by securing wild populations of Spikedace and Gila Topminnow above a barrier.

Partnerships:
This project is in partnership with the Coconino National Forest, U.S. Fish and Wildlife Service and Reclamation. This project builds upon previously funded GRBNFCP projects by continuing to assess establishment of Spikedace above a Reclamation funded fish barrier. This project is part of larger collaborative efforts to replicate populations of Spikedace and Gila Topminnow throughout their historical range.

Strategic Plan Goals:
- Preventing Extinction and Managing Toward Recovery
    - Goal 3. Remove nonnative aquatic species threats.
        - Objective 3a. Eradicate or suppress nonnative aquatic species from a minimum of five surface waters to prepare them for repatriations of native fishes.
    - Goal 4. Replicate populations and their associated native fish community into protected streams and other surface waters.
        - Objective 4a. Replicate Gila Topminnow stocks into a minimum of 10 surface waters.
        - Objective 4b. Replicate each of the other priority species into a minimum of one surface water.

Recovery Goals:
- Spikedace and Loach Minnow recovery plan (1991)
    - Task 6.3-4 (priority 3) Reintroduce into selected reaches and monitor

- Gila Topminnow recovery plan (1999 draft)
    - Task 2.2 (priority 1) Reestablish into suitable habitats
    - Task 3. Monitor natural and reestablished populations and their habitats.
- Gila Chub draft Recovery plan (2015)
    - Task 3.2 (priority 2) Conduct monitoring

Estimated Time and Cost:

- Cost: The estimated cost of this project for FY2025 is $6,632.
- Urgency: This project is urgent because failure to monitor the Spikedace population in Spring Creek will postpone any determination of establishment success.
- Readiness: All necessary compliance has been completed for all partners involved.
- In-Kind or Matching Funds: This project does not have matching or in-kind funds.

Harden Cienega Creek Native Fish Restoration

(Task ID: AZ-2014-1)

Implementing Entity: Arizona Game and Fish Department
Start Year: 2014
Location(s): Harden Cienega Creek and livestock tanks within the drainage.
Species Protected:

- Gila Topminnow: one of nine wild replicated populations of the Bylas management unit (MU).
- Gila Chub[1]: one remnant population, which was replicated in Mule Creek, NM.
- Other native fish species: one population each of Longfin Dace, Speckled Dace, Desert Sucker, and Sonora Sucker.

Project Description:

Background: The initial purpose of this project was to expand the distribution of Roundtail Chub in Harden Cienega Creek and to establish Gila Topminnow in the lower portion of the creek, but Green Sunfish were detected in 2017 and a nonnative removal component was added to the project in 2020. Department staff discovered a waterfall barrier in Harden Cienega Creek in 2013, and only detected Longfin Dace upstream. Downstream of the barrier the fish assemblage included Gila Chub, Desert Sucker, Sonora Sucker, Speckled Dace, and Longfin Dace. The Department proposed expanding the chub distribution above the waterfall, and the first translocation was completed in 2015. Monitoring data from 2017 to 2020 indicated a healthy chub population was established above the barrier, however Green Sunfish were also detected both above and below the barrier at the same time (1, 2, and 4 were removed in 2017 through 2019 respectively). This was not the first record of Green Sunfish in Harden Cienega Creek; McKell (2005) captured a Green Sunfish in Harden Cienega Creek but did not specify the location, and it was assumed the source was the San Francisco River. Given that relatively few Green Sunfish were detected, it was assumed that they were not yet sufficiently abundant to effect native fish populations in the stream. Gila Topminnow (Bylas lineage, Bylas MU) were translocated to suitable habitat in lower Harden Cienega Creek in 2019 (no Green Sunfish had been detected in this lower reach before stocking) and in 2021. Monitoring from 2020 to 2023 failed to detect any Gila Topminnow within this reach.

All stock tanks in the Arizona portion of the drainage were surveyed in 2020, and all were fishless. Beginning in 2021, this project became a joint project with NMDGF (see project NM-2002-1). All stock tanks on Gila National Forest lands in New Mexico were surveyed in 2021 and Green Sunfish were present in three stock tanks. Measurements of the tanks and confirmation of continued presence of Green Sunfish was accomplished with NMDGF in 2022. These tanks, and possibly others in New Mexico (on private lands) appear to be sources of Green Sunfish to lower Harden Cienega Creek. Nonnative fish removal efforts in Harden Cienega Creek were initiated in 2020: 38 Green sunfish were removed (22 by electrofishing and 16 by hoop netting) in 2021, 23 Green Sunfish were removed in two removal passes (pass 1 = 16, pass 2 = 7) during 2021, and catch of Green Sunfish in 2022 declined to only a few individuals between two removal passes (pass 1 = 3, pass 2 = 1). Most recently, 3 Green Sunfish were removed in two removal passes in 2023 (pass 1 = 3, pass 2 = 0). Work planned for FY2025 includes two mechanical removal passes in the perennial portion of Harden Cienega Creek. If no Green Sunfish are detected within this reach in FY2024, work will

[1] In 2016, the American Fisheries Society and the American Society of Ichthyologists and Herpetologists reclassified and merged Roundtail Chub *Gila robusta*, Gila Chub *Gila intermedia*, and Headwater Chub *Gila nigra* into one species, the Roundtail Chub.

entail a pass of eDNA sampling through the perennial reach in lieu of the mechanical removal efforts. If Green Sunfish are detected in isolated pools within the intermittent reach of upper Harden Cienega Creek in 2024, one week of mechanical removal efforts will be implemented to evaluate the feasibility of eradicating fish from isolated pools by mechanical methods. In addition, the final monitoring of Gila Topminnow will occur if none are detected in FY2024. If NMDGF staff pursue eradication efforts within tanks supporting Green Sunfish in New Mexico and require assistance from Department staff, we will request an amendment to this work plan in order to assist.

Project Timeline.
FY2016: Gila Chub translocated above the natural barrier in Harden Cienega Creek
FY2018: First monitoring of Gila Chub above the barrier in Harden Cienega Creek. Discovery of Green Sunfish above the barrier.
FY2019: Monitoring of Gila Chub above the barrier. Translocation of five additional chub above the barrier. Capture of two Green Sunfish above the barrier.
FY2020: Monitoring of Gila Chub. Translocation of 100 chub above the barrier. Translocation of Gila Topminnow below the barrier. Capture of four Green Sunfish below the barrier. Tank surveys completed on AZ portion of Harden Cienega Creek drainage. First mechanical removal pass in Harden Cienega Creek (38 Green Sunfish captured and removed). Final monitoring of Gila Chub above the barrier. Annual monitoring of Gila Topminnow.
FY2021: Augmentation of Gila Topminnow population below barrier. Two mechanical removal passes in Harden Cienega Creek. Annual monitoring of Gila Topminnow. Surveys of stock tanks within the Harden Cienega drainage in New Mexico.
FY2022: Augmentation of Gila Topminnow below barrier if necessary. Two mechanical removal passes in Harden Cienega Creek. Annual monitoring of Gila Topminnow.
FY2023: Two mechanical removal passes in Harden Cienega Creek. Annual monitoring of Gila Topminnow.
FY2024: Two mechanical removal passes in Harden Cienega Creek. Final monitoring of Gila Topminnow if no additional augmentations occur after FY2021. Surveys of tributary streams and intermittent portions of Harden Cienega Creek for isolated populations of Green Sunfish.
FY2025: Two removal passes in Harden Cienega Creek. Removal of Green Sunfish from intermittent portions of Harden Cienega Creek if sunfish are detected in FY24. Verification of Green Sunfish eradication with eDNA samples if three consecutive passes have been completed without detection of Green Sunfish.
FY2026: Work beyond FY2025 is contingent on information obtained during FY2024, and may or may not be necessary.
Estimated project completion date: FY2025.

Geographical Area: The project area includes the perennial reach of Harden Cienega Creek from about 300 m above the confluence with the San Francisco River upstream to about 50 m past the confluence with Prospect Canyon. In addition, there are a total of 43 stock tanks within the Harden Cienega Creek drainage in Arizona and an additional 33 in New Mexico. The project area includes populations of Gila Chub upstream and downstream of the barrier, and populations of Gila Topminnow, Longfin Dace, Speckled Dace, Desert Sucker, and Sonora Sucker downstream of the barrier. The perennial reach downstream of the barrier is apparently protected from upstream invasion of nonnative fishes from the San Francisco River by a short ephemeral reach of approximately 0.3 km, as nonnative fishes have rarely been detected, and have yet to show evidence of reproduction, in the lower reach. The upstream Gila Chub population is protected from upstream invasion of nonnative fishes by a waterfall barrier approximately 3 meters in height. Land

ownership within the perennial reach of Harden Cienega Creek is Apache-Sitgreaves National Forest and managed by Gila National Forest. Stock tanks within the drainage occur on Apache-Sitgreaves and Gila National Forests and private lands in Arizona and New Mexico. Green Sunfish appear to be dispersing from at least one stock tank in New Mexico. The Gila National Forest is supportive of native fish conservation activities in Harden Cienega Creek.

Methodologies: The immediate goal of the removal effort will be suppression of Green Sunfish in Harden Cienega Creek. The primary method used to remove nonnative fish from the perennial reach of Harden Cienega Creek will be backpack electrofishing. To track removal success and ensure complete coverage, removal efforts will consist of a series of full-reach passes each year. Work planned for FY2025 includes two full removal passes. A single full pass is defined as electrofishing all water from the downstream terminus of perennial flow upstream to the confluence with Prospect Canyon. If a full pass is not completed on a given sampling day, personnel will begin sampling the next day at the previous day's endpoint and sample up to Prospect Canyon. In addition to backpack electrofishing, mini-hoop nets will be baited and set in deep pools throughout the reach to more effectively sample habitats too deep for effective backpack electrofishing. Nets will be retrieved after a minimum soak time of two hours. Mini-hoop nets may be left to soak overnight if removals are occurring on successive days. Ideally, removals will occur in May-June when the stream is near base flow in an effort to maximize capture probability of Green Sunfish. Relatively few Green Sunfish were captured from 2017-2023, and spawning (presence of juveniles) has not been documented. If three successive passes occur without detection of Green Sunfish, a pass of eDNA samples will be collected to verify eradication of Green Sunfish from the perennial reach.

Beginning in FY2024, the entirety of the Arizona portion of Harden Cienega Creek from the upstream end of the perennial reach upstream to the state line, the short portions of Antelope Creek and the unnamed drainage downstream of California Tank in Arizona (referred to as the intermittent reach), will be surveyed for presence of isolated perennial pools and presence of Green Sunfish. If Green Sunfish are detected within the intermittent reach in FY2024, removal efforts will be initiated in FY2025. Depending on the location, size, shape, and abundance of pools with Green Sunfish, a number of mechanical removal methods may be used in combination. If pools are shallow enough, multiple passes of backpack electrofishing will be utilized. In pools too deep for electrofishing, mini-hoop nets, gill nets, and potentially seines will be used in combination.

At the end of each year, staff will evaluate size structure and relative abundance of nonnative fish populations. Progress toward successful eradication will be characterized by decreasing relative abundance (CPUE). Measures of success will be evaluated within and between years. A successful annual suppression effort will be characterized by decreasing Green Sunfish relative abundance with each successive pass and the absence of YOY Green Sunfish.

For Gila Topminnow monitoring, the techniques used, sample design, and planned analysis are consistent with the methodologies described for post-stocking monitoring of Gila Topminnow in the most recent annual progress report to Reclamation (Hickerson et al. 2023). Ten to twenty minnow traps will be dispersed from the uppermost stocking site to several hundred meters downstream, set in slow velocity habitats and fished for a minimum of two hours. Captured fish will be counted by size class and released alive back to the stream. Total number captured and mean catch rates (CPUE, fish per hour) will be calculated and reported.

Results, analysis, discussion of results, and recommendations for future work will be presented in the annual report.

Program Priorities:
This project will stabilize one population of Gila Chub, one replicated Gila Topminnow population, and populations of Longfin Dace, Speckled Dace, Sonora Sucker, and Desert Sucker through mechanical removal of nonnative Green Sunfish. This project will create a wild replicate of the Bylas MU of Gila Topminnow, and expand the distribution of the population of Harden Cienega Creek lineage Gila Chub. This project will provide immediate on the ground benefits by identifying the upstream source of Green Sunfish to Harden Cienega Creek, removing Green Sunfish from those tanks and Harden Cienega Creek, and removing a potential source of nonnative fish to the San Francisco River.

Partnerships:
This project is in partnership with the New Mexico Department of Game and Fish, Gila National Forest, the U.S. Fish and Wildlife Service, and Reclamation. This project builds upon previously funded GRBNFCP work to translocate Gila Chub above the barrier in Harden Cienega Creek. The project is part of larger collaborative efforts to conserve chub (Six Species Conservation Agreement) and to replicate populations of Gila Topminnow throughout their range.

Strategic Plan Goals:
- Preventing Extinction and Managing Toward Recovery
    - Goal 3. Remove nonnative aquatic species threats.
        - Objective 3a. Eradicate or suppress nonnative aquatic species from a minimum of five surface waters to prepare them for repatriations of native fishes.
    - Goal 4. Replicate populations and their associated native fish community into protected streams and other surface waters.
        - Objective 4a. Replicate Gila Topminnow stocks into a minimum of 10 surface waters.
        - Objective 4b. Replicate each of the other priority species into a minimum of one surface water.

Recovery Goals:
- Gila Topminnow recovery plan (1999 draft)
    - 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. Monitor natural and reestablished populations and their habitats.

- Gila Chub draft Recovery plan (2015)
    - 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: The estimated cost of this project in FY2025 is $34,587.

- Urgency: This project is urgent because Green Sunfish are currently at a low density and only adults have been captured, suggesting that sunfish are not currently reproducing within Harden Cienega Creek. A majority of the successful mechanical removal efforts completed by this program were characterized by low initial abundance of target nonnative fishes.
- Readiness: All compliance is complete for the monitoring and mechanical removal portions of this project.
- In-Kind or Matching Funds: This project does not have matching or in-kind funds.

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George Wise Spring Nonnative Fish Removals
(Task ID: AZ-2023-1)

Implementing Entity: Arizona Game and Fish Department
Start Year: 2024
Location(s): George Wise Spring, Ash Canyon, stock tanks in drainage
Species Protected:

- Gila Topminnow: one new wild replicate of the Coal Mine Canyon lineage (Lower Santa Cruz MU)

Project Description:
Background: The George Wise Spring nonnative fish removal project is a new project. The purpose of this project is to eradicate Green Sunfish from the Ash Canyon watershed, specifically George Wise Spring, and reintroduce Gila Topminnow. The Coal Mine Canyon lineage of Gila Topminnow will be translocated from one or more of the populations in the state. Gila Topminnow of unknown origin were detected in Ash Canyon approximately 1.7 km upstream from George Wise Spring in 2006. The site was assessed for the potential to reintroduce Gila Topminnow in March 2020, but Green Sunfish were found throughout the perennial reach and in the same pool where topminnow were detected in 2006. Green Sunfish were not observed in Ash Canyon upstream of the topminnow location to Mata Siete Spring, which was also fishless. Work planned by year is presented below.

Project Timeline.
FY2024: Tank Surveys in Ash Canyon drainage and initial depletion estimate in George Wise Spring. Coordinate and draft Green Sunfish removal plan following tank surveys and initial removal pass.
FY2025: Eradicate Green Sunfish from any stock tanks and perennial water in the drainage using appropriate techniques. Follow-up surveys to confirm eradication success.
FY2026: Stocking of Gila Topminnow and initial monitoring.
FY2027: Monitoring of Gila Topminnow, additional translocations as necessary.
FY2028: Monitoring of Gila Topminnow, additional translocation as necessary.
Estimated year of completion: FY2028.

Geographical Area: George Wise Spring provides perennial flow to about 300 meters of stream in Ash Canyon. Ash Canyon is ephemeral for the vast majority of the watershed, including approximately 3 km downstream of the spring to the confluence with Patagonia Lake. The perennial reach supported by George Wise Spring is located on Arizona Game and Fish Commission owned lands. The Department has implemented some habitat improvements at George Wise Spring using Desert Fish Habitat Partnership funds, including the installation of pipe-rail fencing to keep trespass cattle out of the entire riparian area. The property was purchased by the Department for native species conservation generally, and Gila Topminnow specifically, due to its proximity to important topminnow populations in Coal Mine and Fresno Canyons.

The Ash Canyon watershed upstream of George Wise Spring contains at least seven tanks that could potentially serve as upstream sources of Green Sunfish. Two tanks are located on Coronado National Forest Lands (Henry Tank, Ash Canyon #1), three are located on Department owned lands (Cieneguita Canyon Tank, Department Unnamed Tank, and the pool where sunfish were detected in 2020), and two more are on private lands (Mine Tank, Private Unnamed Tank). Ash Canyon #1 was completely dry when visited for stock

tank surveys by Ehret and Dickens in 2009. In addition, one of the tanks on private lands (Private Unnamed Tank) is unlikely to be a source of Green Sunfish, as it completely dried in several years of available satellite imagery (2010, 2011, 2014, 2017, 2018). An archived email in the Department's files on Ash Canyon alludes to a 'pond upcanyon' having a population of Green Sunfish, which is likely the Cieneguita Canyon Tank. Cieneguita Canyon Tank is a relatively large, in-channel tank that held water in virtually all years of satellite imagery available.

Methodologies: This project will have several methodologies to account for the various components of the proposed project.

Stock Tank Surveys. The initial step in the project will be to survey the remaining stock tanks in the Ash Canyon watershed in FY2024 to determine whether there is an upstream source of Green Sunfish to George Wise Spring. Tanks that contain standing water will be surveyed for fish. For most tanks, a bag seine will be hauled across each tank for a minimum of three passes (unless the entire tank can be seined in one or two hauls, or the tank is too shallow to use a seine). Trammel or gill nets will be set in tanks that are too large or deep to seine and dip nets will be used in tanks that are too shallow to seine. Tanks with undesirable nonnative fish will be identified as targets for nonnative removals. If nonnative fish are detected, a total of ten bag seine hauls will be carried out estimate the population size and determine whether mechanical removals are a viable removal method for tanks.

Nonnative removals. Initially, five to seven successive passes of depletion electrofishing will be carried out through the entire perennial reach of George Wise Spring in FY2024 to estimate the Green Sunfish population size and choose an appropriate removal technique. Utilizing the results from the tank surveys and depletion estimate, Department staff will develop a nonnative fish removal plan in FY2024 and select appropriate removal techniques based on the results from the surveys.

The approach for removing Green Sunfish from George Wise Spring and any tanks in the watershed will depend on the information collected during FY2024, and the corresponding nonnative fish removal plan. Mechanical removals will be implemented in FY2025 if results from depletion electrofishing in George Wise Spring in FY2024 suggest that a mechanical removal is reasonably likely to achieve eradication success in a relatively short time period (i.e., less than three years). Similarly, mechanical removals will be pursued in stock tanks where Green Sunfish are found and where mechanical removal seems feasible to implement through some combination of manual draining and seining. If information collected in FY2024 suggests that mechanical removals are unlikely to be feasible in either George Wise Spring or the stock tanks upstream, the Department may initiate the piscicide project planning process to determine whether piscicides can be used to successfully eradicated Green Sunfish from the watershed.

Native fish translocations and post stocking monitoring. Following verification of Green Sunfish eradication, Gila Topminnow will be stocked into the perennial reach at George Wise Spring and potentially other stock tanks on Department property. Translocation procedures, monitoring protocols, establishment criteria and monitoring targets will follow those described in the methodology subsection of the Gila Topminnow Stocking project. Results, analysis, discussion of results, and recommendations for future work will be presented in the annual report.

Program Priorities:

This project will allow for the reintroduction of Gila Topminnow to potential historically occupied habitat. This project will have the immediate on the ground benefit of securing an additional location for reintroduction of Gila Topminnow.

Partnerships:
This project builds upon work funded by the Desert Fish Habitat Partnership to exclude cattle from the perennial portion of George Wise Spring for native fish conservation efforts.

Strategic Plan Goals:

- Goal 3. Remove nonnative aquatic species threats.
  - Objective 3a. Eradicate or suppress nonnative aquatic species from a minimum of five surface waters to prepare them for repatriations of native fishes.
- Goal 4. Replicate populations and their associated native fish community into protected streams and other surface waters.
  - Objective 4a. Replicate Gila Topminnow stocks into a minimum of 10 surface waters.

Recovery goals:

- Gila Topminnow recovery plan (1999 draft)
  - Task 2.2 (priority 1): Reestablish into suitable habitats
  - Task 2.4 (priority 1): Protect suitable reestablishment habitats from detrimental nonnative aquatic species.
  - Task 3.1 (priority 1): Develop standardized population and habitat monitoring protocols and implement them

Estimated Time and Cost:

- Cost: The estimated cost of this project in FY2025 is $49,045.
- Urgency: This project is urgent. Failure to regularly monitor would delay determinations of population establishment.
- Readiness: This project is ready to implement. Programmatic Environmental Assessments cover nonnative fish removals and native fish translocations. Additional internal compliance would be required if it is determined that rotenone treatment is the most appropriate removal technique for nonnative removals. George Wise Spring and several of the stock tanks in the drainage are located on lands owned by the Arizona Game and Fish Commission.
- In-Kind or Matching Funds: This project does not have matching or in-kind funds.