

**NEW MEXICO DEPARTMENT OF GAME AND FISH  
NATIVE FISH CONSERVATION EFFORTS: 2023**

Annual Report



**Submitted to**

Bureau of Reclamation  
Gila River Basin Native Fishes Conservation Program

**From**

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## EXECUTIVE SUMMARY

This report summarizes the Gila River Basin Native Fishes Conservation Program tasks funded for native fish conservation in New Mexico in 2023. Work in 2023 was conducted under a Cooperative Agreement (21AC10115) between the Bureau of Reclamation and the New Mexico Department of Game and Fish. Three ongoing native fish conservation efforts were conducted in 2023: (1) removal of nonnative fishes from the West Fork Gila River, (2) threatened and endangered (T&E) fish repatriations and monitoring, and (3) remote site inventory in the Gila River Basin. The West Fork Gila River nonnative removal was completed in June 2023. Eight nonnative species were captured and removed. Priority species Loach Minnow *Tiaroga cobitis*, Roundtail Chub *Gila robusta*, and Spikedace *Meda fulgida* were all captured during sampling. Stocking at a new site for the repatriation of Loach Minnow was initiated in Saliz Canyon upstream from the previous stocking location. The progeny of Loach Minnow salvaged from Bear Creek in 2020 due to the Tadpole Fire were repatriated back to Bear Creek. Allred Pond in Glenwood, NM, was sampled to investigate the fish community. A remote site inventory of the San Francisco River between the Pleasanton Diversion and the New Mexico-Arizona border was conducted. Specific details of work completed and results for each native fish conservation task are included within this report.

## INTRODUCTION

The Gila River Basin Native Fishes Conservation Program (GRBNFCP) was established to minimize effects on threatened and endangered fishes by the Central Arizona Project (CAP). The United States Fish and Wildlife Service (USFWS) biological opinions in 1994, 2001, and 2008 concluded that operation of the CAP required mitigation for the negative effects on federally listed fish species within the entire Gila River Basin. The GRBNFCP is focused on conservation work for federally listed Gila Chub *Gila intermedia* (now classified as Roundtail Chub *Gila robusta*), Gila Topminnow *Poeciliopsis occidentalis*, Loach Minnow *Tiaroga cobitis*, Razorback Sucker *Xyrauchen texanus*, and Spikedace *Meda fulgida*. In the most recent GRBNFCP Strategic Plan (USFWS et al. 2022), the principal goals are described as: (1) achieve enhanced conservation status of federally-listed and candidate fish species in the Gila River basin, and (2) alleviate and diminish threats from nonnative aquatic species that might enter the Gila River basin via the CAP canal or other pathways. The program is funded by the Bureau of Reclamation (BOR) and is directed by the USFWS and BOR in cooperation with the New Mexico Department of Game and Fish (Department) and the Arizona Game and Fish Department (AZGFD). The Department receives funds from the BOR for work fitting these objectives under a Cooperative Agreement (21AC10115 from 2021 to 2025). The Department prepares an annual report for the GRBNFCP which describes the results of the native fish conservation efforts funded during the preceding calendar year. Most New Mexico native fish conservation tasks are completed through a collaborative effort among the Department, the USFWS, and the United States Forest Service (USFS).

For each task funded in 2023, this report lists the GRBNFCP Strategic Plan goal(s) the task addresses (USFWS et al. 2022), followed by associated recovery objective(s) listed in the Loach Minnow and Spikedace Recovery Plans (USFWS 1991, 1991) and the Gila Chub and Gila Topminnow Draft Recovery Plans (USFWS 1999, 2015). Work performed by the Department in 2023 is presented under each task. For each task, a background of the work is included followed by results, recommendations for the future, and work planned for 2024.

## REMOVAL OF NONNATIVE FISHES FROM WEST FORK GILA RIVER (TASK NM-2006-1)

### Strategic Plan Goals

- Prevent extinction and manage 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.
  - Goal 8. Maintain accurate Program tracking records.

### 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

### Background

The West Fork Gila River supports an intact native fish assemblage including federally endangered Spikedace and Loach Minnow as well as state endangered Roundtail Chub (previously known as Headwater Chub *Gila nigra*). In addition, federally threatened Gila Trout *Oncorhynchus gilae* are stocked in cooler months to provide recreational fishing opportunities and support recovery efforts. Ten nonnative fishes have been documented in the river including Brown Trout *Salmo trutta*, Flathead Catfish *Pylodictis olivaris*, Rainbow Trout *Oncorhynchus mykiss*, Smallmouth Bass *Micropterus dolomieu*, and Yellow Bullhead *Ameiurus natalis*. The Department and partners have been removing nonnative fishes since 2006 from an approximately 4 km reach of the West Fork Gila River at the Department-owned Heart Bar Wildlife Management Area. This reach lies in the vicinity of the confluence of the Middle and West Forks of the Gila River, an area also commonly referred to as “The Forks” (Figure 1). Nonnatives are removed from the Little Creek confluence upstream to the NM15 Bridge. The removal effort consists of a single pass of sampling by individual mesohabitat. Pools and runs are electrofished with two shockers simultaneously, riffles are electrofished and kicknetted into a seine, and sandy shoals are seined. Fish and habitat data collected during this removal effort included species, effort (seconds), habitat type, and area (m<sup>2</sup>) sampled. Total length (to the nearest mm) and weight (to the nearest gram) are collected for the first 50 individuals of each species captured each day. After 50 lengths and weights have been recorded, the remaining fish are enumerated by species and measured for total length. The removal is conducted annually in June, requires a crew of 6 to 9 people, and usually takes 4 to 5 days to complete. The same stretch of river is sampled annually. However, the river has changed considerably since the project began in 2006, including a major shift of the river channel and high variability in the number of braided channels encountered year to year. Propst et al. (2014) evaluated this effort using data from 2007 to 2012. Results suggested that this effort reduced biomass of some nonnative species and increased

Spikedace biomass. The GRBNFCP decided to continue the effort because of the documented reduction of nonnative species.

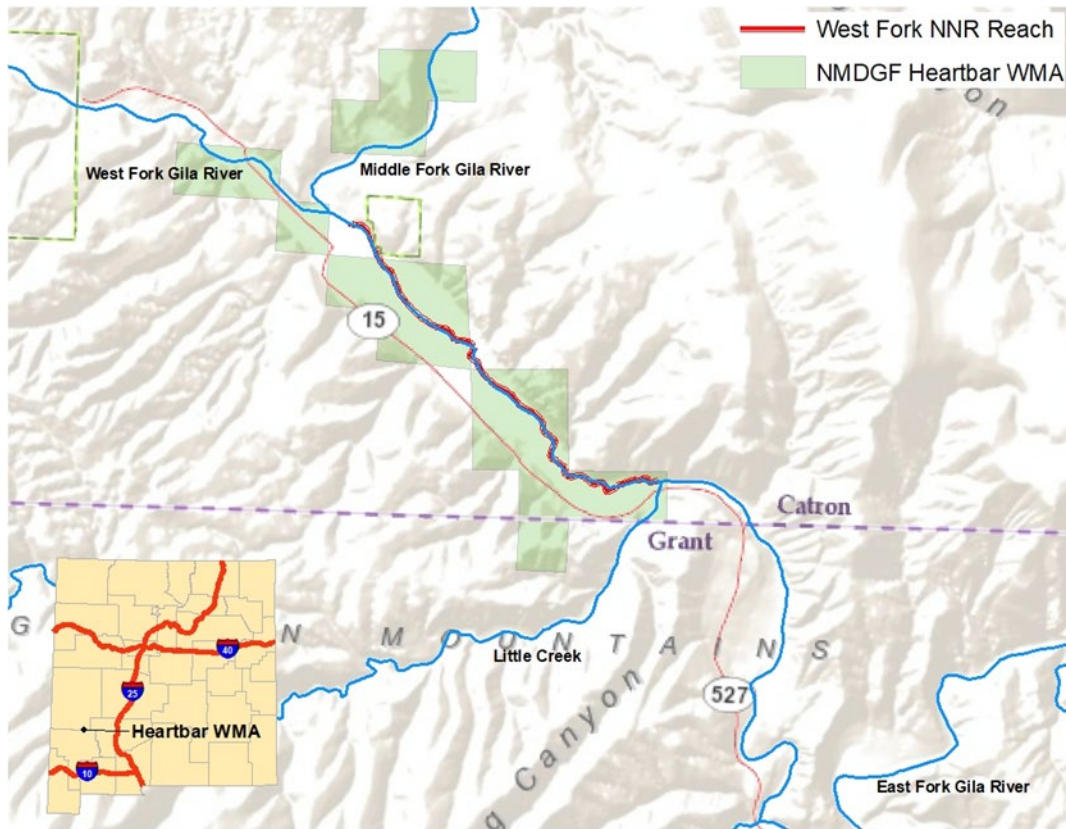


Figure 1. Map showing the location of the West Fork Gila River nonnative fish removal.

## Results

Department, USFWS, and USFS staff conducted the West Fork Gila River nonnative removal from June 5–8, 2023. Total area sampled was 13,688 m<sup>2</sup>, with runs making up the bulk of habitat sampled at 60.04% (Table 1). Desert Sucker *Catostomus clarkii*, Loach Minnow, Longfin Dace *Agosia chrysogaster*, and Sonora Sucker *Catostomus insignis* were the most abundant native species (Table 2; Figures 2 and 3). Bullhead species *Ameiurus* spp. and Smallmouth Bass *Micropterus dolomieu* were the most abundant nonnative species captured. Nonnative species captured in low densities were Common Carp *Cyprinus carpio*, Fathead Minnow *Pimephales promelas*, Green Sunfish *Lepomis cyanellus*, and Rainbow Trout/Rainbow Trout-Hybrids *Oncorhynchus* spp. (Figure 4). Roundtail Chub continue to be present in the reach at low densities, though density (fish/100 m<sup>2</sup>) of this species increased from 0.01 in 2022 to 0.15 in 2023. Flathead Catfish remained at the same density as observed in 2022 at 0.09 fish/100 m<sup>2</sup>. As in 2022, there does not appear to be Flathead Catfish recruitment, as the individuals captured in 2023 ranged in total length from 520 to 720 mm. However, there does appear to be Smallmouth Bass recruitment occurring, as fish captured ranged in total length from 70 to 416 mm. Recent age estimation studies in New Mexico indicate that individuals measuring below 100 mm in total length can be considered young-of-year fish (E. Enriquez, New Mexico Department of Game and Fish, personal communication). The densities of priority species have decreased over the past three years (Figure 2) as have non-priority native fish species other than Desert Sucker and Sonora Sucker (Figure 3). The cause of

this is unknown but shifting habitat use due to increasing environmental stressors and decreasing suitability of some instream habitat are probable causes. Over the past three years, most nonnative species have either declined, remained constant, or increased only slightly (Figure 4). The species that have increased noticeably over this period are Brown Trout (0.01 to 0.14 fish/100 m<sup>2</sup> 2021–2023), Flathead Catfish (0 to 0.09 fish/100 m<sup>2</sup> 2021–2023), and Smallmouth Bass (0.24 to 0.40 fish/100 m<sup>2</sup> 2021–2023).

Table 1. Area sampled and percent composition of all habitat types sampled on the West Fork Gila River during nonnative removal in 2023.

Habitat Type	Area Sampled (m <sup>2</sup> )	Percent Composition
Pool	2134	15.59
Riffle	2790	20.38
Run	8218	60.04
Shoal	123	0.90
Zero Velocity	424	3.10

Table 2. Total number, percent composition, and density (fish/100 m<sup>2</sup>) of all fish captured, by species, in the West Fork Gila River during nonnative removal efforts in 2023.

Species	Number Caught	Percent Composition	Density (fish/100 m <sup>2</sup> )
Native			
Desert Sucker	517	21.54	3.78
Gila Trout	0	0	0
Loach Minnow	93	3.88	0.68
Longfin Dace	134	5.58	0.98
Roundtail Chub	21	0.88	0.15
Sonora Sucker	1490	62.08	10.89
Speckled Dace	26	1.08	0.19
Spikedace	1	0.04	0.01
Nonnative			
Brown Trout	19	0.79	0.14
Bullhead species	28	1.17	0.20
Common Carp	1	0.04	0.01
Fathead Minnow	1	0.04	0.01
Flathead Catfish	12	0.50	0.09
Green Sunfish	1	0.04	0.01
<i>Oncorhynchus</i> spp.	1	0.04	0.01
Red Shiner	0	0.00	0.00
Smallmouth Bass	55	2.29	0.40
Western Mosquitofish	0	0.00	0.00

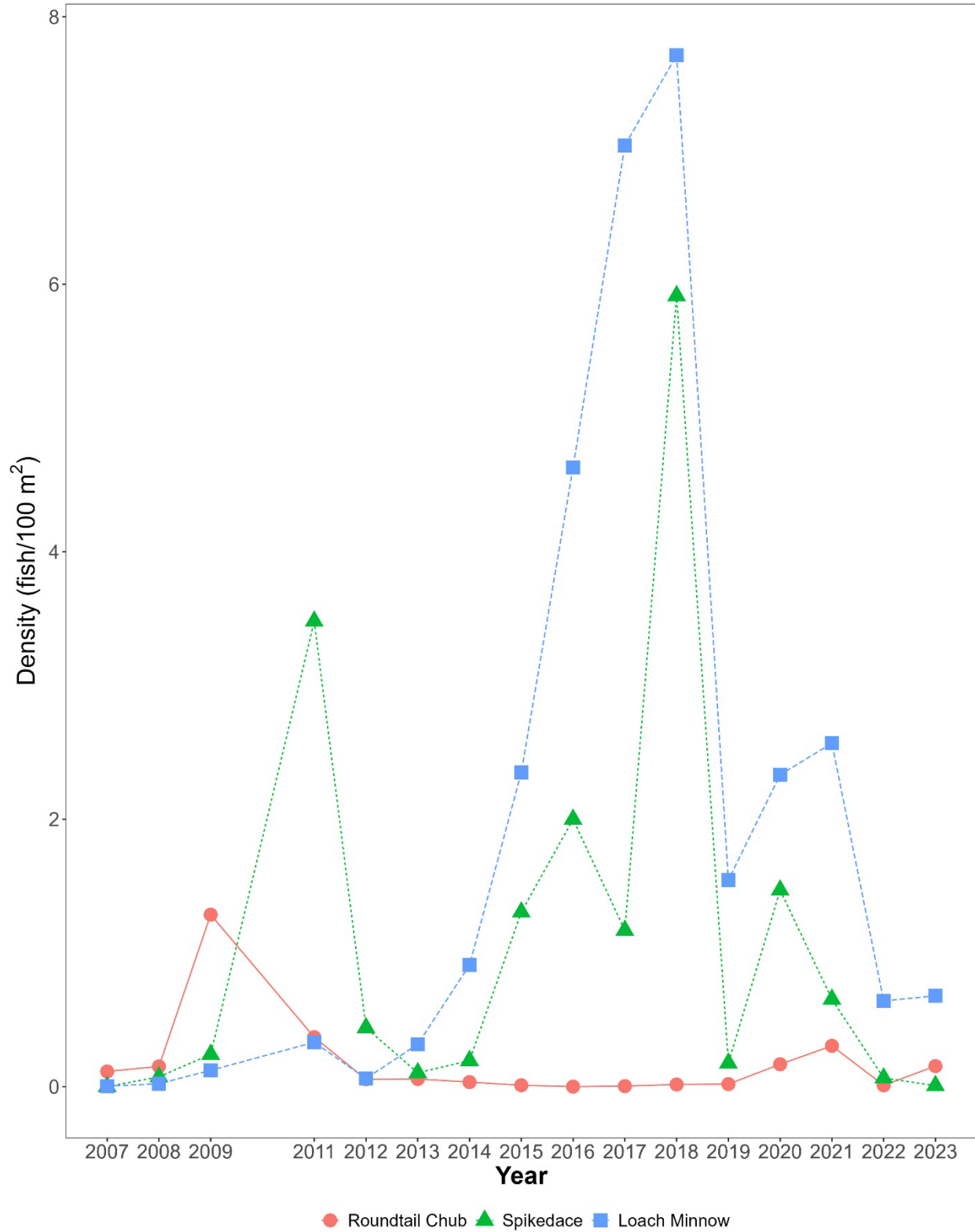


Figure 2. Density (fish/100 m<sup>2</sup>) of priority native fish species captured in the West Fork Gila River nonnative removal from 2007 to 2023. Data from 2006 and 2010 are excluded because habitat measurements were not recorded.

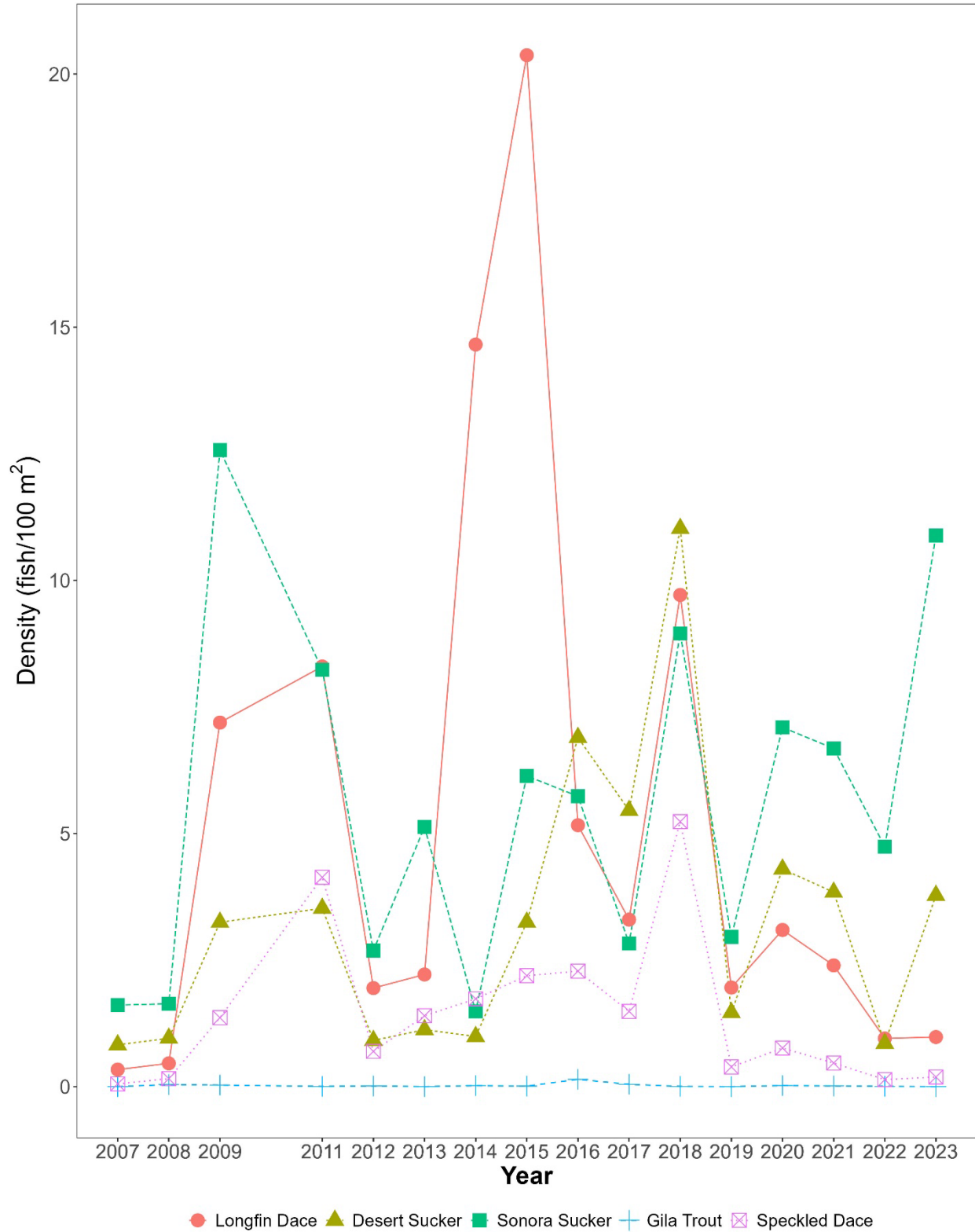


Figure 3. Density (fish/100 m<sup>2</sup>) of non-priority native fish species captured in the West Fork Gila River nonnative removal from 2007 to 2023. Data from 2006 and 2010 are excluded because habitat measurements were not recorded.

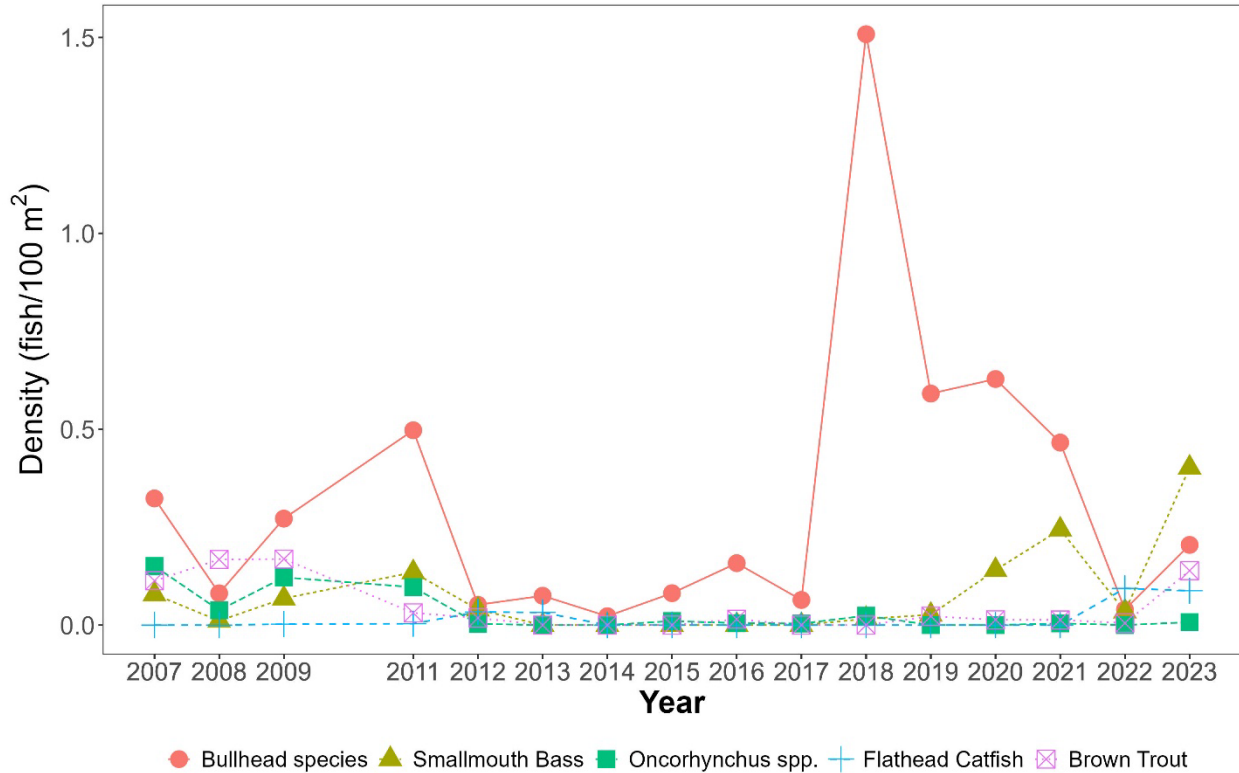


Figure 4. Density (fish/100 m<sup>2</sup>) of nonnative fish species captured in the West Fork Gila River nonnative removal from 2007 to 2023. Data from 2006 and 2010 are excluded because habitat measurements were not recorded. Note that this plot excludes Common Carp, Fathead Minnow, Green Sunfish, Red Shiner, and Western Mosquitofish densities, though these species were captured in 2023.

### Recommendations

- To reduce nonnatives and potentially benefit the native fishes with nonnative suppression, we recommend continuing nonnative removal efforts on the West Fork Gila River. A new protocol employing multiple passes should be implemented to allow for evaluation of removal efforts in the removal reach.

### Work Planned for 2024

- Conduct West Fork Gila River nonnative removal on 4 km Heart Bar Wildlife Management Area reach in June 2024.



## NEW MEXICO T&E FISH REPATRIATIONS AND MONITORING (TASK NM-2002-1)

### Strategic Plan Goals:

- Prevent extinction and manage 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 of target species and their habitats.
  - Goal 8. Maintain accurate Program tracking records.

### 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

### Background

This task is used to identify potential repatriation streams, evaluate potential donor populations and repatriation sites, conduct repatriation to identified streams, monitor populations post-repatriation, and supplement hatchery populations as needed. Repatriations consist of multiple stockings into each repatriation stream successively for 3 to 5 years or until monitoring of the streams determines the populations are established or considered unsustainable. Established streams are then surveyed at least once every five years. It is an ongoing effort to find and evaluate new waters where repatriation may be possible. This task encompasses all New Mexico streams within the Gila River basin where repatriation might occur. Repatriation stockings can be direct transfers of fish from a wild population or stocking from a hatchery such as ARCC. This task is also used for collecting live fish for the purposes of direct stocking, quarantine at ARCC, or development and maintenance of brood stock at ARCC.

### Results

Several ongoing repatriation projects were continued in 2023, including repatriation of Loach Minnow in Saliz Canyon and Bear Creek and an evaluation of sites for potential future repatriation of priority native fish species in Allread Pond in Glenwood.

#### *Saliz Canyon*

Stocking of Loach Minnow into Saliz Canyon began in 2016. Stocking was postponed in 2018 due to habitat degradation resulting from the Owl Fire (Ferguson and Wick 2019). In June 2019, Department and USFWS staff visually assessed the stocking reach of Saliz Canyon. Suitable habitat was found, the substrate was less embedded than in 2018, and other fish species appeared to have recovered. Loach Minnow stocking resumed in 2019. Department and USFWS staff conducted surveys in Saliz Canyon in 2021. Ten Loach Minnow (37–64 mm TL) were captured at the stocking location, however none were captured at an upstream site. The capture of Loach Minnow less than 40 mm TL in 2021 and 2020 indicate that stocked fish have successfully reproduced in Saliz Canyon (Ferguson and Zeigler 2021). Stocking efforts appear to have established Loach Minnow in Saliz Canyon but the repatriated population appears to be spatially limited. An additional access location, approximately 1.0 km upstream from the original stocking location (Figure 5), was identified on July 28, 2022. Based on a visual assessment conducted by Department personnel, the location appeared suitable for stocking, with riffle habitat and perennial streamflow present. On October 10, 2023, one Department and one ARCC staff stocked 205 Loach Minnow in Saliz Canyon. Stocking will continue in 2024 and 2025, and will be followed by a post-repatriation survey in 2026.

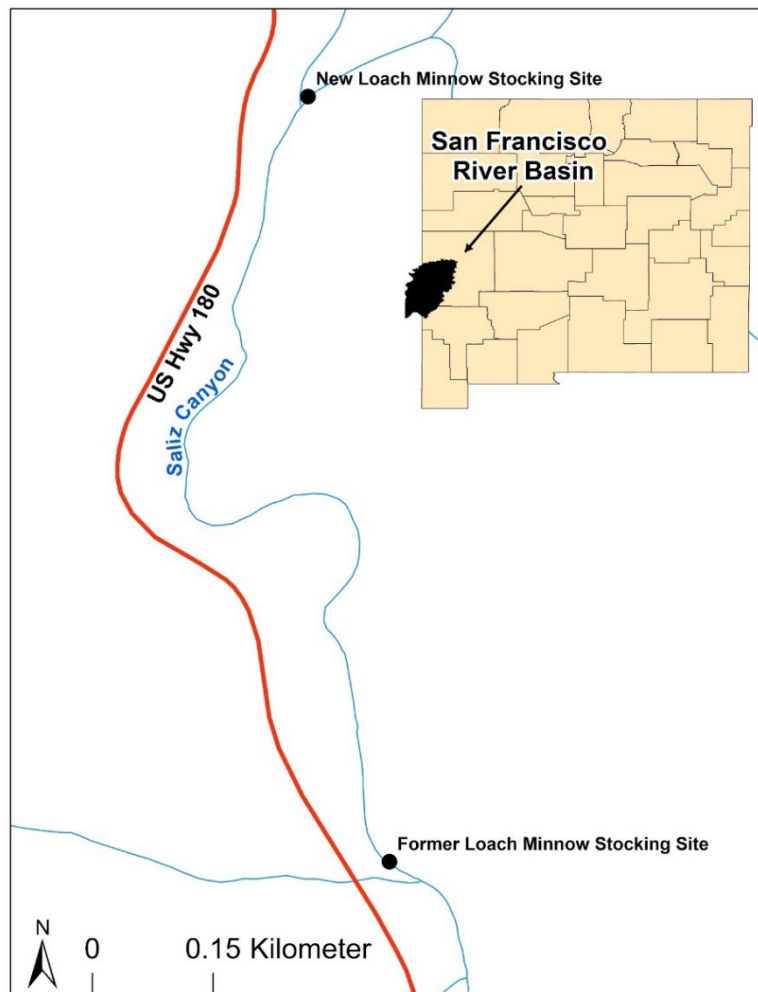


Figure 5. Locations of the former and new Loach Minnow stocking sites in Saliz Canyon.

### *Bear Creek*

Loach Minnow were salvaged from Bear Creek in 2020 and transferred to ARCC after the Tadpole Fire. The progeny (n = 41) of these salvaged fish were restocked into Bear Creek on October 10, 2023. The population will be surveyed in 2024 to assess the success of the repatriation effort.

### *Allred Pond*

In 2021, the Department acquired a property, now referred to as the Glenwood Wildlife Management Area, in Glenwood, NM. A large pond on the property was sampled June 27–29, 2023 to investigate the fish community and possible future stocking of priority native fishes. Trammel nets were set and allowed to soak for 41 hours then pulled from the pond. Species present were Largemouth Bass *Micropterus salmoides* (n = 13), which range in total length from 95 to 424 mm and Sonora Sucker (n = 31), which range in total length from 243 to 438 mm.

### **Recommendations**

- Saliz Canyon should continue to be stocked with Loach Minnow at the new upstream site to expand their distribution within the watershed.
- Spikedace should be stocked in the Tularosa River, as it currently supports Loach Minnow but not Spikedace. Stocking should occur annually for three years and will be followed by surveys in 2027 to assess the success of the stocking effort.
- Bear Creek should be surveyed at the location where Loach Minnow salvaged from the Tadpole Fire were restocked. This survey should be conducted at least one-year post-repatriation to assess the success of the repatriation effort.
- Continue investigating possibility of stocking Allred Pond with Gila Topminnow and Roundtail Chub (formerly Gila Chub) through further sampling.

### **Work Planned for 2024**

- Continue stocking Loach Minnow in Saliz Canyon at identified upstream location.
- Initiate Spikedace stocking in the Tularosa River.
- Survey Bear Creek at the location where Loach Minnow salvaged from the Tadpole Fire were restocked.
- Investigate the possibility of stocking Allred Pond with Gila Topminnow and Roundtail Chub (formerly Gila Chub) or other management actions as needed.

## REMOTE SITE INVENTORY AND ASSESSMENT (TASK NM-2017-1)

### Strategic Plan Goals:

- Prevent extinction and manage toward recovery
  - Goal 7. Monitor to quantitatively measure and evaluate project success in improving the status of target species and their habitats.
  - Goal 8. Maintain accurate Program tracking records.

### 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

### 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 in New Mexico have never been surveyed before. 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 and the lower West Fork Gila River was surveyed in 2021 and the upper West Fork Gila River was surveyed in 2022. In 2023, remote reaches of the lower San Francisco River in New Mexico were surveyed. 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.

### Results

Sampling sites were placed every 2 km within the San Francisco River from the Pleasanton Diversion downstream to the New Mexico-Arizona border. Only sites in the upper portion of planned study area were surveyed in 2023 due to high flows and logistical constraints limiting access to sites further downstream. Department and USFWS staff sampled the upper sites on May 23–25 and June 28, 2023 (Figure 6).

Overall, native fishes were observed in low densities in the lower San Francisco River in New Mexico. At sites where Desert Sucker, Longfin Dace, and Sonora Sucker were captured, these species were captured at low numbers. Only one Desert Sucker was captured during the entire effort. Loach

Minnow, Spikedace, and Roundtail Chub were not captured at any site (Table 3). Nonnative species were observed in higher densities than native species. There was no apparent trend in densities of fish captured, whether native or nonnative, across sampling sites (Figures 7 and 8). The absence of rare native fish species and the low densities of common native fish species may be explained by the presence of large-bodied predatory nonnative fishes such as Channel Catfish *Ictalurus punctatus* and Flathead Catfish. These species appear to be excluded from the upper San Francisco River by the Pleasanton Diversion, and in this upper section rare native species were present during annual sampling in the fall of 2023 and common native species were captured in much greater numbers.

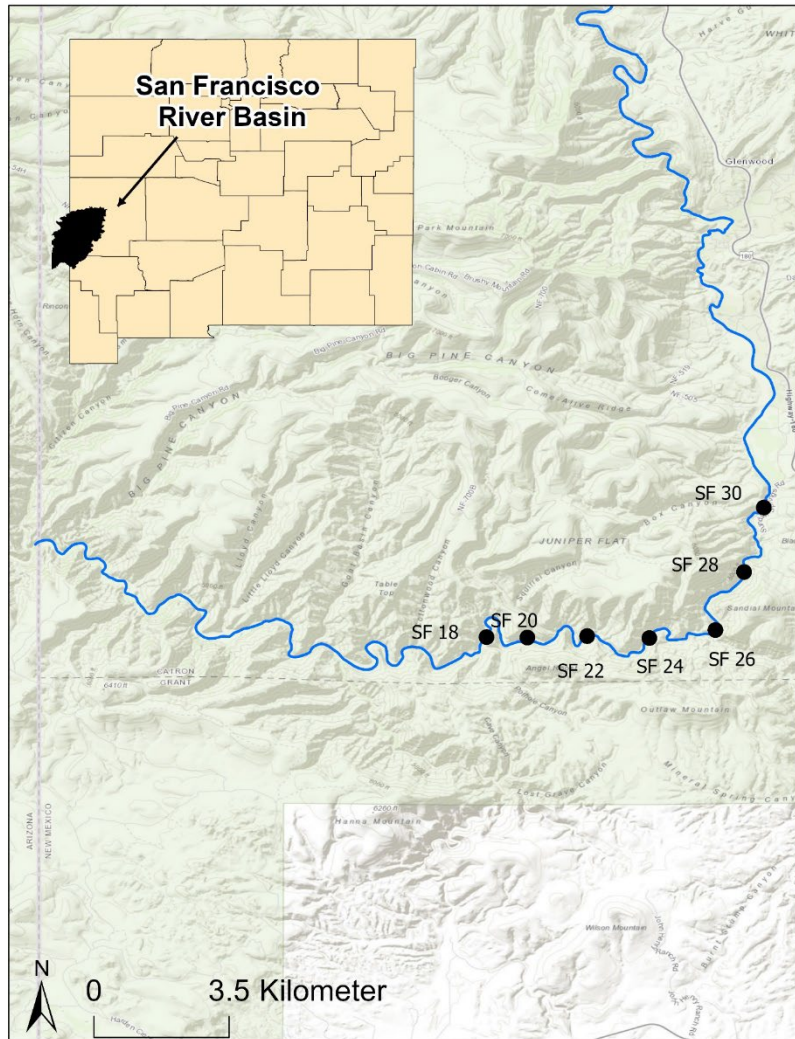


Figure 6. Location of remote inventory sites in the San Francisco River sampled in 2023.

Table 3. Total number of fish, percent composition, and mean density (fish/100 m<sup>2</sup>) of fish captured, by species, in San Francisco River at remote sites sampled in 2023.

Species	Site SF 18			Site SF 20		
	N	Percent composition	Density (fish/100 m <sup>2</sup> )	N	Percent composition	Density (fish/100 m <sup>2</sup> )
Native						
Desert Sucker	0	0	0	0	0	0
Longfin Dace	2	1.71	0.06	2	1.71	0.06
Sonora Sucker	0	0	0	0	0	0
Nonnative						
Channel Catfish	10	8.55	0.29	22	18.80	0.65
Common Carp	4	3.42	0.12	0	0	0
Fathead Minnow	0	0	0	0	0	0
Flathead Catfish	5	4.27	0.15	7	5.98	0.21
Red Shiner	1	0.85	0.03	0	0	0

Species	Site SF 22			Site SF 24		
	N	Percent composition	Density (fish/100 m <sup>2</sup> )	N	Percent composition	Density (fish/100 m <sup>2</sup> )
Native						
Desert Sucker	0	0	0	0	0	0
Longfin Dace	0	0	0	0	0	0
Sonora Sucker	0	0	0	1	0.85	0.03
Nonnative						
Channel Catfish	2	1.71	0.06	2	1.71	0.06
Common Carp	2	1.71	0.06	0	0	0
Fathead Minnow	0	0	0	0	0	0
Flathead Catfish	0	0	0	3	2.56	0.09
Red Shiner	2	1.71	0.06	1	0.85	0.03

Table 3 continued.

Species	Site SF 26			Site SF 28		
	N	Percent composition	Density (fish/100 m <sup>2</sup> )	N	Percent composition	Density (fish/100 m <sup>2</sup> )
Native						
Desert Sucker	0	0	0	0	0	0
Longfin Dace	0	0	0	0	0	0
Sonora Sucker	0	0	0	1	0.85	0.03
Nonnative						
Channel Catfish	2	1.71	0.06	6	5.13	0.18
Common Carp	9	7.69	0.27	1	0.85	0.03
Fathead Minnow	0	0	0	0	0	0
Flathead Catfish	3	2.56	0.09	0	0	0
Red Shiner	2	1.71	0.06	21	17.95	0.62

Site SF 30			
Species	N	Percent composition	Density (fish/100 m <sup>2</sup> )
Native			
Desert Sucker	1	0.85	0.03
Longfin Dace	0	0	0
Sonora Sucker	2	1.71	0.06
Nonnative			
Channel Catfish	0	0	0
Common Carp	0	0	0
Fathead Minnow	1	0.85	0.03
Flathead Catfish	1	0.85	0.03
Red Shiner	1	0.85	0.03

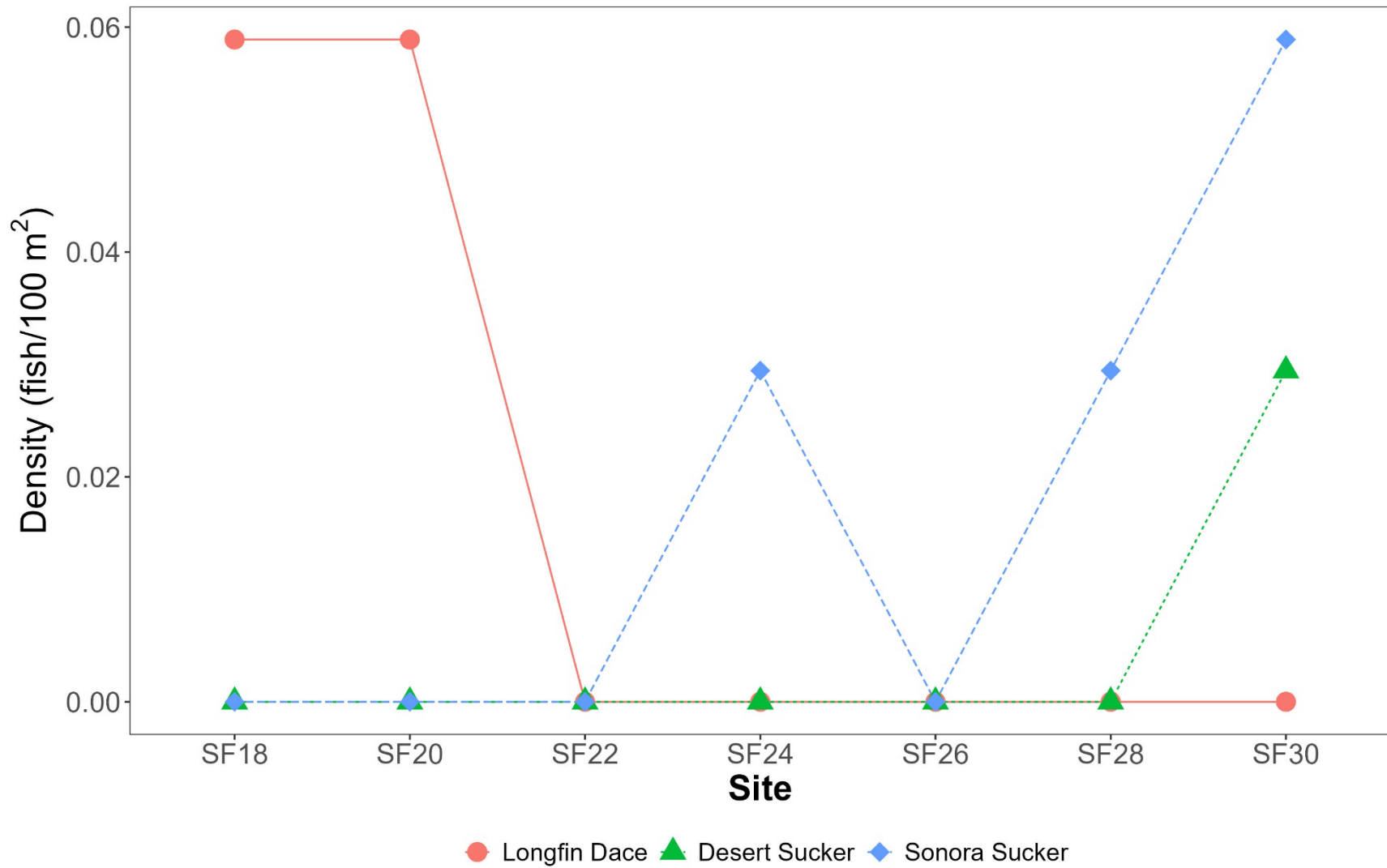


Figure 7. Densities (fish/100 m<sup>2</sup>) of common native species captured at each site sampled during remote site inventories of the San Francisco River in 2023. Note that sites are oriented from downstream (SF18) to upstream (SF30) on the x-axis.



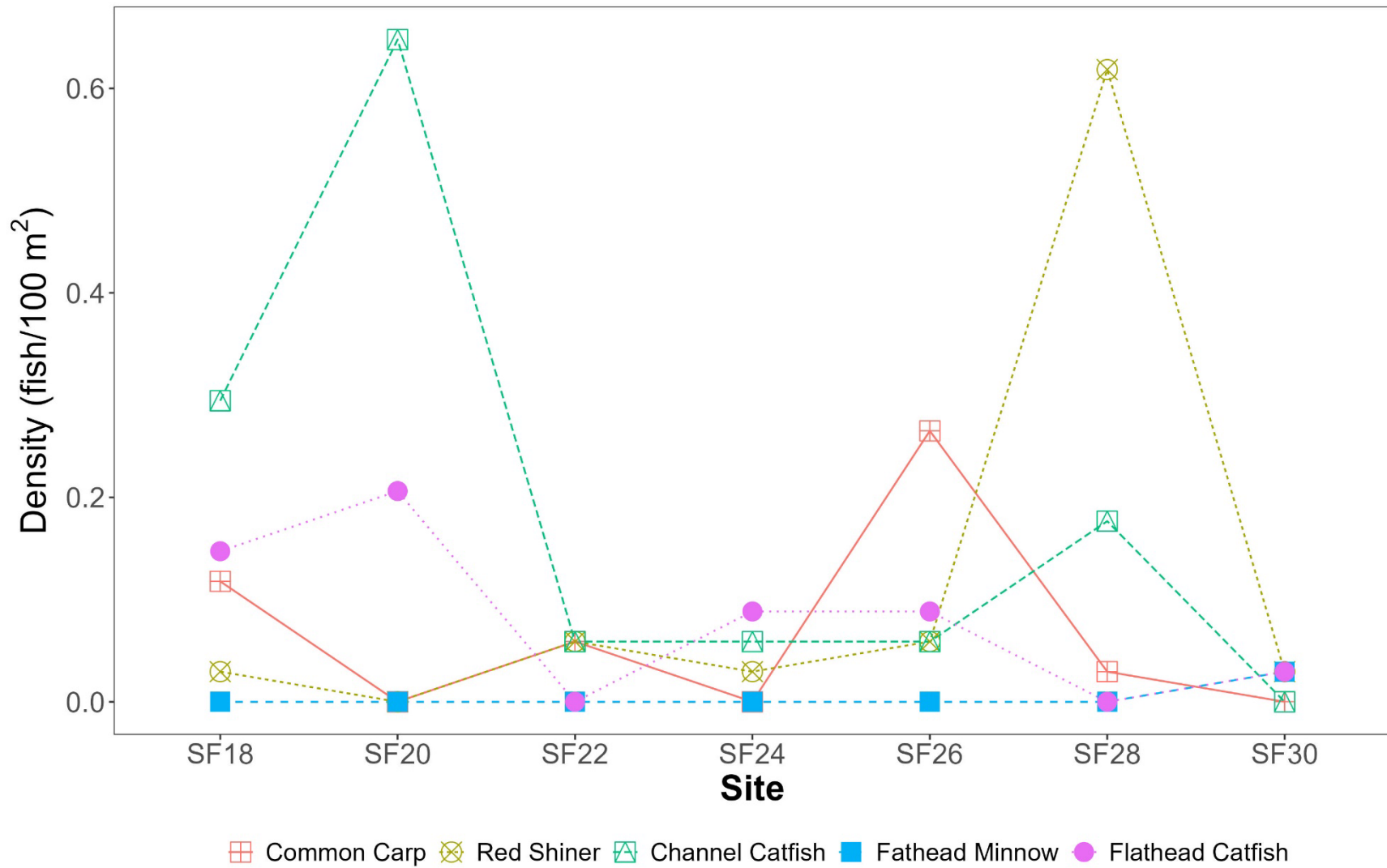


Figure 8. Densities (fish/100 m<sup>2</sup>) of nonnative species captured at each site sampled during remote site inventories of the San Francisco River in 2023. Note that sites are oriented from downstream (SF18) to upstream (SF30) on the x-axis.

## **Recommendations**

- The lower San Francisco River in New Mexico contains a sparse assemblage of native fish species, which does not include Loach Minnow, Spikedace, or Roundtail Chub.
- Sites in the Lower Box of the Gila 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. These surveys should be conducted to assess distribution of priority and native species in the area.

## **Work Planned for 2024**

- Sample remote reaches of the Lower Box of the Gila River.

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