# Gila River Basin Native Fishes Conservation Program

## New Mexico Activities

## 2012-2013

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U.S. FOREST SERVICE, GILA NATIONAL FOREST

U.S. FISH & WILDLIFE SERVICE, NM FISH & WILDLIFE CONSERVATION OFFICE

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## Executive Summary:

This is a report summarizing the Gila River Basin Native Fishes Conservation Program (GRBNFCP) funded projects in New Mexico from 1 July 2012 through 30 June 2013.

The New Mexico Department of Game and Fish (NMDGF) works with two landowners to restore fish on private lands. The Pitchfork Ranch has a refuge population of Gila topminnow in Burro Ciénega. The NMDGF 2012 surveys found them to be common in six areas of Burro Ciénega. The Nature Conservancy Gila Farm Pond was renovated and stocked with roundtail chub in 2008. NMDGF did not find roundtail chub in 2012. Nonnative fish are present in the pond and stocking of additional roundtail chub is not recommended before renovation and evaluation of a fish screen.

The NMDGF's Redrock Ciénega was restored in 2009 as a refuge for Gila topminnow and Gila chub. In 2012, NMDGF surveyed the pond and found Gila chub but no topmminow. Additional shoreline vegetation was planted.

The GRBNFCP is working to restore spikedace to San Francisco River. Spikedace were initially stocked in 2010. Due to the effects of recent fires no sampling or stocking of the spikedace repatriation site was conducted in this reporting period.

The GRBNFCP is working to restore Gila chub to previously occupied streams. In June 2012, Mule Creek was stocked with 118 Gila chub from Harden Ciénega. Surveys in June 2013 found that Gila chub successfully overwintered in Mule Creek and additional stocking is planned.

The GRBNFCP identified Saliz Canyon as a potential loach minnow repatriation site. In June 2013, NMDGF and the Unites States Fish and Wildlife Service (USFWS) surveyed Saliz Canyon and found no loach minnow. Plans for stocking loach minnow can move forward.

In Spring 2012, NMDGF and USFWS initiated the assessment of the canyon bound reach of the Gila River. The initial trip focused on perennial tributaries. Four tributaries were surveyed, but no fish were captured. Three mainstem sites were surveyed and seven nonnative species were collected.

NMDGF, USFWS and the United States Forest Service (USFS) completed multiple trips to inventory and conduct nonnative removal in Turkey Creek. Gila chub above and below a potential barrier were PIT tagged and fin clip genetic samples were collected.

NMDGF, USFWS and USFS moved fishes threatened by wildfire from the West Fork Gila River and the San Francisco River to Southwestern Native Aquatic Resources and Recovery Center (SNARRC). Salvaged fish have been returned to their collection sites except for loach minnow from the San Francisco River, which were transferred from SNARCC to Bubbling Ponds Hatchery to establish a captive population.

The NMDGF, USFWS and USFS perform removal of nonnative fishes in West Fork Gila River and Little Creek for the benefit of native fishes. In 2013, NMDGF, USFWS and USFS made two mechanical removal passes at the Heart Bar Wildlife Management Area. The participating agencies removed 56 nonnative fish. The participating agencies removed 210 brown trout from Little Creek during three mechanical removal trips.

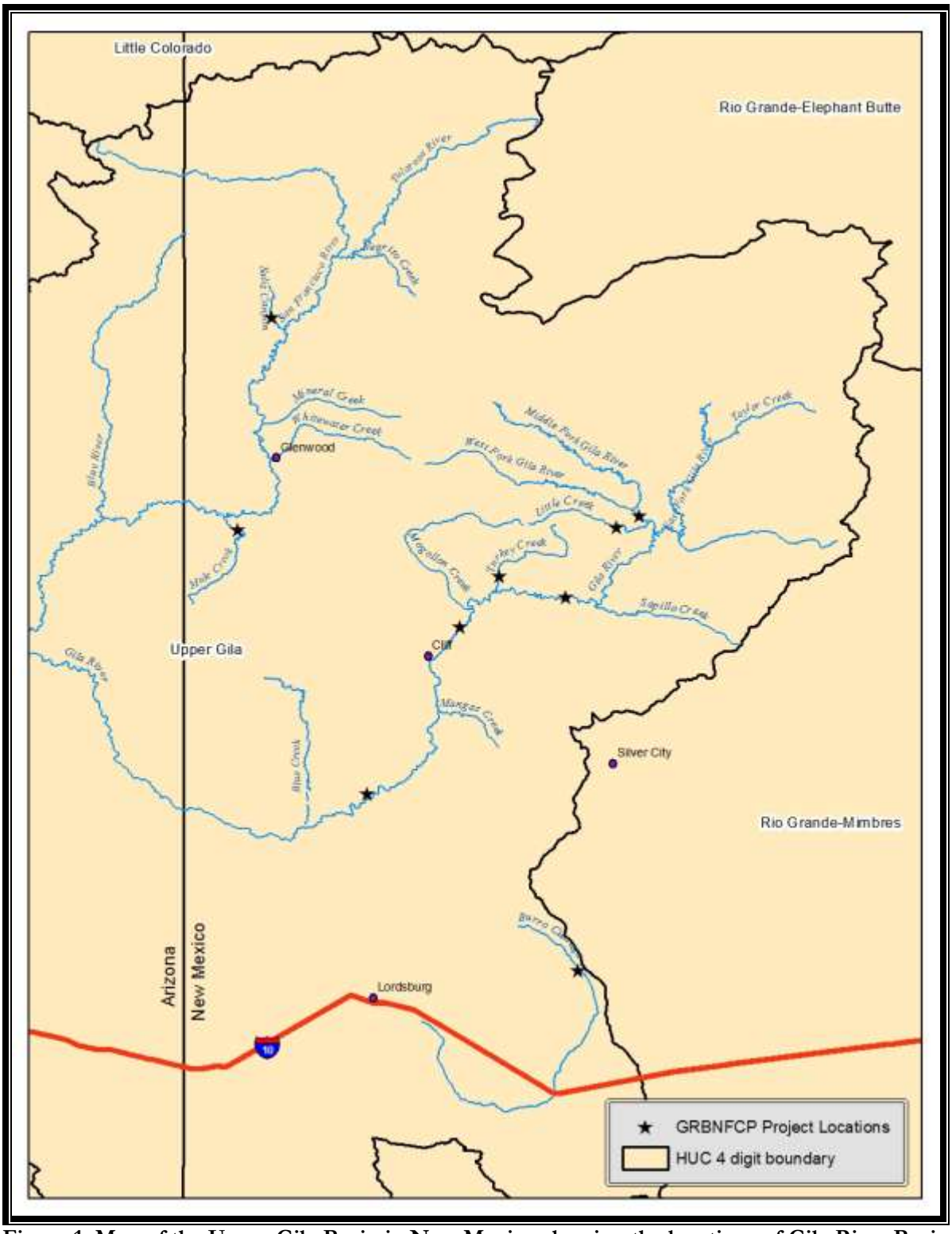


**Figure 1. Map of the Upper Gila Basin in New Mexico showing the locations of Gila River Basin Native Fishes Conservation Program projects described in this report.**

# Native Fishes Recovery & Conservation (RPA 3)

During the reporting period NMDGF spent $31,000.00 on RPA 3.

**Restoration of Native Fishes to Private Lands**

New Mexico Department of Game and Fish (NMDGF) is currently working with two landowners to restore native fishes on private lands. The Pitchfork Ranch, located 24 miles south of Silver City in Grant County, is in the southern portion of the Upper Gila Basin (Figure 1). In 2008 NMDGF and AZDGF stocked Gila topminnow *Poeciliopsis occidentalis* from Bylas Springs, in Burro Ciénega (Figure 2) on the Pitchfork Ranch. Despite several high flow events in 2009 and a severe drought from 2011 through 2013, the species persists and the landowners (A.T. & Cinda Cole) report them common in suitable habitats. Gila topminnow now occupies six distinct areas at Burro Ciénega. New Mexico Department of Game and Fish visited the site in July 2012. A 1/8-inch mesh minnow trap was set for two hours in the windmill overflow pond and more than 300 Gila topminnows were captured. This was done in part to validate the sampling method being used at the NMDGF's Red Rock Ciénega pond. Gila topminnow was common throughout the occupied reach of Burro Ciénega. There is a short reach within the topminnow habitat that has deeper pools that may support Gila chub *Gila intermedia*.

**Figure 2. Gila topminnow habitat in Burro Ciénega on the Pitchfork Ranch.**

The Nature Conservancy owns property on the Gila River four miles upstream of Gila, NM in the Cliff-Gila Valley. The Gila Farm Pond on the property is connected to an irrigation channel, but has no outlet (Figure 3). It had previously been used for agriculture and recreational fishing. After draining and removal of nonnative largemouth bass *Micropterus salmoides*, the pond was stocked with 84 Verde River roundtail chub *Gila robusta* from the Arizona Department of Game and Fish (AZGFD) Bubbling Ponds Hatchery in February, 2008. The Nature Conservancy installed a fish screen on the inflow structure from the irrigation ditch to the pond in 2009. NMDGF observed roundtail chub during snorkel surveys in 2008 and 2009, but no surveys were completed during 2010. In June 2011, NMDGF surveyed the pond with a trammel net and captured two Sonora suckers *Catostomus insignis*. These fish likely entered the pond before fish screen construction as they were 235 and 255 millimeters (mm) standard length (SL). In July 2012, NMDGF set two trammel nets in the pond and captured five bluegill *Lepomis macrochirus* (128 – 146mm total length [TL]), two yellow bullhead *Ameiurus natalis* (243 and 268mm TL), two common carp *Cyprinus carpio* (304 and 470mm TL) and two Sonora sucker (268 and 336mm TL). The nets were 50 and 100 feet long and 6 feet deep. The longer net was set deep (sink set) and the shorter net was set at the surface (float set). The combined catch rate was 4.07 fish per 100 feet of net per hour. The water was turbid during the sampling which prohibited snorkel surveys. Western mosquitofish *Gambusia affinis* were noted along the pond margins. These nonnative fish may have entered the pond before installation of the fish screen. The Nature Conservancy Gila Farm pond should not be considered a roundtail chub refuge in its current condition. Nonnative fishes that are large enough to prey on juvenile roundtail chub are present. The pond would need to be drained again before restocking with additional roundtail chub and the effectiveness of the fish screen at the inlet would need to be evaluated. .

**Figure 3. Pond at The Nature Conservancy's Gila Farm.**

**Restoration of Redrock Ciénega**

Ciénega construction (supported by funds from Gila River Basin Native Fishes Conservation Program, Desert Fishes Habitat Partnership, and US Fish and Wildlife Service [USFWS]) was completed in 2009 (Figure 4). After removal of dense salt cedar (*Tamarix* sp.), NMDGF created an approximately 0.75 acre (0.3 hectare) pond with a central island and variable depth as a refuge site for Gila topminnow and Gila chub (Figure 5). Shortly after completion, Gila topminnow from Bylas Springs were stocked. In October 2010, numerous Gila topminnow were observed along the pond margins. Also in October 2010, 150 Gila chub from Dix Creek in Arizona (collected and provided by AZGFD) were stocked.

**Figure 4. Redrock Ciénega, New Mexico Department of Game & Fish Redrock Wildlife Management Area, 2009 on the left and 2013 on the right.**

**Figure 5. Gila chub, Redrock Ciénega, New Mexico Department of Game & Fish Redrock Wildlife Management Area, February 2013.**

New Mexico Department of Game and Fish monitored Redrock Ciénega in June 2011 using minnow traps set along the ponds perimeter and a seine pulled through shallow open water. Three Gila chub were captured but no Gila topminnow. Two of the chubs were juveniles (45 mm SL)

indicating that chub reproduced in the pond. An additional 174 Gila chub and 2,357 Gila topminnow were stocked by NMDGF and AZGFD personnel in October 2011. Red Rock Ciénega pond was sampled on 16 July 2012 and on 19 February 2013 using minnow traps (Table 1).

**Table 1. Fish captured in Redrock Ciénega pond in minnow traps (fish/trap hour).**

| *Date* | *Species* | *Size Range (mm TL)* | *Total #* | *CPUE* |
|---|---|---|---|---|
| July 2012 | Gila chub | 81 - 119 | 2 | 0.09 |
| Feb 2013 | Gila chub | 59 – 98 | 7 | 0.07 |

NMDGF is uncertain why topminnow were not observed during sampling in the last year. Record cold temperatures (-18° C) during the winter of 2010/2011 may have been a contributing factor. Also, there was an abundance of filamentous algae during the July 2012 survey, which can result in reduced dissolved oxygen in a pond environment. Water quality in the pond may warrant further investigation.

Nonnative vegetation, mostly salt cedar, was removed from the pond area during initial construction. Salt cedar had begun to re-sprout along the pond margins by 2011. It would be beneficial to have some shade along the pond margins to reduce insolation during the summer months that results in raised water temperatures. NMDGF would prefer the shade be provided by native vegetation. At the time of the February sampling salt cedar was manually removed from the pond's shore and additional willow and seepwillow poles were planted.

## Restoration of Spikedace to San Francisco River

NMDGF, USFWS, USFS and AZGFD stocked spikedace *Meda fulgida* in the San Francisco River 10 kilometers upstream of US Hwy 180 in 2010. No followup surveys were completed due to the Whitewater Baldy fire.

## San Francisco River Tributary Survey for Chub Species

In 2007, NMDGF personnel proposed a systematic inventory of tributaries of the San Francisco for restoration of Gila chub. Mule Creek was evaluated and subsequently stocked in 2012. No additional tributaries have been evaluated for Gila chub stocking during this reporting period.

Stocking of Gila chub in Mule Creek and subsequent surveys is covered under the Native Fish Repatriation section of this report.

## Native Fish Repatriation and Monitoring

Mule Creek:
On 27 June 2012, NMDGF, AZGFD and USFS stocked 118 Gila chub in Mule Creek (Figure 6). Stocked Gila chub were collected by AZGFD from Harden Ciénega in April 2012. The fish were

brought to New Mexico by Staff from Bubbling Ponds Hatchery (AZGFD) delivered the fish to New Mexico for helicopter transport to the stocking location on Mule Creek. The helicopter was not able to assist as planned and the fish were transported by ATV in coolers with oxygen to the confluence of Mule Creek. They were then transferred to buckets with aerators attached to external frame backpacks and hiked up Mule Creek. The fish were stocked at three locations where deep pools with overhanging rocks provided appropriate habitat.

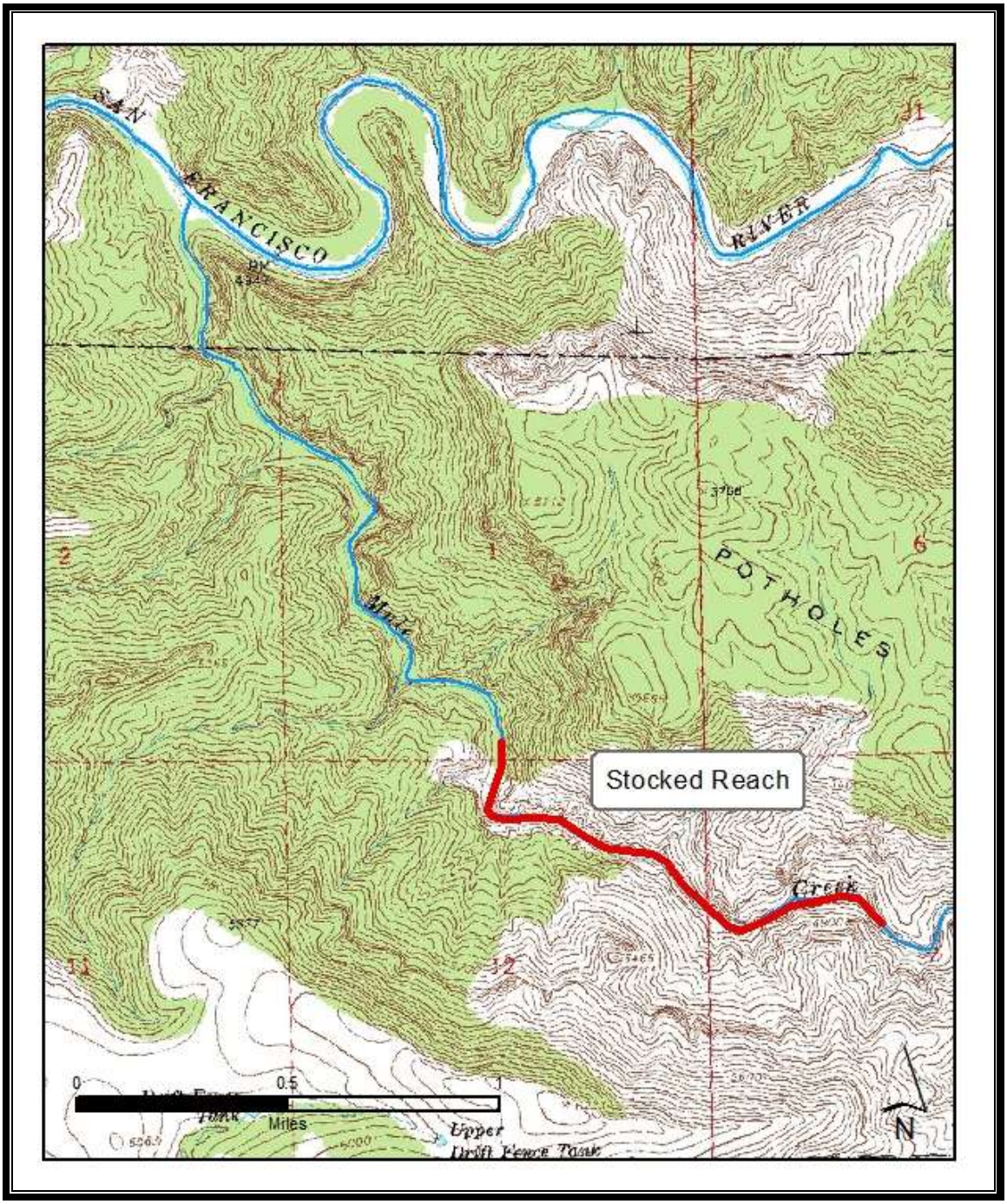


**Figure 6. Mule Creek Gila chub stocking location, June 2012.**

On 6 June 2013, NMDGF, USFWS and USFS surveyed the stocked reach of Mule Creek. They collected seven species in 1,610 seconds of electrofishing (Table 2). One channel catfish (260mm TL) and two green sunfish (120mm and 150mm TL) were collected at the lower end of the survey reach and were unlikely to move higher in the system due to boulders in the creek forming small waterfalls. At this point we do not consider nonnative fish a threat to Gila chub in Mule Creek, but future monitoring will provide better information. Bubbling Ponds Hatchery has additional Gila chub designated for stocking in Mule Creek and is scheduled for October 2013.

**Table 2. Fish captured and Catch per Unit Effort (CPUE, Number / Second) Mule Creek, 2013**

| *Species Common Name* | *Total Number Collected* | *CPUE* |
|---|---|---|
| Longfin Dace | 76 | 0.0472 |
| Sonora Sucker | 113 | 0.0702 |
| Desert Sucker | 131 | 0.0814 |
| Speckled Dace | 46 | 0.0256 |
| Gila Chub | 6 | 0.0037 |
| Channel Catfish | 1 | 0.0006 |
| Green Sunfish | 2 | 0.0012 |

Saliz Canyon:
The GRBNFCP identified Saliz Canyon as the next repatriation site for loach minnow. It is a small stream with perennial reaches that support a native fish assemblage (speckled dace, longfin dace, Sonora sucker, and desert sucker). On 5 June 2013, NMDGF and USFWS surveyed three locations on Saliz Canyon. Four species of fish were collected, but no loach minnow were collected (

Table 3). Due to multiple years of drought, flows in Saliz Canyon were very low during the survey(<2 cfs). Loach minnow habitat was not extensive but was present. In many of the riffles water flowed through the interstitial spaces of the cobble substrate instead of over it. Saliz Canyon is an ideal location to establish a loach minnow population because as a tributary it is protected from impacts in the mainstem San Francisco River. While being geographically separate a Saliz Canyon population would still maintain genetic connectivity when flows are sufficient to establish continuous connectivity to the San Francisco River.

The next step for Saliz Canyon is to stock loach minnow from the San Francisco River population. The Bubbling Ponds Hatchery currently houses San Francisco River loach minnow salvaged in 2012 after the Whitewater Baldy fire. Stocked loach minnow would either be offspring from these fish or wild fish collected upstream in the San Francisco River and transferred to Saliz Canyon. Environmental compliance documents will need to be prepared before stocking.

**Table 3. Fish captured and Catch per Unit Effort (CPUE, Number / Second) Saliz Canyon, 2013**

| *Site* | *Species Common Name* | *Total Number Collected* | *CPUE* |
|---|---|---|---|
| Forest Rd. 16 | Longfin Dace | 90 | 0.1372 |
| | Sonora Sucker | 3 | 0.0046 |
| | Desert Sucker | 19 | 0.0290 |
| | Speckled Dace | 70 | 0.1067 |
| At Cottonwood Can. | Longfin Dace | 75 | 0.0627 |
| | Desert Sucker | 23 | 0.0192 |
| | Speckled Dace | 89 | 0.0744 |
| At Martinez Canyon | Longfin Dace | 77 | 0.3850 |
| | Sonora Sucker | 9 | 0.0450 |
| | Speckled Dace | 27 | 0.1350 |

**Canyon Bound Gila River Assessment**

Surveys of the canyon-bound reach of the Gila River between Alum Camp and the confluence of Turkey Creek were conducted in spring 2012. This stretch of the Gila River had not been sampled by NMDGF since 1983 and has tributaries that have no record of sampling (Figure 7). The 1983 effort focused on the section upstream of Sycamore Canyon and included the lower kilometer of Sapillo Creek. In 2012, three sites were sampled on the mainstem Gila River upstream of Turkey Creek with a backpack electrofisher, seine and gill net. Tributaries that appeared to have perennial water were also surveyed with a backpack electrofisher or visually. These included Hells Canyon, Water Canyon, Wild Cow Canyon and an unnamed canyon on the north side of the Gila River approximately one mile downstream of Utah Bill Canyon (referred to as Wishbone Canyon in field notes).

In the three mainstem samples we collected seven species (Table 4). These included five flathead catfish (400 – 700mm TL), two channel catfish (176 and 420mm TL), 12 sunfish (41 – 124mmTL) and eight smallmouth bass (112 – 226mm TL), all of which are piscivorous and may help explain the absence of native fish species in our samples. The low overall density may suggest there are also other factors involved. Stomach contents were preserved from eight large piscivorous fish for future diet analysis. Species diversity was higher in the 1983 samples and included five native species.

Fish density was low overall in the mainstem samples. Gill net (30 feet x 4 feet) sampling included three sets for a total of 16.82 hours and captured one channel catfish. Backpack electrofishing at the three sites totaled 3,570 seconds and captured 92 fish (CPUE = 0.026 fish/sec). Western mosquitofish represented 75% of the electrofishing catch. Seinable habitat was present at two of the three mainstem sites. Seine hauls covered a total of 370 square meters and captured 114 fish (CPUE = 0.31 fish/square meter). Western mosquitofish represented 90% of the seine catch.

No fish were found in the tributaries. Habitat in the tributaries consists of high gradient flow with large substrate and a scarcity of pools. All tributaries had perennial sections upstream of their mouths, but had no surface water connectivity to the Gila River at the time of the survey.

The assessment of the canyon bound reach of the Gila River and its tributaries will continue in future years. It is not recommended that any of the tributaries sampled in 2012 be considered as repatriation streams for federally listed species due to a lack of habitat.


**Figure 7. Location of canyon bound Gila River sampling in 1983 and 2012.**

**Table 4. Fish species captured during surveys of the Gila River between Turkey Creek and Alum Camp, including tributaries, 1983 and 2012.**

| *Species Common Name* | *1983* | *2012* |
|---|---|---|
| Longfin Dace (Native) | X | |
| Yellow Bullhead (Nonnative) | X | |
| Black Bullhead (Nonnative) | X | |
| Sonora Sucker (Native) | X | |
| Western Mosquitofish (Nonnative) | X | X |
| Roundtail Chub (Native) | X | |
| Green Sunfish (Nonnative) | X | X |
| Smallmouth Bass (Nonnative) | X | X |
| Desert Sucker (Native) | X | |
| Rio Grande Sucker (Nonnative) | X | |
| Fathead Minnow (Nonnative) | X | |
| Speckled Dace (Native) | X | |
| Brown Trout (Nonnative) | X | |
| Flathead Catfish (Nonnative) | | X |
| Red Shiner (Nonnative) | | X |
| Bluegill (Nonnative) | | X |
| Channel Catfish (Nonnative) | X | X |

## Turkey Creek Inventory, Assessment, Nonnative Removal and Salvage

From 4 – 6 April 2012, USFWS, NMDGF and USFS surveyed approximately 4.7 miles of Turkey Creek (Figure 8). From 9 – 11 April 2013, USFWS, NMDGF and USFS surveyed the same section, plus an additional 1.8 miles above the 2012 survey. Nonnative removal was conducted concurrent with both surveys. There is an area of hot springs above and below a small waterfall that likely limits fish movement upstream during base flows (Figure 10). We used the waterfall at the hot springs to delineate between "lower Turkey Creek" and "upper Turkey Creek". The survey of upper Turkey Creek included two tributaries, Brush Canyon (~ 0.2 miles) and Sycamore Canyon (~0.5 miles). Surveys were conducted working upstream with two people dip netting and one person operating the backpack electrofisher. Gila chub were collected from the confluence with the Gila River up to an elevation of approximately 1,660 m. In 2012, 412 Gila chub were captured. In 2013, 209 Gila chub were captured. In 2012, passive integrated transponder (PIT) tags were implanted in 31 Gila chub (118 mm – 280 mm TL), 19 from the lower section and 12 from the upper section. In 2013, twelve Gila chub (155 mm – 225 mm TL) were PIT tagged, three from the lower section and nine from the upper section. Additionally in 2013, we recaptured two PIT tagged Gila chub in the upper reach that were likely fire salvage fish PIT tagged by SNARCC. In 2012, fin clip samples were collected from 132 Gila chub, 88 from the lower section and 44 from the upper section, and will be used for genetic analysis. In 2013, we collected fin clips from an additional 26 Gila chub for genetic analysis. Fin clips were delivered to the Museum of Southwestern Biology at the University of New Mexico.

In lower Turkey Creek Gila chub were collected up to the hot springs area just below the waterfall. Water temperature at the collection location closest to the hot springs was 25°C. Some of the Gila chub captured had tubercles and swollen vents. The smallest Gila chub collected with tubercles was 121mm (TL).

We found less overall fish density in lower Turkey Creek (0.010 fish/second) than upper Turkey Creek (0.036 fish/second). No nonnative fish were captured in lower Turkey Creek in 2013. These changes are likely due to continued drought and multiple fires in the Turkey Creek watershed. Fires in the Turkey Creek watershed have caused ash flows and increased runoff that transports sediment and debris. Vegetative cover has been reduced in parts of the upper watershed where the fire burned riparian areas along Turkey Creek and its tributaries.

Gila chub were salvaged in response to the 2011 Miller Fire and the 2012 Whitewater Baldy Fire. In both cases Gila chub were returned to the creek after the fire. Several canyons in upper Turkey Creek were burned resulting in habitat alteration and ash flows. Despite these changes Gila chub survived in Turkey Creek and evacuated chub were returned to habitat occupied by remaining Gila chub.

Turkey Creek contains the sole remnant population of Gila chub in New Mexico and represents a unique Management Unit identified in the Gila Chub Recovery Plan (USFWS, in preparation). The GRBNFCP has identified Turkey Creek as a potential barrier site with the best overall conservation benefit. The hot springs and waterfall are unlikely to act as a barrier at elevated stream flows and they are upstream of a significant portion of Gila chub habitat. A barrier closer to the mouth of Turkey Creek would be needed to protect the Gila chub population from nonnative species that are present in the Gila River. The confluence of Turkey Creek and the Gila River is dry at base flows. When flows increase and there is a direct connection there is no barrier to movement of fish from the Gila River into Turkey Creek. Despite this connection with the Gila River, Turkey Creek supports a predominantly native fishery. Green sunfish and smallmouth bass are the only nonnatives that were collected in lower Turkey Creek and rainbow trout the only nonnative present in upper Turkey Creek (Table 5). Additional nonnative piscivorous species that are present in the Gila River and could gain access to Turkey Creek include channel and flathead catfish. Barrier sites have been evaluated by Clarkson and Marsh (2013) and NMDGF contracted Pioneer Technical Services to evaluate two potential barrier sites in the same general area (Pioneer Technical Services, 2013 technical memorandum to J. Wick, NMDGF, on Turkey Creek barrier evaluation). The downstream site is just outside the Wilderness Area boundary and the upstream site just inside the boundary. The downstream site would require a larger structure, but the upstream site would require permission to construct a temporary road and use motorized construction equipment or deliver materials by helicopter.

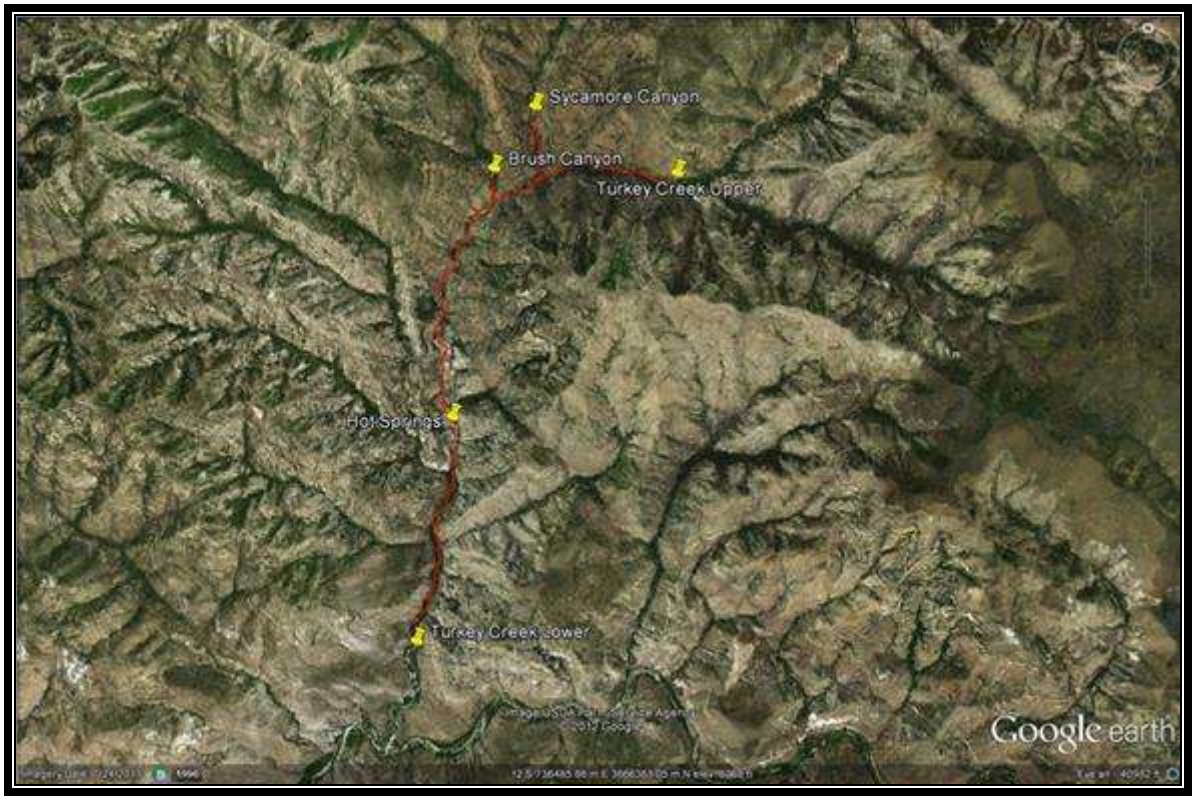


**Figure 8. Map of Turkey Creek and tributaries surveyed in 2012. The 2013 survey included an additional 1.8 miles of Turkey Creek upstream of the 2012 survey.**

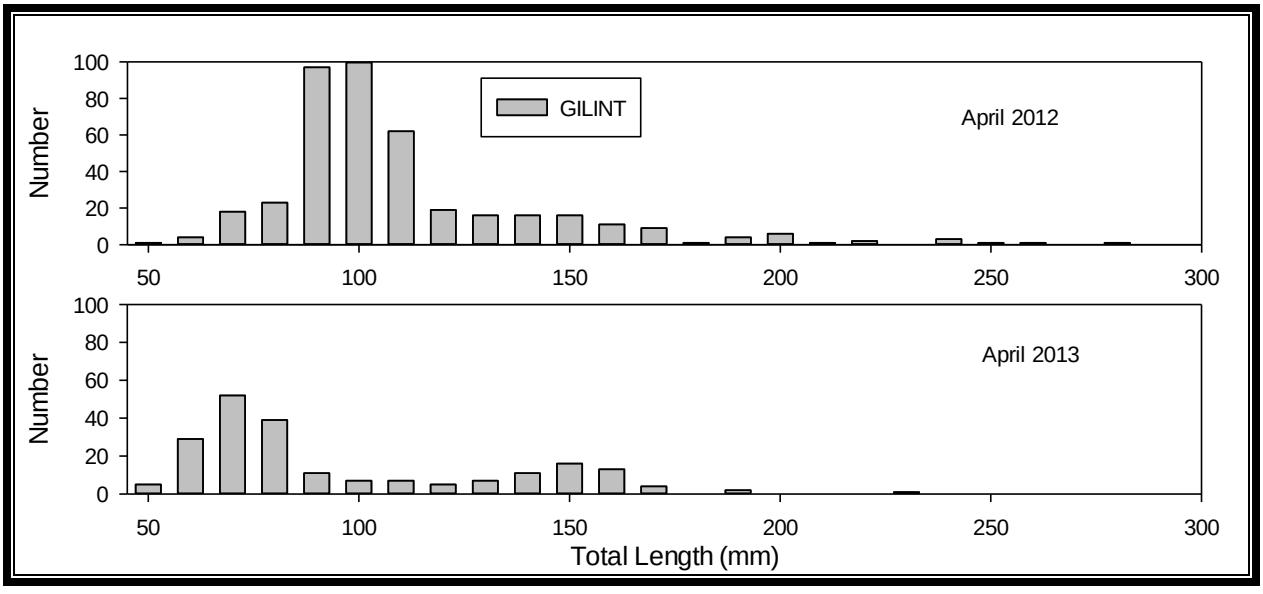


**Figure 9. Length-frequency of Gila chub captured in Turkey Creek, New Mexico.**

**Table 5. Fish Surveys of Turkey Creek (including Sycamore Canyon). Catch Per Unit Effort (CPUE) is #/second. Size range is total length in millimeters.**

| *Reach* | *Species* | *Size 2012* | *# 2012* | *Size 2013* | *# 2013* | *CPUE 2012** | *CPUE 2013*** |
|---|---|---|---|---|---|---|---|
| Upper | Gila Chub | 51-258 | 125 | 45-194 | 136 | 0.007 | 0.006 |
| | Speckled Dace | 31-96 | 282 | 25-91 | 616 | 0.015 | 0.029 |
| | Rainbow Trout | 107-204 | 2 | 109-290 | 13 | <0.001 | 0.001 |
| Lower | Gila Chub | 68-280 | 287 | 56-225 | 73 | 0.019 | 0.008 |
| | Longfin Dace | 70-82 | 32 | 73 | 1 | 0.002 | <0.001 |
| | Sonora Sucker | 87-305 | 70 | 132-210 | 2 | 0.005 | <0.001 |
| | Desert Sucker | 72-257 | 184 | 65-160 | 15 | 0.012 | 0.002 |
| | Green Sunfish | 62-107 | 5 | | 0 | <0.001 | 0 |
| | Smallmouth Bass | 90-117 | 4 | | 0 | <0.001 | 0 |

*2012:Shocking time – Lower: 15,286 seconds Upper: 18,926 seconds
**2013:Shocking time - Lower: 8,852 seconds Upper: 21,632 seconds

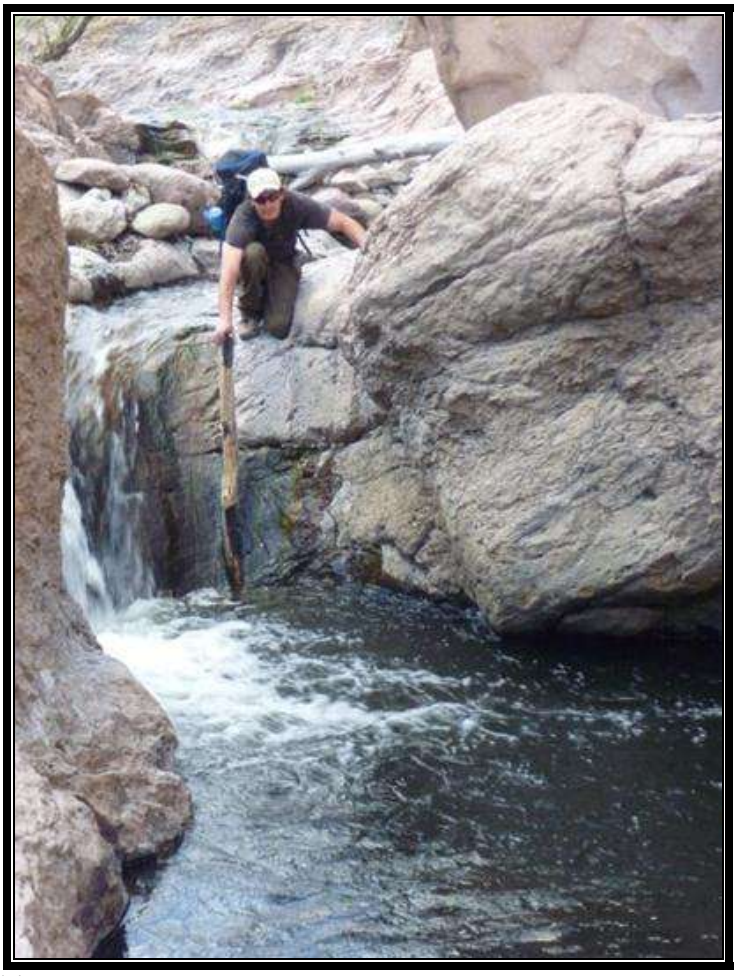

**Figure 10. Waterfall at Turkey Creek hot springs.**

**Spikedace and Loach Minnow Fire Evacuation**

In June 2012, the Whitewater Baldy Fire burned in the upper Gila River and San Francisco River watersheds. In anticipation of severe ash and debris flows, spikedace and loach minnow were evacuated on 15 June 2012. NMDGF and USFWS collected 66 loach minnow and 60 spikedace from the West Fork Gila River at the Heart Bar Wildlife Management Area and transferred them to SNARRC for holding. On 10 July, after the first ash flows in West Fork Gila, a second trip was made and 210 spikedace and 53 loach minnow were collected and taken to SNARRC (Figure 11). NMDGF and SNARRC returned 100 loach minnow and 239 spikedace to the West Fork Gila River on 20 June 2013.

On 26 June 2012, NMDGF, USFWS and USFS collected 48 loach minnow from the San Francisco River at the Glenwood Ranger Station, which were transported to SNARRC. Loach minnow from the San Francisco were subsequently transferred from SNARRC to Bubbling Ponds Fish Hatchery in Arizona in summer 2013. The San Francisco River loach minnow population is not currently represented in captivity and Bubbling Ponds Hatchery plans to establish a captive breeding population from those that were collected. .

**Figure 11. Salvaging spikedace and loach minnow from the West Fork Gila River after the Whitewater Baldy Fire.**

# Nonnative Control (RPA 4)

During the reporting period NMDGF spent $22,000.00 on RPA 4.

**West Fork Gila River**

New Mexico Department of Game and Fish has been conducting nonnative removal activities at the Heart Bar Wildlife Management Area since 2006. The removal reach is the West Fork Gila River from its confluence with Little Creek upstream to the NM Highway 15 bridge. Each year in June

NMDGF, USFWS and USFS jointly conduct a comprehensive fish survey including removal of nonnative species and enumeration and measurement of native species by habitat. The first four years of the effort (2006 - 2009) were evaluated and although the effects of all the variables could not be accounted for (e.g., flow regimes, fine sediment excavation, or unknown factors) the results were positive (reported in previous reports). The GRBNFCP decided to continue the effort based on a demonstrated reduction in piscivorous predators.

The NMDGF experienced personnel change on this project in 2010 and was shorthanded. With limited personnel they were able to perform the June mechanical removal and community assessment, but habitat data was collected differently. That meant CPUE could not be compared directly to previous years. The West Fork Gila River nonnative removal incorporates seining and electrofishing for greatest removal efficacy, but this complicates CPUE reporting. Seining CPUE is recorded as area seined and electrofishing CPUE is recorded by time electrofished. In the 2009 nonnative removal report, CPUE was calculated by habitat area. That is, the sampled area of each mesohabitat in the river was measured and all fish captured with electrofishing and seining were combined. In 2010 the same protocol was used for fish capture, but effort was recorded as electrofishing seconds and area seined separately (i.e. no area was recorded for electrofishing). In 2011, NMDGF experienced additional changes in personnel and remained shorthanded. The nonnative removal effort in 2011 included one trip in June. NMDGF considers this the most important of the scheduled efforts because it maintains a continuum of community data that can be used to show a response to mechanical removal. In 2011 NMDGF used the same protocol for fish capture and collected habitat data in the same way as it had been done previous to 2010. Due to the issue with the 2010 habitat data the only continuous trend data presented in this report is relative abundance (Figure 12).

During sampling we use electrofishing, seining, and electrofishing into the seine depending on what is the best method for the habitat type. Habitat type, length, width, and fish data for each habitat are recorded independently allowing for fish density to be calculated per habitat unit. The most common mesohabitats in the Heart Bar reach of the West Fork Gila are pools, runs, riffles, glides, and shoals. A crew collecting mesohabitat data follows crews collecting fish. The habitat crew records length, width, depth, substrate, and embeddedness for each mesohabitat. The fish crews record morphometric data for all fish and remove nonnative fish. Native fish are returned to the mesohabitat of capture before proceeding to the next mesohabitat. This allows for calculation of CPUE by square meters of each mesohabitat. This provides the best resolution data for comparing fish densities between years. For this reason, NMDGF uses only June removal data to evaluate effects to nonnatives and response of natives to mechanical removal efforts.

The West Fork Gila River Heart Bar reach was electro-fished and seined in June 2013 to remove nonnative fishes and document abundance of all species. Native fishes continue to be more abundant than nonnative fishes (Table 6). All previously recorded native species were collected in 2013, except Gila trout *Oncorhynchus gilae*. In previous years, Gila trout were stocked at the Heart Bar, but no stocking occurred in 2013 due to the Whitewater Baldy fire in 2012. Water temperatures were warm (>30°C) in June and no trout species were represented. Six nonnative fish species were collected in 2013, a decrease from ten in 2012. Smallmouth bass were absent from the 2013 survey, although they appear to be replaced by flathead catfish. Large flathead catfish have been consistently caught in deep pools since 2011. While not great in number they do represent a large

piscivorous biomass. Flathead catfish removed since 2011 have ranged in mass from 840 – 4,900 grams.

Although there has been an overall downward trend in relative abundance of nonnative fishes (Figure 12), two large bodied fish have increased in abundance in the last three years. Common carp were not collected before 2012 and prior to 2012, flathead catfish were caught on only two occasions. Large biomass piscivorous fish likely have a larger impact on small bodied fish populations than do smaller size predators. NMDGF has collected flathead catfish in the mainstem Gila River consistently since 1983, but did not capture one in the Forks until 2006. It is not clear whether flathead catfish occur at the Heart Bar due to ongoing range expansion, or if successfully decreasing the abundance of smallmouth bass created a vacuum for catfish to move in. Propst et. al. (2013) compared control sites on the West Fork and Middle Fork to the nonnative removal reach and showed that when flathead catfish were excluded there was a decrease in biomass of nonnative fish. At the same time there has been a significant increase in spikedace. This is of particular importance because spikedace has declined throughout its range over the past few decades leading to its uplisting from Threatened to Endangered in 2012 (USFWS 2012)

Ash flows as a result of the Whitewater Baldy fire affected habitat in the Heart Bar reach by depositing fine sediments and ash, thus decreasing depth and size of pools and embedding cobble. Although the West Fork Gila River did not experience severe flooding immediately after the fire, record high flows have occurred during the 2013 monsoon season. These flows likely impacted both native and nonnative fishes in the removal reach.

NMDGF, USFWS and USFS made a second pass of the removal reach the day after completing the annual monitoring pass. The second pass resulted in the removal of an additional four flathead catfish, four yellow bullhead and one fathead minnow in addition to those listed in Table 6.

**Table 6. Number of individuals and relative abundance by year of native and nonnative fishes captured during June in West Fork Gila River Heart Bar reach, New Mexico, 2007-2013. Data from 2006 was not included because it was not collected in June of that year. See previous annual reports for 2006 data.**

| *Species* | *2007* | | *2008* | | *2009* | | *2010* | | *2011* | | *2012* | | *2013* | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *#* | *Rel. Ab.* | *#* | *Rel. Ab.* | *#* | *Rel. Ab.* | *#* | *Rel. Ab.* | *#* | *Rel. Ab.* | *#* | *Rel. Ab.* | *#* | *Rel. Ab.* |
| **Native** | 945 | 81.0% | 1361 | 92.4% | 11449 | 94.1% | 2256 | 96.6% | 6887 | 95.9% | 2619 | 93.3% | 2840 | 98.4% |
| Longfin dace | 115 | 9.9% | 207 | 14.1% | 3444 | 28.3% | 712 | 30.5% | 2000 | 27.8% | 675 | 24.1% | 625 | 21.6% |
| Headwater chub | 38 | 3.3% | 46 | 3.1% | 518 | 4.3% | 90 | 3.9% | 108 | 1.5% | 18 | 0.6% | 16 | 0.6% |
| Spikedace | 0 | 0.0% | 27 | 1.8% | 103 | 0.8% | 84 | 3.6% | 1023 | 14.2% | 138 | 4.9% | 29 | 1.0% |
| Speckled dace | 17 | 1.5% | 59 | 4.0% | 566 | 4.6% | 153 | 6.5% | 1063 | 14.8% | 237 | 8.4% | 393 | 13.6% |
| Loach minnow | 1 | 0.1% | 8 | 0.5% | 50 | 0.4% | 6 | 0.3% | 99 | 1.4% | 20 | 0.7% | 89 | 3.1% |
| Sonora sucker | 511 | 43.8% | 641 | 43.5% | 5328 | 43.8% | 1002 | 42.9% | 1654 | 23.0% | 1231 | 43.9% | 1372 | 47.5% |
| Desert sucker | 263 | 22.6% | 360 | 24.4% | 1427 | 11.7% | 208 | 8.9% | 939 | 13.1% | 296 | 10.5% | 316 | 10.9% |
| Gila trout | 0 | 0.0% | 13 | 0.9% | 13 | 0.1% | 1 | 0.0% | 1 | 0.0% | 4 | 0.1% | 0 | 0.0% |
| **Nonnative** | 221 | 19.0% | 112 | 7.6% | 724 | 5.9% | 80 | 3.4% | 297 | 4.1% | 187 | 6.7% | 47 | 1.6% |
| Red shiner | 0 | 0.0% | 0 | 0.0% | 0 | 0.0% | 2 | 0.1% | 1 | 0.0% | 2 | 0.1% | 0 | 0.0% |
| Fathead minnow | 0 | 0.0% | 1 | 0.1% | 0 | 0.0% | 19 | 0.8% | 62 | 0.9% | 45 | 1.6% | 1 | 0.0% |
| Bullheads | 97 | 8.3% | 30 | 2.0% | 281 | 2.3% | 41 | 1.8% | 150 | 2.1% | 17 | 0.6% | 20 | 0.7% |
| Flathead catfish | 0 | 0.0% | 0 | 0.0% | 1 | 0.0% | 0 | 0.0% | 1 | 0.0% | 11 | 0.4% | 9 | 0.3% |
| Rainbow trout | 48 | 4.1% | 14 | 1.0% | 47 | 0.4% | 0 | 0.0% | 28 | 0.4% | 1 | 0.0% | 0 | 0.0% |
| Brown trout | 36 | 3.1% | 62 | 4.2% | 361 | 3.0% | 11 | 0.5% | 9 | 0.1% | 6 | 0.2% | 0 | 0.0% |
| Western mosquitofish | 15 | 1.3% | 0 | 0.0% | 4 | 0.0% | 0 | 0.0% | 6 | 0.1% | 90 | 3.2% | 11 | 0.4% |
| Green sunfish | 1 | 0.1% | 0 | 0.0% | 1 | 0.0% | 5 | 0.2% | 3 | 0.0% | 13 | 0.4% | 0 | 0.0% |
| Smallmouth bass | 24 | 2.1% | 5 | 0.3% | 29 | 0.2% | 2 | 0.1% | 37 | 0.5% | 2 | 0.1% | 0 | 0.0% |
| Common Carp | 0 | 0.0% | 0 | 0.0% | 0 | 0.0% | 0 | 0.0% | 0 | 0.0% | 2 | 0.1% | 6 | 0.2% |

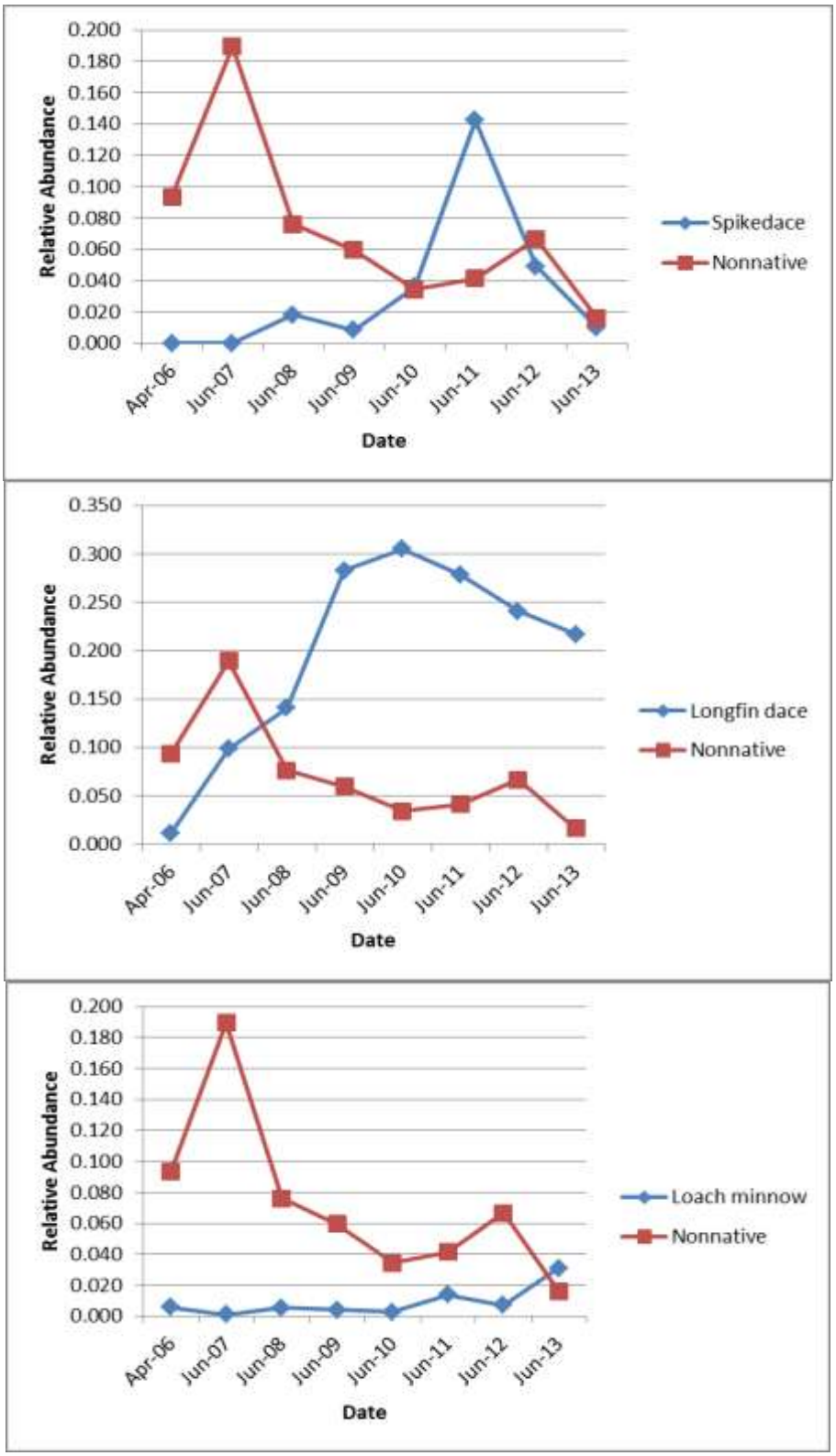


**Figure 12. Relative abundance of three minnow species in relation to relative abundance of all nonnative fishes captured in Heart Bar reach of West Fork Gila River, New Mexico. The remainder of the total proportion is made up of native fishes.**

**Little Creek**

The GRBNFCP initiated nonnative removal in Little Creek with the intent of creating a location for repatriation of loach minnow. Mechanical removal of nonnatives is accomplished by electrofishing. The effort is focused on nonnative removal and does not have a community survey component in the protocol. Native fishes are captured and measured on the first pass as time permits. The methods call for three passes three times per year for a total of nine passes per year. Little Creek has proven to be a difficult stream to work in and a single pass of the six km removal reach takes 2-3 days, so a three pass removal effort is not feasible.

The USFWS, USFS and NMDGF completed a baseline survey and nonnative removal on six km of Little Creek working upstream from NM 15 box culvert during two efforts in June and July 2010 (Figure 13). Native species present in Little Creek include longfin dace, speckled dace, desert sucker, Sonora sucker, and Gila trout. Nonnative species in Little Creek are rainbow trout *Oncorhynchus mykiss* and brown trout as well as one smallmouth bass captured in 2011and one bullhead captured in 2013. The majority of the nonnative species collected are brown trout (Table 7) and it appears that removal efforts are resulting in a decrease of brown trout greater than 100 mm TL (Figure 14). The proposal for Little Creek nonnative removal states that loach minnow would be stocked when there is less than one nonnative fish per kilometer. This threshold has not been reached yet.

During this reporting period we completed two complete removal passes with additional passes made where the greatest numbers of nonnatives were found during the first pass. In August 2012, three passes were made in the 600 m below the barrier. Number and CPUE of brown trout *Salmo trutta* decreased in each pass, 68 (0.018/s), 16 (0.009/second [s]) and 14 (0.007/s), respectively. In April 2013, two passes were made lower in the nonnative removal reach. This was done because no brown trout were collected in the reach where multiple passes were made in August 2012. In April 2013, 19 (0.002/s) brown trout were removed in the first pass of the entire nonnative removal reach. On the second pass of the highest density portion (Figure 13) an additional 11 (0.003/s) brown trout were removed.


**Figure 13. Aerial photograph of Little Creek showing nonnative removal reach and locations of multiple passes.**

**Table 7. Number and catch rates (CPUE in fish/minute electrofishing) of nonnative fishes captured in Little Creek, New Mexico.**

| *Trip* | *Brown Trout* | *Rainbow Trout* | *NN CPUE* | *NN/km* |
|---|---|---|---|---|
| Jun-Jul 2010 | 201 | 2 | 0.312 | 33.7 |
| Jun 2011 | 92 | 34 | 0.466 | 22.9 |
| Jun 2012 | 479 | 0 | 0.771 | 79.8 |
| Aug 2012 | 166 | 1 | 0.573 | 27.8 |
| Apr 2013 | 30 | 1 | 0.125 | 5.3 |
| Jun 2013 | 12 | 0 | 0.377 | N/A* |

* Partial pass of nonnative removal reach

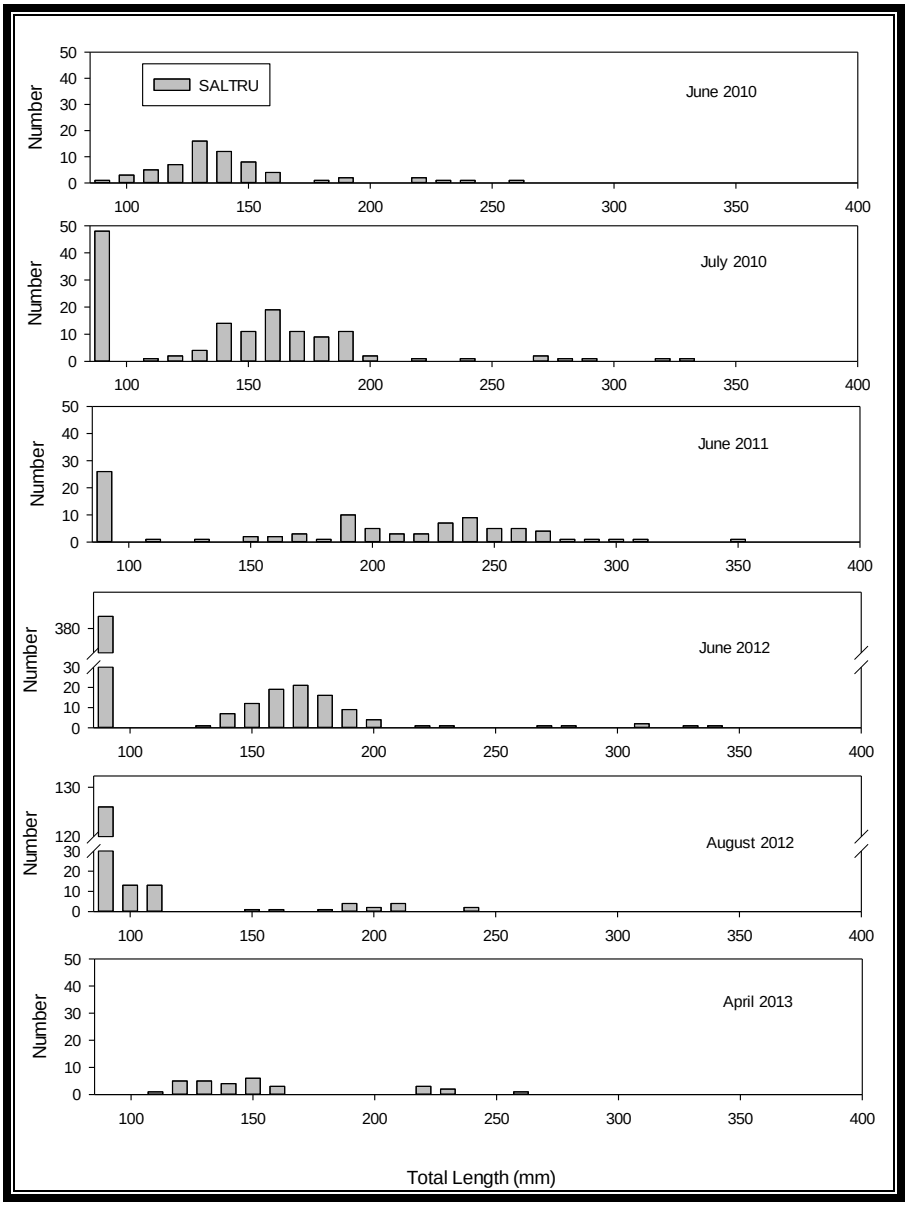


**Figure 14. Length-frequency of brown trout captured in Little Creek, New Mexico. The first bar represents all fish up to 90mm TL.**

Literature Cited:

Clarkson R.W., P.C. Marsh. 2013. Preliminary Investigation of Potential Fish Barrier Sites on Middle Fork Gila River and West Fork Gila River, New Mexico, With Notes on the Alma Diversion Dam on San Francisco River and a Summary of All New Mexico Streams Evaluated to Date.

Propst D.L., K.B. Gido, J.E. Whitney, E.I. Gilbert, T.J. Pilger, A.M. Monié, Y.M. Paroz, J.M. Wick, J.A. Monzingo, D.M.Myers. 2013, Manuscript submitted for publication. Efficacy of Mechanically Removing Nonnative Predators from a Desert Stream.

USFWS. 2012. Endangered Status and Designations of Critical Habitat for Spikedace and Loach Minnow. Federal Register 77:36(23 Feb 2012): 10809 -10932