2024

HERITAGE AND WILD TROUT PROGRAM

California Department of Fish and Wildlife

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EXECUTIVE SUMMARY

The Heritage and Wild Trout Program (HWTP) is composed of fisheries biologists throughout California working to conserve, manage, and enhance the state's diverse native and wild trout resources. The HWTP's work includes conducting field surveys, removing or mitigating non-native species impacts, managing designated Wild and Heritage Trout Waters, assessing barriers to fish passage, and engaging with partners and the public through extensive outreach and education events.

This report summarizes the HWTP's major accomplishments during the 2024 field season, including significant restoration and monitoring work in the Golden Trout Wilderness, Lahontan Basin, and Smith River watershed, as well as expanded outreach and the launch of a new interactive Story Map to accompany this year's report.

Year End Highlights

Golden Trout Wilderness (South Fork Kern River and Tributaries)

A central focus of 2024 was the continued monitoring and protection of California Golden Trout (CAGT) within the Golden Trout Wilderness (Inyo/Tulare counties). Electrofishing surveys were conducted across the South Fork Kern River (SFKR) and tributaries to assess population status, evaluate non-native species presence, and monitor barrier integrity.

Results showed that CAGT populations remain strong in several upper reaches, particularly in Mulkey Creek and the SFKR in Tunnel Meadow. However, Brown Trout were again detected above Templeton Barrier, indicating that the invasive population has expanded its range despite past eradication efforts. To better understand this re-invasion, HWTP biologists worked closely with CDFW Conservation Engineering staff to assess the structural integrity and passability of key barriers at Templeton, Ramshaw, and Schaeffer meadows, natural features in the adjacent Four Canyons tributary system, and connectivity in the headwaters of Strawberry Creek.

Environmental DNA sampling, habitat surveys, and population estimates were used together to determine where Brown Trout have spread and to identify which barriers are still effectively isolating CAGT populations. These findings will inform next steps for barrier maintenance, habitat restoration, and long-term recovery planning for California's State Fish. The work completed this year marks a significant advancement in understanding and managing the connectivity challenges critical to sustaining the native California Golden Trout lineage in its historical range.

Lahontan Cutthroat Trout Recovery – Silver Creek (Mono County)

In the Inland Deserts Region, the HWTP continued a multi-year Lahontan Cutthroat Trout (LCT) restoration effort on Silver Creek. Favorable field conditions allowed for full dewatering of the 7.5-mile project area, resulting in the removal of the final remaining non-native Brook Trout (only six individuals were found). This marks a major milestone in achieving one of the primary LCT recovery goals for the Walker Basin. Continued eDNA monitoring will confirm eradication success and guide future recovery actions.

Smith River (Del Norte County) and Northern California (Modoc County) Monitoring

In the Northern Region, HWTP staff conducted fish population and habitat assessments across multiple tributaries, including the North Fork and Middle Fork Smith Rivers and Goose Lake tributaries. The Smith River surveys documented robust populations of Coastal Cutthroat Trout and Coastal Rainbow Trout, as well as high-quality habitat conditions following a series of wet years. These data continue to inform long-term management and potential Heritage Trout Water Designation proposals.

Public Outreach, Partnerships, and Education

The HWTP conducted one of its most active outreach years to date. Program staff participated in over a dozen major outreach events statewide, including the Bart Hall Show, the Central Valley Sportsman's RV and Boat Show, and educational workshops such as the Classroom Aquarium Education Program. HWTP biologists also engaged with angling clubs, conservation groups, and the Fisheries Resource Volunteer Corps on volunteer projects, public presentations, and habitat cleanups in key watersheds like Lytle Creek and Mill Creek.

The California Heritage Trout Challenge continued to grow in popularity, with a record 56 certificates awarded in 2024, the highest annual total in program history. Additionally, the HWTP produced a promotional video and media release to celebrate the 500th certificate awarded, further raising awareness of California's native trout diversity, conservation, and angling opportunities.

2024 Wild Trout Water Designation

In 2024, the Fish and Game Commission approved the HWTP's proposal to expand the North Fork Mokelumne River Wild Trout Water designation to include Deer Creek, Blue Creek, and Summit City Creek in Alpine County. These tributaries offer exceptional angling opportunities and unique access along the Deer Valley OHV trail, adding 40 miles of high-quality wild trout habitat to California's designated waters.

New Story Map

A new Heritage and Wild Trout Program Story Map was developed in 2024 to accompany this annual report. The interactive map highlights statewide survey locations, key findings, and photographs in an accessible online format, providing a dynamic visual overview of the HWTP's work and impact.

PROGRAM INTRODUCTION

History

In 1971 the California Fish and Game Commission (Commission) established the Wild Trout Program to protect and enhance quality fisheries sustained by wild trout populations. The Commission directed the California Department of Fish and Game (Department) to study and identify waters that would provide quality wild trout angling for designation as Wild Trout Waters. In 1998 the Commission established the Heritage Trout Program (HTP) by expanding its Wild Trout Policy so that streams or lakes featuring one or more of the state's native trout within their native range may be designated as Heritage Trout Waters. Later, the Wild Trout Program title was modified to the Heritage and Wild Trout Program (HWTP) to incorporate the newly established Heritage Trout Program elements.

As of January 1, 2025, the HWTP has designated 46 streams totaling 2060.8 miles and 17 lakes/lake complexes totaling 27,579 acres.

Overview

California's wild trout resources are diverse, extensive, and comprise one of the nation's largest and most heavily used fisheries resources. Trout occur in upwards of 18,000 miles of streams and are the principal sport fish in over 9,000 cold water lakes and reservoirs in California. Trout habitats range in character from coastal steelhead rivers to alpine lakes higher than 13,000 feet in the Sierra Nevada. These resources are threatened by land and water development, nonnative species, and are subjected to heavy use and competing demands of anglers. Human population growth complicates effective wild trout conservation as habitat destruction accelerates while anglers are demanding more and better fishery resources.

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The overarching goal of the HWTP is to protect and manage California's wild & heritage trout populations through:

- protection and enhancement of coldwater habitats;
- preparation, publication and implementation of watershed management guidelines and strategies;
- continued statewide assessment of designated and non-designated trout waters;
- conducting scientific research that will benefit trout management programs;
- conserving and restoring the state's native trout forms; and
- preserving and enhancing the opportunity for the angling public to fish for the state's native and non-native wild trout now and in the future.

The California HWTP is guided by Department policy, legislative mandates, and input from stakeholders. Working under the Department Wild Trout Policy, the HWTP primary goal is to study and identify waters that may provide quality wild trout angling for designation as Wild Trout Waters. In addition, the Department is required by Commission Policy to prepare and periodically update management guidelines or each Wild Trout Water.

The HWTP uses a phased approach to select and monitor designated waters:

1. Phase 1 is the initial resource assessment to determine if the water fits the criteria for designation. Relatively quick and inexpensive survey methods are used such as hook and line, angler surveys, and snorkel surveys. Surveys examine species and size classes present, public access, and catch rates.
2. Phase 2 involves a more in-depth look at population size, habitat condition, and angler usage.
3. Phase 3 is the designation and management process which includes writing a management plan and submitting the water to the Fish and Game Commission for formal designation.
4. Phase 4 is the post-designation monitoring. This involves conducting additional surveys and making updates to the management plan if needed.

Primary Tasks

A critical facet of the HWTP has been the ability of program personnel to coordinate at the statewide level. This level of coordination creates continuity throughout the state and across time, while providing standardization for survey methodology and data gathering and storage. The HWTP personnel work under five primary tasks that make up the foundation of this program.

1. Population Management and Planning

The HWTP prepares management plans for designated Wild Trout Waters and Heritage Trout Waters. These plans incorporate data collected in Tasks 2 and 3 and provide management objectives for each watershed. They may also serve as the basis for larger Basin Management Plans and Strategic Trout Plans.

2. Resource Assessment and Fishery Monitoring

The HWTP uses a variety of survey methods to collect information on the status of native and wild trout populations and the fisheries they support. Survey types are wide ranging and can be adapted to meet the specific objectives of a watershed or project. Methods include electrofishing, snorkel surveys, drought assessments, genetic tissue sampling, and angler surveys. The HWTP is also responsible for recommending candidate Wild Trout Waters to the Commission. A phased approach is used to evaluate waters for Heritage and/or Wild Trout designations and monitor existing designated waters.

3. Habitat Improvement

The HWTP is committed to the restoration and enhancement of wild trout populations and fishing opportunities by improving the quality and quantity of trout habitat. Restoration activities may involve negotiating conservation easements, purchasing land, acquiring water rights, removing nonnative species, securing instream flows through administrative processes, and reviewing activities that threaten fish habitat.

4. Public Outreach and Education

Public outreach is an important tool for promoting wild trout conservation and management. In 2008, the HWTP first initiated the Heritage Trout Challenge, a nationally recognized challenge that encourages anglers to explore the native trout diversity in California. To date, almost 500 Heritage Trout Challenge certificates have been issued to anglers who have caught six different species of native trout in their native watersheds. The HWTP regularly participates in public presentations at venues such as the International Sportsman's Exposition, angling groups, and the Department's Recruit, Retain, Reactivate program. Another key component to the HWTP are the volunteers that help with various projects. This provides the HWTP with the opportunity to educate people from the public, while accomplishing goals that would not be possible without volunteer support.

5. Research

The HWTP conducts research that supports management decisions and adds to the body of scientific information on wild trout resources. This both strengthens the validity of the program's management decisions and provides scientifically based and peer-reviewed information to the scientific community and the public.

2024 FIELD SEASON

Fisheries Branch

Resource Assessment and Fishery Monitoring

Stony Creek, Colusa County

Survey Dates: May 14 – 16

Overview:

The Upper Stony Creek drainage offers anglers both fast-action and trophy trout angling opportunities for Coastal Rainbow Trout and was designated as a Wild Trout Water in 2009. The Heritage and Wild Trout Program is mandated to reassess management of the water every five years.

Objective:

Assist the North Central Region with electrofishing, snorkeling, and angling surveys to support the management plan for Stony Creek and to train new staff in various survey protocols.

Methods:

Direct Observation Snorkel

Two habitat units were snorkeled with 3-4 divers. Habitat units are defined as riffle, flatwater or pool. A random number of habitat units was selected after each section to determine the next habitat unit surveyed. Fish were identified to species and categorized by the following size classes: YOY (young of year), Small (0-5.9in), Medium (6-11.9 in), Large (12-17.9 in), and Extra Large (18 in+).

Single Pass Electrofishing

Two locations were used for single pass electrofishing surveys. One on South Fork Stony Creek at Deafy Glade and one on a tributary called Mill Creek. Two Smith Root LR-20B electrofishers were used with two netters and a live car tender on both surveys. Staff switched positions throughout the surveys to train new staff. Water quality and streamflow measurements were taken in section. Length (mm) and weight (g) measurements were taken for each fish caught. Fish were then returned to the creek.

Hook-and-Line

Two locations on South Fork Stony Creek were used for hook-and-line surveys – near South Fork Campground and near Deafy Glade. The first survey had 7 anglers and the second had 4 anglers participate. Fly fishing gear was used. Catch-per-unit-effort (CPUE) was calculated from each angler. Fish were identified to species and categorized by the following size classes: YOY (young of year), Small (0-5.9in), Medium (6-11.9 in), Large (12-17.9 in), and Extra Large (18 in+).

Results:

Direct Observation Snorkel

17 total Rainbow Trout were observed in both snorkel sections ranging from small (0-5.9in) to medium (6-11.9in) in size. Other species observed were California Roach, Speckled Dace, Sculpin spp, Minnows spp, Western Pond Turtles, Foothill Yellow Legged Frogs, and Garter Snakes spp.

Single Pass Electrofishing

14 Rainbow Trout were caught during the survey on the South Fork Stony Creek at Deafy Glade. Young of year Rainbow Trout and Pacific Giant Salamanders were also observed in section.

No trout were caught on the Mill Creek tributary survey. Other species that were caught were Sculpin spp, California Roach, and Speckled Dace. Crayfish spp, Garter Snakes spp, and Foothill Yellow Legged Frogs were all observed in section.

Hook-and-Line

The average CPUE at South Fork Campground was 0.6 fish/hour, while the average CPUE for Deafy Glade was 4.25 fish per hour. California Roach were also caught during the survey at the campground.

Discussion:

The data from these surveys will help the North Central Region make management decisions for the Upper Stony Creek drainage. These surveys were also used to train new crew members on the statewide crew.

<u>North Fork and Middle Fork Smith River, Del Norte County</u>

Survey Dates: May 22 – 29

Overview:

The Smith River watershed offers a variety of angling experiences including backcountry and roadside access, fast-action fisheries, unique native trout species, and trophy trout fisheries. The streams support Coastal Rainbow Trout (*Oncorhynchus mykiss irideus*), Coastal Cutthroat Trout (*Oncorhynchus clarkii clarkii*), and anadromous trout and salmon populations. The South Fork Smith River was designated as a wild trout water in 2016-2018 and previous surveys support expanding that designation to the North and Middle Forks of the Smith River.

Objective

The 2024 surveys focused on the presence/absence and distribution of Coastal Cutthroat Trout in the North and Middle Forks of the Smith River to support a future designation as a wild trout water. These surveys were also used to train new crew members in HWTP survey protocols.

Methods:

Direct Observation Snorkel

Direct observation snorkel surveys took place on Patrick Creek (Middle Fork Smith River tributary), and Diamond Creek (North Fork Smith River tributary). Four habitat units were surveyed on Patrick Creek. Eleven habitat units were surveyed on Diamond Creek in two different sections of the creek – one at the confluence with North Fork Smith River and the other further upstream by North Fork Diamond Creek.

Hook-and-Line

Hook-and-line surveys were conducted on the North Fork Smith River, Patrick Creek, Diamond Creek, and Little Jones Creek to calculate average catch-per-unit-effort (CPUE) on each stream. 1-6 anglers participated in the surveys and fly and spin rod fishing gear were used.

Fish were identified to species and categorized by the following size classes: YOY (young of year), Small (0-5.9in), Medium (6-11.9 in), Large (12-17.9 in), and Extra Large (18 in+).

Results:

Direct observation snorkel data including total fish observed and estimated observations per mile from Patrick Creek, Lower Diamond Creek, and Upper Diamond Creek are recorded in Table 1, Table 2, and Table 3 respectively.

Hook-and-line survey data for Patrick Creek, Lower Diamond Creek, Upper Diamond Creek, North Fork Smith River, and Little Jones Creek including CPUE, trout species, and size classes captured are recorded in Table 4.

Table 1. Direct observation snorkel survey data from Patrick Creek (tributary to the Middle Fork Smith River).

Section	Species Observed	Total Fish Observed	Estimated Observations/Mile
0124	Coastal Rainbow Trout	16	706
0124	Unidentified Salmonid	2	88

Section	Species Observed	Total Fish Observed	Estimated Observations/Mile
0224	Coastal Rainbow Trout	5	493
0224	Coastal Cutthroat Trout	2	197
0224	Unidentified Salmonid	10	986
0324	Coastal Rainbow Trout	9	305
0324	Coastal Cutthroat Trout	2	67
0324	Unidentified Salmonid	10	339
0424	Coastal Rainbow Trout	14	305
0424	Coastal Cutthroat Trout	3	168
0424	Unidentified Salmonid	18	18

Table 2. Direct observation snorkel survey data from Lower Diamond Creek (tributary to the North Fork Smith River).

Section	Species Observed	Total Fish Observed	Estimated Observations/Mile
0124	Coastal Rainbow Trout	19	440
0124	Unidentified Salmonid	4	92
0224	Coastal Rainbow Trout	1	94
0224	Unidentified Salmonid	6	567
0324	Coastal Rainbow Trout	1	38
0324	Unidentified Salmonid	10	387
0424	Coastal Rainbow Trout	4	391
0424	Unidentified Salmonid	3	293
0524	Coastal Rainbow Trout	6	576

Section	Species Observed	Total Fish Observed	Estimated Observations/Mile
0524	Unidentified Salmonid	11	1056
0624	Coastal Rainbow Trout	10	488
0624	Coastal Cutthroat Trout	1	48
0624	Unidentified Salmonid	49	2395
0724	Coastal Rainbow Trout	12	592
0724	Coastal Cutthroat Trout	2	98
0724	Chinook Salmon	1	49
0724	Unidentified Salmonid	60	2963

Table 3. Direct observation snorkel survey data from Upper Diamond Creek (tributary to North Fork Smith River).

Section	Species Observed	Total Fish Observed	Estimated Observations/Mile
0824	Coastal Rainbow Trout	12	357
0824	Coastal Cutthroat Trout	3	89
0824	Unidentified Salmonid	56	1666
0924	Coastal Rainbow Trout	29	954
0924	Chinook Salmon	1	32
0924	Unidentified Salmonid	37	1217
1024	Coastal Rainbow Trout	75	2543
1024	Coastal Cutthroat Trout	3	101
1024	Unidentified Salmonid	17	576
1124	Coastal Rainbow Trout	6	260

Section	Species Observed	Total Fish Observed	Estimated Observations/Mile
1124	Unidentified Salmonid	71	3085

Table 4. Hook-and-line survey results on the North and Middle Fork Smith River tributaries from the 2024 field season.

Stream Name	# of Anglers	Average CPUE (fish/hour)	Species Captured	Size Classes Captured
Patrick Creek	6	0.6	Coastal Rainbow Trout	Small, Medium, Large
Lower Diamond Creek	1	0	None captured	None captured
Upper Diamond Creek	5	0.2	Coastal Rainbow Trout, Coastal Cutthroat Trout	Small, Medium
North Fork Smith River	3	1.1	Coastal Rainbow Trout	Small, Medium
Little Jones Creek	5	1.5	Coastal Cutthroat Trout	Small, Medium

Discussion:

Coastal Cutthroat Trout and Coastal Rainbow Trout were observed throughout all snorkel surveys on Diamond Creek which shows their distribution extends at least 4 miles upstream from the confluence with the North Fork Smith River.

Coastal Cutthroat Trout and Chinook Salmon were observed this year in Patrick Creek during the snorkel surveys, which were not observed in previous years. More surveys are needed to determine distribution throughout Patrick Creek.

Most of the participating crew members did not have previous experience using hook-and-line survey protocols which could account for the lower CPUE results on all streams.

This data will be used in combination with previous year's data to support a future wild trout designation of the North and Middle Forks of the Smith River. The Smith River watershed meets all the requirements for designation as a Heritage Trout Water and provides some of the best opportunities in California for encountering Coastal Cutthroat Trout.

Middle Fork Feather River, Plumas County

Survey Dates: June 27 – July 2

Overview:

In February 2024, a train derailment spilled several train cars containing coal into the Middle Fork Feather River near Blairsden, CA. The affected area was about 13 miles upstream of the section of river designated as a Wild Trout Water. In response to the derailment, the HWTP statewide crew organized snorkel surveys to assess the wild Rainbow and Brown Trout populations in the designated area of the river.

Objective:

Conduct direct observation snorkel surveys to assess the potential impact of the spilled coal on the trout population.

Methods:

Sixteen habitat units were snorkeled by 4-5 snorkelers starting from the confluence of Nelson Creek and ending about 6 miles upstream near the confluence of Peoria Creek ( ). Habitat units were defined by riffle, flatwater, or pool. Snorkel sections were selected based on a random number from a dice roll and started at accessible points along the river. A representative width, a maximum depth, and a section length were taken in each section. Air and water temperatures, dominant substrate, and water visibility were also recorded in each section. Fish were identified to species when possible and categorized by the following size classes: YOY (young of year), small (0-5.9in), medium (6-11.9in), large (12-17.9in), and extra-large (18in+).

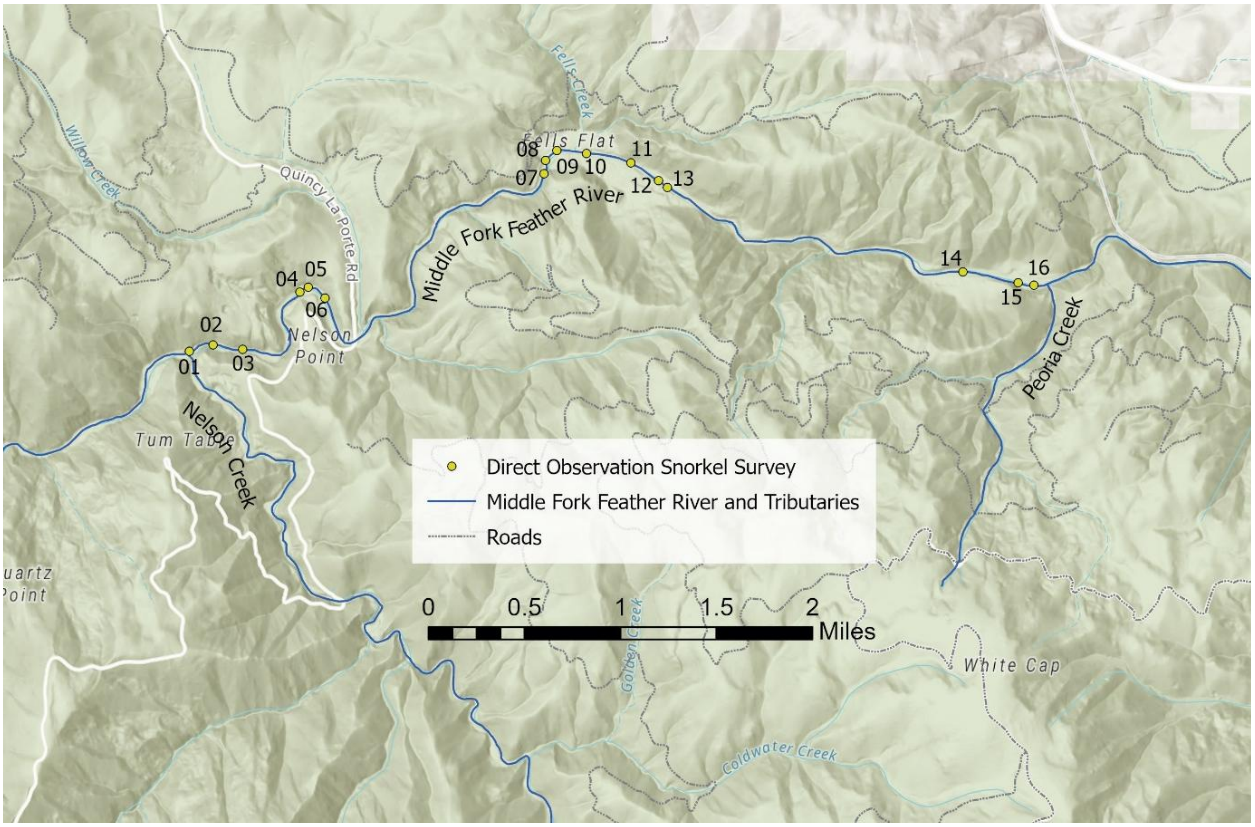


Figure 1. Map of direct observation snorkel surveys on the Middle Fork Feather River between Nelson Creek and Peoria Creek.

Results:

A map of all snorkel survey locations is shown in Figure 1. No coal was found in any of the sections. A breakdown of all the size classes of the different fish species observed in all 16 snorkel sections is portrayed in Table 5. Rainbow, Brown and unidentified trout observations and estimated observations/mile from each snorkel section are recorded below in Table 6. Other observations included unidentified minnows, unidentified sculpin, unidentified sucker, crayfish, freshwater bivalves, and unknown egg masses.

Out of the sixteen sections snorkeled, about 70% were flatwater habitat and 30% were riffle habitat. No pool sections were snorkeled during these surveys. The dominant substrate in the riffle sections was either cobble or boulder, while the flatwater sections ranged from silt/fines, gravel, cobble and boulder. Many of the flatwater sections had silt/fines covering the substrate of the river bottom because of the slower water moving through those sections. Air temperatures ranged from 22°C to 32°C with an average of 25.9°C and the weather was sunny, and mostly clear throughout the survey days. Water temperatures ranged from 16°C to 22°C with an average of 18.7°C.

The shortest snorkel section was 201ft, while the longest section was 1,428ft, with an average section length of 461.8ft. A representative width was taken in each section and ranged from 37.5ft to 124.5ft across, with an average of 74.3ft. A maximum depth was also taken in each section, which ranged from 2.3ft to 15.5ft, with an average of 6.1ft. Water visibility ranged from 4.7ft to 13.3ft. The riffle sections had lower visibility mostly due to water turbulence and bubble curtains.

Table 5. Size class breakdown of all fish species observed in all snorkel sections of the Middle Fork Feather River.

Species Observed	YOY	Small (0 – 5.9in)	Medium (6 – 11.9in)	Large (12 – 17.9in)	XL (18in +)	Total
Rainbow Trout	2	67	435	85	1	590
Brown Trout	67	13	17	2	0	99
Unidentified Trout	726	61	65	6	0	858
Unidentified Minnow	1850	209	0	0	0	2059
Unidentified Sucker	1	24	5	1	0	31
Unidentified Sculpin	1	6	1	0	0	8
Unidentified Fish	34	0	2	0	0	36

Table 6. Direct observation snorkel survey trout observations and estimated observations/mile for the Middle Fork Feather River.

Section	Species Observed	Total Fish Observed	Estimated Observations/mile
01	Rainbow Trout	20	255
01	Unidentified Trout	102	1300
02	Rainbow Trout	34	672
02	Unidentified Trout	18	355
03	Rainbow Trout	24	279
03	Brown Trout	1	11

Section	Species Observed	Total Fish Observed	Estimated Observations/mile
03	Unidentified Trout	485+	5652
04	Rainbow Trout	15	227
04	Brown Trout	2	30
04	Unidentified Trout	50	758
05	Rainbow Trout	72	1735
05	Brown Trout	1	24
05	Unidentified Trout	40	964
06	Rainbow Trout	68	1266
06	Brown Trout	6	111
06	Unidentified Trout	50	931
07	Rainbow Trout	3	56
07	Unidentified Trout	6	112
08	Rainbow Trout	19	499
08	Brown Trout	8	210
08	Unidentified Trout	5	131
09	Rainbow Trout	55	849
09	Brown Trout	5	77
09	Unidentified Trout	13	200
10	Rainbow Trout	34	209
10	Brown Trout	9	55
10	Unidentified Trout	5	30

Section	Species Observed	Total Fish Observed	Estimated Observations/mile
11	Rainbow Trout	56	207
11	Unidentified Trout	10	36
12	Rainbow Trout	22	147
12	Brown Trout	1	6
12	Unidentified Trout	11	73
13	Rainbow Trout	31	737
13	Brown Trout	9	214
13	Unidentified Trout	6	142
14	Rainbow Trout	12	160
14	Brown Trout	12	160
14	Unidentified Trout	6	142
15	Rainbow Trout	34	362
15	Brown Trout	12	128
15	Unidentified Trout	19	202
16	Rainbow Trout	91	1204
16	Brown Trout	33	436
16	Unidentified Trout	32	423

Discussion:

Throughout the 16 snorkel sections, the HWTP statewide crew observed Rainbow, Brown and unidentified trout in all size classes (Table 5). Most of the observed trout were in the YOY and medium size classes. The high number of YOY shows that spawning was successful in this area despite the coal spill upstream. The presence of trout in every size class also suggests that there was not an extreme effect on the population numbers. Without a baseline dataset prior to the coal spill in this area, the effect on the population is difficult to determine. This dataset could be used as a baseline for post-spill population data.

There were some challenges that came with these surveys. Firstly, the river in this area had very few access points and moving upstream was difficult due to terrain and time constraints. Secondly, the swift current made surveying upstream more difficult, especially in the deeper sections where swimming against the current was nearly impossible without handholds. This made observing fish difficult in some spots. Additionally, some of the crew members were relatively new to snorkel surveys which may have affected detection rates.

Upper North Fork Mokelumne Watershed Hook and Line Surveys, Alpine County

Survey Dates: June 3, July 12, and July 30

Overview:

The mainstem of the Nork Fork Mokelumne River from Salt Springs Reservoir upstream to the Lower Highland Lake was designated as a Wild Trout Water in 2022. Previous surveys have shown potential for other waters to be designated within the North Fork Mokelumne watershed, but the amount of recent data is limited.

Objective:

Conduct phase 4 angling surveys on the mainstem as both a training opportunity for new staff and follow-up surveys of the already designated section. Conduct phase 2 angling surveys to help support expanding the North Fork Mokelumne River to include the Lower Highland Lake and several tributaries.

Methods:

Angling protocols and size class definition follow the methods described in the Hook and Line section for Stony Creek. Survey locations were located on the mainstem downstream of the crossing with Highway 4, where the Deer Valley OHV trail crosses Deer and Blue creeks, and at the Lower Highland Lake (Figure 2). Fly fishing was used on the creeks and mainstem and a mix of fly fishing and conventional fishing (lures and bait) were used at the lower Highland Lake.

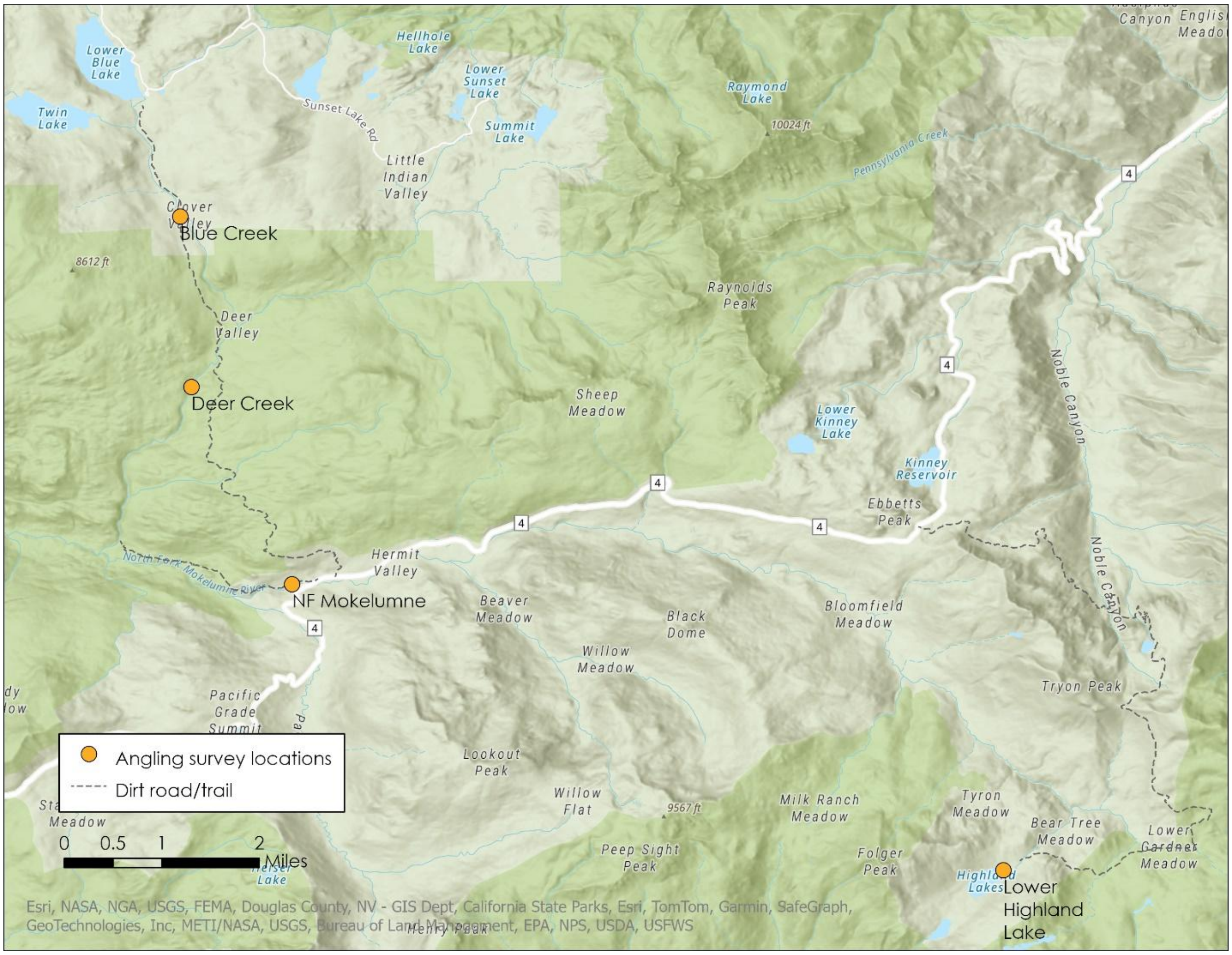


Figure 2. Map of 2024 angling sites in the upper North Fork Mokelumne River watershed.

Results:

No fish were captured during the June 3rd surveys on the North Fork Mokelumne River (Table 7); however, the survey was shortened due to high runoff and difficult access.

The lower Highland Lake had fast action fishing. The survey took place between 10:00 and 13:00, and generally faster catch rates were observed in the morning, but fishing remained productive throughout the duration of the survey.

Blue Creek and Deer Creek both supported very fast action Brook Trout fisheries. Blue Creek paralleled the Deer Valley OHV trail and had multiple access points. Deer Creek had good access at the trail crossing but was more limited beyond that.

Table 7. Results of 2024 angling surveys in the North Fork Mokelumne watershed.

Stream Name	Date	Phase	# of Anglers	Average CPUE (fish/hour)	Trout Species Captured	Size Classes Captured
North Fork Mokelumne River	6/3	4	6	0	NA	NA
Lower Highland Lakes	7/12	2	4	2.8	Brook Trout	Small, Medium
Blue Creek	7/30	2	1	12	Brook Trout	Medium
Deer Creek	7/30	2	1	6	Brook Trout	Medium

Discussion:

The poor capture rates on the North Fork Mokelumne River are likely a reflection of the difficult angling conditions at the time of the survey and not necessarily a reflection of the trout population present.

The lower Highland Lake meets all the criteria for a Wild Trout Water designation. It presents a fast action fishery for medium-sized Brook Trout, is located in a very scenic area, and has roadside access with an adjacent USFS campground. The high catch rate observed is uncommon among wild trout lakes with roadside access.

Deer Creek and Blue Creek both had very fast action Brook Trout fisheries and meet the criteria for a Wild Trout Water designation. Additionally, the access along an OHV trail provides a unique opportunity.

Willow Creek, Alpine County

Survey Dates: June 4, 2024

Overview:

Willow Creek is a tributary to the West Carson River in Alpine County. It is a small creek with a robust Brook Trout population. It has been surveyed sporadically over the years, often as part of trainings for new crew members. It is an ideal location for training due to its high fish abundance, early season accessibility, and proximity to Sacramento.

Objective:

Conduct phase two angling surveys. The primary goal of the survey was to train new staff in fly fishing techniques and angling survey methods.

Methods:

See hook and line methods from Stony Creek. Seven anglers surveyed Willow Creek using only fly fishing gear and experience varied greatly among anglers.

Results:

Catch Per Unit effort ranged from 0 to 6 fish per hour with an average of 1.8 fish per hour. All trout captured were Brook Trout in the small and medium size classes.

Discussion:

Catch rates varied greatly due to the experience of the anglers but was generally fast action. The flows were still slightly higher than ideal fishing conditions, so some higher gradient sections were more difficult to fish.

South Fork Kern River, Tulare County

Survey Dates: Multiple dates from July 25 - September 8

Overview:

Beginning in the 1960's and continuing into the 1990's chemical treatments successfully eradicated Brown Trout and Rainbow X California Golden Trout hybrids from the headwaters of the South Fork Kern River (SFKR). One of three barriers built in the SFKR to isolate the upper watershed from future invasions was situated near Templeton Mountain. However, in 2023, Brown Trout were observed above the Templeton Barrier necessitating surveys to assess the severity of the invasion.

Objective:

The objectives of the 2024 surveys included:

- Determining the relative abundance of California Golden Trout and Brown Trout in Templeton and Ramshaw meadows of the South Fork Kern River.
- Determining population estimates for California Golden Trout to track the impact of the Brown Trout invasion.
- Using eDNA to determine if Brown Trout have passed barriers upstream of Templeton.
- Collecting California Golden Trout fin clips for genetic analysis to determine if hybridization with hatchery strains of Rainbow Trout has occurred.
- Additionally, Conservation Engineering staff assessed the passability of Ramshaw, Templeton, and Schaeffer Barriers and the connectivity between Strawberry Creek's Stringer and the South Fork Kern River. This assessment will be included in a separate report.

Methods:

Multiple Pass Electrofishing Surveys

2024 surveys included nine multiple pass electrofishing surveys: two in Mulkey Creek above the barriers; two in Tunnel Meadow above Ramshaw Barrier; one in Ramshaw Meadow; two in Templeton Meadow, one just above Schaeffer Barrier, and one below Shaeffer Barrier (Figure 3). Survey locations were based on historical electrofishing sites and were conducted from July 25 – September 8.

Block nets were set up at the upstream and downstream ends of the section to isolate the population. Crew size varied based on the size of the stream and staff availability but generally contained two electrofishers, two to three netters, and one live car tender. Three to four passes were completed for each section beginning at the downstream end and working upstream. Crew roles and electrofisher settings were kept the same for each pass. Population estimates were calculated using methods based on the MicroFish 3.0 software originally developed by Van Deventer and Platts (1985).

Fish were anesthetized, identified to species, measured (millimeters), and weighed (grams). Caudal fin clips were taken on a subset of California Golden Trout. Additionally, pelvic fin clips were taken on a subset of Sacramento Suckers (*Catastomus occidentalis*). Otoliths and scales were taken from two exceptionally large Brown Trout captured in Ramshaw Meadow.

A habitat assessment was conducted for each section that included measuring section length, average width, streamflow (discharge), and gradient, and estimating percentage of substrate types, cover types, and erosion.

Single Pass Electrofishing Surveys

One single pass electrofishing survey was conducted. This section was based on a historical multiple pass section, however, water depth and habitat complexity prevented capture rates that would produce an accurate population estimate. The crew contained two electrofishers, two netters, and one live car tender. Fish were anesthetized, identified to species, measured (millimeters), and weighed (grams). Caudal fin clips were taken on a subset of California Golden Trout and pelvic fin clips were taken on a subset of Sacramento Suckers.

A habitat survey was not conducted for this section.

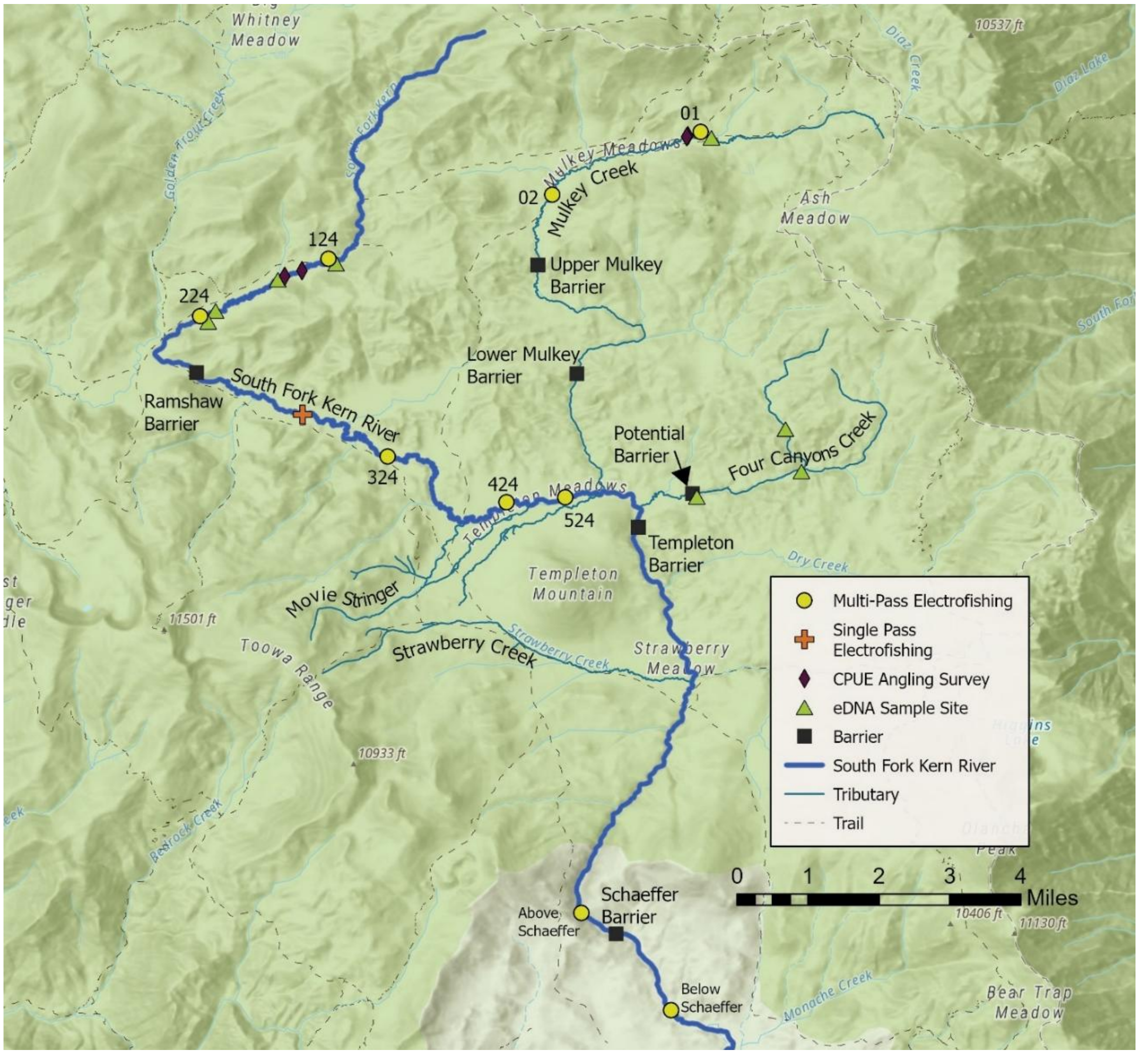


Figure 3. Locations of 2024 survey sites and barriers on the South Fork Kern River.

Environmental DNA Sampling

Eight Environmental DNA samples were collected throughout the South Fork Kern River watershed: one from Mulkey Creek, four from Tunnel Meadow, and three from above a potential barrier on Four Canyons Creek. Samples were collected using a Smith Root eDNA Citizen Science sampler and 0.45 µm self preserving filter packs. Samples were analyzed for the presence of Brown Trout DNA by CDFW's Genetics Research Lab.

Results:

Multiple Pass Electrofishing Surveys

In total nine multiple pass surveys were conducted throughout the upper South Fork Kern River watershed (Table 8). CAGT densities were highest in Mulkey Creek. Tunnel Meadow and Templeton Meadow also had fairly high CAGT densities. Brown Trout were not found in Mulkey Creek or Tunnel Meadow and their densities were still low in Templeton Meadow.

Caudal fin clips were taken from CAGT from all survey sites to determine if introgression rates have changed since samples were last taken in 2016. These have been sent to CDFW's Genetics Research Lab and are awaiting analysis. Otoliths and scale samples were taken from two very large Brown Trout (Figure 4). Both fish were aged at 5-6 years old based on both the otoliths and the scale samples.

Table 8. Summary of population estimates from 2024 South Fork Kern River surveys.

South Fork Kern River Area	Section #	Species	Section Length (ft)	Total captured	Est. section population	95% conf. interval	Est. density (fish/mile)
Tunnel Meadow	124	CAGT	403	74	89	70-108	1166
Tunnel Meadow	224	CAGT	652	202	207	201-213	1676
Ramshaw Meadow	324	CAGT	359	40	41	38-44	603
Ramshaw Meadow	324	Brown Trout	359	33	33	32-34	485

South Fork Kern River Area	Section #	Species	Section Length (ft)	Total captured	Est. section population	95% conf. interval	Est. density (fish/mile)
Ramshaw Meadow	324	Sac. Suckers	359	38	39	36-42	574
Templeton Meadow	424	CAGT	303	98	122	96-148	2126
Templeton Meadow	424	Brown Trout	303	8	11	-5-27	192
Templeton Meadow	424	Sac. Sucker	303	57	58	55-61	1011
Templeton Meadow	524	CAGT	364	93	98	91-105	1422
Templeton Meadow	524	Brown Trout	364	5	5	3-7	73
Templeton Meadow	524	Sac. Sucker	364	66	66	64-68	957
Above Schaeffer	Above Schaeffer	CAGT	245.5	10	10	9-11	215
Above Schaeffer	Above Schaeffer	Brown Trout	245.5	27	30	23-37	645
Above Schaeffer	Above Schaeffer	Sac. Sucker	245.5	26	26	24-28	559
Below Schaeffer	Below Schaeffer	CAGT	315	28	53	0-123	888
Below Schaeffer	Below Schaeffer	Brown Trout	315	47	69	31-107	1157
Below Schaeffer	Below Schaeffer	Sac. Sucker	315	195	223	201-245	3738
Mulkey Creek	01	CAGT	283.5	140	191	143-239	3557
Mulkey Creek	02	CAGT	290.8	163	196	168-334	3559

Figure 4. The largest Brown Trout captured out of Ramshaw Meadow. This fish measured 520 mm (20.5 inches) and weighed 2032.9 g (4.5 lbs.).

Single Pass Electrofishing Survey

During the single pass electrofishing survey 19 CAGT, 14 Brown Trout, and one Sacramento Sucker were captured. Deep pools and overhanging willows made it difficult to electrofish, so capture rates were likely very low.

Environmental DNA Sampling

All eDNA samples were negative for Brown Trout. Debris in the water made collection difficult and very time consuming in the South Fork Kern River and Mulkey Creek, so only five samples were collected from these waters. Conditions were better in Four Canyons Creek.

Discussion:

Electrofishing Surveys

Section 324 had the highest density and relative abundance of Brown Trout, as well as the lowest density of CAGT in the South Fork Kern River above Templeton barrier. Additionally, two very large Brown Trout were discovered in this section and there was a noticeable lack of CAGT in the habitat units that contained these fish. This difference in relative abundance of each species between Ramshaw Meadow and Templeton Meadow is consistent with the angling data from 2023 and the 2024 single pass survey. The reduced CAGT population in Ramshaw may be an indication that Brown Trout are already having localized impacts on the CAGT populations.

Brown Trout have been present in the South Fork Kern River for decades. Previous surveys have shown considerable decreases in the sizes of CAGT populations in the presence of Brown Trout (Weaver and Mehalick 2009). This has been most dramatic in the section between Templeton Barrier and Schaeffer Barrier (Figure 5). The 2024 surveys from above and below Schaeffer Barrier also showed CAGT to have a lower relative abundance than Brown Trout. The lower CAGT population in the below Templeton reaches may provide a good indication of what to expect in Ramshaw and Templeton meadow as the Brown Trout population expands.

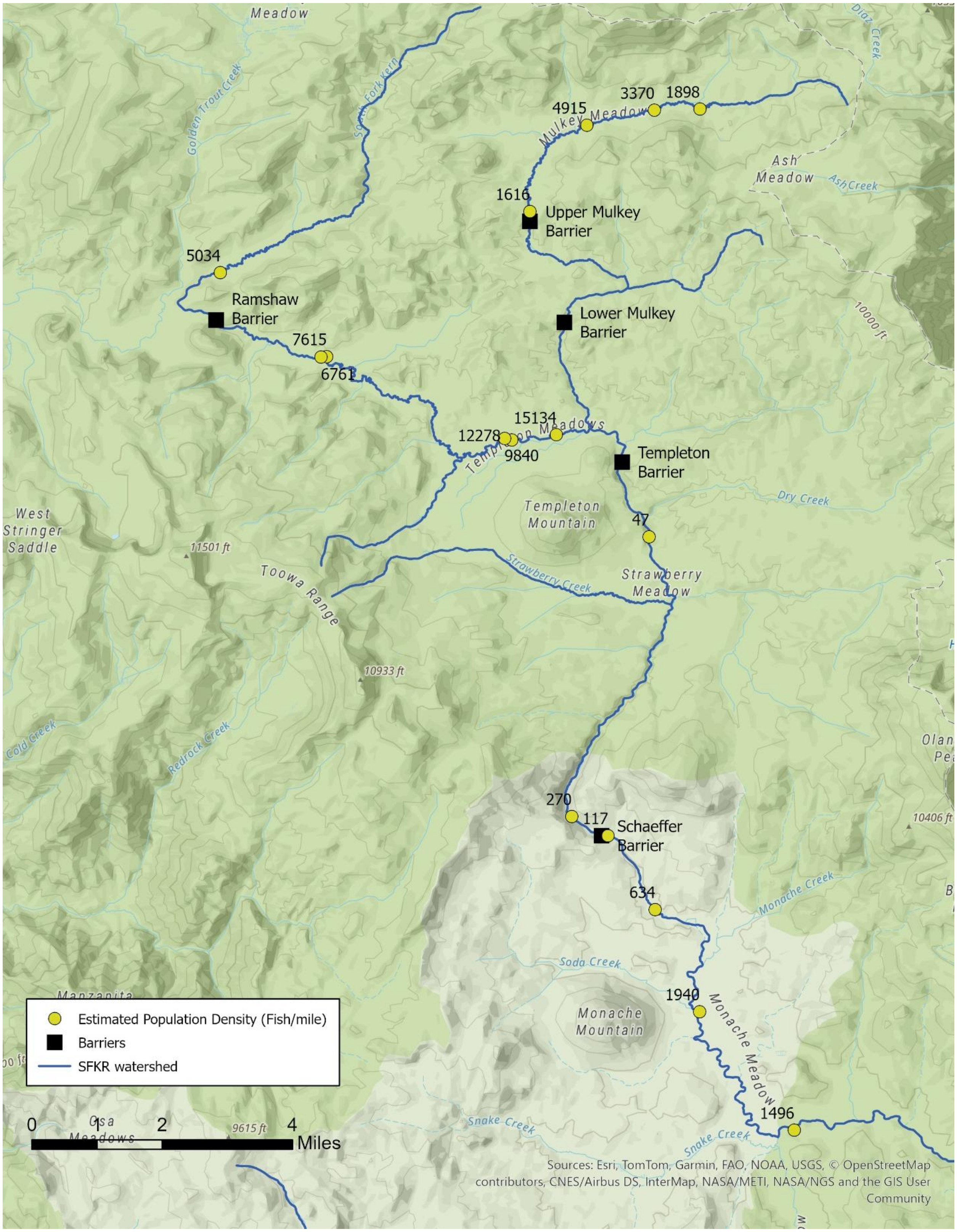


Figure 5. Map of historic population surveys with densities shown in CAGT per mile. Data is from surveys conducted in 2003 – 2009 for the South Fork Kern River and 2015 for Mulkey Creek.

Environmental DNA Sampling

Although all eDNA samples were negative for Brown Trout, the sampling design was not extensive enough to confidently conclude the absence of Brown Trout at the sample locations. It would be beneficial to analyze eDNA with a more robust sampling design paired with a survey of potential barriers to fully understand which features are currently acting as barriers to Brown Trout.

2024 Wild Trout Water Designation

Waters Designated: The North Fork Mokelumne River designation was expanded to include Deer Creek, Blue Creek, and Summit City Creek, Alpine County.

Overview:

Wild Trout Waters are those that support self-sustaining (wild) populations of trout, are aesthetically pleasing and environmentally productive, provide adequate catch rates in terms of numbers, size, or species of trout, and are open to public angling. Wild Trout Waters may not be stocked with catchable sized hatchery trout (Bloom and Weaver 2008). Heritage Trout Waters are a subset of Wild Trout Waters and highlight populations of California's native trout found within their historic drainages.

In 2024, the Heritage and Wild Trout Program proposed to the Fish and Game Commission the expansion of the North Fork Mokelumne designation to include Deer Creek, Blue Creek, Summit City Creek, and the lower Highland Lake. The creeks were all approved but not the lower Highland Lake. The expansion of the North Fork Mokelumne designation adds unique angling opportunities due to the quality fishery and unique access. Deer Creek and Blue Creek are fast action Brook Trout fisheries that are accessed by the Deer Valley OHV trail, a popular destination for offroad enthusiasts.

Public Outreach and Education

California Heritage Trout Challenge

Date: Ongoing

Format: Angler Recognition Program

Summary: The Heritage Trout Challenge is an angler recognition program designed to encourage anglers to learn more about California's native trout assemblage. Anglers are rewarded with a hat and personalized poster for catching six of the eleven native trout strains within their native watersheds. 56 trout challenge certificates were awarded in 2024, marking the highest number of certificates ever awarded in one year. As of January 1, 2025, 581 certificates have been awarded.

Location: NA

500th California Heritage Trout Challenge Promotional Video and News Release

Date: Youtube video posted April 22, 2024, News Release on May 1, 2024

Format: Youtube video, CDFW News Release

Summary: In 2023 the Heritage and Wild Trout Program awarded the 500th Heritage Trout Challenge certificate. This milestone was highlighted in a CDFW news release and a Youtube video. These were both released during the spring to bring more attention to the Heritage Trout Challenge before the start of the 2024 trout season.

Location: Youtube, CDFW News Release

Northern Region

Population Management and Planning

Eagle Lake, Lassen County

Dates: February - November

Summary:

The 2024 Eagle Lake Rainbow Trout (ELRT) spawning effort was completed at the Pine Creek Trap. Unlike most years, regional HWTP did not assist with spawning efforts in 2024 but did assist with fish rescues and preventing ELRT from spawning in Papoose Creek. Papoose Creek is a small tributary to Eagle Lake that typically shows favorable water quality parameters (stream flows and warmer water temperatures) early in the season, which leads to ELRT ascending this creek early in the spawning season. Unfortunately, this smaller creek does not provide adequate spawning habitat for ELRT and tends to dry up early in the season. Regional HWTP staff assisted with fish rescues in Papoose Creek (fish translocated back to the lake) and the installation of an Alaskan weir near the confluence with Eagle Lake to prevent additional fish from ascending the creek.

Eagle Lake fin clipping takes place twice every year at two different state hatcheries to mark all ELRT fish that will be stocked back into Eagle Lake to maintain the Eagle Lake fishery. The fin marking protocols include three different annual marks - right ventral, left ventral, and adipose fin repeated on a three-year cycle. The marking of the fish allows for year-class identification; reduces the pairing of siblings when artificially spawned; and identifies potential wild produced trout (i.e. have no marks). The fin clipping for 2024 occurred at the Crystal Lake Hatchery during June 17-21 and the Darrah Springs Hatchery during November 4-8, approximately 213,000 juvenile trout were marked from both hatcheries.

Resource Assessment and Fishery Monitoring

Angler Survey Box (ASB) Monitoring Program

Dates: Ongoing

Summary:

The ASB monitoring program is a long-term monitoring program that utilizes a self-reporting angler census/creel. Select Wild Trout Waters and trout waters of

HWTP interest have ASBs installed to collect this data. ASBs are serviced by HWTP staff throughout the year, which includes visiting each ASB and supplying recording media (i.e., pencils and pre-printed paper slips) and maintenance. Data collected is reviewed for completeness and errors and entered into a Microsoft Access database. ASB data provides angler catch and use statistics (Appendix B) that are used for annual summary reports (annual ASB and web-based) and fishery trends over time. ASB data, along with other sources, can be used in the management of the local fishery.

Starting in 2022, CDFW has been developing a new system to collect ASB data utilizing QR codes (quick response codes) and mobile phones instead of the traditional physical datasheets. The new system will minimize staff time/effort needed to service the ASBs while being able to increase and process the number of ASBs and data collected. The new ASB QR code system will likely be fully operational in 2025. Until that time the traditional ASBs will be in operation and may be overlapped in time with the QR system to facilitate a phased transition.

Angler survey box data is summarized in Appendix B. For more detailed results, visit the Heritage and Wild Trout Program website. During 2024 Northern Region collected ASB data for the following waters:

- Antelope Creek
- Big Lagoon
- Burney Creek
- Butte Lake
- Clear Lake
- Fall River
- Hat Creek
- Klamath River
- Lassen Creek
- Lower McCloud River
- Manzanita Lake
- Pit River
- Smith River
- Stone Lagoon
- Upper Sacramento River
- Yet Atwam Creek

Goose Lake West Side Tributaries, Modoc County

Survey Dates: April 17, May 1, and September 24

Overview:

A reconnaissance survey to gather information about west side tributaries to Goose Lake during the seasonal runoff period and measure stream flow and water quality parameters. The information gathered will be used to determine the potential use for adfluvial Goose Lake Redband Trout (GLRT).

Objective:

Measure physiochemical water quality parameters during the spring-run off period (wet conditions) and repeat the effort again in the early fall period (dry conditions). In addition, sample for fish and evaluate the stream habitat for GLRT suitability.

Methods:

Document water temperature, dissolved oxygen, specific conductivity, and stream flow at an upstream and downstream location (where feasible) for each stream surveyed. Sample sites will also be sampled for existing fish species and evaluated for GLRT habitat suitability using subjective professional evaluation.

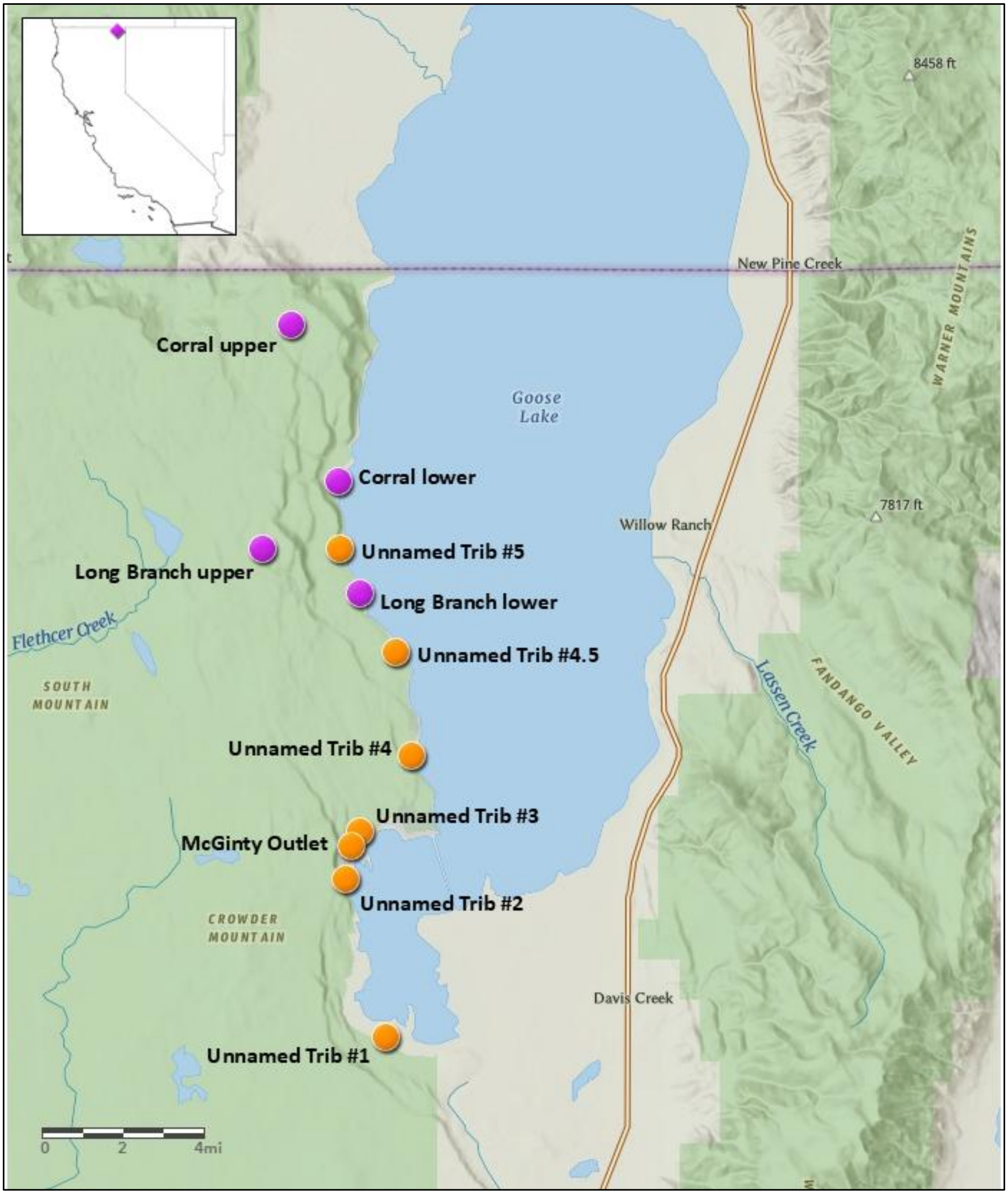


Figure 6. Goose Lake west side tributaries survey locations. Violet markers indicate tributaries that were surveyed. Orange markers indicate tributaries that were not surveyed and/or were dry.

Summary:

Of the nine tributaries observed with flowing water, only two, Long Branch Creek and Corral Creek, provided adequate surface flow, lake connectivity, and sufficient fish bearing habitat at the time of the visual survey in April (Figure 6Figure 6). Due to no access, unnamed tributaries #1, #2, and #3, and McGinty Outlet were not visually observed. Most "unnamed tributaries" were either dry or had limited surface water/flow. The surface flow of most unnamed tributaries appears to be linked to springs originating near or close to County Road 48. Due to observed limited surface flow and aquatic stream habitat in the unnamed tributaries, only Long Branch and Corral creeks will be discussed further in this report.

Table 9. Water quality and surface flow parameters from May 1, 2024 (surface flow was estimated on April 17, 2024.

Waterbody	Water Temp (°C)	Dissolved Oxygen (mg/L)	Specific Conductivity (µS/cm)	Est. Surface Flow (M^3/s) April 17	Surface Flow (M^3/s) May 1
Long Branch Creek	15.9	8.76	58.9	0.08	0.05
Corral Creek	8.3	8.62	48.3	0.06	0.02

Fish were only observed at the Long Branch Creek, upper site. The fish species included an estimated 20 Black Crappie (adults), 10 Largemouth Bass (sub-adults), and 2 Green Sunfish (adults). All fish were in one pool just upstream of the Forest Road 47N37 crossing (Figure 7) and appeared to be in good condition. These fish were only observed during the May 1 survey and were absent during the April 17 survey. These warmwater fish are more suited to a lentic environment and likely moved downstream from Householder Reservoir during high flows. It is unlikely these fish will survive in the creek due to the small size of the stream, limited food resources, and seasonality of the stream.

The mapping exercise and visual survey were designed to identify, observe, and document the potential fish bearing habitat for the Goose Lake west side tributaries. There is limited information for the west side tributaries describing fish habitat. This area, in the rain shadow of the Modoc Plateau, may not support sufficient stream volume and/or duration for perennial fish habitat (Figure 7). Most of the annual precipitation (rain/snow) for this area occurs during the winter and spring seasons. Springs are common in the area and do provide some perennial habitat near Goose Lake. Stream surveys during the latter half of the wet season will likely provide the ideal time to observe higher flows for these tributaries. The September 24 survey documented the stream habitat/conditions during the tail end of the dry period. The seasonality of these streams was confirmed with the April and September observations, during an above normal water year. Another consideration besides intra-annual surveys, is to look at inter-annual differences between different water years.

Figure 7. Long Branch Creek (upper sample site) showing stream flow seasonality. Top image taken April 17 and bottom image taken September 24, 2024, at Forest Road 47N37 crossing.

Goose Lake has dried up several times over the past 10 years, with the most recent lake drying event occurring in 2022. It is unknown how long it will take Goose Lake fishes to recolonize Goose Lake, but it may take at least several years of adequate lake and stream connectivity events to allow enough passage for stream populations to reestablish the lake populations. Future monitoring and sampling of GLRT in the 16-18-inch (41-46 cm) range (TL) from known spawning tributaries would be a good indicator of a lake population existing again.

<u>Smith River, Del Norte County</u>

Survey Dates: May 7-8 and May 21-23

Overview:

Continue a multi-year sampling effort for the Smith River to document trout statistics and angler use focusing on the Middle and North forks of the Smith River.

Objective:

Complete Phase 1 and Phase 2 sampling for the Middle Fork Smith River and tributaries, revisiting past HWTP sampling sites and methods to document changes over time. A new sampling site on Eighteenmile Creek was added.

Methods:

For consistency and comparability between past datasets, similar sampling methods and locations were implemented where feasible. These methods included - CPUE (angling), direct observation (snorkeling), and a new sampling method for this waterbody, multi-pass/depletion backpack electrofishing.

Results:

Trip 1 – CPUE (May 7 and 8)

The angling effort included two streams -Knopki and Siskiyou Fork creeks (Figure 8 and Figure 9). Two anglers fished for a total of 4.7 hours in Knopki Creek with an average 1.7 CPUE (fish catch per hour). The water temperature was measured at 48.9 °F (9.4 °C). In Siskiyou Fork Creek two anglers fished for a total of 3.0 hours and caught no fish (Table 10). The water temperature was measured at 50.0 °F (10.0 °C). Observed stream flow appeared to be above summer base flows.

Table 10. Angling effort and catch for Knopki and Siskiyou creeks.

Waterbody	Angler	Hours Fished	Species	Small (<5.9")	Medium (6-11.9")	Total Catch	CPUE
Knopki Creek	1	2.7	RT	2	0	2	0.7
Knopki Creek	2	2.0	RT	6	4	6	3.0
Siskiyou Fork Creek	1	1.5	n/a	0	0	0	0
Siskiyou Fork Creek	2	1.5	n/a	0	0	0	0

Trip 2 CPUE (May 21 and 23)

The angling effort included two streams -Little Jones and Eighteenmile creeks. Three anglers fished for a total of 4.8 hours in Little Jones Creek (Figure 10) with an average 0.87 CPUE (fish catch per hour). The water temperature was measured at 55.9 °F (13.3 °C). In Eighteenmile Creek two anglers fished a total of 1.4 hours and caught no fish (Table 11), but several juvenile and adult Foothill Yellow-legged Frogs (*Rana boylii*) were observed. The water temperature was measured at 52.2 °F (11.2 °C). Stream flow appeared to be above summer base flows.

Table 11. Angling effort and catch for Little Jones and Eighteenmile creeks.

Waterbody	Angler	Hours Fished	Species	Small (<5.9")	Medium (6-11.9")	Total Catch	CPUE
Little Jones Creek	1	1.40	CCT	0	1	1	0.7
Little Jones Creek	2	2.00	n/a	0	0	0	0
Little Jones Creek	3	1.05	CCT	1	1	2	1.9
Eighteenmile Creek	1	0.40	n/a	0	0	0	0
Eighteenmile Creek	2	0.45	n/a	0	0	0	0

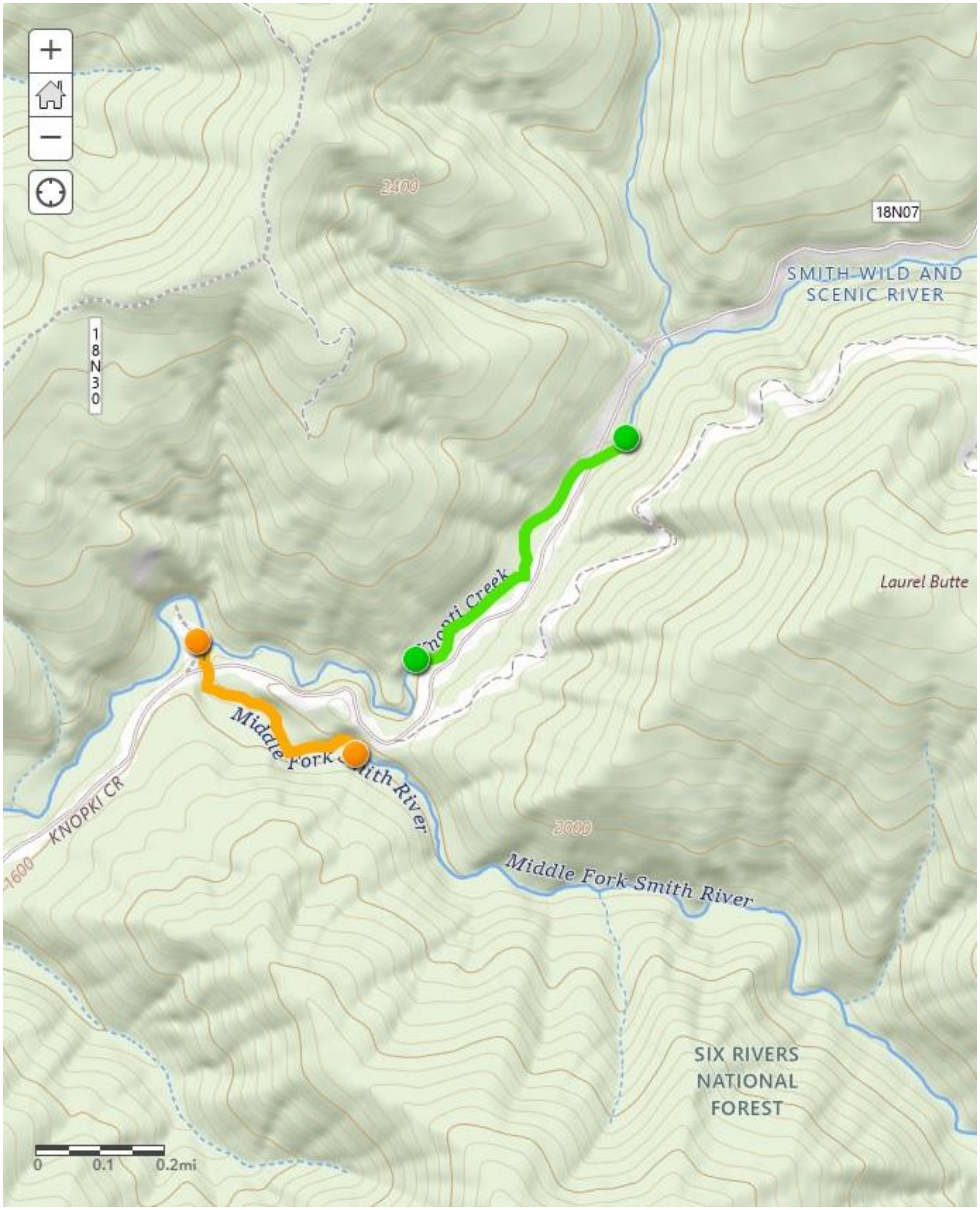


Figure 8. Middle Fork Smith River and Knopki Creek sampling sections. Direct observation (5/8) highlighted in orange and CPUE (angling) (5/8) highlighted in green.

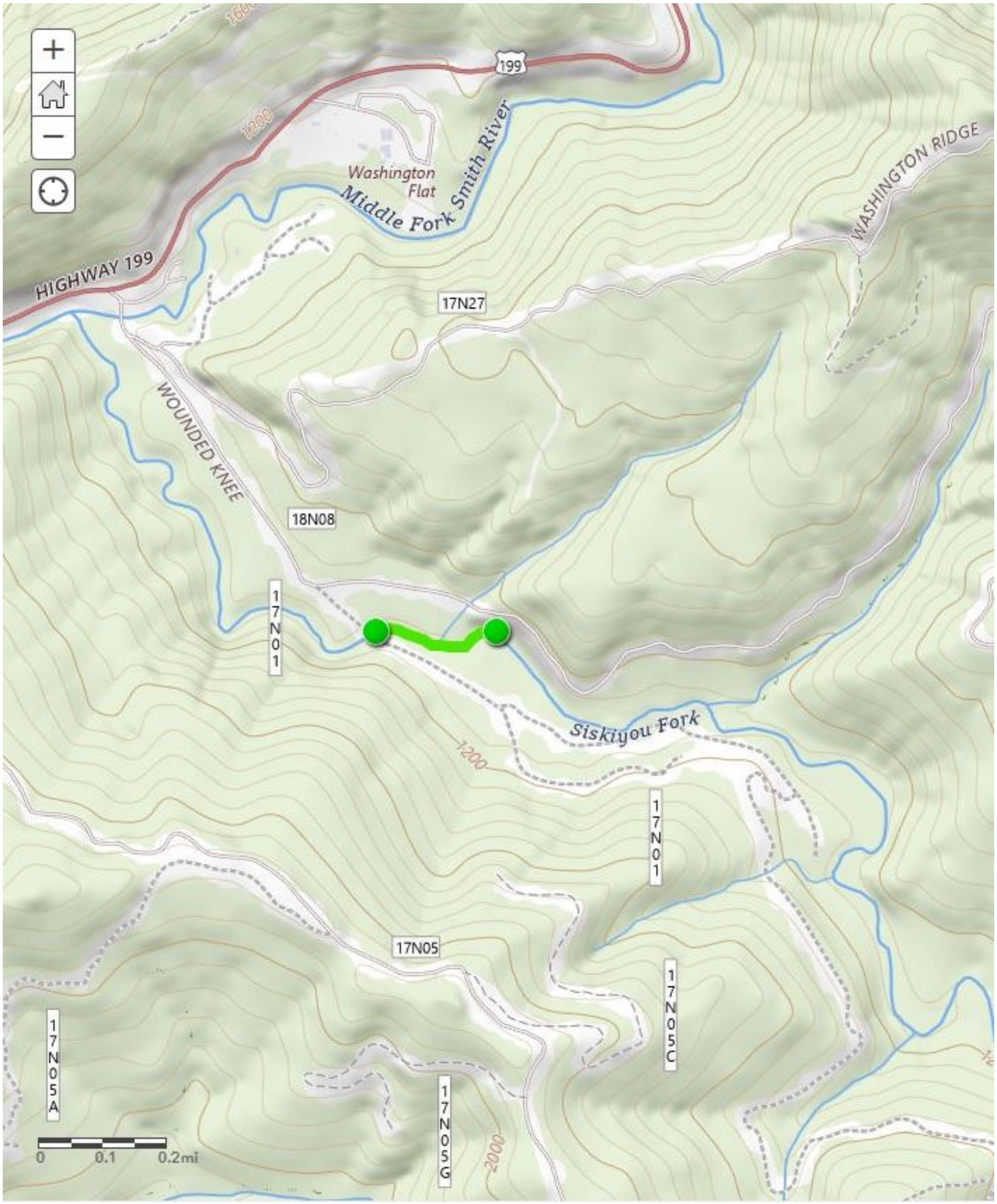


Figure 9. Siskiyou Fork CPUE (angling) (5/7) sampling section highlighted in green.

Figure 10. Little Jones CPUE (angling) (5/21) section highlighted green and backpack electrofishing (multiple-pass depletion) (5/22) highlighted in violet.

Phase II Backpack electrofishing, population estimate (May 22)

The multi-pass depletion population estimate was conducted with backpack electrofishing gear in Little Jones Creek (Figure 10). A 582-foot section of Little

Jones Creek containing several pools, runs, and riffles was isolated with block nets. A total of three equal electrofishing passes were made in the isolated section to record catch.

In total, 13 Coastal Cutthroat Trout (CCT) (Figure 11) ranging in size between 113- and 223-mm TL (mean 155 and SD 35.5) were sampled. To estimate the population size in this section the Moran-Zippin (with Carle and Strub modification) multiple depletion equation was used. The population estimate of CCT in this section was 17 ±13.54 (Table 12) with 151 CCT per mile (94 per km). Other aquatic species collected included one Pacific Giant Salamander (*Dicamptodon sp*.) and one Tailed Frog tadpole (*Ascaphus truei)*. In addition to the fish sampling effort, stream habitat parameters were recorded which included surface flow = 19.77 cfs (0.56 m/s), dissolved oxygen = 10.09 mg/L, average stream width = 29.2 feet (8.9 m), and section gradient = 2.48%.

Table 12. Moran-Zippin multiple pass depletion population estimate.

Total CCT Catch	Population Est.	Probability of Capture	Standard Error	95% Confidence Limits ±	Fish per Mile
13	17	0.41	6.77	3-30	151

Discussion:

The early season sampling conducted in May, during an above normal water year, posed some additional sampling challenges in the Smith River tributaries. The main challenge was higher surface flows that likely reduced sampling efficacy which may underestimate the catch statistics in this report. This may be evident in the backpack electrofishing multiple-pass depletion effort. The flows and stream size of Little Jones Creek were likely too large to efficiently sample with this method. Although a population estimate was calculated (Table 12), the low catch, low probability of capture, and high variance in the 95% confidence values are signs that this population estimate should be used cautiously.

The 2024 sampling effort in the Smith River marks the final Phase II effort before the HWTP will propose the Middle Fork Smith River and North Fork Smith River to be listed as a Wild Trout (sub designation Heritage Trout) water anticipated in 2025. The addition of the Middle Fork and North Fork will complete the designation process for the Smith River watershed (the South Fork was previously listed between 2016-18).

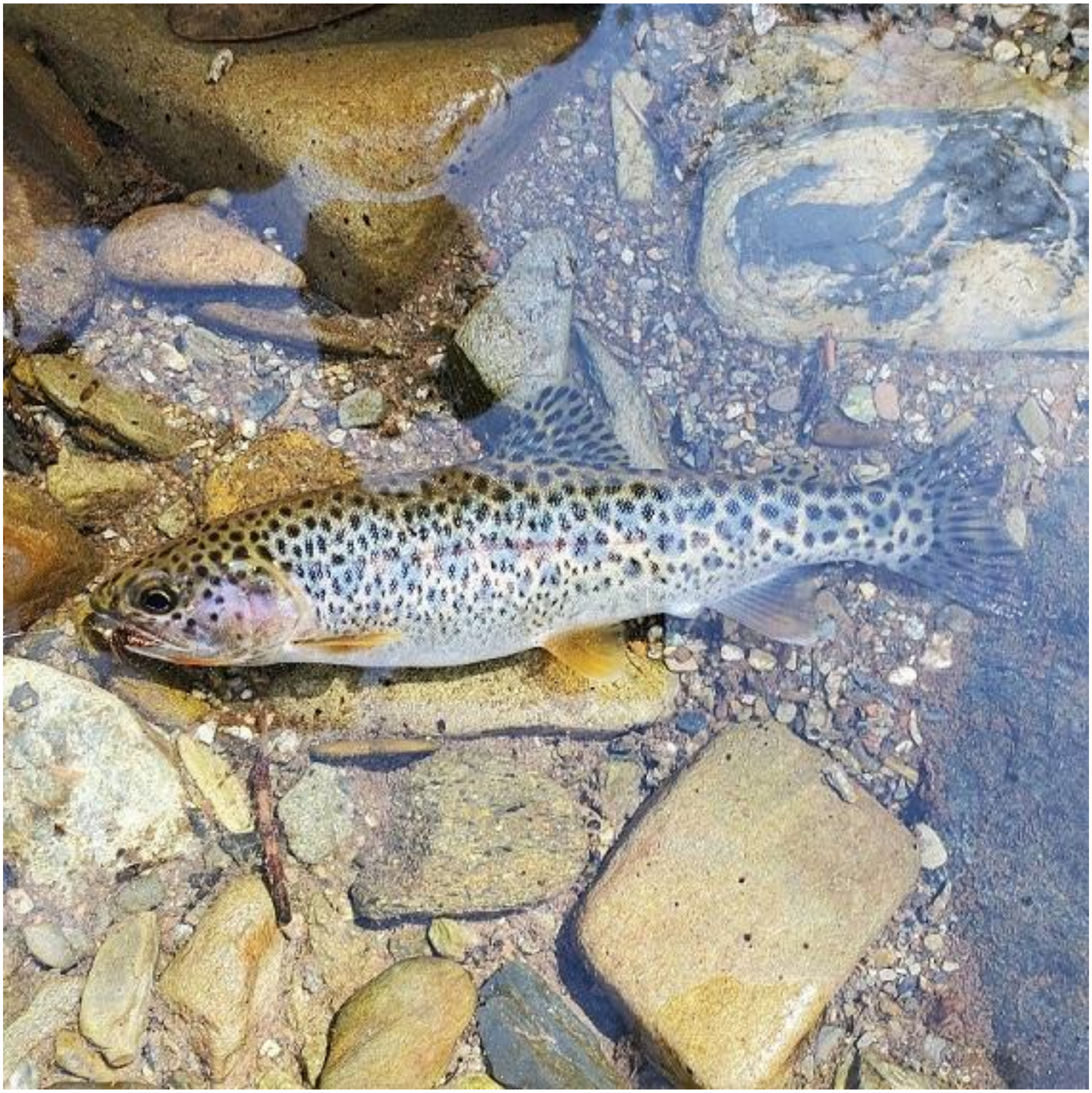


Figure 11. Little Jones Creek Coastal Cutthroat Trout sampled on 5/21.

Dismal Creek, Modoc County

Survey Date: July 17

Overview:

Dismal Creek Warner Lakes Redband Trout (WLRT) tissue collection for subsequent genetic analyses.

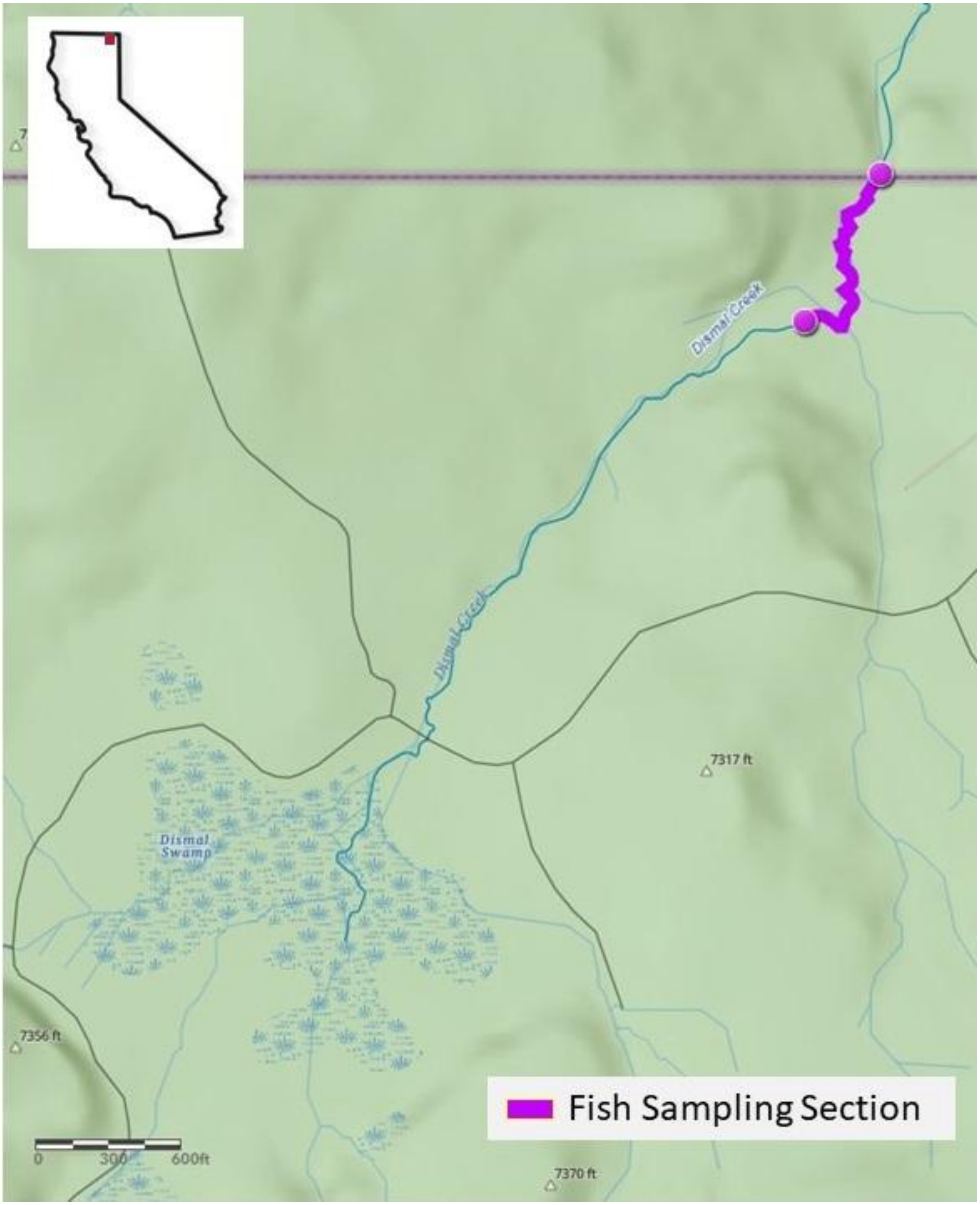


Figure 12. Map of upper Dismal Creek showing the fish sampling section.

Objective:

Sample Dismal Creek to collect 30+ tissue samples from WLRT.

Methods:

Upstream single pass backpack electrofishing from the state border with Oregon to a previous sampling site used in 2023.

Results:

A total of 16 WLRT were sampled within the section described above. There were no other fish species observed. All WLRT sampled had an upper caudal fin clip removed and stored on waterproof paper in labeled coin envelopes. In addition to the tissue collected, lengths and weights were recorded for each fish sampled. Several WLRT photos were taken during fish processing (Figure 13). Water temperature during sampling was 59.2 °F (15.1 °C) and dissolved oxygen was 8.39 mg/L.

Discussion:

The 2024 WLRT genetic sampling effort completed a multi-year effort (2021-2024) to collect enough (30+ tissues) to conduct a representative population level genetic analysis. The tissues from all years were grouped and sent to the CDFW's tissue archive. Typically tissues for genetic analyses are collected from a stream in a single sampling event, but due to the reduction in the fish population (CDFW 2023b), remoteness of the site, and limited sampling season this task took 4- years to complete. Historically, tissue samples have been collected from WLRT in Dismal Creek, but these samples are now over 20 years old and new samples were needed to update our information on the genetic composition and health of the population.

Figure 13. A representative Warner Lakes Redband Trout sampled from Dismal Creek.

Dismal Swamp tributary sampling, Modoc County

Survey Dates: September 25-26

Overview:

Sample for WLRT in spring streams located in Dismal Swamp which are tributaries to Dismal Creek.

Objective:

Sample for WLRT presence/absence in tributary springs to Dismal Creek. If WLRT are encountered, determine distribution, abundance, and collect genetic samples.

Methods:

Sample tributaries in an upstream direction with a backpack electrofisher and one netter/live car tender. All perennial waters draining into or within Dismal Swamp that provided enough fish habitat (professional opinion) were sampled.

Results:

In total four tributary streams (DSS052, DSS056, DSS068, and DSS069) were sampled (Figure 14 and Table 13). Of these four streams only DSS068 contained

WLRT within a 1,535-foot section (468 m). A total of 10 WLRT were sampled, and length, weight, and genetic tissues were collected.

Discussion:

Information about Dismal Swamp and fish presence in regional records is very limited. This effort was a follow-up to a previous effort that found fish in one tributary, DSS068 a couple years prior. Although three other tributaries were sampled that appeared to have adequate habitat to support fish, only one tributary DSS068 contained WLRT. No other fish species were captured which is consistent with the California Dismal Creek fish composition (most of Dismal Creek is in Oregon). Although no other tributaries contained fish during this sampling effort, it is possible that the other tributaries may have contained WLRT at one time. The genetic samples will be combined with past samples collected in this unnamed tributary stream and transferred to the CDFW genetic archive in West Sacramento.

Dismal Creek has been experiencing a decline in its WLRT numbers (CDFW 2022, 2023b) and the decline may be linked to additional stress from recent droughts and habitat impacts from intense cattle grazing in the area. Minimizing these impacts may be accomplished through a grazing management plan that either reduces the intensity or eliminates cattle grazing in the vicinity of Dismal Swamp, tributary springs, and Dismal Creek. Currently CDFW is reaching out to the US Forest Service and NGOs to discuss and develop a long-term plan to address these impacts.

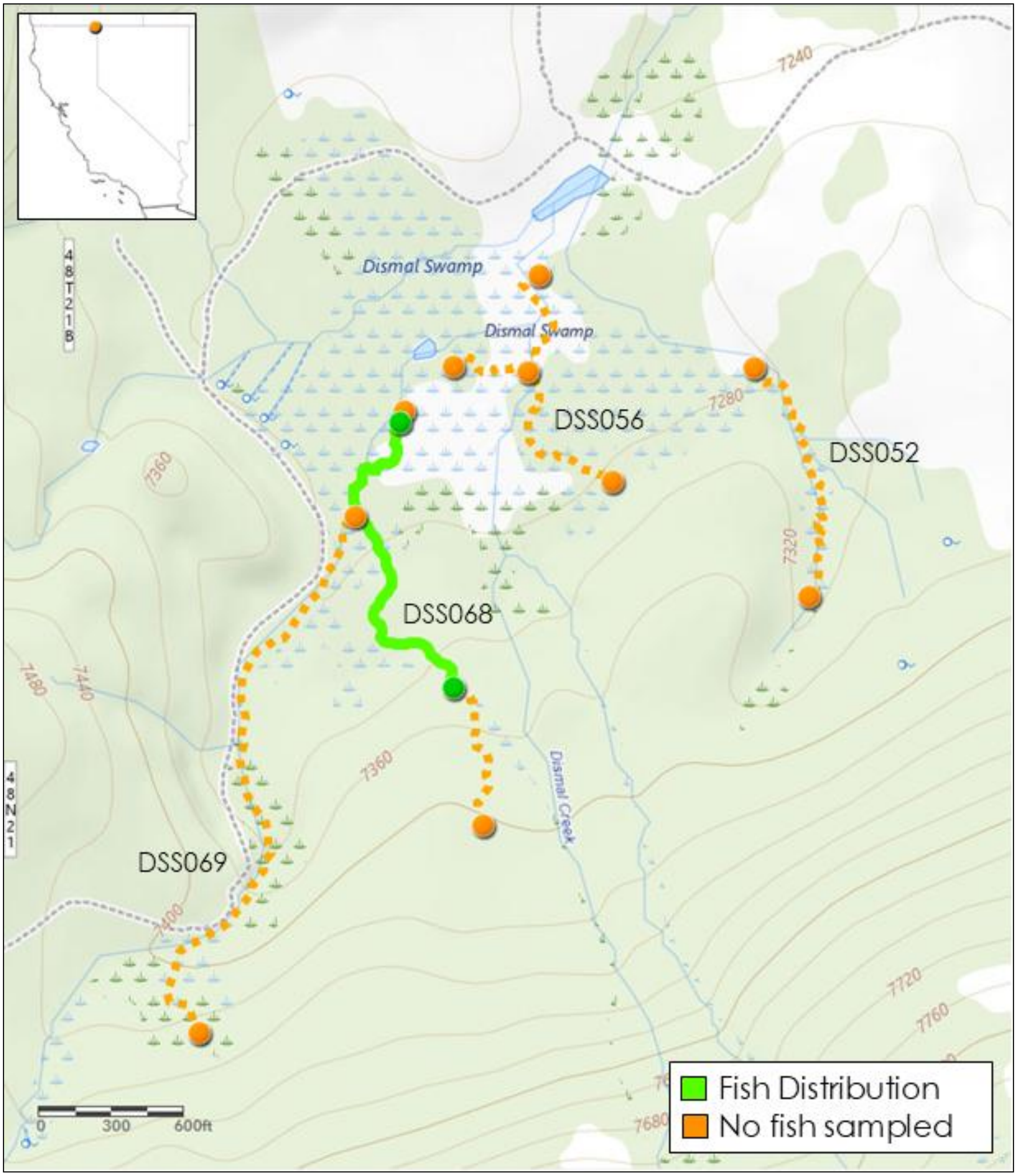


Figure 14. Map of the Dismal Swamp area showing spring tributaries to Dismal Creek. Sampled sections are hatched orange colored and fish bearing sections are green colored.

Table 13. Stream codes and GPS coordinates of sampled locations (U=upstream section and D=downstream section).

Stream Code	Upstream Latitude	Upstream Longitude	Downstream Latitude	Downstream Longitude
DSS052	41.98334°	-120.16988°	41.98593°	-120.17072°
DSS056	41.98699°	-120.17401°	41.98464°	-120.17289°
DSS068 U	41.98074°	-120.17487°	41.98545°	-120.17606°
DSS068 D	41.98595°	-120.17531°	41.98589°	-120.17418°
DSS068 FISH	41.98230°	-120.17531°	41.98531°	-120.17612°
DSS069	41.97838°	-120.17919°	41.98425°	-120.17682°

Figure 15. The downstream end or terminal section of tributary stream DSS068 fish bearing section. Cattle encroachment at stream's edge is visible.


Figure 16. Warner Lakes Redband Trout sampled from stream DSS068.

<u>Pit River, Shasta County</u>

Survey Dates: July 24

Overview:

Sample a section of the Pit River (Pit 3, below Lake Britton) for CPUE data.

Objective:

Sample for trout species using angling gear to generate catch per unit effort (fish catch/hour).

Methods:

Fish were sampled with angling gear (fly fishing) in stream habitats likely to hold trout.

Results:

Two anglers spent 2.25 hours angling catching two Rainbow Trout in the 6-11.9 size class. The CPUE for this effort is 0.89 fish per hour.

Figure 17. Northern Region HWTP staff fishing the Pit River, section 3 below Lake Britton.

Discussion:

The 2024 Pit River sampling is a continuation of previous efforts to build a larger dataset of fish/angling statistics. The Pit River between, below Pit River Falls to its confluence with Lake Shasta can be a difficult river to sample with traditional fishery sampling methods. This is due to the extreme ruggedness of the surrounding terrain, boulder dominated streambed, high flows and deep pools making wading dangerous, and limited visibility of the water.

The Pit River below Lake Brittion is being considered for future designation into the program. The angling CPUE data along with angler survey box data will be two data sources that will be used to support designation of this unique California river.

<u>Butcherknife Creek, Shasta County</u>

Survey Dates: August 14

Objective:

Electrofish Butcherknife Creek to collect 30 tissue samples for CDFW's tissue archive.

Methods:

Butcherknife Creek was sampled implementing a single-pass backpack electrofishing method to collect Rainbow Trout of all size classes susceptible to the electrical field. One backpack electrofisher and two netters were used in the sampling effort.

Results:

The sampling section is approximately 450 feet (137 m) in stream length and is located at:

Upstream: 41.11810°, -122.03180° (NAD83, DD) and

Downstream:41.11704°, -122.03357° (NAD83, DD).

A total of 32 Rainbow Trout were sampled within the section described above. There were no other fish species observed, but Coast Giant Salamander (*Dicamptodon tenebrosus)* were observed in many of the pools or slower moving sections of the creek sampled. All sampled Rainbow Trout had an upper caudal fin clip removed and stored on waterproof paper in labeled coin envelopes. In addition to the tissues collected, lengths and weights were recorded for each fish sampled. Several Butcherknife Rainbow Trout photos were taken during fish processing. Water quality parameters were limited to water temperature 55.8 °F (13.2 °C), dissolved oxygen 9.53 mg/L, and specific conductivity147.2 µS/cm.

Discussion:

Butcherknife Creek is a representative tributary for the lower McCloud River Rainbow Trout population (along with Claiborne Creek or another surrogate stream) (Simmons et al. 2010). The 2024 samples will update information from samples collected by UC Davis in 2006. The 32 samples collected will be sent to the CDFW's tissue archive.

Figure 18. Typical Butcherknife stream habitat within the sampled section.

Recommendations include: continuing to sample Butcherknife Creek every 5-10 years or as needed for updating genetic information. Keep Butcherknife Creek as a genetic reference site for the lower McCloud River's Rainbow Trout population. The other stream representing the Rainbow Trout of the lower McCloud population from Simmons' report (2010) is Claiborne Creek located at the McCloud River Club.

Trout Creek Population Estimate, Siskiyou County

Survey Dates: August 27

Objective:

Post Antelope Fire (2021) fish monitoring in a section of Trout Creek sampled in 2021 (CDFW 2021).

Methods:

Multi-pass electrofishing depletion within a pre-designated section (CDFW 2021) of Trout Creek. The section was isolated with block nets to stop movement of fish in and out of the sample site and electrofished in an upstream direction, covering all stream habitat types encountered.

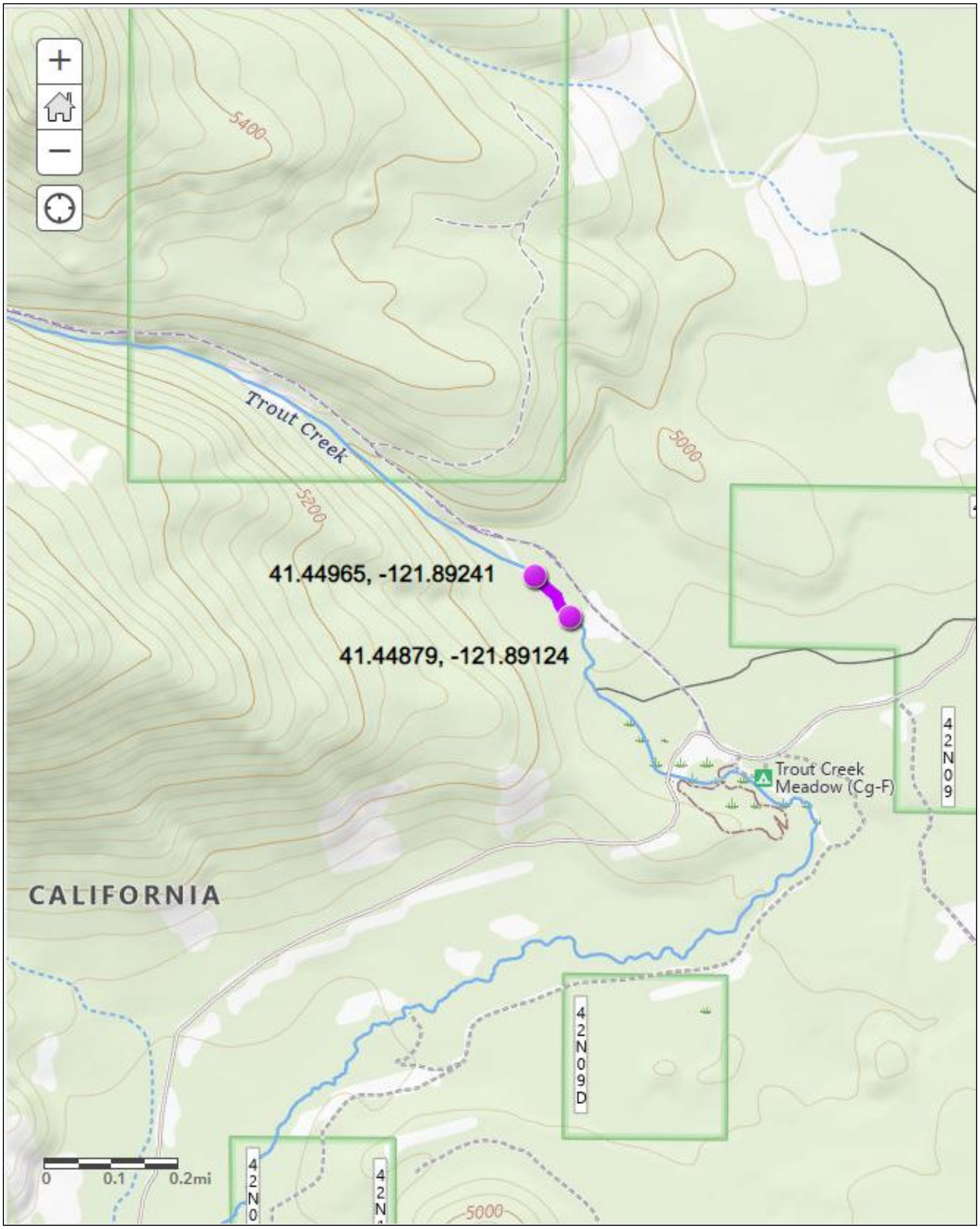


Figure 19. Trout Creek sampling location including downstream and upstream GPS points.

Results:

A total of 65 McCloud River Redband Trout (MRRT) were sampled and measured for length and weight. The distribution of observed fish lengths shows year-class separation (Figure 20 and Table 14), indicating a recovering and healthy population post-fire and drought. Water quality parameters included temperature (11.4 ˚C) and dissolved oxygen (9.66 mg/L).

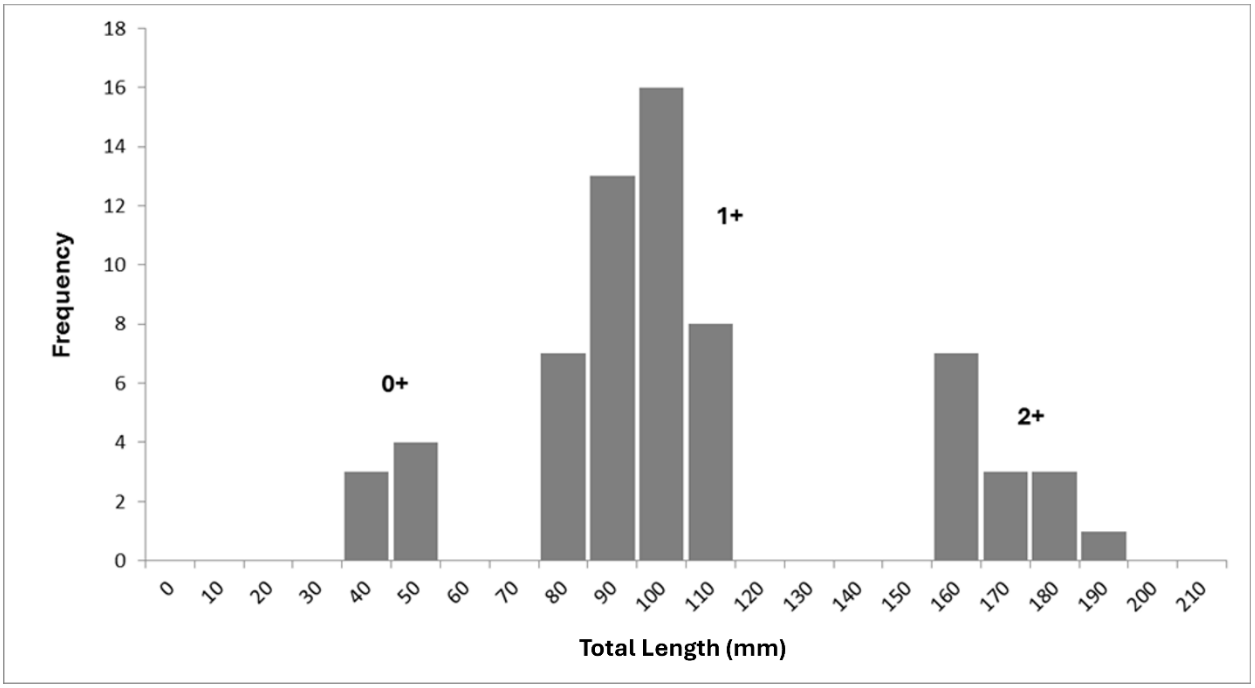


Figure 20. Length frequency graph of MRRT sampled showing year-class or annual cohort separation.

Table 14. Catch statistics from Trout Creek in 2024.

Year Class	Catch	Mean Length (mm)	Mean Weight (g)
0+ (YOY)	7	39.7	1.1
1+	44	91.1	8.5
2+ (3+))	14	164.2	48.9

Discussion:

This sampling effort was designed to document the status of MRRT post Antelope Fire (2021). Several months after the fire, a late-summer rain event deposited a thick layer of fine sediment in Trout Creek. The USFS surveyed the creek after the sediment event and noted the sediment deposition and MRRT losses (Figure 21). After the 2021-2022 winter season, it appeared the creek did not experience another high sediment load and was "cleaned" of the sediment load deposited the prior year. In addition, California was experiencing another multi-year severe (D2) to extreme (D3) drought in the area between 2020-2022 (National Weather Service Climate Prediction Center, Climate Prediction Center).

Figure 21. Sediment flow event (2021) in Trout Creek post Antelope Fire (photo USFS).

The first MRRT status check was conducted post fire after a sediment event impacted the creek (2021) and only two MRRT were captured (CDFW 2021). This report summarizes the second post-fire status check from the 2022 sampling location and 65 MRRT were captured. The increase of MRRT sampled, which included multiple year classes from YOY to 2+ (possibly 3+) shows a resilient and healthy MRRT population in this section. It is likely this reach is a good representation of the lower section of Trout Creek or within the Trout Creek Campground area. It appears that the Trout Creek MRRT population has recovered from the Antelope Fire and the recent drought.

Trout Creek, as well as other Core Conservation Streams identified in the Conservation Agreement for Upper McCloud River Redband Trout, are small, isolated headwater streams that are susceptible to changes in the environment. These streams, and the MRRT populations within them, should be monitored continuously to document status and changes over time. If monitoring trends indicate negative population effects, managers should review and implement the recommendations/actions found in the Conservation Agreement.

<u>Trout Creek Genetic Sampling, Siskiyou County</u>

Survey Dates: August 28

Objective:

Collect samples (minimum 30 tissues) above the natural fish barrier for genetic analysis.

Methods:

Single-pass electrofishing between 1-3 sections above the barrier. Historical sampling sites (2007-2008) and one new sample site were selected based on accessibility and past catch records.

Results:

No MRRT were captured above the barrier at two sampling locations (the third and furthest upstream location was inaccessible). As an alternative sampling site, a section just below the natural fish barrier was sampled. A total of 45 McCloud River Redband Trout (MRRT) were sampled from the alternative site. Water quality was not taken during this effort, but it was recorded on August 27, 2024, at a site just downstream of the barrier and near the USFS campground property. Water temperature 11.4 °C (52.5 °F) and dissolved oxygen at 9.66 mg/l were measured at this site (CDFW 2024).

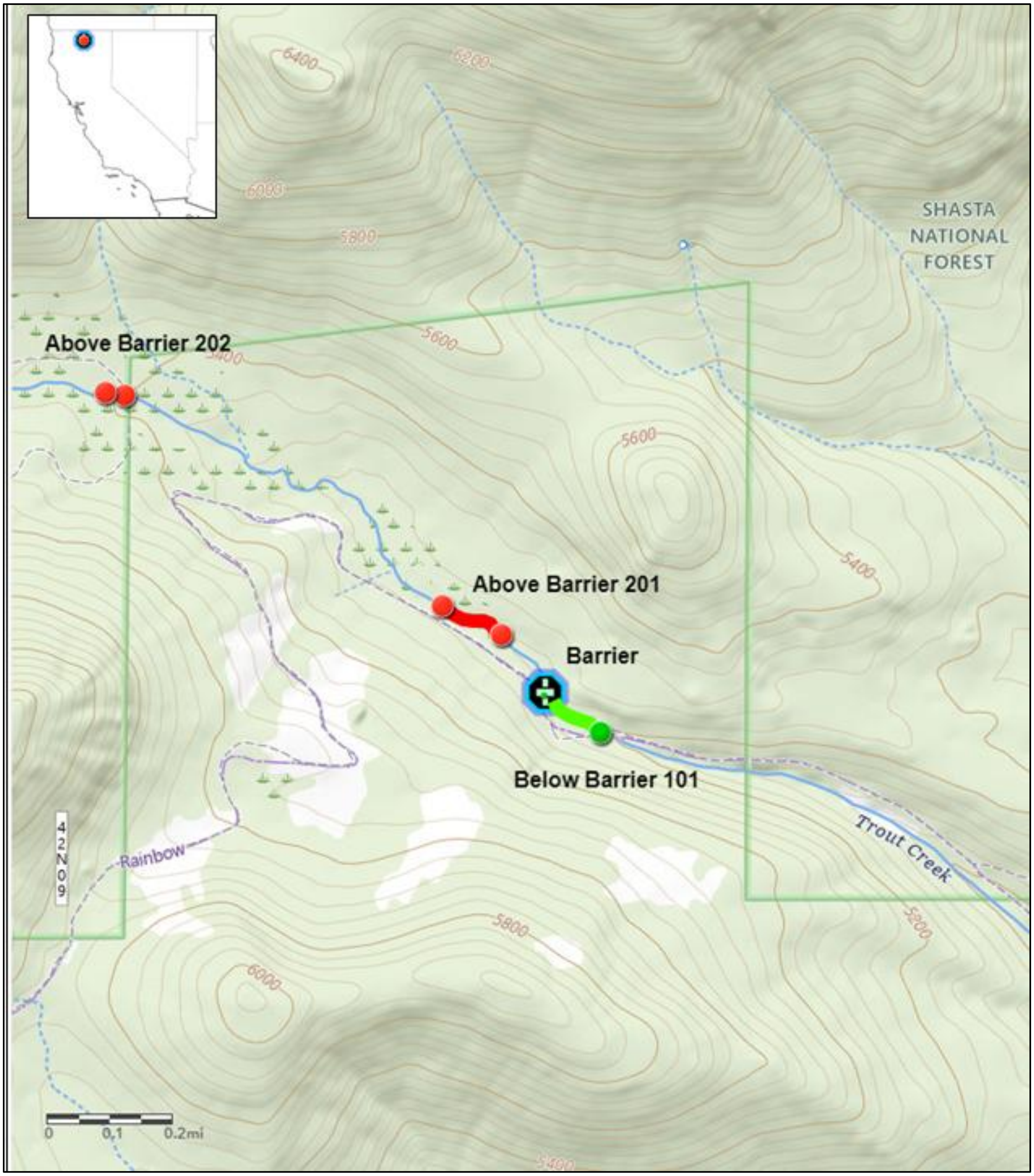


Figure 22. Map of the sampling area showing the natural barrier and catch (green), and no catch (red) sections sampled.

Discussion:

This effort was designed to sample 1-3 sections of Trout Creek above a natural fish barrier to gather tissue samples for future analysis. Genetic analyses have shown that the Trout Creek MRRT population displays some introgression with Rainbow Trout. The identification of any introgressed trout in Trout Creek is puzzling as the Creek was chemically treated in 1977 to eradicate all fish and only stocked with MRRT from Sheepheaven Creek, a genetically distinct population showing no introgression post-chemical treatment. There are two hypotheses why Trout Creek MRRT shows some introgression – 1) the 1977 chemical treatment was not 100% effective leaving some Rainbow Trout to mix with stocked MRRT and/or 2) illegal fish stocking occurred post-chemical treatment. Based on CDFW and USFS sampling efforts, it is likely the introgression is limited to the lower section of Trout Creek or within the Campground area and downstream until the Creek goes subsurface. This is supported to some extent with genetic analyses showing mixed results from sampling sections above and below the barrier and the documentation of non-native Brown Trout in the lower system. CDFW has no stocking records for Brown Trout post-chemical treatment, and it is possible Rainbow Trout and Brown Trout were part of the illegal stocking.

The tissue samples collected from Trout Creek just below the natural barrier should be analyzed to determine whether this location has introgressed fish or is a genetically distinct MRRT population. To complicate future genetic results, the area just above the barrier was stocked by CDFW with genetically distinct MRRT in 2016 to supplement depleted populations of MRRT post-drought conditions. It is unknown if these stocked MRRT moved downstream (below the barrier) or disappeared over time. The genetic results may be able to identify the 2016 fish ancestry and level of introgression. The genetic results and history of fish management actions should help guide management options to restore Trout Creek back to a genetically distinct MRRT population.

Fitzhugh Creek, Modoc County

Survey Dates: September 4-5

Objective:

Update fisheries and habitat data (species composition, size distribution, population estimate and/or relative density, condition, and habitat typing) to document and add to the long-term dataset for Fitzhugh Creek and to provide fishery data for restoration projects being implemented in this drainage.

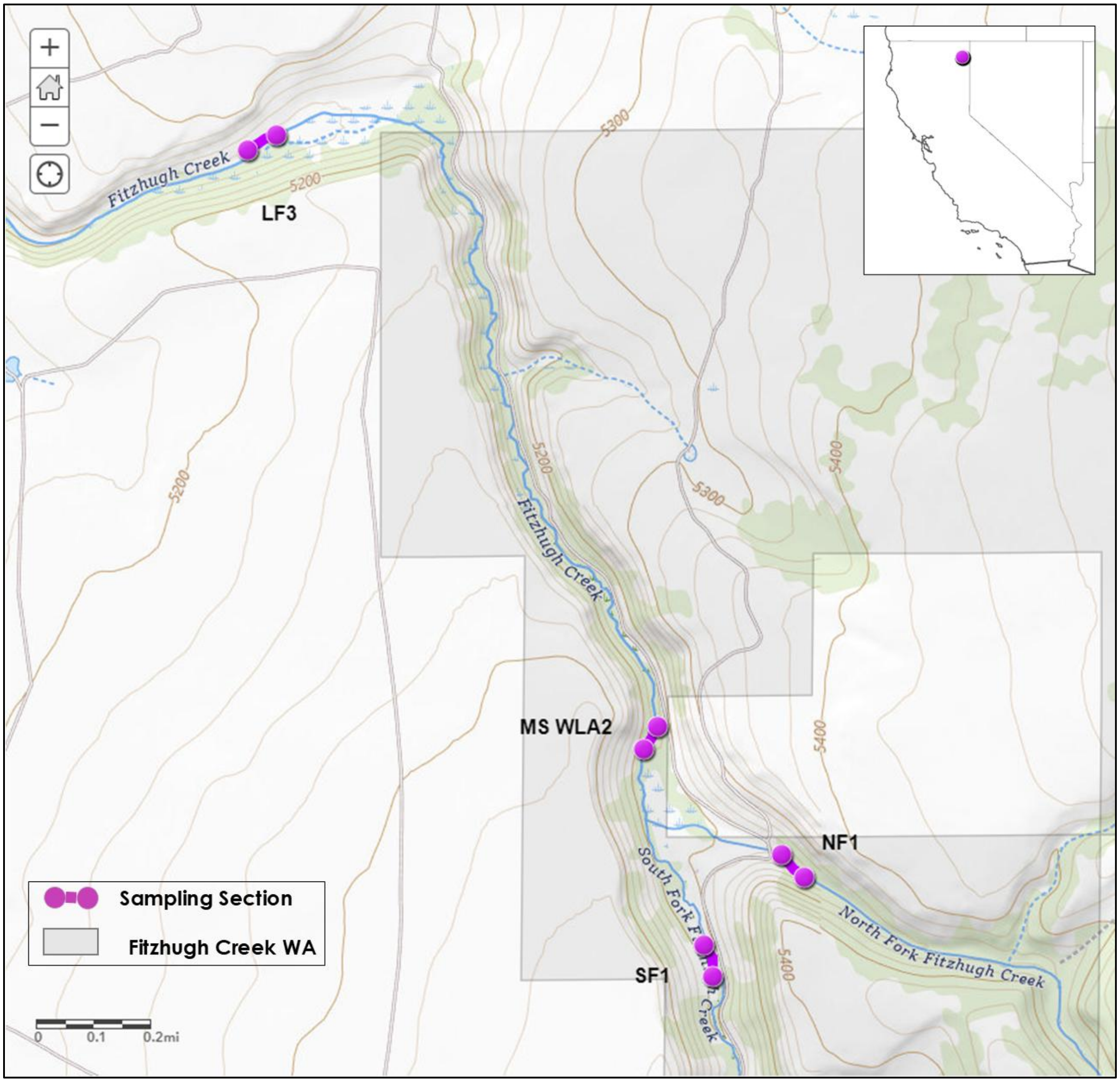


Figure 23. Map of the 2024 sampling stations (NF1, SF1, MS WLA2, and LF3). All sampling stations are in the Fitzhugh Creek Wildlife Area except LF3 which is on BLM land.

Methods:

Resample previously surveyed stations (2003 and 2011) in Fitzhugh Creek (including North Fork and South Fork) to build upon fish and habitat trends over time. The fish sampling method included multi-pass depletion backpack electrofishing in closed or isolated sections of stream. Each station was closed to fish movement (ingress and egress) by placing block nets at upstream and downstream locations prior to electrofishing. Water quality and stream habitat parameters were documented and characterized following standard HWTP survey protocols. Each sampling station is approximately 300 feet (100 meters) in length, but some deviations occurred due to natural stream configurations/accessibility.

Results:

A total of four sampling stations (Figure 23) were surveyed over the two-day effort. The fish catch totaled 6 Rainbow Trout/Redband Trout, 195 Brown Trout, 110 Pit Sculpin, and 23 Pit-brook Lamprey. Catch totals per station can be found in Table 15.

Table 15. Species catch, mean length, and mean weight per station.

Station	Species	Catch	Mean Length (mm)	SD	Mean Weight (g)	SD
NF1	Brown Trout	119	74	25.77	5.50	10.25
NF1	Rainbow Trout	2	122	7.07	15.50	6.36
SF1	Brown Trout	8	254	56.93	178.13	89.13
SF1	Pit Sculpin	9	84	20.51	10.63	8.73
MS WLA2	Brown Trout	18	208	55.86	107.33	78.40
MS WLA2	Pit Sculpin	54	82	19.34	7.95	5.60
MS WLA2	Pit-Klamath Brook Lamprey	19	n/a	n/a	n/a	n/a
MS WLA2	Rainbow Trout	3	179	35.30	67.33	44.46
LF3	Brown Trout	50	123	61.87	35.06	53.30
LF3	Pit Sculpin	47	n/a	n/a	n/a	n/a
LF3	Pit-Klamath Brook Lamprey	4	n/a	n/a	n/a	n/a
LF3	Rainbow Trout	1	225	n/a	120.00	n/a

Trout population estimates were calculated using Moran-Zippin equation with a Carle and Strub modification (Carle and Strub 1978). Expanded relative abundance was calculated from the station population estimate and expanded to fish per mile. The four sampling stations selected in 2024 were selected based on the ability to generate a population estimate and to maintain consistency with previous sampling efforts (CDFW 2011). Comparing population estimates from each station and between years (2003, 2011, and 2024) has shown varied and questionable results due to low catch numbers from some stations and years. This uncertainty makes the estimates and comparisons between sampling events less reliable but provides some relative data about the trout populations. Table 16Table 16Table 11 summarizes the Brown Trout population estimates from 2024 and compares these results to 2003 and 2011 estimates (Table 17). Rainbow Trout/redband estimates were not made due to the very low catch numbers as noted in Table 15.

Table 16. The 2024 Brown Trout population estimates for each sampled station.

Station	Estimated Population	Prob. of Capture	SE	Lower (95% CL)	Upper (95% CL)
NF1	**128**	0.45	4.37	119.01	136.99
SF1	**10**	0.27	3.21	3.58	16.42
MS WLA2	**22**	0.49	n/a	n/a	n/a
LF3	**57**	0.52	6.54	44.19	69.81

Table 17. Station population estimates/fish per mile for Brown Trout in 2003, 2011, and 2024.

Year	NF1	SF1	MS WLA2	LF3
2003	87 / 1,435	5 / 52	n/a	43 / 660
2011	42 / 660	n/a	36/549	40 / 318
2024	128 / 2,086	10 / 145	22/396	57 / 949

The percentage of Brown Trout and Rainbow Trout/redband catch from all four stations combined has shown Brown Trout dominating the total trout catch between 2003 through 2024. Although interesting to note, there appears to be a four percent decline in Rainbow Trout/redband catch percentage between sampling events (Figure 24).

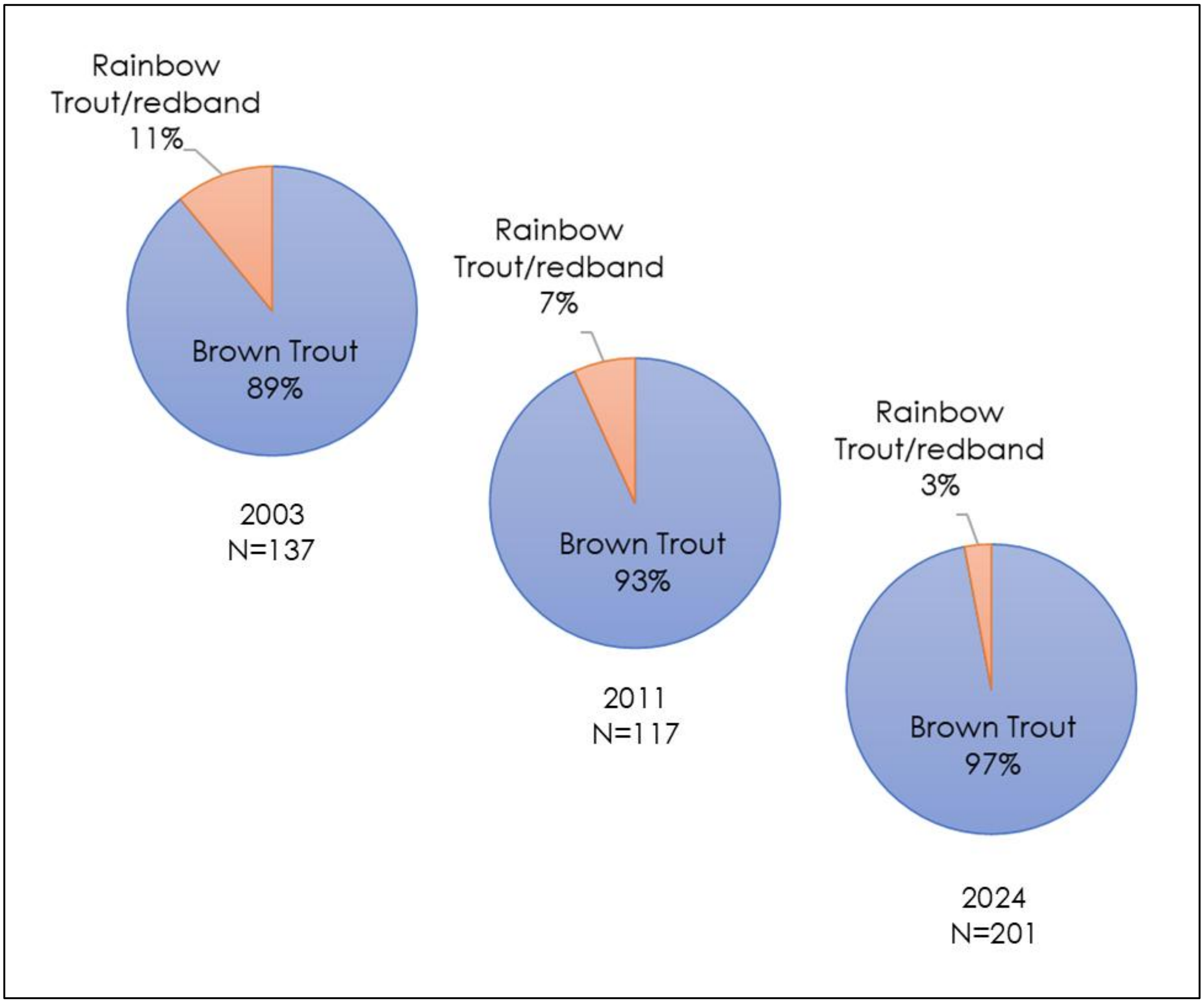


Figure 24. Brown Trout and Rainbow Trout/redband catch shown as a percentage of the total trout catch from 2003, 2011, and 2024.

Recorded habitat parameters included: stream characteristics, habitat type, instream cover, substrate, and water quality. Select stream parameters are summarized in Table 18 and Table 19. Percent "Gravels" in Table 18 represents the sum of bedrock, boulders, cobble, and gravel in the streambed and Percent "Fines" represents the sum of sand, silt/fines, and organics in the streambed within each station section. Additional descriptions on measuring/recording each habitat parameter are described in the HWTP sampling protocols and datasheets.

Table 18. Select stream habitat parameters for each station.

Station	% Riffle	% Flatwater	% Pool	% Large Woody Debris	% Gravels	% Fines
NF1	12	80	8	10	65	35
SF1	0	50	50	0	30	70
MS WLA2	10	85	5	0	70	30
LF3	15	65	20	1	72	28

Table 19. Select stream habitat parameters for each station (continued).

Station	Average Width (ft)	Average Depth (ft)	Discharge (cfs)	% Station Gradient
LF3	6.6	1.09	1.95	0.85
MS WLA2	8.2	0.64	1.38	1.27
NF1	5.6	0.53	1.07	3.08
SF1	8.5	0.87	1.27	0.76

Discussion:

The Fitzhugh Creek Wildlife Area (FCWA) has a long history (50-years) of fish monitoring. Within this timeframe Fitzhugh Creek has been chemically treated to remove "rough fish" in 1979, the land has been purchased by CDFW with WCB funds in 2003 creating the Fitzhugh Creek Wildlife Area, and restoration projects including - thinning stands of Western Juniper and beaver dam analogs have been implemented. Additional non-fishery monitoring, such as wildlife use information and local climate data are being collected by CDFW. This data, along with the fisheries data, can be used synergistically to better understand and manage the fish and wildlife resources at the FCWA and surrounding Modoc Plateau/Warner Mountains area.

The 2024 sampling effort was implemented to provide a status update to the Fitzhugh Creek fishery and comply with a management task (B2) found in 2010 Management Plan for the Fitzhugh Creek Wildlife Area (CDFW 2010). The sampling design was to maintain consistency with the sampling efforts in 2003 and 2011 and to compare changes over time. Initially the sampling was scheduled for late July 2024 but was postponed to early September due to smoke particulate (AQI values >150 or unhealthy) caused by the Camp Fire (July 2024). Although sampling was delayed by a month, the sampling occurred when seasonal/biological conditions were similar to the other sampling efforts.

The trout population within the sampling area appears to be in good, stable condition with multiple year classes represented over a mix of varying habitat types sampled. California has been through multiple severe to exceptional droughts over the past 10-years (NOAA Drought Monitoring, Drought Monitoring). The intensity and duration of some of these droughts are unprecedented and have impacted fishery resources throughout the State (CDFW 2017). Although the Fitzhugh Creek fishery was not directly monitored during these droughts, the current habitat/fishery observed in 2024 appears to be resilient enough to withstand the harsh conditions brought on by severe droughts.

Of concern is the diminishing population of Rainbow Trout/redband since 2003 (Figure 24). This decline is more alarming today as recent findings by Dr. Jeff Rodzen (in prep.) has identified genetic redband markers in the Fitzhugh Creek population. It has been assumed historically that the Fitzhugh Creek *O. mykiss* population was likely a redband or a redband x Rainbow Trout based on historical documentation (Behnke 1992) and visual observations. The historical ratio, if any, of redband to Rainbow Trout is unknown prior to fish stocking. One possible cause or deterrent to establishing a strong Rainbow Trout/redband population may be the presence/competition of non-native Brown Trout in system. Although many lotic systems in California can have both species coexist in good numbers/condition, additional information will be needed to determine the cause(s) for the diminishing Rainbow Trout/redband population in Fitzhugh Creek, if a native trout species is preferred for this fishery.

The HWTP will continue to monitor the FCWA and BLM lands where meadow instream restoration work, including beaver dam analogs, is being completed. Ideally, sampling should occur every five years or as needed based on conditions and fishery concerns. Future sampling should maintain consistency, if possible, with previous efforts for comparability and/or to document changes over time. Due to the close proximity of the stations to each other, it might be advantageous to expand sampling (further upstream) to document the extent of the fish bearing habitat.

In addition, the Fitzhugh Creek *O. mykiss* population has been identified as containing redband markers by Dr. Rodzen as noted in the “Discussion” section above. Although the Rainbow Trout/redband population has mixed over time, the initial round of genetic analysis showed a relatively good “signal” of redband genetics in the population when compared to other Warner Mountain Rainbow Trout/redband populations. The good “signal” is worth noting and should be considered when prioritizing waters for future monitoring and restoration efforts, including restoring the Fitzhugh Creek redband population if desired.

Habitat Improvement

Dismal Creek Meadow Project, Modoc County

Project Status: in progress.

Project Overview:

The Dismal Creek Meadow Project is a joint project between Trout Unlimited, CDFW, USFS, and other partners. The project will restore channel/floodplain connectivity within Dismal Swamp and Dismal Creek. In addition, cattle exclusion and a cattle grazing plan will be implemented to protect the restoration work and allow the sensitive wetland and riparian vegetation to recover.

Actions completed in 2024:

Include a project proposal and approval funded by the CDFW Restoration Grant - Wetlands and Mountain Meadows Restoration for project design.

McCloud River Redband Trout Refuge Pool Habitat Enhancement Project

Project Status: in progress. This is a joint project between CalTrout and CDFW. The project has been funded in 2023 (CDFW drought funds) and initial design plans and a contractor selected to complete the work.

Project Overview:

The McCloud River Redband Trout (MRRT) Refuge Pool Enhancement Project will create or enhance instream pool habitat in two MRRT core conservation streams (Edson Creek and Sheepheaven Creek, Siskiyou County). During periods of severe to exceptional drought, MRRT instream habitat becomes very limited with some streams providing less than 1,000-1,500 feet of wetted stream habitat. With the reduction of stream habitat, the remaining instream pools provide the only viable habitat for MRRT. This project was developed from observational field data and the success of a past project where instream habitat was created to provide instream habitat during periods of critical low flows caused by drought conditions.

Actions completed in 2024:

The design concept has been finalized, and a contractor (Streamwise) has been selected. It is anticipated that the groundwork for this project will be completed in the summer of 2025.

Research

<u>Cold Spring McCloud River Redband Trout Habitat Suitability</u>

Overview:

A habitat suitability study of a fishless water within the upper McCloud basin. The spring stream is limited in length (194 m) before reaching Cold Creek. Locating new suitable habitat for MRRT within the upper McCloud basin (historic range of MRRT) is very difficult. So, any potential new habitat will be investigated by CDFW for feasibility and long-term sustainability.

Objective:

Continue with MRRT suitability sampling to document inter-annual and intra-annual habitat parameters. If habitat parameters are conducive to MRRT establishment then a proposal for stocking Cold Spring will be submitted.

Methods:

Deploy four Hobo water temperature loggers recording water temperature near the Cold Spring origin and near the confluence with Cold Creek.

Results:

In progress.

Discussion:

The temperature logger deployment is part of a larger study to evaluate the potential of Cold Spring as a McCloud River Redband Trout refuge stream within the upper McCloud Basin. Previous sampling efforts in 2022-23 have shown that Cold Spring and Cold Creek are fishless, and the Cold Spring area does not contain any amphibians (CDFW 2023a). The potential MRRT habitat was made aware to CDFW by the USFS and is owned by the USFS. Preliminary habitat results have indicated that the spring habitat may be suitable for MRRT, but the water temperatures may be too cold for the species to sustain itself in perpetuity. Cold Creek may also provide MRRT habitat but is subject to sporadic debris flows coming off Mt. Shasta at times which may be detrimental to the species long-term existence in the Creek.

Continue to monitor and gather data on Cold Spring and Cold Creek. Summarize the multi-year data set to determine if the area would provide a net benefit to MRRT and, if so, propose translocation of MRRT to CDFW management and the USFS in accordance with the Conservation Agreement for MRRT.

North Central Region

Public Outreach and Education

International Sportsmen's Exposition

Date: January 17 – 21, 2024

Format: In person, booth

Overview: The International Sportsmen's Exposition is an event held at the Cal Expo building in Sacramento. This is a large event which offers shopping for outdoor gear, fishing and hunting products, plus four-wheelers, camping RVs, and a huge selection of fishing boats. This is a family-friendly event that offers outdoor products as well as seminars. CDFW staffs a booth every year to help answer questions from the public.

Figure 25. CDFW staff at the International Sportsmen's Exposition.

Trout Unlimited, El Dorado Chapter

Date: January 18, 2024

Format: In person PowerPoint Presentation

Overview: The El Dorado Chapter of Trout Unlimited hosted a meeting where CDFW staff presented data on wild trout population dynamics based off recent fisheries assessments in Caples Creek, El Dorado County.

Trout Unlimited, El Dorado Chapter

Date: March 21, 2024

Format: In person PowerPoint presentation

Overview: The El Dorado Chapter of Trout Unlimited hosted a meeting where CDFW staff presented data on past snorkel survey findings in Caples Creek, El Dorado County.

Amador Fly Fishers

Date: April 3, 2024

Format: In person PowerPoint Presentation

Overview: The Amador Fly Fishers angling organization hosted a monthly meeting where CDFW staff presented to club members about Lahontan Cutthroat Trout management and angling opportunities in the North Central Region.

Gold Country Fly Casters

Date: May 20, 2024

Format: In person PowerPoint presentation

Overview: The Gold Country Fly Casters angling organization hosted a monthly meeting where CDFW staff presented to club members about Lahontan Cutthroat Trout management and angling opportunities in the North Central Region.

CDFW Providing Angling Opportunities Through Lahontan Cutthroat Trout Stocking

Date: Youtube video released October 2, 2024

Format: YouTube video

Overview: Regional HWTP staff were interviewed for a CDFW short-film on Lahontan Cutthroat Trout, their role in the State's hatchery system, angling qualities, and distribution throughout the State.

Figure 26. Screen shot from the Lahontan Cutthroat Trout Hatchery video.

Location: YouTube

California Fly Fishers Unlimited

Date: October 1, 2024

Format: In person PowerPoint Presentation

Overview: The California Fly Fishers Unlimited Organization in Sacramento hosted a monthly meeting where CDFW staff presented to club members about coldwater fisheries management and angling opportunities in Alpine, El Dorado, Nevada, Placer, Plumas, and Sierra Counties.

National Disability Employment Awareness Month (NDEAM) Job Fair

Date: October 10, 2024

Format: In person, booth

Overview: HWTP staff participated in the NDEAM job fair on the West lawn of the State Capitol in Sacramento. Staff worked at the CDFW booth, answered public questions about CDFW employment and resource management, and was on hand to discuss what the daily work of an Environmental Scientist was like.

Figure 27. CDFW staff working the booth at the NDEAM job fair.

<u>Trout Unlimited, El Dorado Chapter</u>

Date: November 7, 2024

Format: In person PowerPoint presentation

Overview: The El Dorado Chapter of Trout Unlimited hosted a meeting where CDFW staff presented the newly developed California Inland Recreational Angler Survey (CIRAS). Chapter members were solicited for their feedback about the CIRAS program and its functionality.

<u>Huntsman's Banquet</u>

Date: November 14, 2024

Format: In person, question and answer.

Overview: CDFW staff were on-hand at the Huntsman's banquet at the Sutter Club in Sacramento to discuss fish and wildlife resource management. Staff answered questions about fishing and hunting opportunities, regulations, and public volunteer opportunities with CDFW surveys / field work.

Amador Fly Fishers

Date: November 26, 2024

Format: In person PowerPoint presentation

Overview: The Amador Fly Fishers angling organization hosted a monthly meeting where CDFW staff presented to club members about coldwater fisheries management and angling opportunities in Alpine, Amador, Calaveras, and El Dorado Counties.

Public Discussion at NCR

Date: December 10, 2024

Format: In person, public meeting

Overview: A public meeting to discuss wild trout angling opportunities and trout management objectives in waters of Placer, Nevada, Sierra, Plumas, and El Dorado Counties.

Research

American River, South Fork - Single Pass Electrofishing Event

Survey Date(s): August 5 - 8, 2024

Overview:

The American River is a 120-mile-long river located in the North Central Region of California. The American River has three tributaries with headwaters originating from snowmelt in the Sierra Nevada range. The North Fork, Middle Fork, and the South Fork American River (SFAR) eventually converge at Folsom Reservoir (Coloma-Lotus Chamber of Commerce, 1995-2018). The main stem of the American River, also known as the Lower American River, starts just below Nimbus Dam and flows into the Sacramento River and the San Francisco Bay Delta watershed (EPA, 2018). This single pass electrofishing study takes place on the SFAR and includes sections of the river from Lake Audrain (meadow) downstream to the 42 Milestone River Crossing, Strawberry, California. (Figure 28).

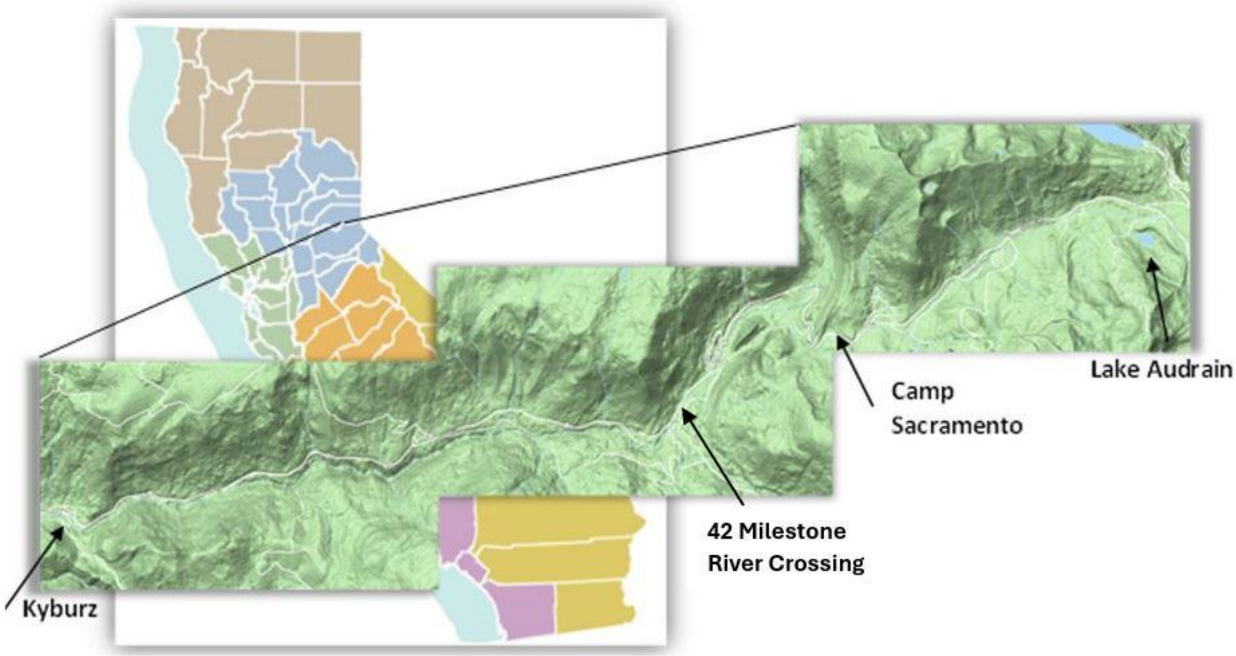


Figure 28. The SFAR survey reaches from Lake Audrain downstream to the 42 Milestone River Crossing, Strawberry, California.

Historical fish stocking on the SFAR occurred at multiple high use, roadside access points and, at its height, involved the release of 15,000 catchable Rainbow Trout annually. Beginning in 1974, allotments were reduced to make room for inland salmon production at hatchery facilities, to save on mileage costs, a determination that the allotment was too high, and the presence of private cabins reducing the desirability of a catchable trout program (Memorandum to File 1974). Electrofishing events on the SFAR have identified large majorities of non-native salmonids present in the Upper SFAR as far back as 1974 (Memorandum to File 1974). Currently, wild populations of Brook, Brown, and Rainbow Trout can be found in varying densities from Lake Audrain downstream to the town of Kyburz. According to a dispersal and longevity study of hatchery origin Rainbow Trout in the SFAR conducted in 2013, Rainbow Trout acclimated to the stocking location and largely did not disperse provided depth was adequate. This fidelity to the stocking location was likely due in large part to water depth at the stocking site. In addition, it was determined that propagated trout were highly susceptible to harvest within the first week following a stocking event. Limited dispersal downstream of the stocking locations, combined with high levels of angler harvest likely result in limited adverse impacts to native and wild trout populations present in more suitable habitat (Kundargi, 2013). Currently, the California Department of Fish and

Wildlife annually stocks hatchery raised Rainbow Trout into one location between Lake Audrain and Kyburz – Camp Sacramento. The intent of this allotment is to supplement the wild trout fishery present in the SFAR and provide enhanced summer fishing opportunities, high catch rates, and quality / trophy sized fish to visitors and locals alike.

Objective:

Conduct a single pass, backpack electrofishing survey of multiple sections of the SFAR from Lake Audrain (meadow) downstream to the 42 Milestone River Crossing, Strawberry, CA to provide a general assessment of fish density, species composition, size averages, and wild vs. hatchery influence on the fishery.

Methods:

This survey was conducted by Michael Mamola, Ben Ewing, Mike Maher, Lucas Brattesani, and Andy Martinez, CDFW. Electrofishing was conducted in a downstream to upstream direction, with two backpack electrofishing units being used, two netters, and one live car for fish transport through the survey section. Fish caught were measured in millimeters at fork length, and then placed in size bins (converted to inches) consisting of four size classes (small, medium, large, x-large). After fish length was recorded, fish were released in optimum holding areas (deeper pools and undercut riverbanks) on the river in the section surveyed. The survey covered a total of four sections of the SFAR, with habitat consisting of a meadow complex, as well as a series of riffles, runs, pools, and cascades (Figure 29).

Figure 29. The SFAR behind the town of Strawberry, California in the El Dorado National Forest, El Dorado County.

Results:

Due to limited staff availability, only the top four sections of the SFAR were surveyed, and included Lake Audrain (meadow), Sierra at Tahoe to Tamarack Pines Road, Sayles Creek tributary, and the Town of Strawberry to 42 Milestone River Crossing. A combination of 69 trout and char were captured from the four sections surveyed. The distribution of trout and char varied with each section. Lake Audrain (meadow) produced zero fish as flows through the meadow were intermittent and dry in many locations. Sierra at Tahoe to Tamarack Pines Road produced both Brook Trout (34 fish) and Brown Trout (15 fish), Sayles Creek Tributary produced Brook Trout (17 fish) and Brown Trout (2 fish), and Strawberry to the 42 Milestone River Crossing produced Rainbow Trout (1 fish). Catch rates were recorded as Fish per River Mile on a sectional basis, with the greatest catch occurring higher in the watershed (Table 20).

Table 20. Catch Statistics for the SFAR comparing surveyor counts, total survey effort, total catch and fish per river mile on a sectional basis. * Indicates high flows and low associated capture efficiency.

Section	Surveyor Count	Total Effort (seconds)	Total Catch	Fish Captured/ River Mile
Audrain Meadow	4	0	0	0 (Meadow Dry)
Tamarack Pines Rd.	5	3889	49	226.7
Sayles Creek	4	4723	19	70.8
42 Milestone to Strawberry Meadow	5	2215	1	2.6*
Total	18	10827	69	58.9

Trout and char captured were broken down by size class (small 0-5.9 in., medium 6-11.9 in., large 12-17.9 in., x-large 18 + in.). 26 Brook Trout and 5 Brown Trout were classed as small. 18 Brook Trout, 10 Brown Trout, and 1 Rainbow Trout were classed as medium. Zero trout or char were classed as large or x-large. 7 Brook Trout were classed as UNK and 2 Brown Trout were classed as UNK (Figure 30 through Figure 33).

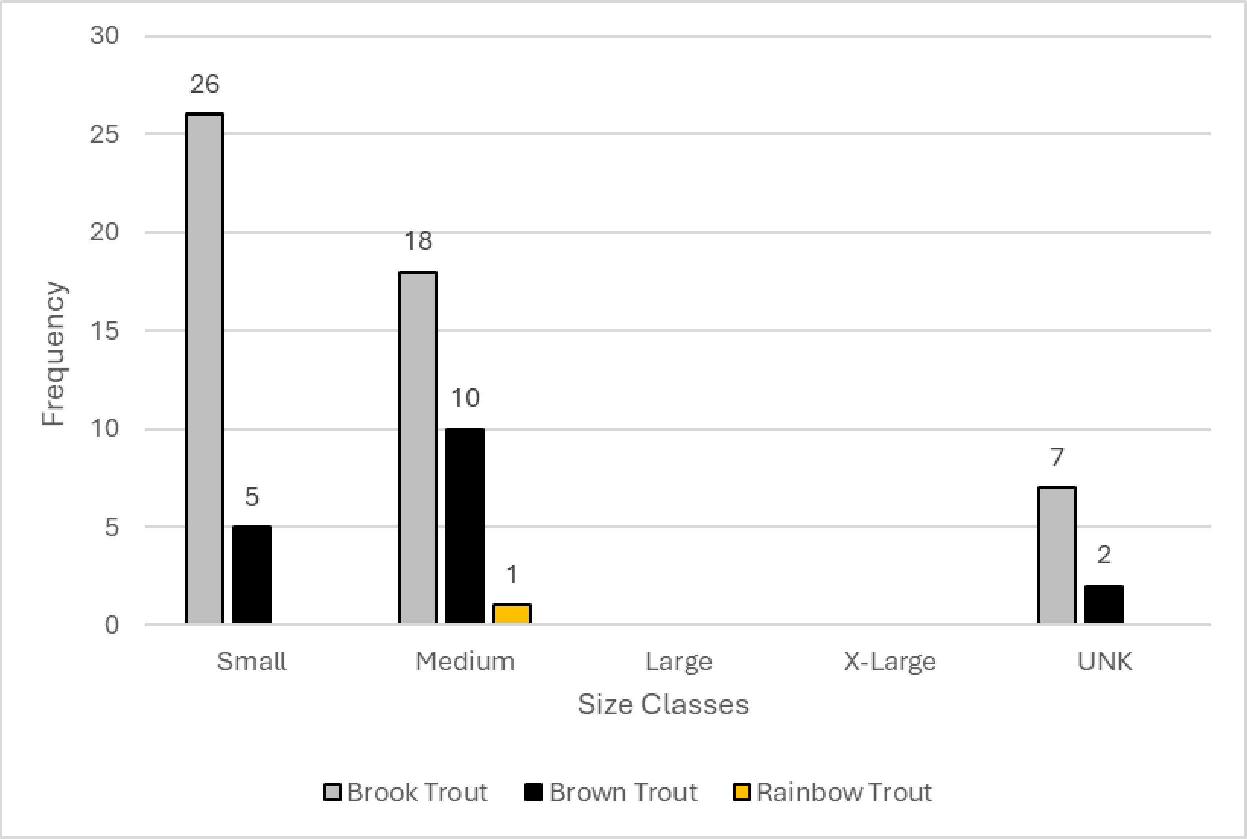


Figure 30. A breakdown of size classes of trout and char caught on the SFAR from Lake Audrain (meadow) to the 42 Milestone River Crossing, El Dorado County, in 2024.

Figure 31. A Brook Trout caught at Tamarack Pines Road on the South Fork American River on August 5th, 2024.

Figure 32. A Brown Trout caught at Tamarack Pines Road on the South Fork American River on August 5th, 2024.

Figure 33. A Rainbow Trout caught at Strawberry Meadow on the South Fork American River on August 6th, 2024.

Discussion:

Upon conclusion of this single pass backpack electrofishing survey, CDFW staff determined that both fish densities and species variety increase further up in the watershed. Brook and Brown Trout were all found in and above the Sayles Creek Tributary, with a singular Rainbow Trout being captured between the town of Strawberry and the 42 Milestone River Crossing. In addition, the Rainbow Trout captured by CDFW staff was determined to be of wild origin based upon a lack of identifiable fin erosion associated with artificially propagated trout of similar sizes.

For the 2025 field season, it is recommended that a snorkel survey be conducted on the same sections of the SFAR that the 2024 single pass backpack electrofishing survey was conducted. This effort in 2025 will provide a more comprehensive understanding of trout and char densities (fish per river mile) and provide the CDFW fisheries managers with a rough population estimate throughout the upper SFAR watershed on a sectional basis.

Bay Delta Region

Resource Assessment and Fishery Monitoring

Pescadero Creek, San Mateo County

Survey Dates:

Study 1: November 30, 2023 – April 29, 2024

Study 2: June 25, 2024 – October 30, 2024

Overview:

Pescadero Creek drains a 210 km^2 area on the western slopes of the Santa Cruz Mountains, in San Mateo and portions of Santa Cruz County (ESA 2004). The upper watershed is forested, predominately with mixed conifer forest containing an assemblage of Redwood (*Sequoia sempervirens*) Douglas Fir (*Pseudotsuga menziesi*) and assorted hardwood species. The lower watershed is characterized by a small alluvial valley where much of the land has been converted to agricultural lands, and coastal terraces and uplands which are ranch land or open space. The stream has a bar-built estuary (Pescadero Lagoon Complex (PLC)) near its terminus with the Pacific Ocean, which is in a Natural Preserve managed by California Department of Parks and Recreation (State Parks).

Total available anadromous fish habitat in the basin is estimated at 78.25 km of stream (ESA 2004). The Pescadero watershed has populations of Central California Coast (CCC) steelhead trout (*Oncorhynchus mykiss*) which are listed as threatened by the federal Endangered Species Act (ESA) (NMFS 2016 a. & b.), and Central California Coast (CCC) Coho Salmon (*Oncorhynchus kisutch*) which are listed as endangered by both the federal and state ESAs (NMFS 2012).

Fishing regulations permit fishing in short reaches of Pescadero Creek and its main tributary Butano Creek for steelhead trout from December 1 to March 7 on Wednesdays, weekends, holidays and opening and closing days of the season only. Pescadero Creek provides one of the best steelhead trout fishing opportunities in close proximity to the Bay Area metropolitan region.

Objective:

Conduct Phase 2 Heritage and Wild Trout Candidate assessments to get estimates of annual adult steelhead trout spawning escapement (Study 1) and assess abundance of juvenile steelhead trout rearing in PLC in Summer and Fall (Study 2).

Methods:

Study 1:

We used the spatially balanced and randomized Generalized Random Tessellation Stratified (GRTS) sampling to select spawner survey reaches (Stevens and Olsen 2004). This is the recommended approach in Fish Bulletin 180 (Adams et. al. 2011) for selecting sample reaches for regional salmon and steelhead spawner surveys in coastal Northern California watersheds. Nine reaches were selected for sampling this year from the 36 total reaches in the watershed (Figure 34).

Spawner surveys were conducted using the Coastal Northern California Spawning Survey Protocol (Gallagher and Knechtle 2005). An attempt was made to survey all reaches bi-monthly (approximate 15-day rotation).

Crews would conduct the survey by accessing sample reaches at the downstream end and walking upstream. As surveyors walked the stream, they documented live and moribund steelhead and salmon, and the location of any redds, which are gravel depressions dug by female salmon and steelhead in which they lay their embryos while male(s) simultaneously fertilize them. For more details on protocols see Gallagher and Knechtle (2005).

Redd counts from surveyed reaches were converted to spawning escapement estimates for steelhead and Coho Salmon according to the methodology described in Fish Bulletin 180 (Adams et al 2011), and using supplemental data collected by a monitoring program at Scott Creek in Santa Cruz County (Kiernan et al. 2024).

Figure 34. Map Showing Pescadero Creek, San Mateo County. Reaches surveyed in 2023-24 spawner surveys are highlighted in orange.

Study 2:

Pescadero lagoon was sampled on fifteen occasions (three times monthly) from June 25 to October 30, 2024. During each event a 50’ or 100’ beach seine was used to capture fish in the lagoon. Seines were set parallel to shore and retrieved by pulling them perpendicular to shore or by walking them upstream and round hauling to one shore point.

All steelhead caught were checked for Passive Integrated Transponder (PIT) tags and had their fork length measured. A subset of fish had scale samples taken to discern age and life history information and some previously unmarked juvenile steelhead were anaesthetized using Alka Seltzer Gold, and a hypodermic needle was used to insert a 12 or 23 mm HDX PIT tag in their visceral cavity. We estimated the population of juvenile steelhead in the lower lagoon, which is inclusive of the lower 0.45 miles of the estuary, to the confluence of Butano Creek, Pescadero Creeks largest tributary. We used a POPAN mark-recapture model for population estimation (White and Burnham1999, Frechette et al. 2016).

All other fish species were identified and released. Water quality in PLC was monitored using a fixed network of sondes and periodic spot-check profiles were taken with a YSI water quality meter from spring through fall to characterize habitat conditions for steelhead rearing in the lagoon. Water quality parameters measured were salinity, temperature, and dissolved oxygen.

Results:

Study 1:

Individual reaches were surveyed between six and eight times throughout the season. Peak stream flow in Pescadero Creek ([USGS Current Conditions for USGS 11162500 PESCADERO C NR PESCADERO CA]) occurred during storms in January. Flows during the peak event were just under 2,000 cubic feet per second (cfs). For the season, 42 steelhead trout redds were identified in our survey reaches. The watershed-wide escapement estimate for adult steelhead trout was 353 (95% confidence interval (CI) 130-572).

Study 2:

As mentioned above, our mark-recapture survey only estimates the juvenile steelhead trout population in the lower lagoon, although we do opportunistically sample sites in the upper lagoon arms. For July, August and September, population estimates for the lower lagoon were 6,130, 9,879 and 2,424 respectively (Figure 35). Average growth rate for recaptured steelhead season was 0.68 mm per day (SE= 0.05).

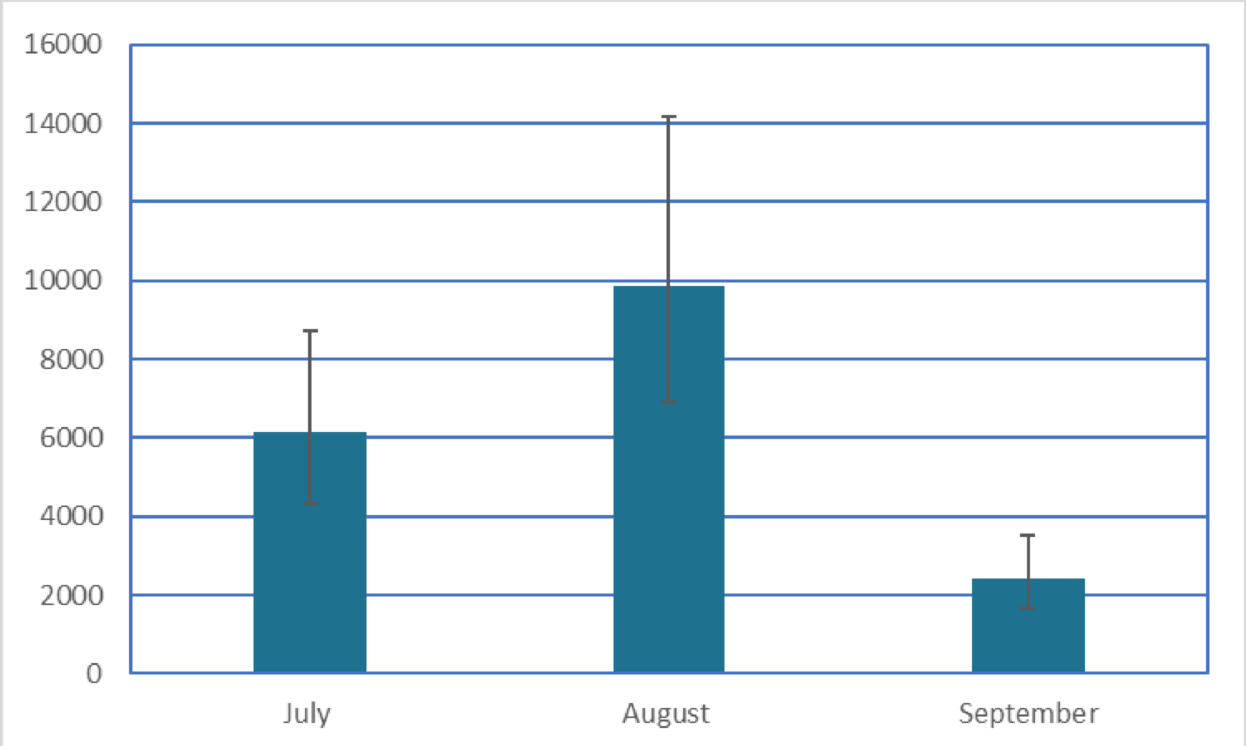


Figure 35. POPAN monthly mark-recapture population estimates for juvenile steelhead in Pescadero Lagoon, 2024.

Discussion:

Study 1:

Winter precipitation in 2024 was close to average. Storms in January and February may have impacted survey results by obscuring redds made prior to storms so they were not visible to survey crews. Adult steelhead escapement in winter 2023-24(N=353) was similar to 2022-23 (N=336), and much lower than 2021-22 (N=1,048). Estimated steelhead escapement in nearby Scott Creek (Santa Cruz County) was well below average (Kiernan et al. 2024). Low returns may have been influenced by marine conditions, or drought conditions in 2021-22 that impacted freshwater and estuarine productivity.

Study 2:

During the sampling season the mouth of PLC progressed from fully open to a perched opening by late August, and the mouth closed on October 14, 2024. Water quality in the lagoon was relatively good throughout the season, and the most challenging conditions were documented around the time of closure, when the lagoon was strongly salinity stratified, and respiration in deeper stratified layers resulted in periods of bottom-water anoxia.

The POPAN model estimates relative survival, and emigration rates from the study area. These estimates indicate there was movement of juvenile steelhead between the lower lagoon and areas upstream, and that increasing numbers of fish emigrated to the lower lagoon through August, and that fish left the lower lagoon between August and September.

Similar emigration patterns have been documented in other California bar-built estuaries) where fish may be moving due to a combination of factors including water quality, food and habitat availability and density dependent effects (Osterback et al. 2018). After the mouth closed fish may have left to take advantage of increased habitat in the upper lagoon arms and on adjacent marsh plains. Fish also may have been heading for the upper watershed. Hayes et al. (2011) documented many steelhead in nearby Scott Creek lagoon migrate in fall from the lagoon to upstream areas where they presumably overwinter before migrating back downstream in spring as smolts. The mechanism behind this behavior is unknown, and similar migration patterns have also been documented amongst Pescadero lagoon steelhead.

Juvenile steelhead at the end of the season were large and robust, with an average fork length of 228 mm. This is significant because these lagoon reared juvenile steelhead grow substantially faster and to a larger size than juveniles occupying freshwater stream reaches (Hayes et al. 2008). Their larger size confers a significant survival advantage, since early marine mortality for juvenile steelhead typically is size-biased. Recent habitat restoration work in PLC seems to be improving conditions, and large anoxia-related fish kills that previously affected steelhead in the lagoon following bar breaching events have not occurred for nearly a decade.

Figure 36. Releasing an adult steelhead captured in Pescadero Lagoon during sampling in August of 2024.

Putah Creek and Lake Solano, Solano County and Yolo County

Survey Dates: January 1, 2024, to December 31, 2024

Overview:

Putah Creek originates in the Mayacama Mountains and flows down to Lake Berryessa which is formed by water impounded by the Monticello Dam. The water flowing out of Monticello Dam is then impounded by the Putah Diversion Dam (PDD)which forms Lake Solano. The area between Monticello Dam and the PDD is known as the inter-dam reach (IDR) (Figure 37). The IDR was designated as two separate Wild Trout Waters in 2014, the stream section of Putah Creek below Monticello Dam to Lake Solano which includes 4.7 miles of stream habitat and Lake Solano which provides approximately 69 acres of aquatic habitat. The trout population of both designated Wild Trout Waters are managed as a single population as trout can freely migrate between the stream and lake sections in the IDR. The designated wild trout waters within the IDR are publicly accessible along Hwy 128 through the Putah Creek Wildlife Area, Yolo County Parks Public Fishing Accesses, and Lake Solano County Park. Most of the fishing effort is concentrated in the stream section between Monticello Dam and the formation of Lake Solano. The fishery is open year-round with a zero bag limit. The fishery is popular due to trophy size trout and its proximity to large population centers of the San Francisco Bay Area and Sacramento.

Figure 37. Map of the Putah Creek IDR and Lake Solano designated wild trout areas.

Objective:

Conduct Phase 2 assessment utilizing angler survey boxes (ASB) and hook-and-line surveys.

Methods:

ASBs are stocked with survey forms for anglers to voluntarily submit their angling data. The forms are periodically collected and the ASBs are restocked with new forms. ASB collected forms are entered and the data is summarized. Hook-and-line surveys are scheduled bimonthly, every two months. The survey collected various biological measurements and pit tagged fish for identification.

Results:

During 2024, anglers submitted 42 data forms through the ASBs (Table 21 and Table 23). The first data form was submitted on January 14, and the last form was submitted on December 26. Angler data was submitted on 38 unique days. 2024 ASB data was summarized and compared to historical data (Figure 38, Table 22, Figure 39, and Table 24). On 6/18/2024, 8/20/2024, and 12/10/2024, CDFW personnel conducted hook-and-line surveys on Putah Creek using both spin fishing and fly fishing gear. There were 18 fish that were measured and pit tagged. The largest fish was 18.25in. The lengths and weights were plotted (Figure 40).

Table 21. Summary of Putah Creek ASB data from 2023, 2024, and 2012 through 2020.

Year	Number of Forms	Fish caught per hour	Species composition-Rainbow Trout	Species composition-other
2012-2020	549	0.66	Rainbow Trout	N/A
2023	36	0.38	Rainbow Trout	N/A
2024	38	0.61	Rainbow Trout	N/A

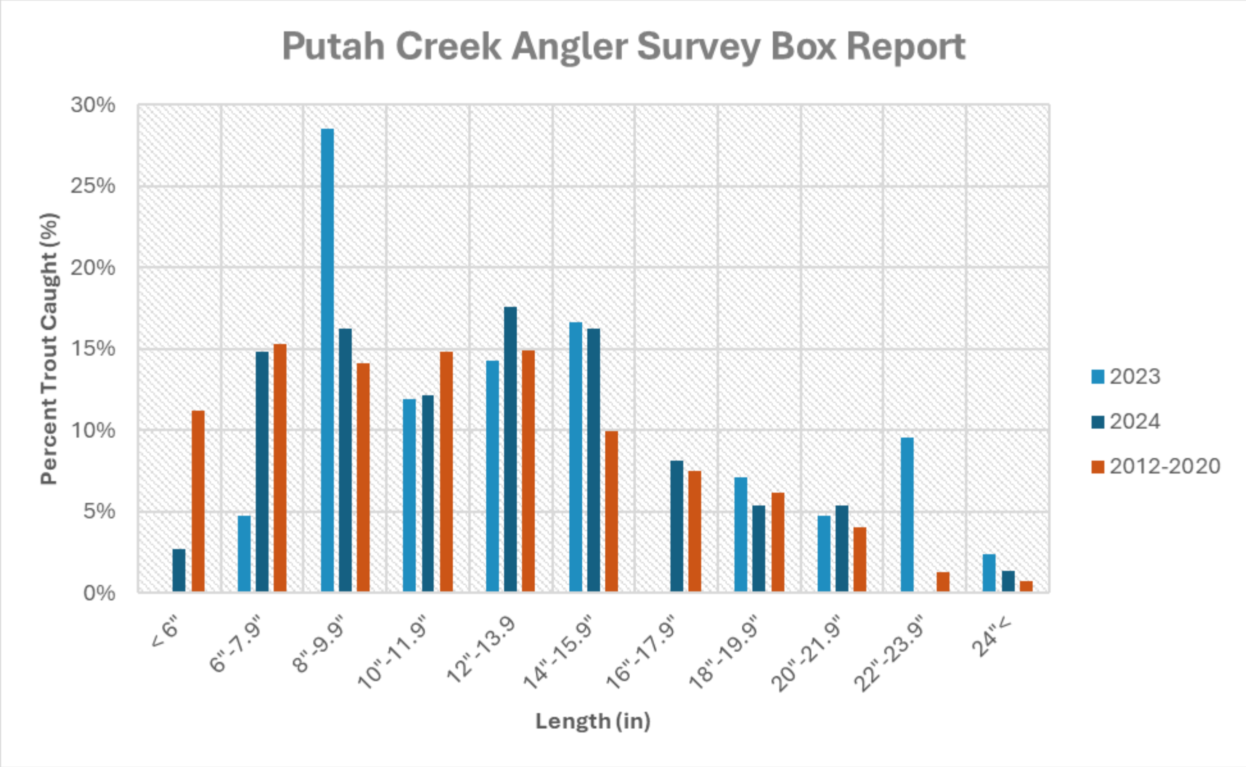


Figure 38 Histogram for Putah Creek distribution of size classes captured from 2023,2024, and 2012 through 2020.

Table 22. Results of the Putah Creek angler satisfaction survey (averages): -2 (least satisfied) to +2 (most satisfied).

Year	Overall angling experience	Size of fish	Number of fish
2012-2020	0.8	0.5	0.2
2023	0.4	0.6	-0.2
2024	1.1	0.7	0.6

Table 23. Summary of Lake Solano ASB data from 2022 to 2024.

Year	Number of Forms	Fish caught per hour	Species composition- Rainbow Trout	Species composition- other
2022	11	0.08	Rainbow Trout	N/A
2023	2	0.00	Rainbow Trout	N/A
2024	4	0.00	Rainbow Trout	N/A

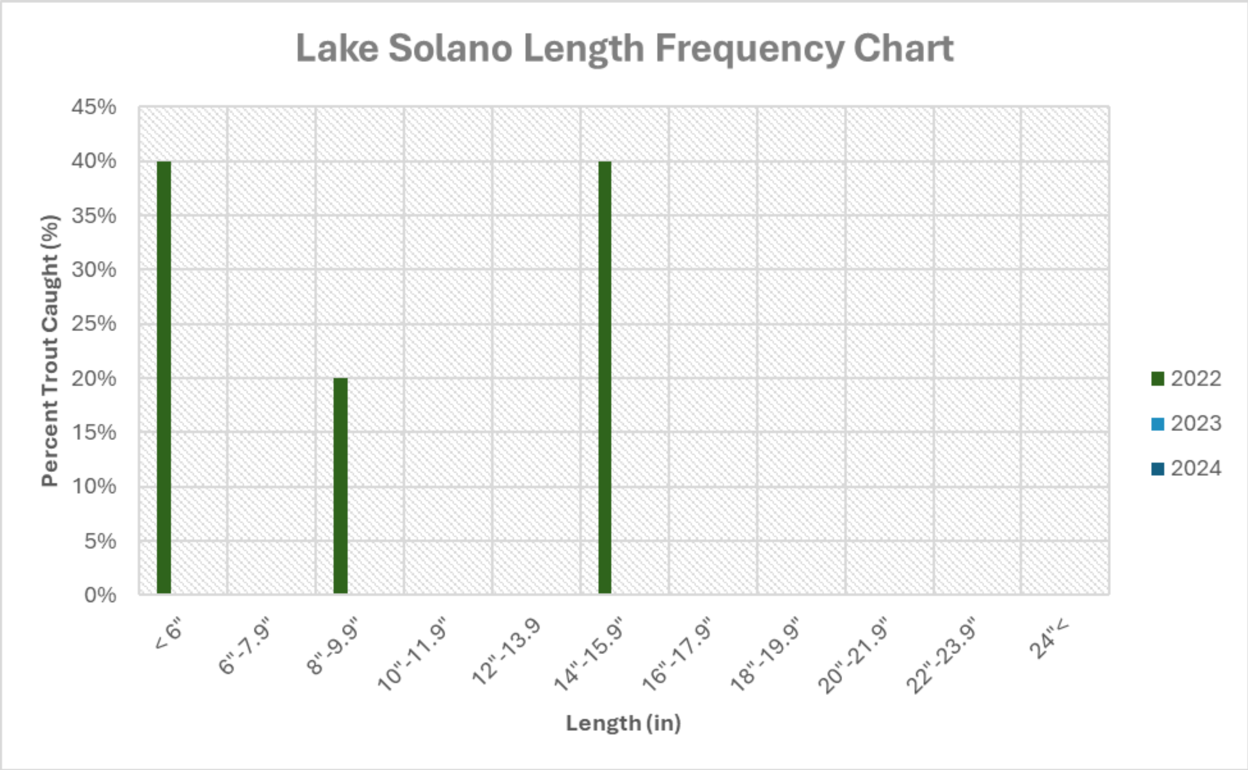


Figure 39. Histogram for Lake Solano distribution of size classes captured from 2022-2024.

Table 24. Results of the Lake Solano angler satisfaction survey (averages): -2 (least satisfied) to +2 (most satisfied).

Year	Overall angling experience	Size of fish	Number of fish
2022	-0.3	-0.1	-0.3
2023	0.0	2.0	1.0
2024	-0.5	-0.8	-0.5

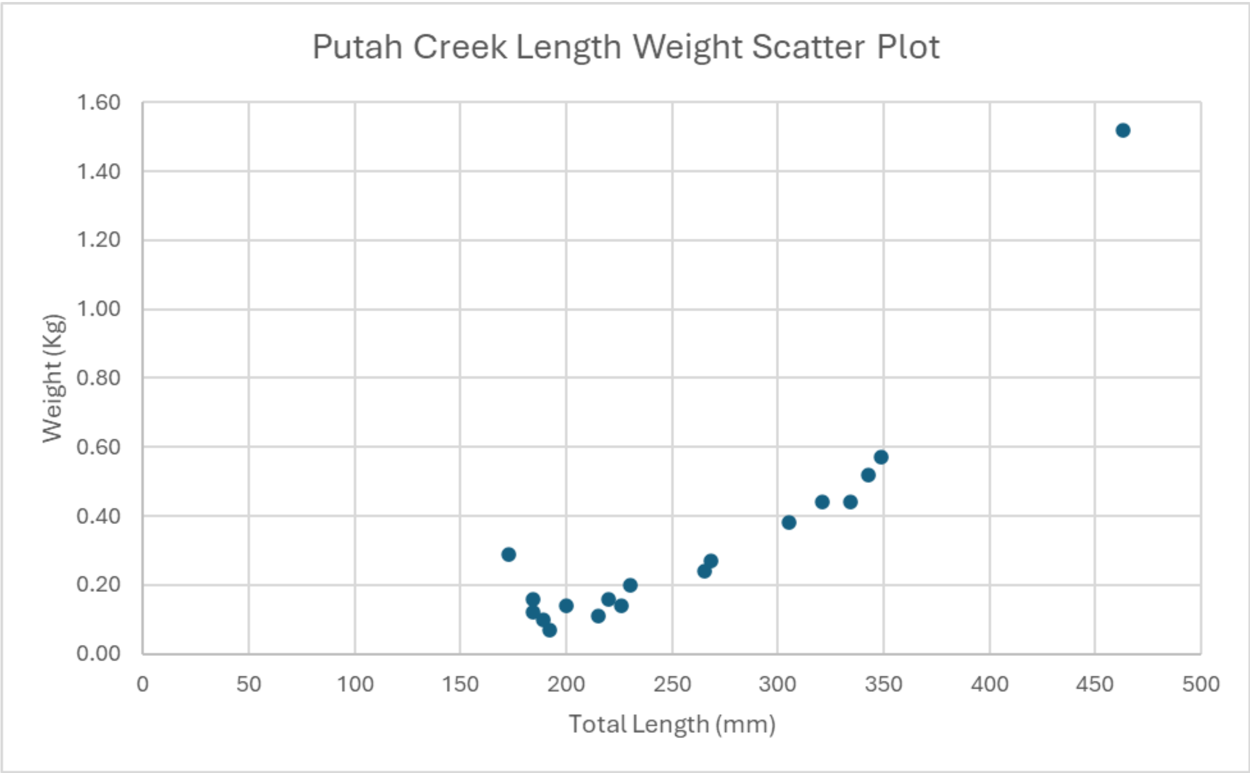


Figure 40. Putah Creek scatter plot of lengths and weights of fish caught during 2024 hook and line survey.

Discussion:

2024 ASB data showed that anglers submitted about 10% more forms than in 2023. A comparison of the number of forms submitted in 2024, with the 10 year historical average showed ASB submissions were on parr with the average submissions of 41 ASB forms. The wild trout fishery in the Putah IDR showed an increase in catch per unit effort (CPUE) in comparison to the previous season, which is on parr with the historical average 0.61 fish per hour. Angler satisfaction was up in 2024 as the number of fish caught was up when compared to the historical average. In 2024, angler satisfaction with the size of fish remained on parr to the historical average. The ASB data also showed that 12.2% of the reported angler catch was trophy size fish which was on parr with the historic average. These indicators vary year by year based on trout population demographics, angling effort, and environmental conditions. Based on these annual variations there doesn't appear to be an immediate concern for the fishery in 2024 as the goal of this fishery is to maintain a trophy trout fishery (18 inches and greater in length). ASB data collected in 2024 supports that the wild trout fishery continues to meet its goal as a trophy fishery. Improving overall angler satisfaction and the size of fish caught will need to be investigated but will likely require habitat restoration to improve spawning habitat and survival.

The hook-and-line surveys are in the early stages of implementation, and there is not enough data to support any management action to improve the fishery.

Central Region

Resource Assessment and Fishery Monitoring

Four Canyons – tributary to South Fork Kern River (Tulare County, Golden Trout Wilderness)

Survey Dates: June 12-13, 2024

Overview:

The South Fork Kern River and Golden Trout Creek watersheds are the only two watersheds in the native range of California's State Fish, the California Golden Trout (*Oncorhynchus aguabonita*, CAGT). In 1969, Brown Trout (*Salmo trutta*) were confirmed to be present in the upper South Fork Kern River watershed at Tunnel Meadow. The presence of Brown Trout and hybridized California Golden Trout posed significant risk to the native population of California Golden Trout. California Department of Fish and Wildlife (CDFW) responded by establishing three fish barriers on the South Fork Kern River (Figure 41) to prevent upstream passage of non-native Brown Trout and hybridized Rainbow-California Golden Trout. Ramshaw Barrier was constructed in the 1970s by blasting a high gradient reach between Tunnel and Ramshaw meadows to enhance effectiveness against fish passage. Templeton and Schaeffer barriers were constructed in the 1980s. Both the Templeton and Schaeffer barriers were originally rock gabion construction and were later replaced by more robust concrete structures. A series of chemical treatments followed and by 1981, Brown Trout had been eliminated from the South Fork Kern River, above Templeton Barrier (Pister, 2008).

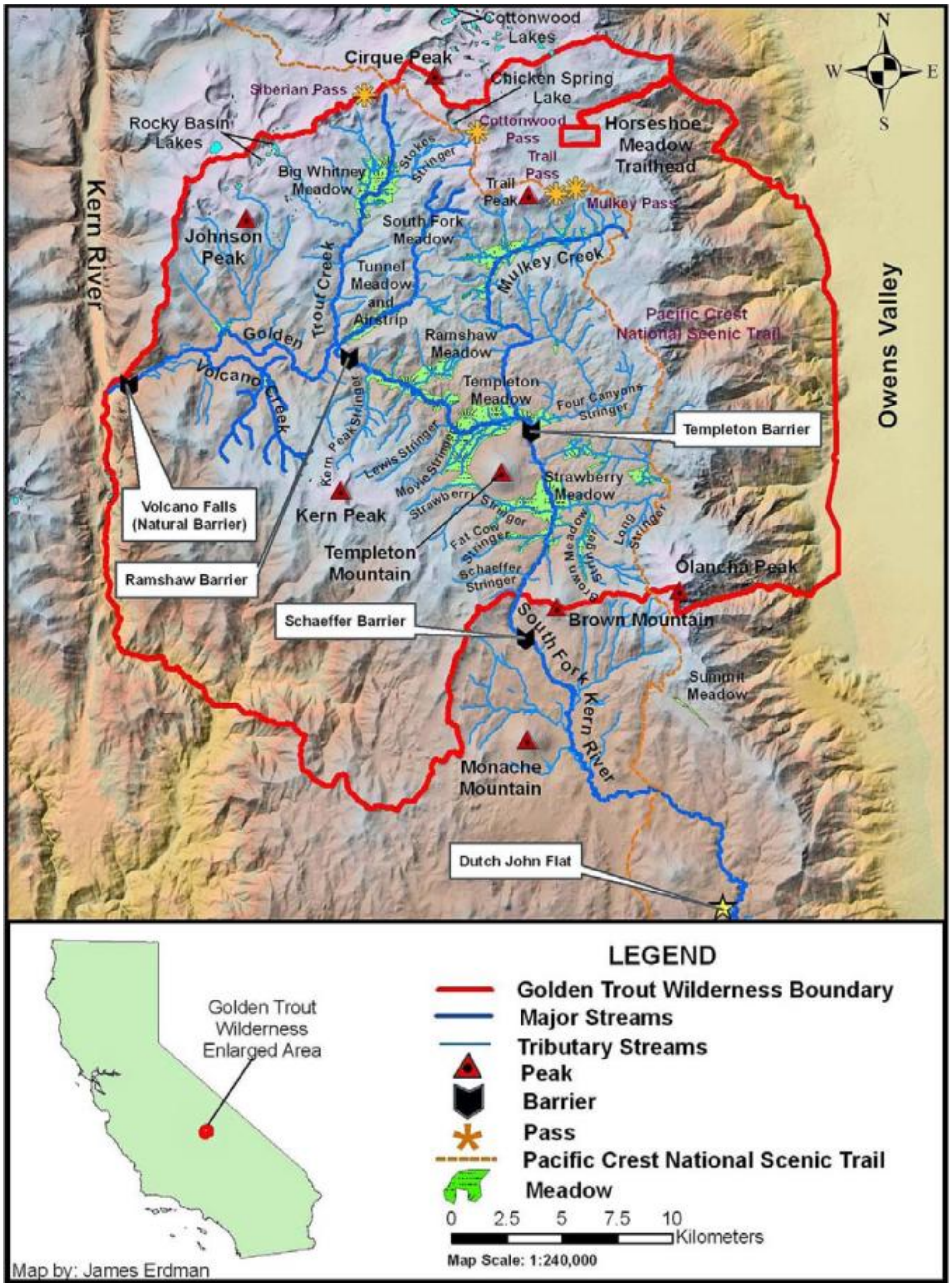


Figure 41. Map taken from "Restoration of the California Golden Trout in the South Fork Kern River, Kern Plateau, Tulare County, California, 1966-2004, with Reference to Golden Trout Creek" (Pister 2008)

The winter of 2022/2023 was a record water year for the Southern Sierras. Snowpack was nearly 300 percent of average, and the resulting runoff prevented access to the high Sierras until late summer. In July of 2023, CDFW was notified by Trout Unlimited that volunteers assisting the USFS, Inyo on a project in Ramshaw Meadow caught several Brown Trout. CDFW hook-and-line surveys on the mainstem South Fork Kern River conducted on August 8-9, 2023, confirmed the presence of Brown Trout in Templeton and Ramshaw meadows but did not detect Brown Trout upstream of Ramshaw Barrier in Tunnel Meadow.

On June 12-13, 2024, CDFW performed hook and line surveys in the upper reaches of Four Canyons to assess the extent of Brown Trout invasion into tributaries to the South Fork Kern River, upstream of Templeton Barrier.

Objective:

- Determine extent of Brown Trout invasion into the tributaries to the South Fork Kern River, upstream of Templeton Barrier.
- Document natural barriers to fish passage

Methods:

A combination of hook-and-line and visual encounter surveys were conducted to determine fish species present, numbers and size class. Time and GPS locations were recorded at the start and end of survey reaches. Potential barriers to fish passage were noted and GPS locations recorded.

Results:

The upper reaches of Four Canyons were surveyed on June 12-13, 2024. Approximately 4,109 meters (4.109 km or 2.6 miles) of stream habitat was surveyed. Fifty-eight California Golden Trout were caught/observed, twenty-two trout of unknown species were observed, and no Brown Trout were observed (Table 25, Figure 42). No fish were observed in Section 5. Potential natural barriers to fish passage were documented in Section 2, approximately a couple hundred meters below the upper end survey point. The potential barriers consisted of two vertical drops of about 12 feet each that were approximately 30 feet apart (Figure 43 and Figure 44).

Table 25. Four Canyons survey sections, lengths, species and size class observed.

Date	Survey Section #	Survey Section Length (Meters)	Fish Species	YOY	1 – 3.9"	4 – 5.9"	6 – 7.9"	≥8"
06/12/2024	1	226	CAGT	0	0	2	2	2
06/12/2024	1	226	Unknown	2	9	0	0	0
06/12/2024	2	743	CAGT	0	0	2	2	1

Date	Survey Section #	Survey Section Length (Meters)	Fish Species	YOY	1 – 3.9"	4 – 5.9"	6 – 7.9"	≥8"
06/12/2024	3	852	CAGT	0	19	8	13	1
06/12/2024	3	852	Unknown	0	8	1	2	0
06/12/2024	4	169	CAGT	0	0	4	2	0
06/13/2024	5	2,119	CAGT	0	0	0	0	0

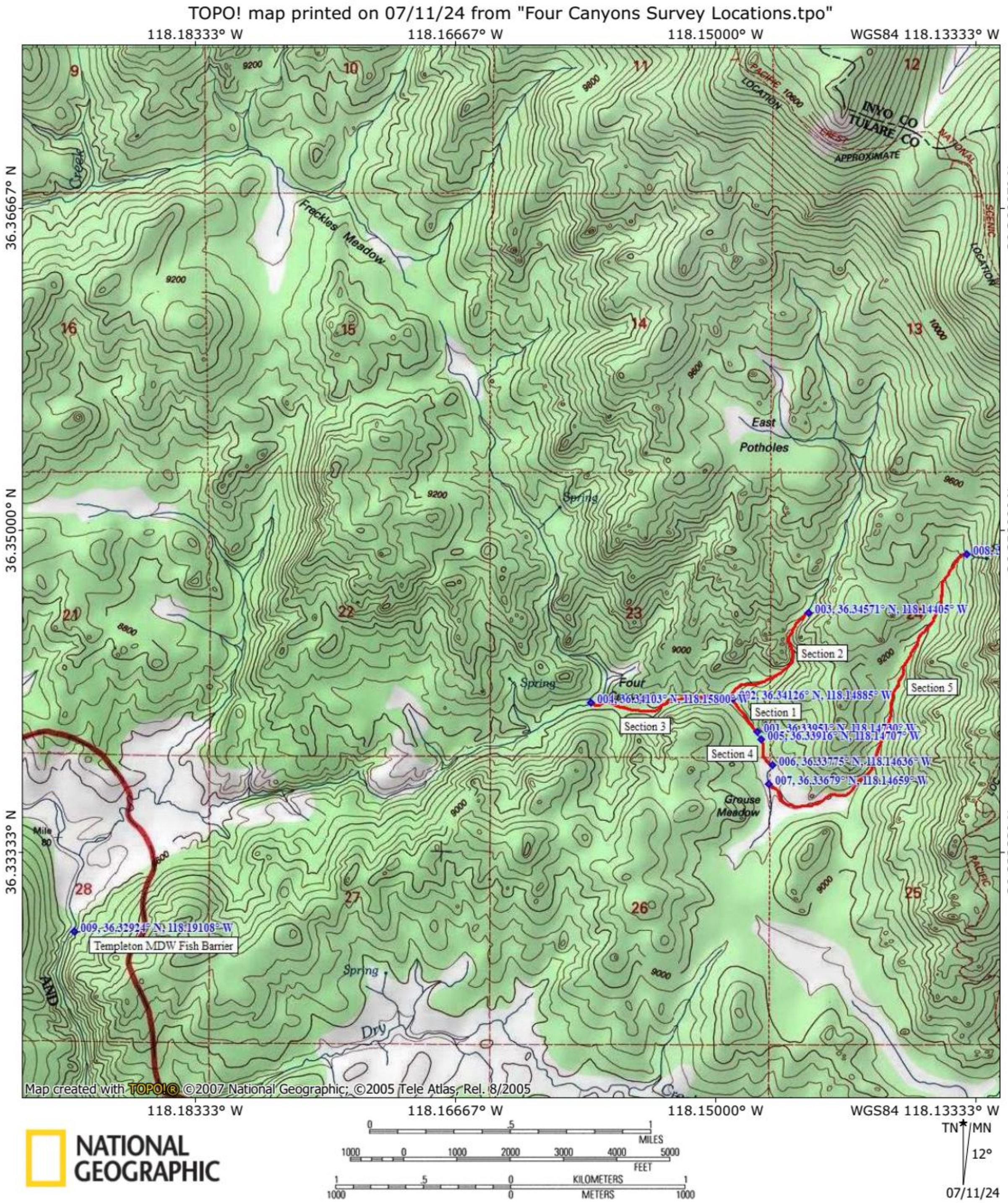


Figure 42. Map of Four Canyons drainage showing survey reach locations and proximity to Templeton Meadow barrier.

Figure 43. Four Canyons Survey Section 2 - Potential upper barrier to fish passage. Vertical drop is approximately 12 feet.

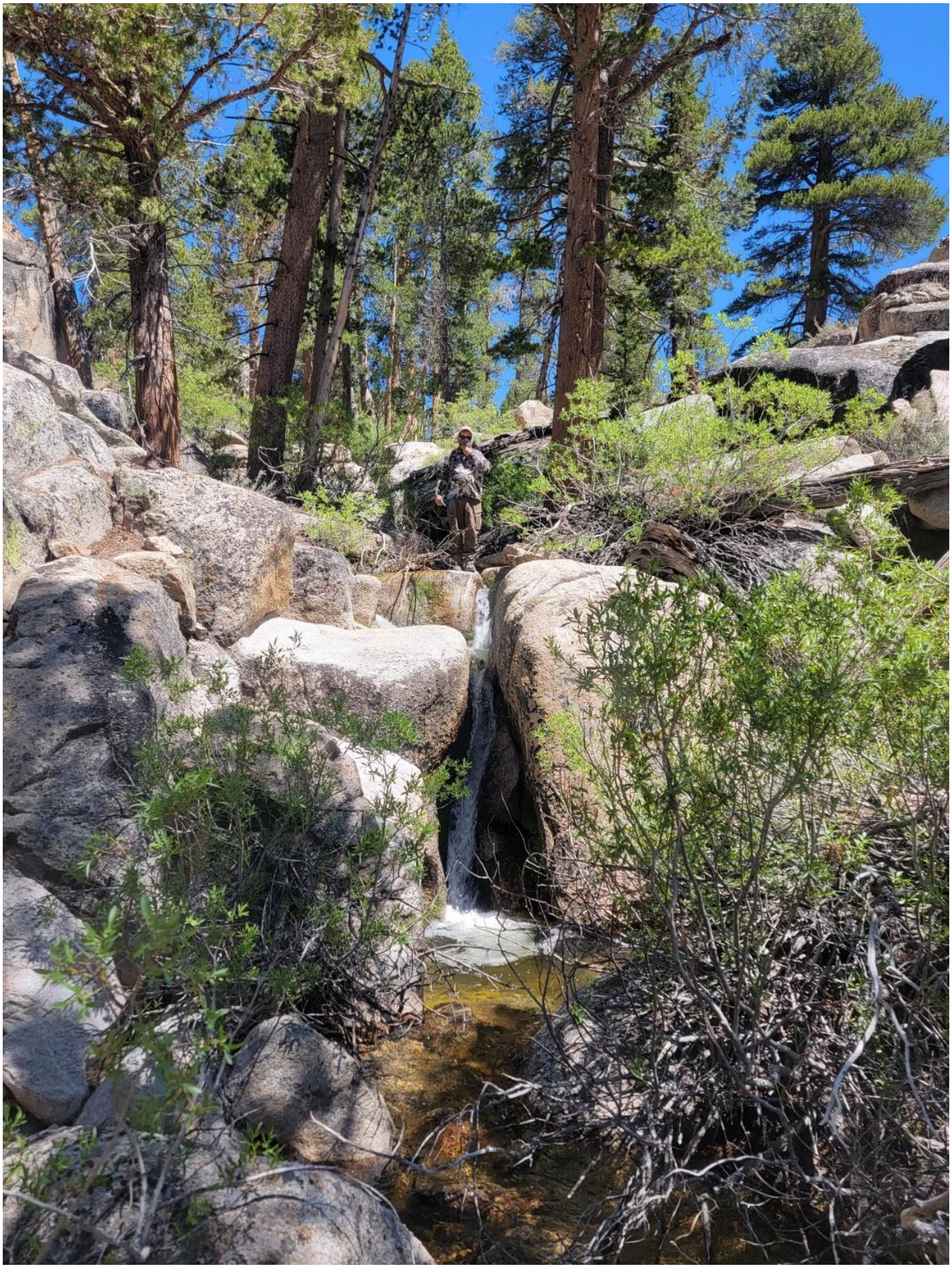


Figure 44. Four Canyons Survey Section 2 - potential lower barrier to fish passage with vertical drop of approximately 12 feet. The top of the upper fish barrier can be seen in the background.

Discussion:

CDFW hook-and-Line/visual encounter surveys in the upper reaches of Four Canyons positively identified only California Golden Trout (Figure 45) and did not detect the presence of Brown Trout in the upper reaches of Four Canyons. Twenty-two trout of unknown species were observed. These unknown trout species were likely California Golden Trout, but positive visual identification could not be made.

The upper reaches of Four Canyons appear to not have been invaded by Brown Trout, as of the time of this survey (June 12-13, 2024). Additional surveys need to be performed on the lower reaches of Four Canyons to determine extent of Brown Trout invasion and document possible barriers to fish passage.

Further investigations need to be performed on all tributaries to the South Fork Kern River, between Templeton and Ramshaw barriers. Documenting the extent of Brown Trout invasion and identifying potential barriers is critical to making informed decisions for management of California Golden Trout in the South Fork Kern River watershed.

Figure 45. California Golden Trout caught in the upper reaches of Four Canyons, tributary to the South Fork Kern River, Golden Trout Wilderness.

Lower Four Canyons Barrier Assessment– tributary to South Fork Kern River (Tulare County, Golden Trout Wilderness)

Survey Date: August 12, 2024

Overview

See above section for Four Canyons Creek.

Methods

On 08/12/2024, a CDFW crew consisting of three employees (Robert Delmanowski, Richard Vega, Robert Sherrick) surveyed the Four Canyons area within Golden Trout Wilderness, which is a tributary of the South Fork Kern River (Figure 46). The survey covered Four Canyons Creek from Templeton Meadow upstream to the confluence of the canyon #2 drainage and Four Canyons Creek, then continued upstream the canyon #2 drainage.

Results

A natural fish barrier was discovered along Four Canyons Creek (36.33615°, -118.17984°). Also, the drainage in canyon #2 was found to be fishless. No Brown Trout were discovered upstream of the barrier, so it appears to have effectively prevented the upstream migration of Brown Trout. Environmental DNA samples were collected at multiple upstream locations to confirm the absence of Brown Trout. The discovery is significant, as it has important implications for the management of fish populations in the area.

Barrier Description

The fish barrier, located in the remote Four Canyons area, is formed by a combination of large boulders and natural debris, creating a physical obstruction in the stream (Figure 47 - Figure 53). The height and configuration of the barrier make it impassable for Brown Trout attempting to move upstream. Surveys conducted above the barrier confirmed the absence of Brown Trout in the upstream habitat, indicating that the barrier has successfully restricted their migration.

Discussion

Ecological Impact

The presence of this natural barrier has positive implications for the native fish species in the Golden Trout Wilderness, particularly the California Golden Trout (*Oncorhynchus aguabonita*), which faces competition and predation threats from non-native Brown Trout. By preventing Brown Trout from accessing upstream habitats, the barrier may provide a refuge for native trout populations, reducing interspecific competition. The barrier is also effective for preserving the genetic integrity of the California Golden Trout by preventing hybridization threats.

Recommendations

Further assessment is still needed to evaluate the continued effectiveness of the Four Canyons Barrier. This should include a hydraulic modeling to determine the barrier's effectiveness under various hydrologic flows and conditions.

Conclusion

The discovery of this natural fish barrier in Four Canyons provides an opportunity to protect the California Golden Trout from non-native Brown Trout. While the barrier has effectively prevented Brown Trout migration upstream, more assessment is still needed to evaluate the barrier's continued effectiveness under various conditions.

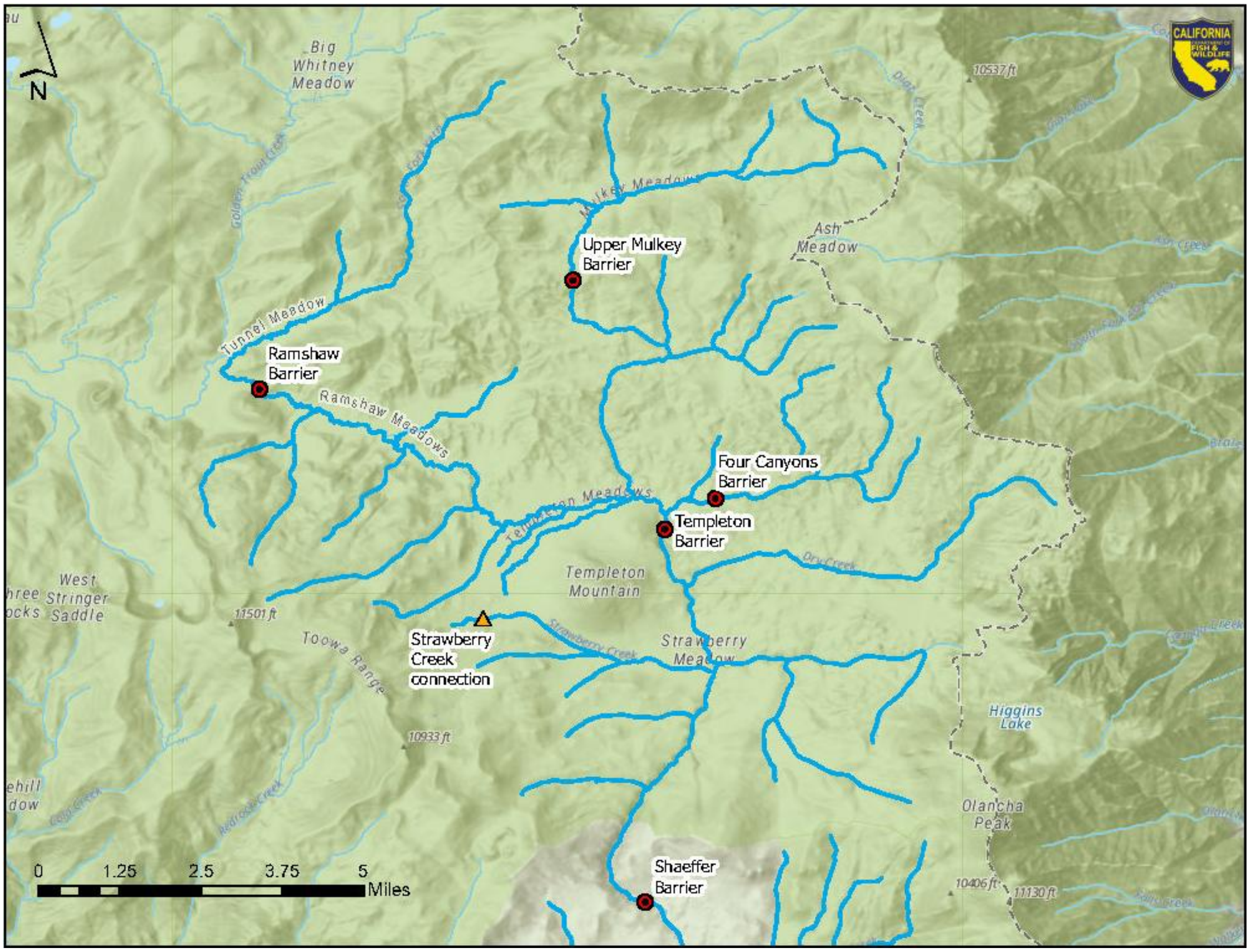


Figure 46. SF Kern River and its tributaries above Schaeffer Barrier in Golden Trout Wilderness.

Figure 47. The Four Canyons barrier facing upstream.

Figure 48. River right side of barrier, facing upstream.

Figure 49. Four Canyons barrier facing upstream.

Figure 50. Top of Four Canyons barrier facing downstream.

Figure 51. River left side of barrier facing upstream.

Figure 52. River left side of barrier facing upstream.


Figure 53. River left side of barrier facing upstream.

Volcanic Creek, Left Stringer and Right Stringer – Golden Trout Wilderness (Tulare County)

Survey Dates: August 28-29, 2024

Overview:

The Volcanic Creek strain of California Golden Trout (CAGT) is a pure strain of CAGT within the native range of CAGT. The genetic integrity of the Volcanic Creek strain is a result of its remote location and intermittent connection with Golden Trout Creek. Recent genetic analyses have shown that the Volcanic Creek population are genetically the same as the CAGT found in Golden Trout Creek, but less diverse. Volcanic Creek's dependence on spring sources for water, small size and lack of connectivity to Golden Trout Creek poses a risk to the CAGT population it supports, especially during extended drought periods.

Objective:

Conduct Phase 4 population monitoring using visual encounter surveys (VES) to document CAGT populations and habitat conditions.

Methods:

Visual encounter surveys are performed starting at the bottom of the wetted reach and working upstream. California Golden Trout are counted and size class is estimated. Size classes are: YOY, 0-4", 4-6", 6-8" and $\geq$8 inches.

Digital trail cameras are used to document streamflow (magnitude and duration) and wildlife activity. Cameras are timelapse set up to take pictures once every hour, on the hour, from 6:00 AM to 6:00 PM to document stream flow. Cameras are also set for infrared trigger to capture pictures of wildlife.

Results:

Volcanic Creek:

Crews surveyed Volcanic Creek on August 29, 2024. VES counts verified 451 CAGT present (YOY=350, 0-4"=60, 4-6"=36, 6-8"=5, >8"=0, Unknown=0). The 2024 VES count for this reach were the highest counts to date since 2014 (Table 26, Figure 54, Figure 55). Wetted habitat was approximately 2.67 km, of which 2.06 km was surveyed.

Volcanic Creek technically begins at the confluence of Left and Right Stringer. For surveying purposes, we include the short segment of Left Stringer that coalesces from a series of springs, near the bottom of Volcano Meadow and sustains flow down to Volcanic Creek as one reach – Volcanic Creek. Due to time constraints and difficult viewing conditions in Volcano Meadow, the meadow reach was not surveyed (Figure 44). The main reach of Left Stringer (includes Upper and Lower Left Stringer VES reaches) usually goes subsurface at the head of the meadow during the summer months.

Table 26. Volcanic Creek wetted reach length and VES surveys 2013 - 2024. *Crews surveyed part of Left Stringer (lower meadow reach up to trail camera) and reach traditionally called Volcanic Creek. Sixty-one CAGT were observed, most were in the meadow reach of Left Stringer. Viewing conditions were difficult due to the high water and VES is considered not valid. **Survey cancelled - Unable to reschedule survey.

Survey Date	Wetted Length (Km)	VES Count (CAGT)
September 10, 2013	2.09 Km	Not Surveyed
June 11, 2014	1.45 Km	Not Surveyed
July 30, 2014	1.45 Km – 26 meters	255
September 23, 2014	1.45 Km – 26 meters	152
June 17-18, 2015	0.97 Km	108
July 7-8, 2015	0.97 Km + 15 meters	86
July 28-29, 2015	0.97 Km – 15 meters	72
August 17-19, 2015	0.97 Km – 23 meters	52
September 1-3, 2015	0.97 Km – 8 meters	61
September 15-16, 2015	0.97 Km + 17 meters	53
June 17-18, 2016	1.3 Km	48
July 27-28, 2016	0.97 Km	26
August 18-19, 2016	0.97 Km	18
September 20, 2016	0.97 Km	Not Surveyed

Survey Date	Wetted Length (Km)	VES Count (CAGT)
June 16-17, 2017	4.6 Km	*
July 12, 2017	4.6 Km	Not Surveyed
August 24, 2017	3.2 Km	Not Surveyed
August 5-6, 2018	1.56 Km	386
July 26, 2019	4.6 Km	Not Surveyed
August 19-23, 2020	Survey Cancelled**	Survey Cancelled**
August 18-19, 2021	1.43 Km	354
September 14, 2022	1.0 Km	89
2023	Not Survey	Not Surveyed
August 29, 2024	2.67 Km (2.06 Km Surveyed)	451

Left Stringer Lower:

Crews surveyed the Lower Reach of Left Stringer on August 28, 2024. Visual Encounter Surveys (VES) counted 2,786 CAGT (YOY=2,622, 0-4”=65, 4”-6”=69, 6-8”=27, >8”=3, Unknown=0). The 2024 VES counts (Total CAGT = 2,786) for this reach were the highest counts to date since 2014 (Table 27,

Table 28, Figure 54). Wetted reach was measured to be 3.4 km on August 28, 2024 and extended all the way through Volcano Meadow.

Table 27. Left Stringer Lower wetted reach lengths and VES surveys 2013 - 2024. *Crews surveyed part of Left Stringer (lower meadow reach up to trail camera) and reach traditionally called Volcanic Creek. Sixty-one CAGT were observed, most were in the meadow reach of Left Stringer. Crews also surveyed from a trail camera in Volcano Meadow upstream to the top of the lower reach. Viewing conditions were difficult in both sections due to the high water and VES is considered not valid. **Survey cancelled – Unable to reschedule survey.

Survey Date	Wetted Length (Km)	VES Count (CAGT)
September 10, 2013	2.9 Km	Not Surveyed

Survey Date	Wetted Length (Km)	VES Count (CAGT)
June 11, 2014	Not Surveyed	Not Surveyed
July 30, 2014	2.7 Km (2.6 Km surveyed)	466
September 23, 2014	2.7 Km – 34 meters (1.5 Km Surveyed)	307
June 17-18, 2015	2.4 Km	214
July 7-8, 2015	2.4 Km + 53 meters	129
July 28-29, 2015	2.4 Km – 487 meters	158
August 17-19, 2015	2.4 Km – 710 meters	174
September 1-3, 2015	2.4 Km – 629 meters	156
September 15-16, 2015	2.4 Km – 271 meters	150
June 17-18, 2016	3.4 Km	53
July 27-28, 2016	2.9 Km	79
August 18-19, 2016	2.4 Km	134
September 20, 2016	2.7 Km	Not Surveyed
June 16-17, 2017	3.4 Km	*, **
July 12, 2017	3.4 Km	Not Surveyed
August 24, 2017	3.4 Km	Not Surveyed
August 5-6, 2018	2.9 Km + 43 meters	472
July 26, 2019	3.4 Km	Not Surveyed
August 19-23, 2020	Survey Cancelled**	Survey Cancelled**
August 18-19, 2021	2.37 Km	398
September 14, 2022	2.68 Km	113

Survey Date	Wetted Length (Km)	VES Count (CAGT)
2023	Not Surveyed	Not Surveyed
August 28, 2024	3.4 Km	2,786

Left Stringer Upper:

Left Stringer, upper reach, was not surveyed in 2024, due to time constraints and limited staff. Flow in Left Stringer, upper reach, is stable and the fish populations appeared to be stable during earlier drought monitoring efforts (Table 28, Figure 54, Figure 55). Flow between Left Stringer Upper and Left Stringer Lower is continuous. The reaches are separated due to a high gradient segment that is overgrown with willows that is not conducive to VES surveys.

Table 28. Left Stringer Upper wetted reach lengths and VES surveys 2013 - 2024. * Survey cancelled – Unable to reschedule survey.

Survey Date	Wetted Length (Km)	VES Count (CAGT)
September 10, 2013	Not Surveyed	Not Surveyed
June 11, 2014	Not Surveyed	Not Surveyed
July 30, 2014	Not Surveyed	Not Surveyed
September 23, 2014	Not Surveyed	Not Surveyed
June 17-18, 2015	0.56 Km	63
July 7-8, 2015	0.56 Km	71
July 28-29, 2015	0.56 Km	60
August 17-19, 2015	0.56 Km	38
September 1-3, 2015	0.56 Km	55
September 15-16, 2015	Not Surveyed	Not Surveyed
June 17-18, 2016	0.56 Km	61
July 27-28, 2016	0.56 Km	28
August 18-19, 2016	0.56 Km	47

Survey Date	Wetted Length (Km)	VES Count (CAGT)
September 20, 2016	0.56 Km	44
June 16-17, 2017	Not Surveyed	Not Surveyed
July 12, 2017	Not Surveyed	Not Surveyed
August 24, 2017	Not Surveyed	Not Surveyed
August 5-6, 2018	0.56 Km	54
July 26, 2019	0.56 Km	64
August 19-23, 2020	Survey Cancelled*	Survey Cancelled*
August 18-19, 2021	Not Surveyed	Not Surveyed
September 14, 2022	Not Surveyed	Not Surveyed
2023	Not Surveyed	Not Surveyed
August 28-29, 2024	Not Surveyed	Not Surveyed

Right Stringer:

Crews surveyed approximately a 0.4 km segment of Right Stringer from near the trail crossing in Volcano Meadow downstream to the confluence with Left Stringer. Right Stringer was dry except for an isolated segment of approximately 50 meters that had a few inches of water, when visited on August 29, 2024. No fish were observed in the isolated pool, and no flow was observed downstream to the confluence with Left Stringer. (Table 29, Figure 54, Figure 55).

Table 29. Right Stringer wetted reach lengths and VES 2013 – 2024. *1.4 km surveyed upstream, from the confluence with Left Stringer. Flow was present above the 1.4-mile reach, but unable to survey due to time constraints. **Flow was present at upper trail crossing and above. No survey performed. *** Survey cancelled – Unable to reschedule survey

Survey Date	Wetted Length (Km)	VES Count (CAGT)
September 10, 2013	No Flow Observed	N/A
June 11, 2014	No Flow Observed	N/A

Survey Date	Wetted Length (Km)	VES Count (CAGT)
July 30, 2014	No Flow Observed	N/A
September 23, 2014	No Flow Observed	N/A
June 17-18, 2015	No Flow Observed	N/A
July 7-8, 2015	No Flow Observed	N/A
July 28-29, 2015	No Flow Observed	N/A
August 17-19, 2015	No Flow Observed	N/A
September 1-3, 2015	No Flow Observed	N/A
September 15-16, 2015	No Flow Observed	N/A
June 17-18, 2016	No Flow Observed	N/A
July 27-28, 2016	No Flow Observed	N/A
August 18-19, 2016	No Flow Observed	N/A
September 20, 2016	No Flow Observed	N/A
June 16-17, 2017	1.4 Km*	4
July 12, 2017	**	Not Surveyed
August 24, 2017	No Flow Observed	N/A
August 5-6, 2018	No Flow Observed	N/A
July 26, 2019	Flow Present – Dry on 8/19/2019	N/A
August 19-23, 2020	Survey Cancelled***	Survey Cancelled***
August 18-19, 2021	No Flow Observed	N/A
September 14, 2022	No Flow Observed	N/A
2023	Not Surveyed	Not Surveyed
August 29, 2024	50 meter Isolated Pool	0

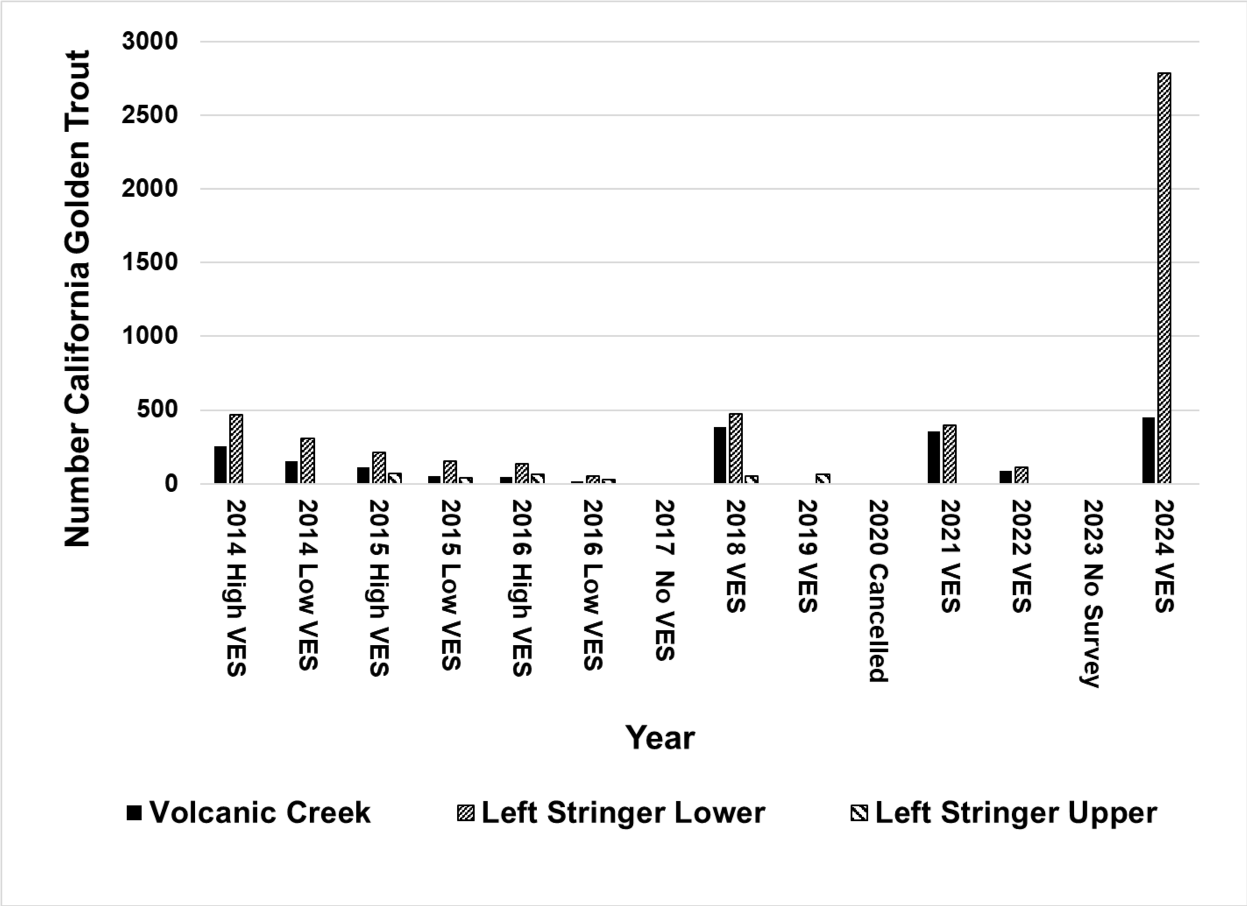


Figure 54. Visual encounter survey (VES) counts of California Golden Trout for 2014 through 2024. Visual encounter surveys were not performed in 2017 due to high water. Only Left Stringer (upper reach) was surveyed in 2019 due to high water. The 2020 survey was cancelled and was unable to reschedule. The record snowpack in 2023 delayed access to the High Sierra until August 2023 and no surveys were performed.

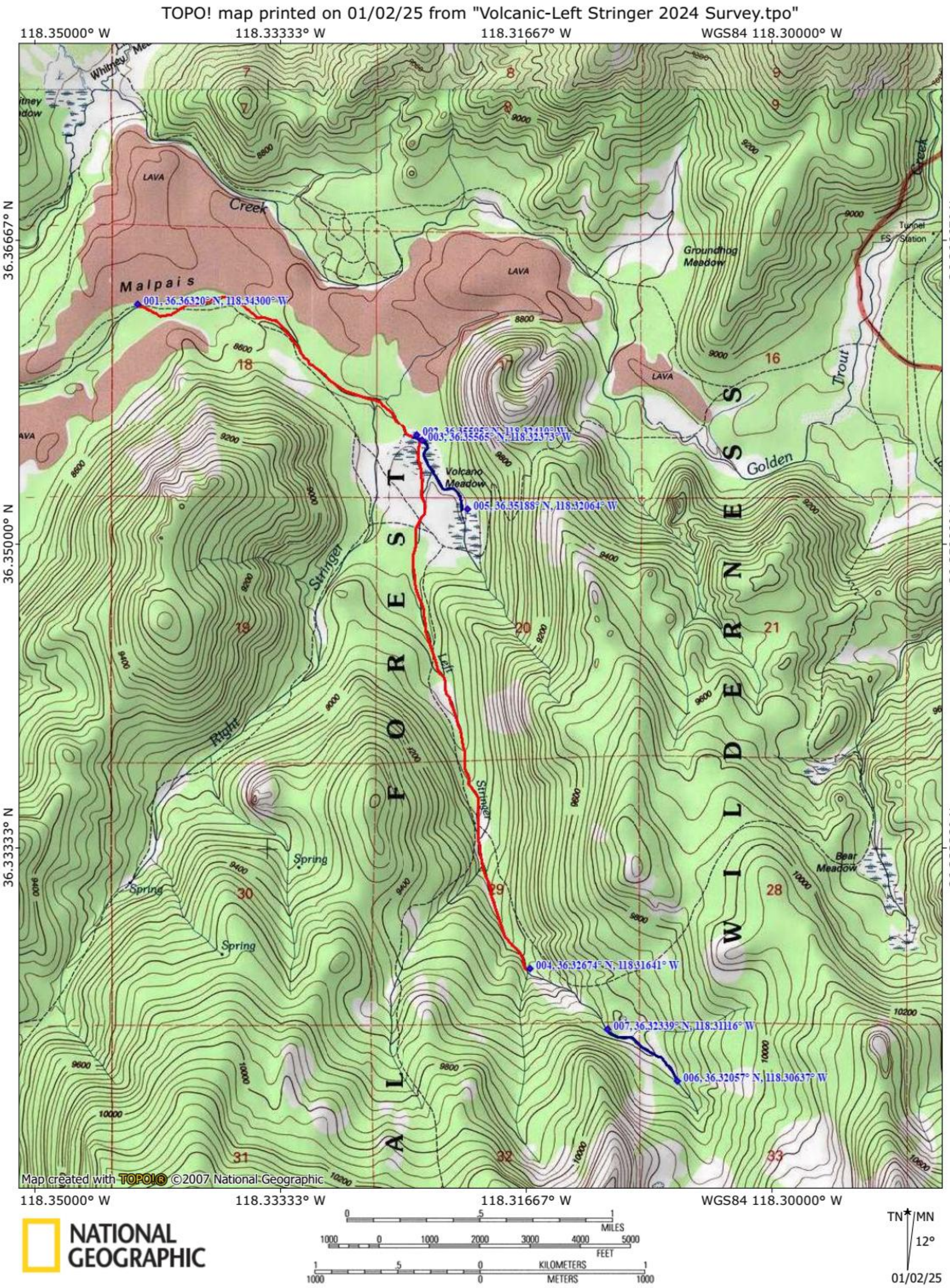


Figure 55. Volcanic Creek and Left Stringer, Golden Trout Wilderness. Red lines are wetted reaches surveyed in 2024. Blue lines are wetted reaches historically surveyed but not surveyed in 2024 (Upper Left Stringer and the meadow reach of Volcanic Creek).

Figure 56. Volcano Meadow August 28, 2024.

Figure 57. Volcanic Creek Channel in the lower end of Volcano Meadow showing dense vegetative growth which hinders VES counts.

Digital Trail Camera Monitoring

Left Stringer Lower (Volcano Meadow Camera):

Digital trail camera photos (2015 - 2019) have shown that Left Stringer connects to Volcanic Creek in water years that are slightly below average or higher water years (Table 30, Figure 58). Length of connection generally lasts for a few weeks starting as early as late April into June and coincides with the spring snowmelt. VES counts have documented California Golden Trout utilizing this connection when flow is present. DNA analysis has shown that the fish in Left Stringer, Upper Left Stringer and Volcanic Creek are genetically the same. Crews were unable to survey/service digital trail cameras in 2020. When crews returned in 2021, the digital trail camera on Left Stringer Lower, in Volcano Meadow had disappeared and could not be found. Additional trail camera monitoring at this site is not warranted at this time.

Table 30. Digital trail camera streamflow observations on Left Stringer, middle of Volcano Meadow. "X" = Streamflow Observed. "0" = No Streamflow Observed. "ns" = Not Surveyed.

Year	Jan	Feb	Mar	Apr	May	June	Jul	Aug	Sept	Oct	Nov	Dec
2015	ns	ns	ns	ns	ns	ns	ns	ns	0	0	0	0
2016	0	0	0	0	X	X	0	0	0	0	0	0
2017	0	0	0	0	X	X	X	X	X	X	X	X
2018	X	X	X	X	X	X	0	0	0	0	0	0
2019	0	0	0	X	X	X	X	ns	ns	ns	ns	ns

Figure 58. Picture from digital trail camera on Left Stringer, middle Volcano Meadow showing flow through Volcano Meadow (June 11, 2019).

Right Stringer (Upstream from confluence with Left Stringer):

A digital trail camera was placed on Right Stringer, July 27, 2019 to present, to document flow (Table 31, Figure 41). Right Stringer is usually dry during the summer, with summer flow present only in the higher water years.

Crews serviced the digital trail camera on August 29, 2024. The camera was still in operation at this time and took 8,940 pictures during the period of 09/14/2022 through 08/29/2024.

Table 31. Digital trail camera streamflow observations on Right Stringer, above the confluence with Left Stringer/Volcanic Creek. "X" = Streamflow Observed. "0" = No Streamflow Observed. "ns" = Not Surveyed.

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
2019	ns	ns	ns	ns	ns	ns	X	X	0	0	0	ns
2020	0	ns	0	ns	X	0	0	0	0	0	ns	ns
2021	ns	0	0	0	0	0	0	0	0	0	0	0
2022	0	0	0	0	0	0	0	0	0	0	0	0

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
2023	0	0	0	0	X	X	X	X	X	0	0	0
2024	0	0	0	X	X	X	0	0				

Figure 59. Picture of Right Stringer taken from digital trail camera showing flow present in Right Stringer on June 29, 2023.

Volcanic Creek near Confluence with Golden Trout Creek:

A digital trail camera on Volcanic Creek, near the confluence with Golden Trout Creek was placed to monitor stream connectivity and has been in operation from June 2014 to present (Table 32, Figure 60)

Crews serviced the digital trail camera on August 29, 2024. Durning the period of September 14, 2022 to August 29, 2024 the camera took 69 pictures. All 69 pictures were taken on September 14, 2022 and then the batteries failed. Unfortunately, crews were not able to make it into Volcanic Creek to service digital trail cameras again until August 29, 2024. Therefore, no data was collected during the period of September 15, 2022 through August 28, 2024.

Table 32. Digital trail camera streamflow observations of Volcanic Creek, near the confluence with Golden Trout Creek. "X" = Streamflow Observed. "0" = No Streamflow Observed. "ns" = Not Surveyed.

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
2014	ns	ns	ns	ns	ns	0	0	0	0	0	0	0
2015	0	0	0	0	0	0	0	0	0	0	0	0
2016	0	0	0	0	0	0	0	0	0	0	0	0
2017	0	0	0	X	X	X	X	X	0	0	0	0
2018	0	0	X	X	0	0	0	0	0	0	0	0
2019	0	0	0	X	X	X	X	X	0	0	0	0
2020	0	0	0	X	X	0	0	0	0	0	0	0
2021	0	0	0	0	0	ns	ns	0	0	0	0	0
2022	0	0	0	0	0	0	ns	ns	0	ns	ns	ns
2023	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns
2024	ns	ns	ns	ns	ns	ns	ns	0	ns	ns	ns	ns

Figure 60. Digital trail camera picture documenting no streamflow in Volcanic Creek, near the confluence with Golden Trout Creek on September 14, 2022.

Discussion:

California Golden Trout 2024 VES counts were the highest recorded since VES surveys began in 2014. The record water year of 2022/2023 followed by the average water year of 2023/2024 provided optimal habitat for reproduction. Left Stringer flow through Volcano Meadow is believed to have been continuous from the spring melt in 2023 through 2024. Young-of-Year (YOY) age class were the most numerous size class observed in both Volcanic Creek and Left Stringer. Two Thousand, Six Hundred, Twenty-two YOY were observed in Left Stringer, of which 2,400 YOY were found in the Volcano Meadow reach of Left Stringer. Crews were unable to survey the meadow reach of Volcanic Creek due to time constraints and thick vegetation. Volcanic Creek counts would most certainly have been higher if this section had been included in the VES.

During our visit to Volcano Meadow on August 28-29, 2024, Left Stringer flowed all the way through Volcano Meadow and connected with Volcanic Creek. However, Volcanic Creek eventually went sub surface and did not make it down to Golden Trout Creek. Unfortunately, the batteries died prematurely in the digital trail camera on Volcanic Creek, near the confluence with Golden Trout Creek and we were unable to capture the magnitude flow or duration of connectivity at this location. It is possible that the connection persisted through the summer months of 2023 due to the record snowpack and most likely connected in the early summer months of 2024.

Right Stringer was dry except for a 50 meter isolated pool holding only a few inches of water during our visit on August 29, 2024. Camera data shows flow present in Right stringer during April – June 2024 and May – September 2023. The summer of 2023 saw record runoff due to the record snowpack. However, the record snowpack was still not enough to sustain flow in Right Stringer year-round. California Golden Trout utilize Right Stringer when conditions allow. Reproductive success in Right Stringer is unknown but is considered substantially lower than that of Left Stringer and Volcanic Creek.

<u>South Fork Kern River (Tulare County)</u>

Survey Dates: Templeton Barrier 08/10/2024, Ramshaw Barrier 08/11/2024 and Schaeffer Barrier October 31, 2024.

Overview:

The South Fork Kern River and Golden Trout Creek watersheds are the only two watersheds native to California's State Fish, the California Golden Trout. In 1969, Brown Trout were confirmed to be present in the upper South Fork Kern River watershed at Tunnel Meadow. The presence of Brown Trout and hybridized

California Golden Trout posed significant risk to the native population of California Golden Trout. California Department of Fish and Wildlife (CDFW) responded by establishing three fish barriers on the South Fork Kern River (Figure 61) to prevent upstream passage of non-native Brown Trout and hybridized rainbow-California Golden Trout. Ramshaw fish barrier was constructed in the 1970s and consisted of blasting a high gradient reach between Tunnel and Ramshaw meadows to enhance effectiveness against fish passage. Templeton and Schaeffer Barrier were constructed in the 1980s. Both the Templeton and Schaeffer Barriers were originally rock gabion construction and were later replaced by more robust concrete structures. A series of chemical treatments followed and by 1981, Brown Trout had been eliminated from the South Fork Kern River, above Templeton Fish Barrier (Pister, 2008).

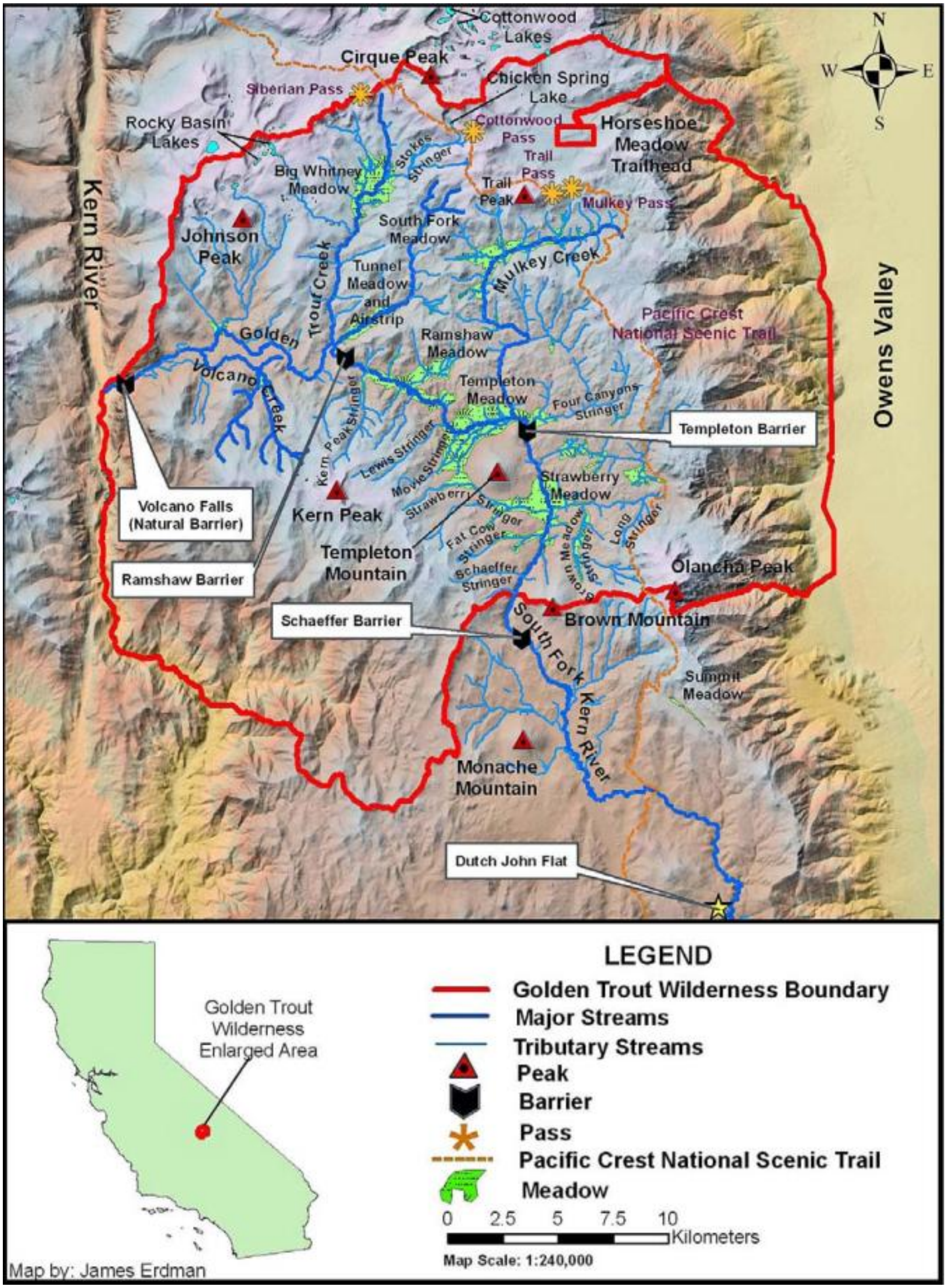


Figure 61. Map taken from "Restoration of the California Golden Trout in the South Fork Kern River, Kern Plateau, Tulare County, California, 1966-2004, with Reference to Golden Trout Creek" (Pister 2008).

The winter of 2022/2023 was a record water year for the Southern Sierras. Snowpack was nearly 300 percent of average, and the resulting runoff prevented access to the high Sierras until late summer. In August 2023, Brown Trout were confirmed to be present above Templeton Barrier to Ramshaw Barrier, but not upstream of Ramshaw Barrier. Digital Trail Camera photos showed bank to bank flows over Templeton Barrier during peak snowmelt runoff in 2023. It is likely that fish passage over Templeton Barrier and around Templeton Barrier at the Strawberry Creek connection occurred during this period.

CDFW conducts annual barrier surveys to document barrier integrity with visual inspections and barrier effectiveness against fish passage under varying flows using digital trail cameras.

Objective:

Assess fish barrier integrity and barrier effectiveness at preventing fish passage under varying flow conditions.

Methods:

Annual visual inspections are performed at the two constructed fish barrier sites (Schaeffer and Templeton barriers) to assess barrier integrity. Two Digital trail cameras are in place at each barrier to evaluate barrier effectiveness at different flows and wildlife passage. One camera is placed downstream and is set to take a photo every hour, on the hour from 6:00 AM to 6:00 PM to document barrier effectiveness at different flows and infrared trigger to document wildlife. A second camera is set with infrared trigger to capture wildlife passage around the fish barrier.

A third fish barrier site (Ramshaw barrier) was formed by blasting in a high gradient reach between Ramshaw and Tunnel Meadows. In 2024, A camera was placed in the stream channel below the barrier to evaluate barrier effectiveness under varying flow conditions. This camera was also set to take photos every hour, on the hour from 6:00 AM to 6:00 PM.

Results:

Fish Barrier Integrity and Effectiveness

Schaeffer Barrier:

Schaeffer Barrier was visited on October 31, 2024. The digital trail camera documenting barrier effectiveness took 12,380 pictures from 09/21/2023 through

10/31/2024 (Figure 62). Peak flow occurred around April 22-23, 2024. Flow appears to have reached the top of the first step briefly each day for a few days but otherwise remained below the top of the first step. The barrier was considered 100% effective in preventing fish passage during this period. Barrier integrity was considered good, with no signs of deterioration. CDFW engineers did a more thorough evaluation of barrier integrity on September 5, 2024, and will generate a separate report for their evaluation.

Figure 62. Picture of Schaeffer Barrier documenting barrier effectiveness under peak flow conditions on April 23, 2024.

A second camera (Figure 63) documented wildlife passage around the east wing of Schaeffer Barrier and recorded 23,268 photos from 9/21/2023 to 10/31/2024. Deer, coyotes, bears, mountain lions and cows have been recorded passing along the eastern side of the Schaeffer Barrier.

Figure 63. Picture of Schaeffer Fish Barrier documenting wildlife passage.

Templeton Barrier:

CDFW Hydrological Engineers and Environmental Scientists visited Templeton Barrier on 08/10/2024. Digital trail cameras were serviced at this time. The trail camera that takes photos of the face of the barrier is set to take pictures each day, on the hour, from 6:00 AM to 7:00 PM. This camera is used to monitor barrier effectiveness against fish passage. During the period of 08/09/2023 to 08/10/2024 the camera took 5,139 pictures. Peak spring runoff occurred around April 22-23, 2024. The flows reached close to the top of the wing dams but did not overtop them (Figure 64). Templeton Barrier was 100% effective against fish passage during this period.

Figure 64. Peak spring flow at Templeton Fish Barrier on 04/22/2024.

Generally, peak flows are thought to occur during the Spring runoff. However, isolated storm events can produce flows of great magnitude but usually shorter in duration. Figure 65 is a picture of Templeton Barrier taken on 08/09/2023, the day that the cameras were serviced the previous season and shows typical summer flow. Two weeks later, on August 21, 2023, a heavy rain event hit that produced high flows similar to those seen during spring runoff but lasted for just 2-3 days.

Figure 65. Templeton Barrier showing typical summer flows on 08/09/2023.

Figure 66. Templeton Barrier showing high summer flow caused by a storm event. This flow is similar to peak flows seen during the spring runoff but are shorter in duration. High flows pictured lasted one day and began to recede on 08/22/2023.

During the period of 08/09/2023 to 08/10/2024, The digital trail camera mounted on the East bank, documenting wildlife passage around the barrier, recorded 80 photos. All photos were taken on 08/09/2023, the day the camera was serviced (Figure 66). It appears that the new replacement batteries failed, and no images were recorded of wildlife passage during this period.

Figure 67. Last picture taken by East bank camera documenting flow and wildlife passage. Camera batteries failed after installation.

Ramshaw Meadow Fish Barrier:

Ramshaw Barrier is the uppermost fish barrier on the SF Kern (Figure 61). The barrier is located in a high gradient reach between Ramshaw Meadow (Below) and Tunnel Meadow (above). Unlike the constructed Templeton and Schaeffer barriers, Ramshaw Barrier utilized blasting in the high gradient reach to create a more robust defense against fish passage. Ramshaw Barrier appears to have been an effective barrier against fish passage during the record high flows seen in 2023. However, channel complexity causes concern for barrier effectiveness.

Digital trail cameras were in place at Ramshaw fish barrier from 2013 – 2019. The steep walled drainage and large boulders prevented adequate observation of flow in the barrier location and cameras were removed. In 2024, crews relocated the camera closer to the barrier site in hopes of gaining a better understanding of effectiveness against fish passage under varying flow conditions.

Figure 68. Ramshaw Meadow Fish Barrier.

Discussion:

Schaeffer barrier construction is robust and shows no sign of deterioration. However, it is an easily accessible area and popular with anglers. The ease of accessibility by the public is the greatest threat of fish passage over Schaeffer fish barrier.

Templeton Barrier is showing signs of deterioration. However, George Heise, Hydraulic Engineer who designed and constructed the barrier, believes the deterioration does not impact effectiveness against fish passage. Although barrier integrity is deemed to be good, Templeton Barrier has proven to not be effective at preventing fish passage under extreme high flows as those observed during the 2023 Spring runoff.

Ramshaw Barrier appears to be an effective barrier against fish passage and is currently holding the line against non-native trout species below and California Golden Trout above. A digital trail camera was installed in 2024, in an area closer to the barrier, to help better understand the effectiveness against fish passage under varying flows.

Also in 2024, CDFW hydraulic engineers collected GPS data above, at and below the Schaeffer, Templeton and Ramshaw barrier sites and at the Strawberry Creek connection during the annual inspections. It is hopeful that information collected can be used to analyze barrier effectiveness against fish passage and make recommendations to improve defense against passage where needed. Results of this data will appear in a separate report.

<u>Fish Population Surveys on the South Fork Kern River (Tulare County) above and below Schaeffer Barrier.</u>

Survey Dates: September 7-8, 2024

Overview:

The winter of 2022-2023 was a record water year in the Southern Sierras. Snowpack was near 300 percent of average and the Spring runoff overwhelmed Templeton Barrier and allowed passage of non-native Brown Trout and hybridized golden trout over Templeton Barrier and around Templeton Barrier at the Strawberry Connection (upper Strawberry Creek watershed).

Hook-and-line and single pass electrofishing surveys (2023) confirmed the presence of Brown Trout in the SF Kern River, below Ramshaw Barrier (Templeton and Ramshaw meadows). No Brown Trout were found above the Ramshaw Barrier (Tunnel Meadow).

Multi-pass depletion electrofishing surveys (2024) documented population numbers of California Golden Trout and Brown Trout in Templeton and Ramshaw Meadows. California Golden Trout populations on the SF Kern River, above Ramshaw Barrier (Tunnel Meadow) and in Mulkey Creek (Mulkey Meadow) were also documented. Brown Trout were not detected in population surveys on the SF Kern River, above Ramshaw Barrier nor in Mulkey Creek (Mulkey Meadow).

Additional multi-pass depletion surveys were performed in 2024, above (09/08/2024) and below (09/07/2024) Schaeffer Barrier (Figure 69). Brown Trout have been present above and below Schaeffer Barrier for decades. The fish population structure above and below Schaeffer Barrier may give us insight on how the fish population structure may respond to the recent Brown Trout invasion of native California Golden Trout habitat between Ramshaw and Templeton Barriers.

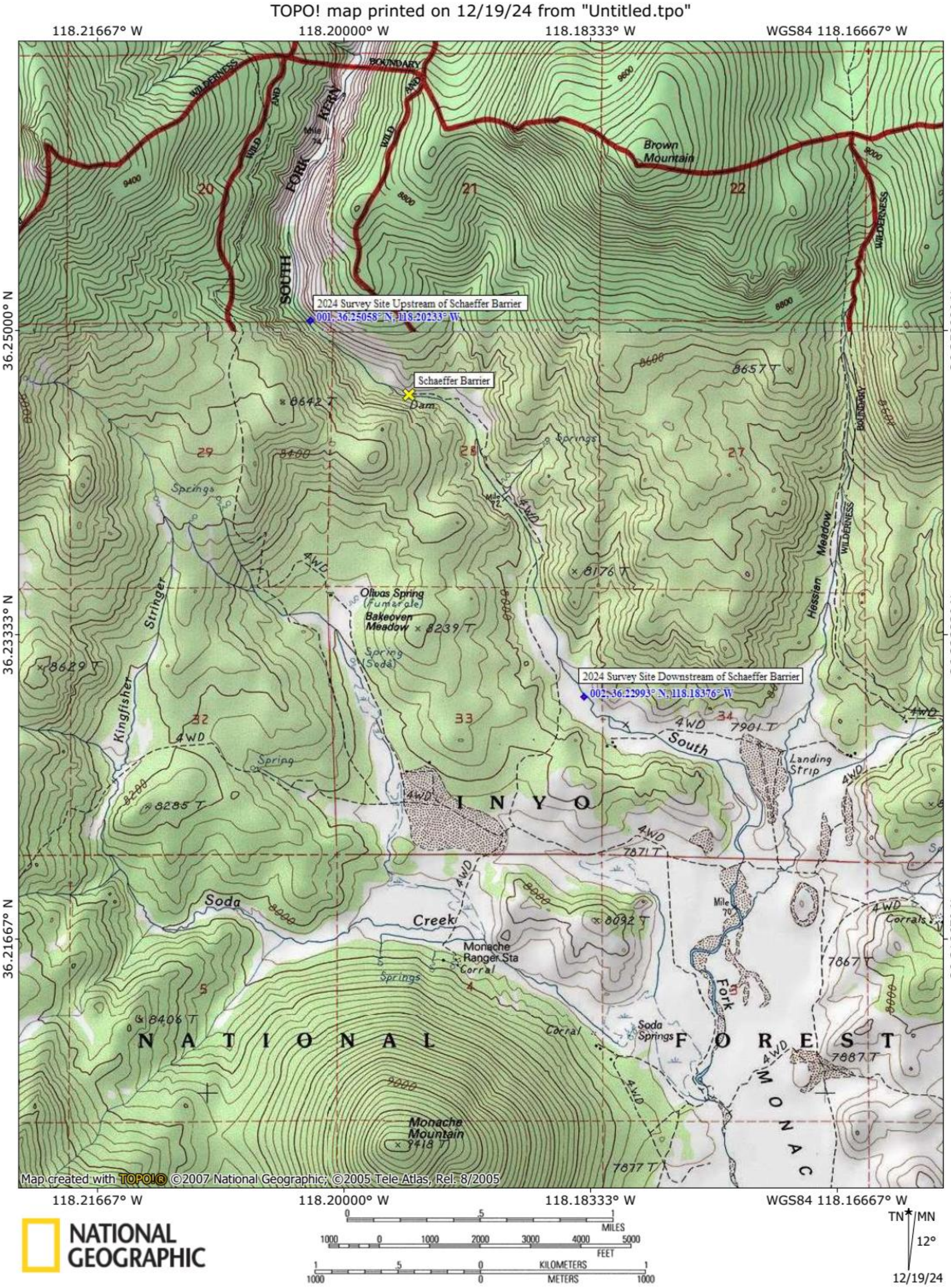


Figure 69. South Fork Kern River fish population survey sites above and below Schaeffer Barrier (2024).

Methods:

Multi-pass depletion electrofishing surveys were performed at historic survey sites. Approximately 14 people were utilized for each survey - Three backpack shockers, three netters, two 5-gallon buckets and a 33-gallon trash can were deployed inside the survey reach. Additional people swapped out buckets along the shoreline and a full workup crew (3 people) identified, weighed, measured and transcribed data.

Block nets were set up to isolate each survey reach and prevent immigration into and emigration out of the reaches surveyed. All captured fish were removed from the survey reach and held outside the survey reach until completion of survey. All fish were identified to species, weighed (g) and measured (Total Length = mm). Missing lengths were assigned the average length for that species/survey reach. Missing weights were calculated using an equation generated using a trendline equation generated by a scatter plot graph using known lengths and weights for each species/survey reach. MicroFish 3.0 was used to statistically analyze the multi-pass depletion data and generate fish population estimates with 95% confidence limits and estimated weight by species. Population and weight estimates were extrapolated to produce fish/mile and pounds/acre estimates.

Results:

CDFW staff and volunteers conducted multi-pass depletion surveys below Schaeffer Barrier (09/07/2024) and above Schaeffer Barrier (09/08/2024). Multi-pass depletion data is presented in Table 33 - Table 35.

California Golden Trout, Brown Trout, and Sacramento sucker were present at both survey sites, above and below Schaeffer Barrier. Sacramento Sucker were the most numerous fish captured below Schaeffer Barrier. Brown Trout were the most numerous fish captured above Schaeffer Barrier, followed closely by Sacramento Sucker. Of the trout species, Brown Trout comprised 56.7% of the trout population estimated below Schaeffer Barrier and 75% above Schaeffer Barrier.

Sacramento Sucker comprised the largest proportion of the estimated fish biomass (pounds/acre) both below and above Schaeffer barrier (75.3% below, 67.2% above). Brown Trout comprised 18.5% of the estimated fish biomass below Schaeffer Barrier and 22.3% above. California Golden Trout comprised the smallest proportion of estimated fish biomass both below and above Schaeffer Barrier (6.1% below, 10.5% above).

Table 33. Survey reach lengths, average widths, average depths and removal pattern of fish species.

Survey Site	Reach Length (ft)	AVG Width (ft)	AVG Depth (ft)	Fish Species	Removal Pattern
Below Schaeffer Barrier	315	28.8	0.57	CAGT	11,9,8
Below Schaeffer Barrier	315	28.8	0.57	BN	19,19,9
Below Schaeffer Barrier	315	28.8	0.57	SS	113,50,32
Above Schaeffer Barrier	245.5	25.0	0.51	CAGT	6,4,0
Above Schaeffer Barrier	245.5	25.0	0.51	BN	15,8,4
Above Schaeffer Barrier	245.5	25.0	0.51	SS	17,7,2

Table 34. Survey sites, fish species, average lengths, length ranges, average weights, weight ranges and condition factors.

Survey Site	Fish Species	AVG Length (mm)	Length Range (mm)	AVG Weight (g)	Weight Range (g)	Condition Factor
Below Schaeffer Barrier	CAGT	127.5	52 - 223	24.7	0.8 - 113	1.04
Below Schaeffer Barrier	BN	164.2	74 - 258	57.5	4.5 - 150	0.90
Below Schaeffer Barrier	SS	182.1	35 - 357	72.4	0.4 - 477	0.98
Above Schaeffer Barrier	CAGT	215	185 - 253	102.2	57 - 168	1.00

Survey Site	Fish Species	AVG Length (mm)	Length Range (mm)	AVG Weight (g)	Weight Range (g)	Condition Factor
Above Schaeffer Barrier	BN	201.7	165 - 240	72.3	38 - 118	0.87
Above Schaeffer Barrier	SS	257.3	135 - 350	247.5	28 - 550	1.32

Table 35. Multi-pass depletion survey data analysis using MicroFish 3.0, including POP estimates +/- 95% confidence intervals.

Survey Site	Fish Species	Total Caught	POP Est.	Pounds/Acre	Fish/Mile	% Trout POP Est.
Below Schaeffer Barrier	CAGT	28	53 ± 70	13.9	888	43.4%
Below Schaeffer Barrier	BN	47	69 ± 38	42.0	1,157	56.6%
Below Schaeffer Barrier	SS	195	223 ± 22	171.0	3,738	N/A
Above Schaeffer Barrier	CAGT	10	10 ± 1	16.0	215	25%
Above Schaeffer Barrier	BN	27	30 ± 7	34.0	645	75%
Above Schaeffer Barrier	SS	26	26 ± 2	100.6	559	N/A

Discussion:

Non-native Brown Trout have been present in the South Fork Kern River, below Templeton Barrier for many decades. Multi-pass depletion surveys above and below Schaeffer Barrier (downstream of Templeton Barrier) have found Brown Trout to be more numerous and grow larger than the native California Golden

Trout. Where Brown Trout are found, they suppress native California Golden Trout populations through predation and competition for food resources. The recent invasion of Brown Trout on the SF Kern River, above Templeton Barrier to Ramshaw Barrier, is expected to negatively impact native California Golden Trout populations similar to that seen below Templeton Barrier.

Acknowledgements

Multi-pass depletion surveys are labor intensive. CDFW relies heavily on volunteers to accomplish these surveys. These surveys could not be done without dedicated volunteers committing 3-4 days of their time to participate. I would like to express my sincere gratitude to Debbie Sharpton (Southwest Council Federation of Fly- Fishers International) for organizing volunteers from across the State to assist CDFW on projects on the Kern Plateau. I would like to especially thank the Sierra Pacific Flyfishers, Santa Barbara Flyfishers, Sespe Flyfishers, Long Beach Casting Club, Aguabonita Flyfishers, Fresno Flyfishers for Conservation, Kern River Flyfishers and several unaffiliated fly flyfishing folks who volunteered their time to make this project happen.

<u>Angler Survey Box (ASB) Monitoring Program</u>

Summary:

The ASB monitoring program is a long-term monitoring program that utilizes a self-reporting angler census/creel. Select Wild Trout Waters and select trout waters of program interest have ASBs installed to collect this data. ASBs are serviced by HWTP staff multiple times a year, which includes visiting each ASB and supplying recording media (i.e., pencils and paper slips), and maintenance. Data collected is reviewed for completeness and errors and entered into a Microsoft Access database. ASB data provides angler catch and use statistics (Appendix B) that are used for annual summary reports (Angler Survey Box Reports) and monitoring fishery trends over time. ASB data, along with other sources, can be used in the management of the local fishery.

The HWTP has been developing a new system to collect ASB data utilizing QR codes (quick response codes) instead of the traditional physical datasheets. The new system will minimize staff time/effort needed to service the ASBs while being able to increase the number of ASBs and data collected. The new ASB QR code system will likely be fully operational in several years. Until that time the traditional ASBs will be in operation.

Angler survey box data is summarized in Appendix B. For more detailed results, visit the Heritage and Wild Trout Program website. Data for the following waters are available for 2024:

- Middle Fork Stanislaus River, Tuolumne County (Wild Trout)
- South Fork Kings River, Fresno County (Wild Trout)
- Tuolumne River, Tuolumne County (Wild Trout)
- Upper Kern River, Tulare County (Heritage and Wild Trout)
- Upper Kings River, Fresno County (Wild Trout)

Public Outreach and Education

California Golden Trout Stakeholder Meeting

Date: May 22, 2024

Overview:

Annual meeting with Federal/State agencies and non governmental organizations to discuss current status of California Golden Trout on the Kern Plateau, work accomplished and future planned activities.

Kings River Public Advisory Group, Fresno, CA Monthly Meetings

Date: Monthly Meeting

Overview:

Participated in the Kings River Fisheries Management Program. The Kings River Fisheries Management Program member agencies include Kings River Water Association, Kings River Conservation District and California Department of Fish and Wildlife. CDFW provided input on stocked rainbow trout and wild trout fisheries on the lower Kings River, below Pine Flat Reservoir.

Central Valley Sportsman's RV and Boat Show

Date: March 15, 2024

Overview:

Attended CDFW booth, answered fisheries questions and informed public on the Heritage and Wild Trout Challenge and ongoing work in Golden Trout Wilderness.

Aguabonita Flyfishers Club

Date: March 5, 2024

Overview:

Power Point presentation on California Golden Trout and on-going work in Golden Trout Wilderness.

South Coast Region

Resource Assessment and Fishery Monitoring

<u>Arroyo Secco, Los Angeles County</u>

Survey Dates: 06/4-6/2024

Overview:

The Aroyo Secco, a tributary to the Los Angeles River, is comprised of two major components – the upper watershed above Devil's Gate Dam and lower watershed below the dam (Figure 70). The lower watershed has been highly impacted by anthropogenic disturbances including barriers and channelization for flood control and is therefore no longer suitable to support Coastal Rainbow Trout (RBT) populations (O'Brien 2010; O'Brien & Stephens 2012; O'Brien & Stephens 2012b). The upper AS also has anthropogenic impacts, including Brown Mountain Dam (approximately 5.5 miles upstream of Devil's Gate), but was known to support a RBT population in recent years. However, the watershed burned extensively in the 2009 Station Fire which likely led to extirpation of the RBT population.

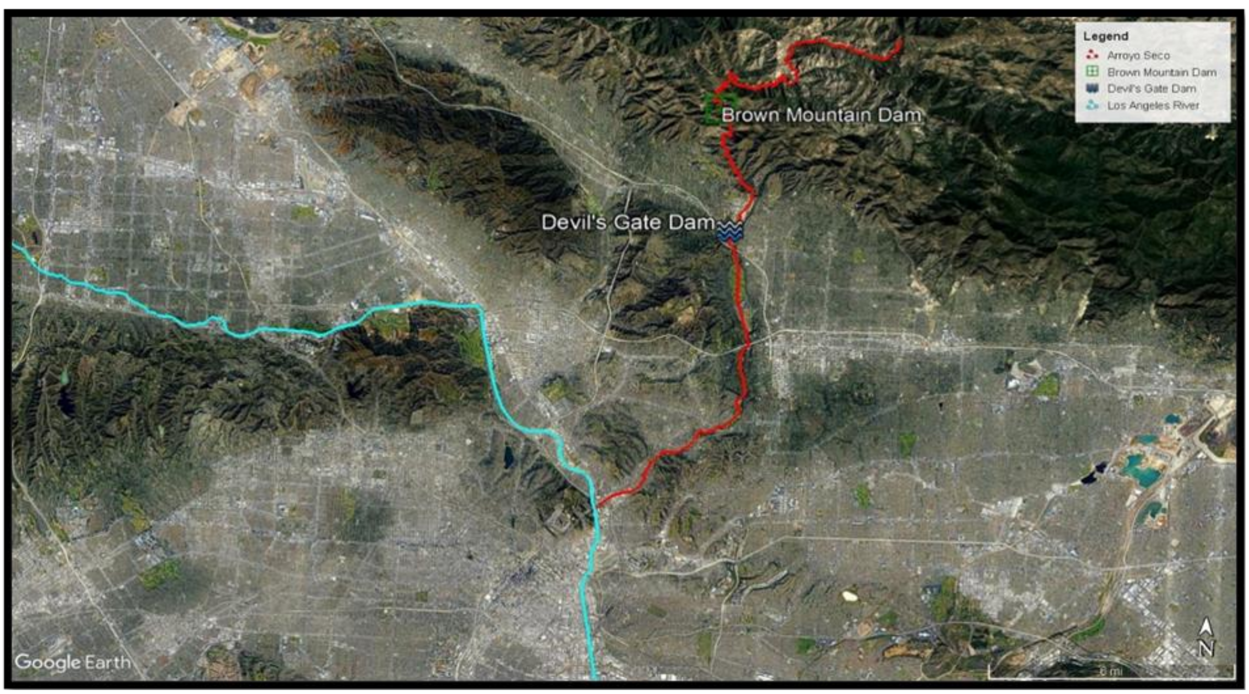


Figure 70. The Arroyo Seco (red), a tributary to the Los Angeles River (blue), is shown with the upper watershed located upstream of Devil's Gate Dam.

Objective:

This report is a follow up technical report to the 2023 Arroyo Seco Summary Report (Stanovich 2023) and is intended to continue to focus on the health of the native Coastal Rainbow Trout population (*Oncorhynchus mykiss*) within the Arroyo Seco (AS). On November 24 and December 1, 2020, a total of 469 Rainbow Trout (RBT) were released into the AS and distributed over 2.5 miles of stream. Much of the population within AS is believed to be from the RBT translocation effort that was undertaken by California Department of Fish and Wildlife (CDFW) staff. This translocation occurred due to emergency actions related to the Bobcat Fire (Pareti, 2021 and 2020b).

Methods:

CDFW staff conducted a combination of direct observation snorkel and hook and line surveys on the Aroyo Secco. Direct observation snorkel surveys are an effective technique for assessing trout populations in southern California. One diver, equipped with a mask, snorkel, and wetsuit, entered a habitat unit at the downstream end and swam or crawled to the upstream end, counting, identifying, and recording all the fish they saw. In small streams or habitat units, a single, experienced diver can effectively count and identify all fish in a single pass. In larger streams or complex habitat units, a combination of divers working together systematically may be necessary to determine fish numbers (Flosi et al. 2010).

Stream reaches that were dry or too shallow (< 4 inches) to snorkel were instead surveyed via streamside visual observations, as described in the *Stream Bank Observation* section of the California Salmonid Stream Habitat Restoration Manual (Flosi et al. 2010). Visual counts from streambanks are a preferred method for assessing fish populations when shallow water depths preclude underwater observation or when alternative capture methods that generate mortality need to be avoided (Bozek and Rahel 1991). Depending on conditions, counts from stream banks may be superior to alternative methods such as electrofishing (Bonneau et al. 1995). Observation of fish from the stream bank or other vantage points is a commonly used technique to determine presence or absence of fish. It also provides "gross" estimates of fish numbers in sampled habitats (e.g., 10-20 young-of-year steelhead) (Flosi et al. 2010).

In some instances, a bank-side observer assisted the diver by counting fish in the areas too shallow to dive or at the upstream boundary of sections where the break in habitat or gradient was not distinct enough to limit fish movement out of the section. All observed trout were counted and categorized by the following size classes in inches (in) based on the following categories: young of the year (YOY) 0-2.9 in, 3-5.9 in, 6-8.9 in, 9-11.9 in, ≥12 in.

Each snorkeled habitat unit was categorized as riffle, pool, or flatwater (Flosi et al. 2010). Additionally, each habitat unit was determined by distinct breaks in habitat types or creek gradient. The length, depth, and width of pool habitat units only were measured. Data was also recorded for other aquatic species (amphibians, aquatic snakes) observed by snorkelers and as the surveyors walked upstream.

CDFW staff collected length and weight data of RBT captured via hook and line. Working with members of the Pasadena Casting Club, CDFW led 3-4 club members to conduct hook and line sampling through 5 separate reaches, measuring approximately 0.25 miles of the AS. The reaches were split up into approximately the same distances of stream to attempt to cover an equal amount of habitat. Once a RBT was caught a CDFW staff member collected total length (mm) and weight (g) of the fish. Each reach of stream was surveyed for approximately 2 hours. The data collected from the hook and line survey was used to calculate relative weight of the RBT within the AS.

Relative weights (W_r) were used to represent the overall condition describing how healthy a fish is at any given length. To determine the W_r for species sampled, the following equations were used:

$$\mathbf{W_r = (W / W_s) \times 100}$$

Where:

W_r = the condition of an individual fish.
W = weight in grams
W_s = length-specific standard weight predicted by a length-weight regression for a species.

The equation to determine the W_s is:

$$\mathbf{\log10\,(W_s) = a' + b * \log10\,(L)}$$

Where:

a’ = intercept value
b = slope of the log10 (weight) – log10 (length) regression equation
L = maximum total length

The intercept and slope parameters for standard weight (W_s) equations were taken from the weight-length regression standard (Wege and Anderson 1978). Utilizing these W_r equations, fish of all lengths, regardless of species, are in good condition with a W_r of 100. Distance from 100, above or below, indicated a healthier or poorer condition relative to the standard.

Results:

CDFW staff conducted a direct observation snorkel survey of the AS between the Pasadena Water and Power Diversion (34.202980°, -118.166475) and Brown Mountain Dam (34.237767°, -118.181503°). CDFW staff snorkeled every location possible for RBT to use as refuge, totaling 3.31 miles.

One hundred and twenty-five habitat units were surveyed and categorized as flatwater, riffle, or pool. In previous surveys length, width, and depth of all habitat types were measured although in this year's survey only significant pools were measured for length, width, and depth after being habitat typed (Table 36). There was still a substantial amount of flow due to significant storms early in the 2022/2023 rain year as well as above average rainfall in the 2023/2024 rain year, which allowed the stream to sustain flows from the previous year. In 2022, Devil's Gate Dam measured accumulated precipitation at 15.12 inches, whereas in 2023 the accumulated precipitation was measured at 42.95 inches and in 2024 the accumulated precipitation was 23.54 inches (Figure 71).

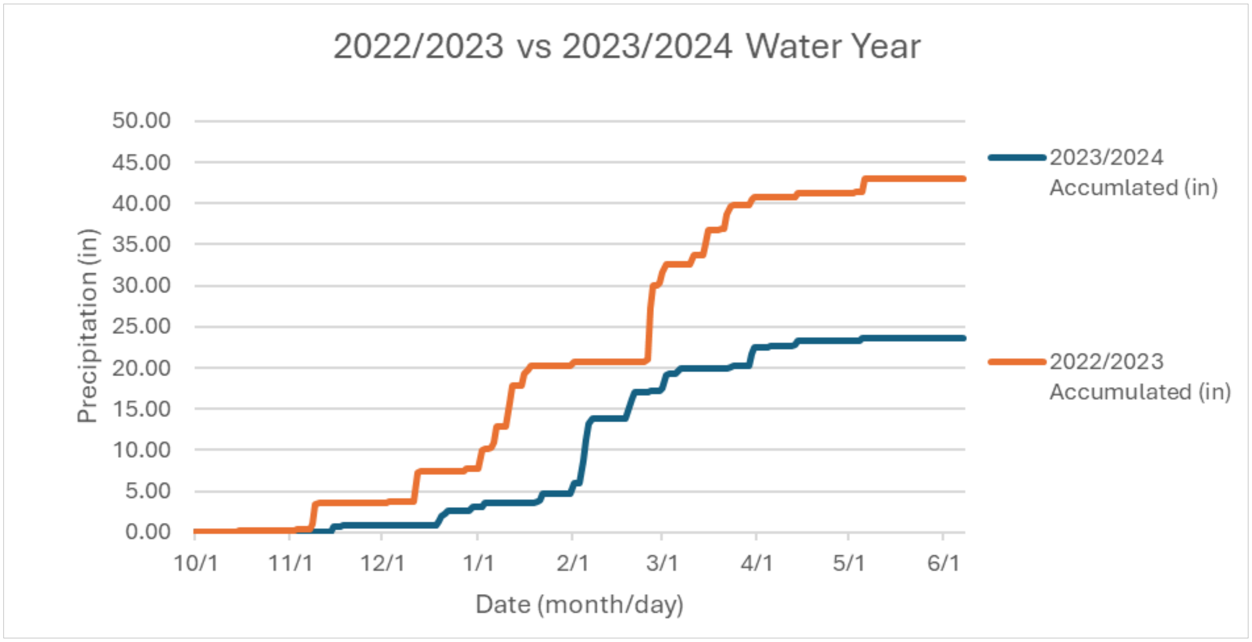


Figure 71. Accumulated Rain in inches throughout the 2022-2023 and 2023-2024 water year.

A total of 4,404 RBT were observed of varying size classes within the survey reach (Table 36). Most of the fish were categorized as 3-5.9 inches, with 1,818 individuals (41.7%) observed in this size class. In 2023, most fish observed were in the 6-8.9 in size class. The number of trout observed by approximate river mile and size class is shown in Figure 72 - Figure 73.

Table 36. June 2024, 2023, 2022, & 2021 AS RBT totals by size class.

Size Class (in)	2024 Total Fish	2023 Total Fish	2022 Total Fish	2021 Total Fish	2024 Percent of Total	2023 Percent of Total	2022 Percent of Total	2021 Percent of Total
0-2.9	1257	184	1570	267	28.54%	28.0%	75.0%	61.2%
3-5.9	1818	169	408	129	41.28%	25.7%	19.5%	29.6%
6-8.9	858	207	84	26	19.48%	31.5%	4.0%	6.0%
9-11.9	348	86	23	13	7.90%	13.1%	1.1%	3.0%
12+	123	11	7	1	2.79%	1.7%	0.3%	0.2%
Total	4404	657	2092	436	100.00%	100.0%	100.0%	100.0%

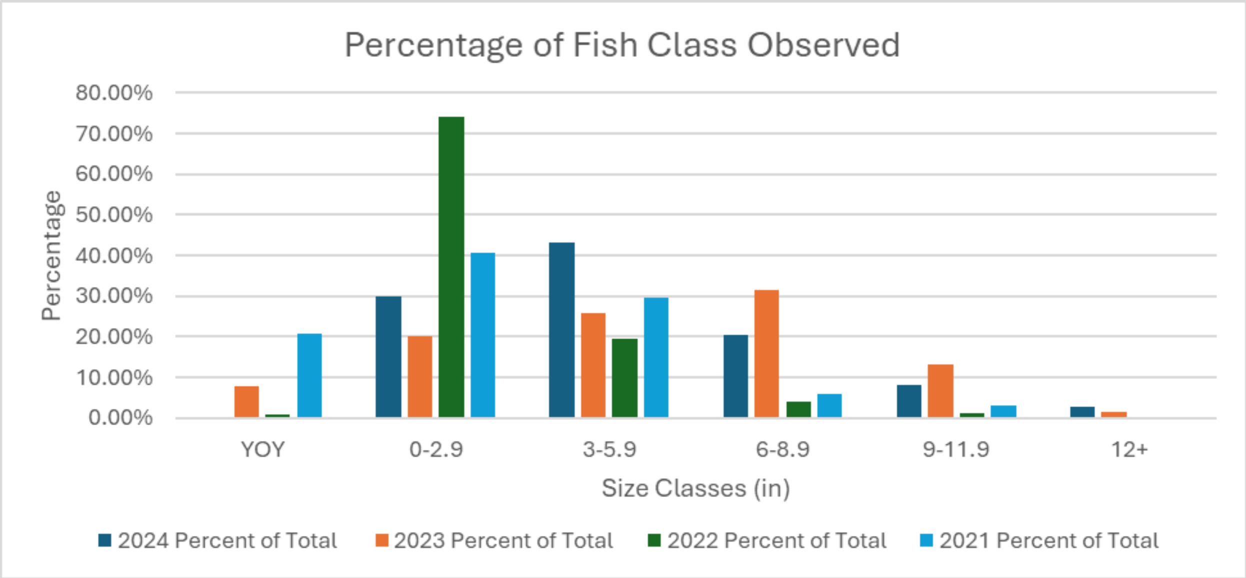


Figure 72. Percent of total RBT by size class observed in AS from 2021-2024.

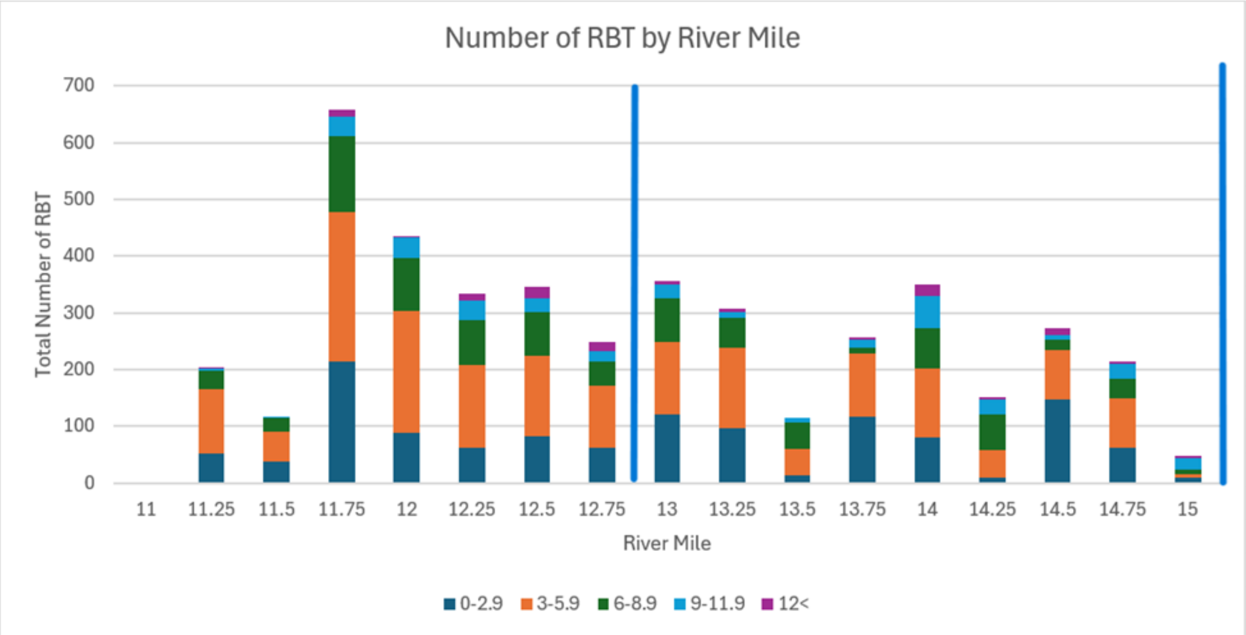


Figure 73. Total number of RBT observed by river mile.

Twenty-five (25) RBT were captured via hook and line and were measured and weighed. 17 RBT captured were >120 mm, allowing for calculation of Wr (Figure 74). RBT <120 mm are not typically used for relative weight calculations because they provide unreliable weights (Simpkins and Hubert 2023). Average Wr for RBT captured was 101. Total lengths of all RBT caught ranged from 95mm to 271mm. The average length of RBT >120mm was 202 mm.

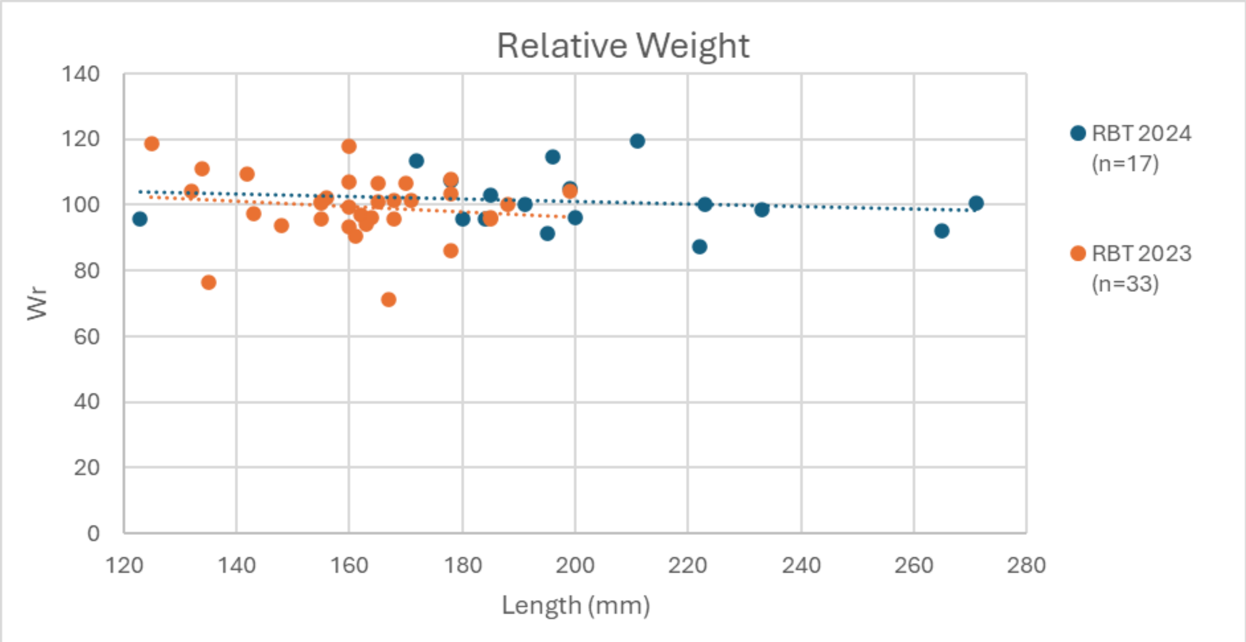


Figure 74. Relative Weight of RBT >120 mm caught during the hook and line survey.

Figure 75. Pasadena Casting Club participating in the hook and line survey to collect fish for CDFW staff.

Figure 76. RBT captured in Arroyo Secco, June 2024.

Discussion:

The 2024 survey observed over six times the amount of RBT than the 2023 survey. Based on the number of RBT observed and the conditions of the watershed during the June 2024 survey, it appears that the established population within AS is still healthy. This could be attributed to the fact that better conditions i.e., thermal stability, high DO, and greater water availability, may have increased growth in fish. During the 2022-2023 water year, AS experienced sustained high flow events due to above average amounts of precipitation and snow melt. As a result, during sustained high flow events there may have been a decline in habitat quality for spawning trout (Yao et. al 2017) and may have also had a displacement effect on RBT. Meaning, high flows may have moved fish downstream (Hilwig and MaKinster 2008) which led to a decrease in the number of RBT observed in the June 2023 survey. Nevertheless, high flow events from 2022/2023 water year combined with the 2023/2024 precipitation accumulation, may have led to continued beneficial discharge within AS, increasing suitable habitat and spawning grounds.

High flows experienced in water years 2022-2023 and 2023-2024 may lead to greater spawning success of RBT through flushing of fine particulate organic material built up over the prolonged drought and exposing interstitial spaces within the substrate. Additionally, flows continued to provide favorable pools, similar to the amount of pool habitat type found in the previous two years of surveying (Table 36).

All size classes of RBT were observed during this survey. The presence of YOY and RBT less than 2.9 inches indicates that successful reproduction continues to occur within the population. Most fish observed were in the size class 3-5.9 in compared to 2023 where most fish observed were in 6-8.9 in size class. Although, it is to be noted that the total number of fish observed in 2023 was 657 and during the 2024 survey 4,404 fish were observed. It should also be recognized that all size classes of RBT had more fish observed during the 2024 survey than any size class count in the 2023 survey. Based on the results of size class distribution there appears to be successful recruitment across all size classes (Table 36).

Mean Wr for RBT (greater than 120mm) sampled was 101, indicative of a population with slightly above average health. Using the relative weight equation, it is known that a Wr of 100 shows the population to be in good condition, and the distance from 100 above or below determines healthier or poorer condition respectively. Although the Wr mean results of this survey were higher than the 2023 survey, a plot of relative weight displays a linear negative relationship (Figure 74). This indicates that the Wr of RBT decreases as the total length of individual fish increases, which is also reflective of last year's survey results. This linear negative relationship shows that larger fish in the system remain slightly poorer in health. Some assumptions for this may be due to prolonged effects of more energy expended from larger trout over a long period of time during the previous two winters (Figure 71) consequently leading to a decrease in relative weight.

South Coast Region 5 fisheries staff recommend continuing spring, summer, and fall evaluations of RBT population to observe fluctuating limitations of habitat and health of population structure, distribution, and abundance. With the current water availability, drought conditions have decreased, however drought conditions likely will continue to fluctuate in the coming years. It is necessary to continue the frequency of survey techniques and locations as drought conditions are expected to return.

Also recommended is to begin a dialogue with Los Angeles County Public Works to discuss best management practices for maintaining Devils Gate Reservoir and avoid stranding RBT. CDFW should explore expanding the distribution of trout within the AS and potentially translocate trout upstream of Brown Mountain Dam.

Lastly, CDFW should continue assessing whether the West Fork San Gabriel River has recovered to a level to support a larger rainbow trout population. Dialogue should be started among CDFW and natural resource constituents to address whether a translocation of trout back into the West Fork San Gabriel to reinforce its population is warranted.

Big Santa Anita Canyon, Los Angeles

Survey Dates: 4/9/2024, 6/20/2024, 7/2/2024, 11/7/2024, 11/19/2024, 12/11/2024

Overview:

Big Santa Anita Canyon (BSAC) was heavily affected by the Bobcat Fire of 2020, after which heavy sedimentation occurred in the system following winter storms. Stream habitat within BSAC has since recovered to a level which can support a self-sustaining population of Rainbow Trout. However, following the 2020 Bobcat fire no fish have been seen by CDFW staff during streamside observation and snorkel surveys in BSAC. This is likely due to two factors: the fire depressing the existing trout population to low enough numbers that they are no longer observed and the fact that fish movement within the stream is severely limited due to the presence of multiple large check dams located between Santa Anita Dam and Sturtevant Falls.

Objective:

Reconnaissance-level stream surveys were conducted by CDFW staff on April 9, June 20, and July 2, 2024, along 1.5 miles of stream in BSAC. The objective of these surveys was to document stream habitat conditions and determine the presence/absence of Rainbow Trout.

In later surveys on November 7, 19, and December 11, 2024, translocation efforts occurred, moving Rainbow Trout from the East Fork San Gabriel River (EFSGR) threatened by the Bridge fire into BSAC. Supplementing the current Rainbow Trout population in BSAC provides the genetically valuable populations from the EFSGR a location with better water quality, suitable habitat, and areas for reproduction. It also allows recreational angling opportunities in BSAC that had been diminished by the Bobcat Fire. The long-term goal is to have the option to move fish back into the EFSGR once the fire damaged habitat has recovered. More on these efforts are discussed later in the EFSGR section of this report.

Methods:

Fish and herpetofauna presence were determined by streambank observation. Photographs and GPS points were taken at regular intervals to document the stream channel, riparian habitat, and potential fish migration barriers. Water quality was measured at designated sites using a YSI ProDSS water quality meter. Discharge was measured using the Global Water flow probe and calculated using the following methods: stream width was divided into ten increments if the total width was greater than ten feet, and five increments if it was less than ten feet. For each increment with a depth less than two feet, average velocity was measured at 60% depth from the bottom of the stream. If the depth was greater than two feet, then an additional velocity would be measured at 40% depth and velocity for that section would be an average between the two. Total discharge would then be calculated via the sum of the product of velocity, depth, and width of each section.

The lower 0.5 miles from the Santa Anita Dam to Hermit Falls was snorkeled on July 2, 2024, to determine the presence of Rainbow Trout. For direct observation snorkel methods please reference the previous methods section of Arroyo Seco.

Results:

Similar to 2023 no fish of any species were seen during surveys in BSAC in 2024. High flow events were not as severe in 2024 as they were in 2023 but continued to improve the habitat as most stretches contained little to no silt and were suitable habitat for Rainbow Trout.

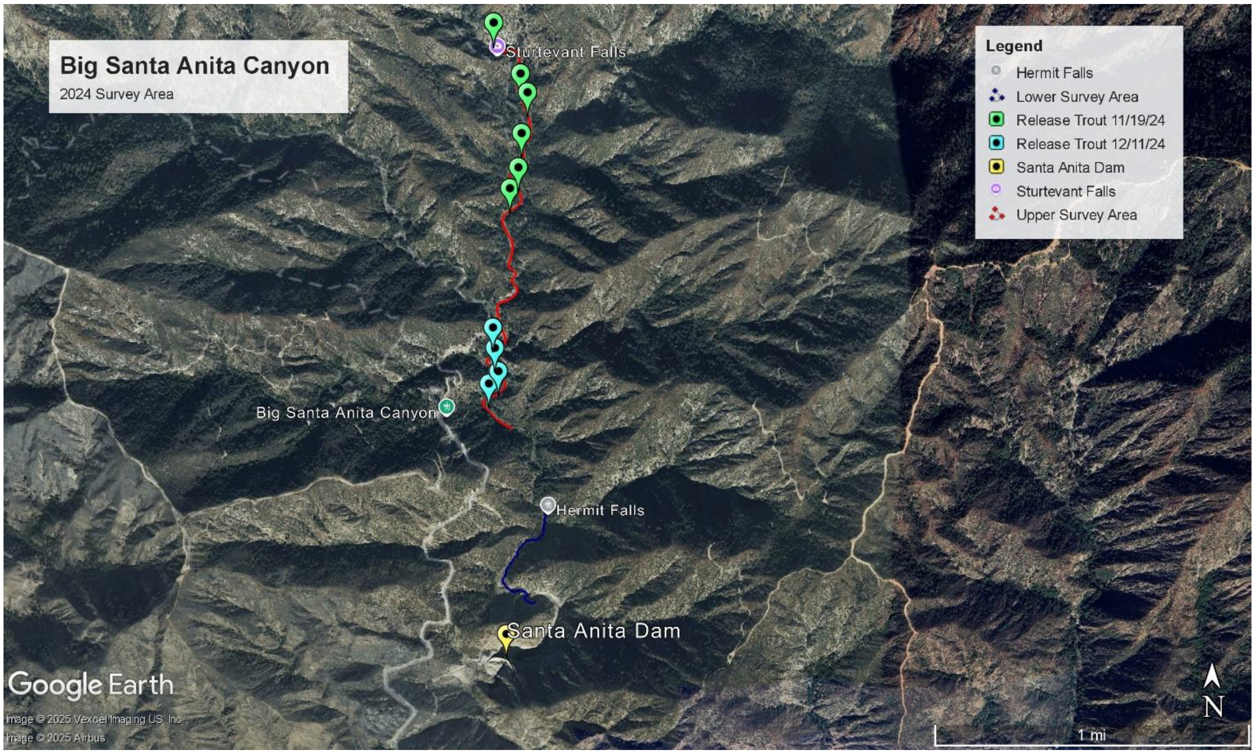


Figure 77. Map of areas surveyed and RBT translocation release locations Big Santa Anita Canyon 2024.

Table 37. Water quality and flow data taken in Big Santa Anita Canyon.

Location	Date	Discharge(cfs)	Water Temp (°C)	DO (mg/L)	pH	Turbidity (NTU)
34.20139°, -118.01824°	4/9/2024	11.4	9.2	10.9	8.7	0
34.20139°, -118.01824°	6/20/2024	6.8	16.0	9.1	8.6	0.1

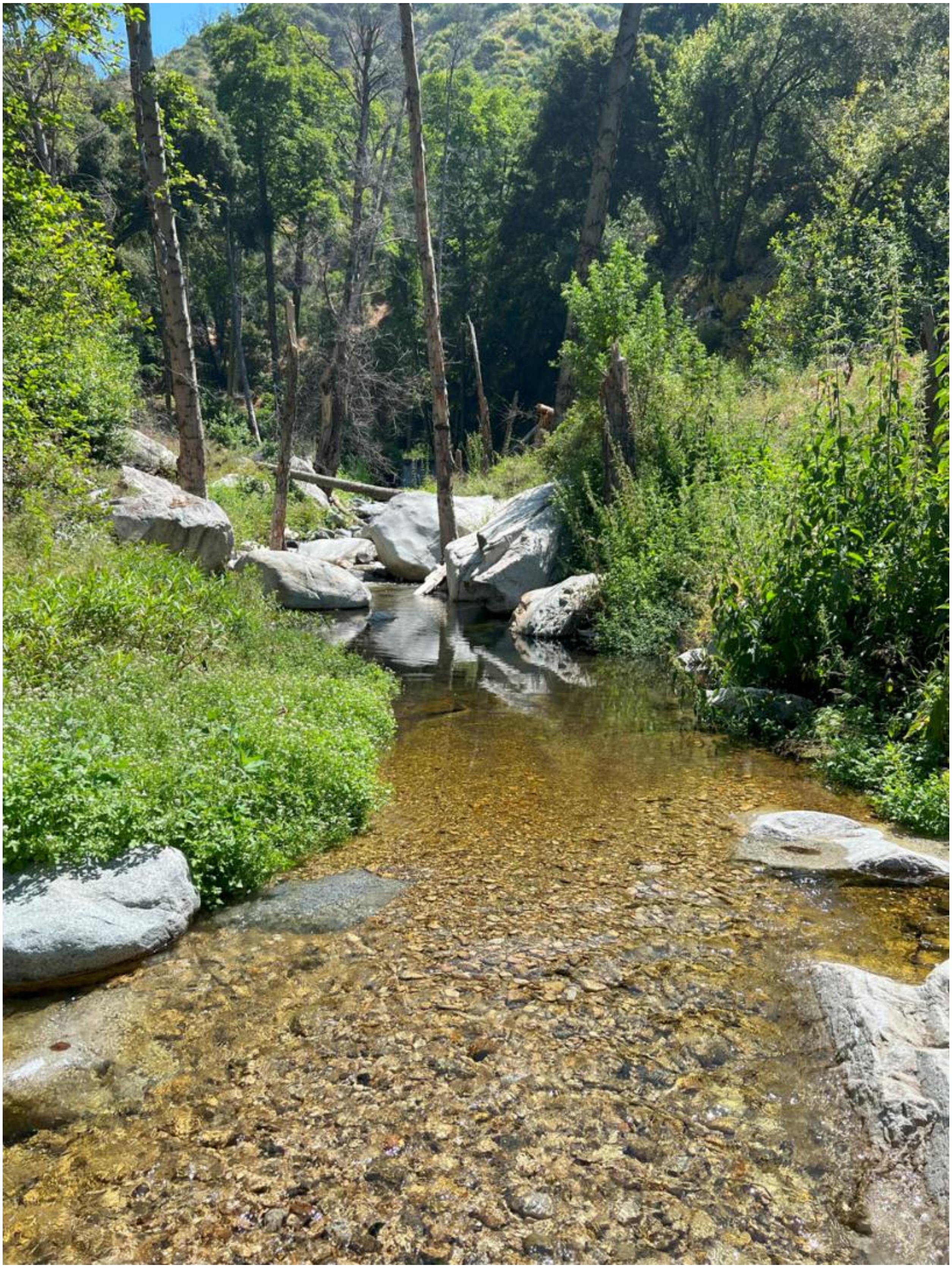


Figure 78. Pool habitat along upper survey area in BSAC 4/9/2024.

Figure 79. Representative habitat along lower survey area BSAC 7/2/2024

Figure 80. Beneath Hermit Falls 7/2/2024.

Discussion:

Despite the habitat having recovered since the 2020 Bobcat fire no trout have made their way back into the stream volitionally. Even between Santa Anita Dam and the first natural barrier, Hermit Falls, trout were not seen. According to the LA Department of Public Works annual species relocation report, while work was being done on Santa Anita Dam in 2023 and into 2024 any trout directly above the dam were to be relocated upstream below Hermit Falls, however no trout were moved/seen while work was ongoing, suggesting that they were extirpated from that location. Considering the quality of the habitat but lack of trout observations (or any other fish) we determined that BSAC was a good candidate to receive supplemental trout.

When the Bridge Fire began September 8, 2024, it was quickly determined that fish would be rescued from the EFSG and translocated to BSAC. A total of 466 trout were released in BSAC over the course of two days (11/19/2024 and 12/11/2024). Follow-up snorkel surveys will be conducted in BSAC during the subsequent field season to monitor the translocated Rainbow Trout. Due to the limited mobility of fish due to barriers to migration, the survey area will be restricted to the sections of BSAC between the check dams where the trout were released.

<u>Big Tujunga Creek, Los Angeles</u>

Survey Dates: biweekly to monthly monitoring 1/17/2024 - 12/10/24, Snorkel Survey 7/30/2024

Overview:

Big Tujunga Creek flows westward out of the Angeles National Forest (ANF) into the Los Angeles River basin. Historically, Big Tujunga Creek has provided habitat for rainbow trout, Santa Ana sucker (SAS; *Catostomus santaanae*), Santa Ana speckled dace (SASD; *Rhinichthys osculus*), and Arroyo chub (*Gila orcutti*). High precipitation continued from 2023 into the 2024 water year providing above average rainfall with approximately 23.79 inches of precipitation (California Water Watch). This was only slightly lower than the previous water year. The higher flow provided by the continued higher precipitation also continued to improve suitable habitat and water conditions for native fish.

Objective:

Throughout 2024, CDFW staff conducted biweekly to monthly monitoring surveys at predetermined locations within Big Tujunga Creek to record native fish abundance, water quality, stream flow, and stream habitat conditions, as well as stream conditions to inform management actions throughout the year. Water quality data was collected using a YSI Pro 2030 water quality meter and stream discharge measurements were collected following USGS guidelines (Water Science School 2018).

On July 30, 2024, CDFW conducted a snorkel survey within the Upper Big Tujunga Creek fish translocation site, upstream of Big Tujunga Reservoir. The purpose of this survey was to monitor presence of Santa Ana sucker and Santa Ana speckled dace. However, rainbow trout data was also captured during this survey and that portion will be summarized in this report.

Methods:

For streambank observation methods please reference the previous methods section of Big Santa Anita Creek

For continual measured discharge, maximum discharge was taken from the Los Angeles Department of Public Works' (LADPW) Big Tujunga weather station and made into a graph. Additionally, one permanent stream temperature monitoring site was established following US Forest Service stream temperature monitoring protocols (Issaak et al. 2013). The site was established at Vogel Flats (34.27911°, -118.22073°) on August 11, 2015. The utilization of Hobo Tidbit v2 temperature loggers enabled continuous, hourly data collection of water temperature on Big Tujunga Creek.

The 2024 monitoring efforts cover approximately 14 miles of stream from Colby Ranch Road to Haines Creek. Monitoring locations were chosen to best represent the condition of the Big Tujunga and RBT, SAS, and SASD stream habitat. Monitoring stations were established at five locations known as "Colby Ranch," "Vogel Flats," "Wildwood," "Delta Flats," and "Haines Creek."

The July 30, 2024, snorkel surveys focused on the sections of stream where SAS and SASD were translocated in 2023 as well as directly downstream and upstream of those locations. On arrival at the stream CDFW staff divided into two teams of 3 or 4 people. Due to time constraints, the entire survey area was not snorkeled, with some areas observed as the survey team walked upstream.

Direct observation snorkel survey methods were utilized as described in the survey methods section.

Results:

Data that was collected during monitoring surveys on Big Tujunga were entered into a CDFW Aquatic Stressor Monitoring portal. These results are based on data that was inputted into this portal. During the 2024 drought monitoring surveys, stream conditions within Big Tujunga varied. The highest stream temperature across all stations was 23.1°C on July 25, 2024 (Figure 82, Table 38). The lowest stream temperature was 6.4°C on February 13, 2024 (Figure 84, Table 38). The highest dissolved oxygen content was 11.2 mg/L on March 26, 2024 (Figure 83, Table 38). The lowest dissolved oxygen content was 5.95 mg/L on August 13, 2024. Peak flow measured 118 cubic feet per second (cfs) on March 26, 2024 (Table 38).

Table 38. 2024 water quality data within Big Tujunga Creek. Water quality was collected at the upstream extent.

Date	max flow (CFS)	min flow (CFS)	max temp (°C)	min temp (°C)	max DO (mg/L)	min DO (mg/L)	Wetted Extent 1: Upstream Coordinates	Wetted Extent 1: Downstream Coordinates	Threat Level (per Threat Assessment Protocol)
1/17	3.34	0.49	15.9	7.1	10.67	9.49	34.30965° -118.113°	34.26677° -118.354°	1
1/30	2.29	1.11	13	7	10.88	10.15	34.30767° -118.074°	34.2828° -118.222°	1
3/26	118	16.15	11.5	6.9	11.18	10.62	34.30768° -118.075°	34.30246° -118.26°	1
4/18	106.76	7.44	19.1	11.4	10.03	8.61	34.30957° -118.113°	34.26673° -118.354°	1
5/1	78.53	16.19	13.6	11.2	9.89	9.64	34.30766° -118.075°	34.29484° -118.242°	1
6/13	25.7	3.05	20.6	17	9.13	8.67	34.30957° -118.113°	34.26674° -118.354°	1
7/25	2.8	2.5	23.1	20.7	8.28	7.4	34.30957° -118.113°	34.26674° -118.354°	1
8/13	2.12	1.68	21.3	19.4	8.63	5.95	34.30959° -118.113°	34.26677° -118.354°	1
8/29	6.4	2.2	19.7	16.4	8.81	7.62	34.30961° -118.113°	34.26674° -118.354°	1

Date	max flow (CFS)	min flow (CFS)	max temp (°C)	min temp (°C)	max DO (mg/L)	min DO (mg/L)	Wetted Extent 1: Upstream Coordinates	Wetted Extent 1: Downstream Coordinates	Threat Level (per Threat Assessment Protocol)
9/12	5.75	1.32	20	18	8.46	8.23	34.28417° -118.223°	34.26675° -118.354°	1
9/24	4.24	0.79	19.7	16.3	8.69	7.32	34.28417° -118.223°	34.26675° -118.354°	1
11/7	0.83	0.5	16	10.2	9.08	7.64	34.28417° -118.223°	34.26675° -118.354°	1
12/10	2.23	1.2	14.5	6.7	10.11	8.56	34.28417° -118.223°	34.26675° -118.354°	1

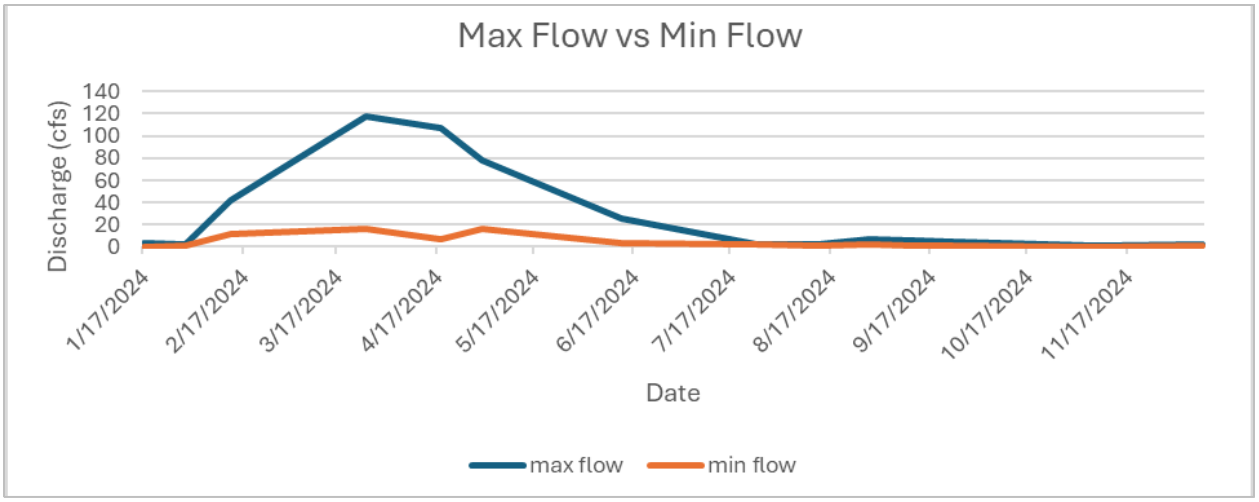


Figure 81. 2024 Maximum Discharge versus Minimum Discharge in Big Tujunga Creek.

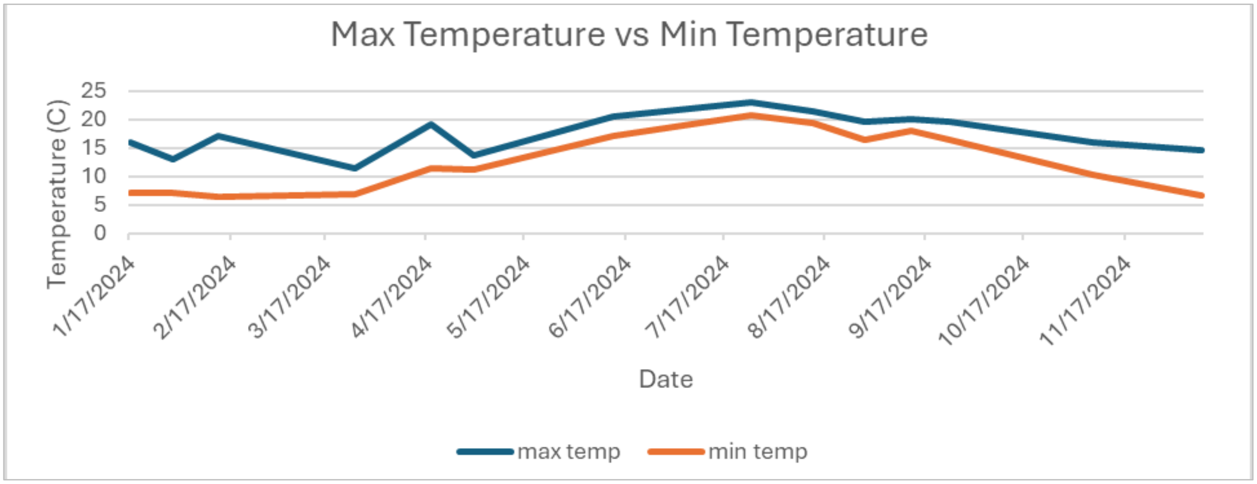


Figure 82. 2024 Maximum Temperature versus Minimum Temperature in Big Tujunga Creek.

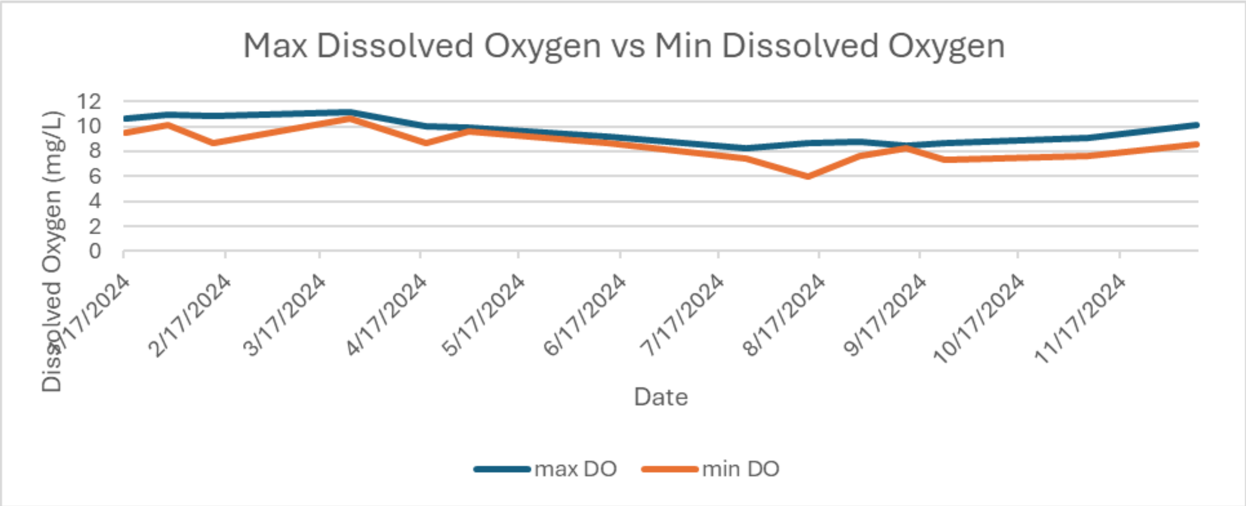


Figure 83. Maximum Dissolved Oxygen Content versus Minimum Dissolved Oxygen Content in Big Tujunga Creek.

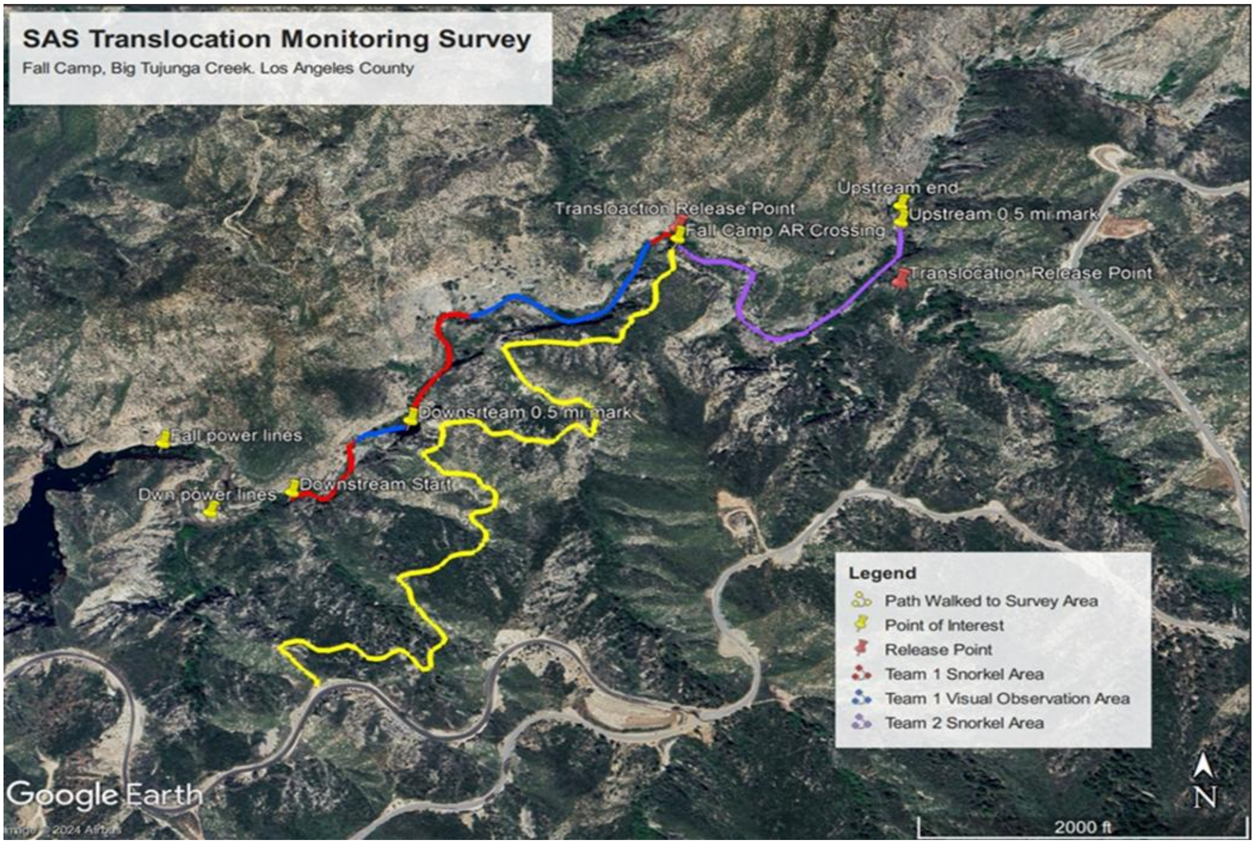


Figure 84. Upper Big Tujunga Creek survey area. July 30, 2024.

Figure 85. Representative stream habitat within the survey area. Upper Big Tujunga Creek, 7/30/2024.

Table 39. Rainbow trout by size class observed on 7/30/2024

Species	Number Observed (2024)	YOY	0-2.9 in	3-5.9 in	6-8.9 in	9-11.9 in	12+ in
Rainbow Trout	1299	8	632	517	104	22	16

Discussion:

During 2024, Big Tujunga Creek maintained more normal conditions providing stable conditions for native fish. Higher flows continued to result in a natural reset to stream habitat, resulting in sediment transfer downstream. Rainbow Trout have benefitted from improved stream conditions as high numbers were observed on the snorkel survey done on July 30, 2024, with 1299 RBT across all size classes being seen.

Monitoring will continue in 2025 and should focus on changing habitat types and availability as drought conditions fluctuate from year to year. If the 2024-2025 water year is again above average, the stream should be monitored for isolated braiding which may require fish rescues during summer months as flow is reduced.

<u>East Fork San Gabriel River, Los Angeles County</u>

Survey Dates: 11/19/2024 & 12/11/2024

Overview:

The East Fork San Gabriel River (EFSGR) is located within the Angeles National Forest (Los Angeles County) approximately 40 miles to the northeast of Los Angeles, CA. It is approximately 17 miles long and is the largest headwater of the San Gabriel River system and supports wild populations of Coastal Rainbow Trout (*Oncorhynchus mykiss*) within their native range. The trout population there is recognized as a valuable genetic resource for southern California Steelhead and native Coastal Rainbow Trout (Abadia-Cardosa et al. 2016, NMFS 2012). In 2010, the California Fish and Game Commission designated the EFSGR from Heaton Flat upstream to the headwaters, including all tributaries, as a Heritage Trout Water.

Objective:

On September 8, 2024, the Bridge Fire began near the Cattle Canyon Bridge at the confluence of the EFSGR and Cattle Canyon Creek. It burned 56,030 acres of the Angeles National Forest in Los Angeles and San Bernardino counties, including most of the EFSGR watershed above Cattle Canyon (Inciweb 2024). CDFW biologists conducted reconnaissance level surveys on September 25, 2024 resulting in the observation of the extensively burned watersheds with little to no vegetation remaining on the steep surrounding mountainsides (Figure 86). The Burned Area Emergency Response (BAER) Report projected that upon the arrival of moderate rainfall, heavy debris and sediment loads would occur within the stream (Figure 86) resulting in high mortality of native fish species throughout the EFSGR and Cattle Canyon (USFS 2024). A fish rescue was discussed with US Fish and Wildlife (USFWS) and US Forest Service (USFS), and all agreed with the CDFW rescue and release plan.

The West Fork San Gabriel River (WFSGR) and Big Santa Anita Creek (BSAC) were chosen as release areas for the rescued fish. All captured Rainbow Trout were to be translocated to BSAC, while all other native fish species would be translocated to the WFSGR. Both streams were surveyed prior to the fish rescue to locate suitable release locations for each of the native species.

Methods:

Electrofishing was utilized to capture all fish and was conducted using one to two backpack electrofisher units (Smith Root Models LR-20B and LR-24) per team depending on staff availability, as well as stream width and morphology. At least two netters were assigned to each unit. Electrofisher voltage settings ranged from 150-250V depending on water depth. Remaining settings were as follows: 30Hz pulse frequency, 5 ms pulse width, and 15 percent duty cycle. Rescue locations were selected based on accessibility, CDFW habitat and fish data, as well as where CDFW staff believed fish populations would be severely impacted by sediment flows based on the 2024 BAER report. Electrofishing was conducted in an upstream direction in selected rescue locations.

Captured fish were placed in buckets with water and aerators and then transferred to streamside coolers also containing aerators that were monitored at regular intervals. All fish were identified and counted by species. The data collected varied by species according to the release plan as follows:

- Arroyo Chub: all rescued individuals were counted.
- Santa Ana Speckled Dace: all rescued individuals were counted.

- Santa Ana Sucker: all rescued individuals were counted.
- Rainbow Trout: all rescued individuals were counted and marked by adipose fin clipping. Tissue samples, taken from the caudal fin, were obtained from 30 Rainbow Trout (10 from each team) and stored dry in individually labeled envelopes for subsequent genetic analyses. Of the 466 Rainbow Trout collected across the two dates, 134 were weighed and measured. The remaining Rainbow Trout were categorized by size class: 0–2.9", 3–5.9", 6–8.9", 9–11.9", and 12"+.

The fish were transferred to a Bonar bin containing stream water for transport to designated release locations. Water temperature within the bin was monitored, and sealed bags of ice were utilized to regulate the temperature during transport. Multiple battery-operated aerators were employed to maintain adequate oxygenation wherever fish were stored.

Results:

A total of 303 rainbow trout were released into BSAC on November 19, distributed over approximately 1.25 miles of stream between check dams below Sturtevant Falls. On December 11th, another 163 rainbow trout were translocated again to BSAC, this time over 0.35 miles in an area downstream of the first translocation. Fish were hiked to release locations in insulated coolers and backpacks outfitted with aerators and released in small quantities (10-25 fish) into areas with the best available habitat. Fish were observed following release to confirm that they were behaving normally. No mortalities were observed. A total of 342 Santa Ana Speckled Dace, 41 Santa Ana Sucker, and 27 Arroyo Chub were released in WFSGR on November 19, distributed right below Glen campground.

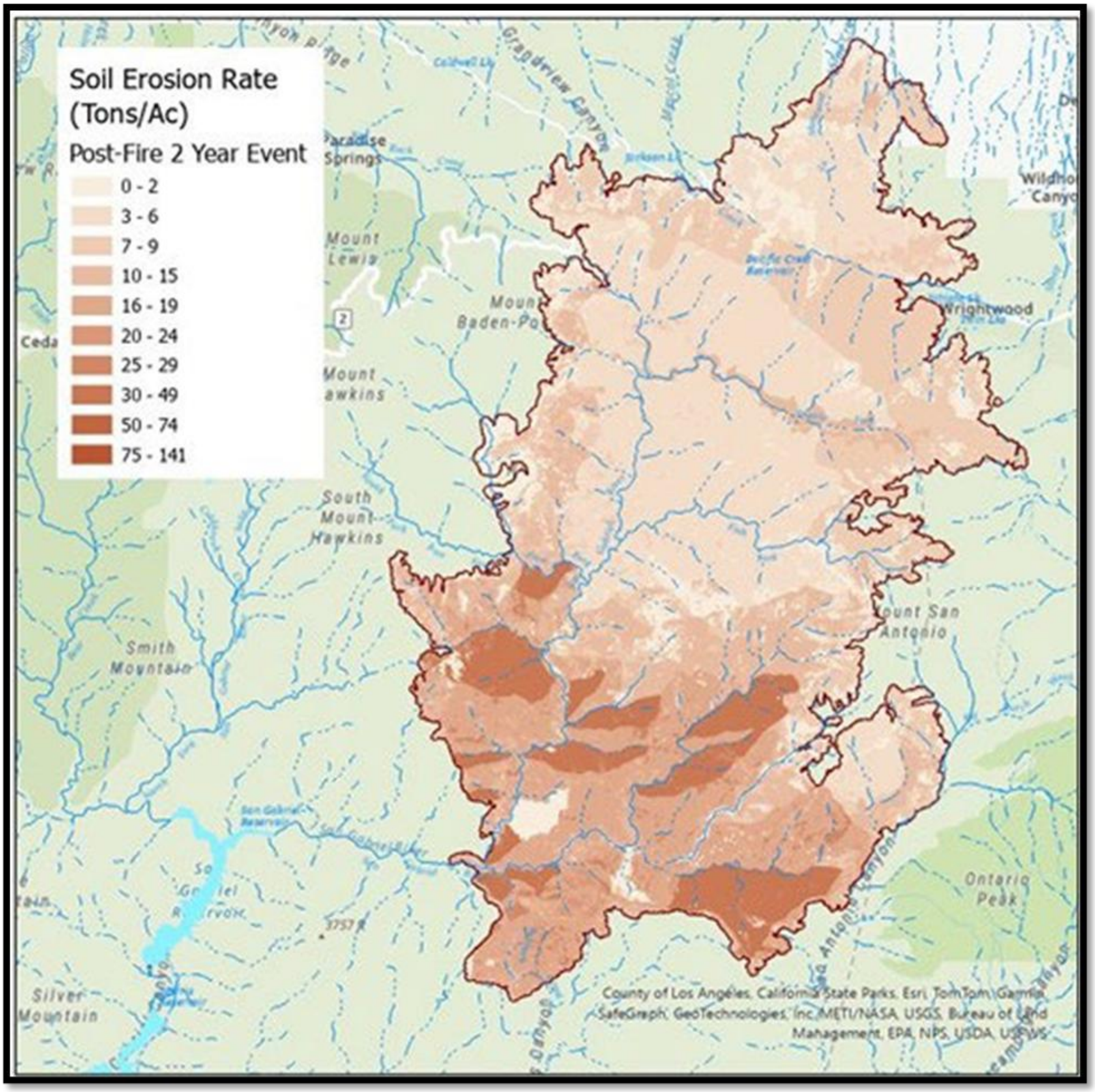


Figure 86. Bridge Fire Burn Area and Erosion Rate Map from the USFS BAER Report (USFS 2024)

Figure 87. Bridge Fire Fish Rescue Locations on the East Fork San Gabriel River and Cattle Canyon Creek. November 19 and December 11, 2024

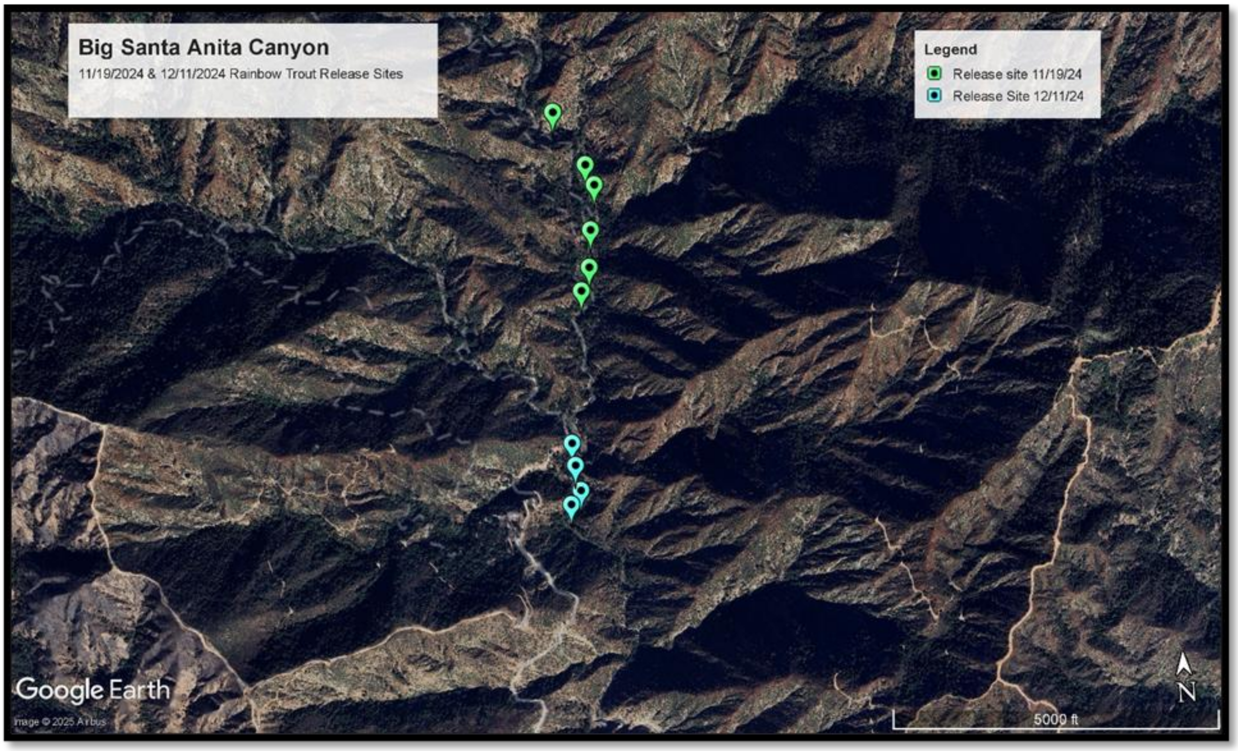


Figure 88. Bridge Fire Fish Rescue Trout Release Locations on Big Santa Anita Creek. November 11 and December 19, 2024

Table 40. Total Fish Rescued in EFSGR and Cattle Canyon Creek by species and rescue date.

Native Fish Species	Number of Fish Rescued (11/19)	Number of Fish Rescued (12/11)	Mortality	Total Fish by Species
Arroyo Chub	27	N/A	0	27
Santa Ana Speckled Dace	342	N/A	4	364
Santa Ana Sucker	41	N/A	0	41
Rainbow Trout	303	163	0	466
Total	713	163	4	880

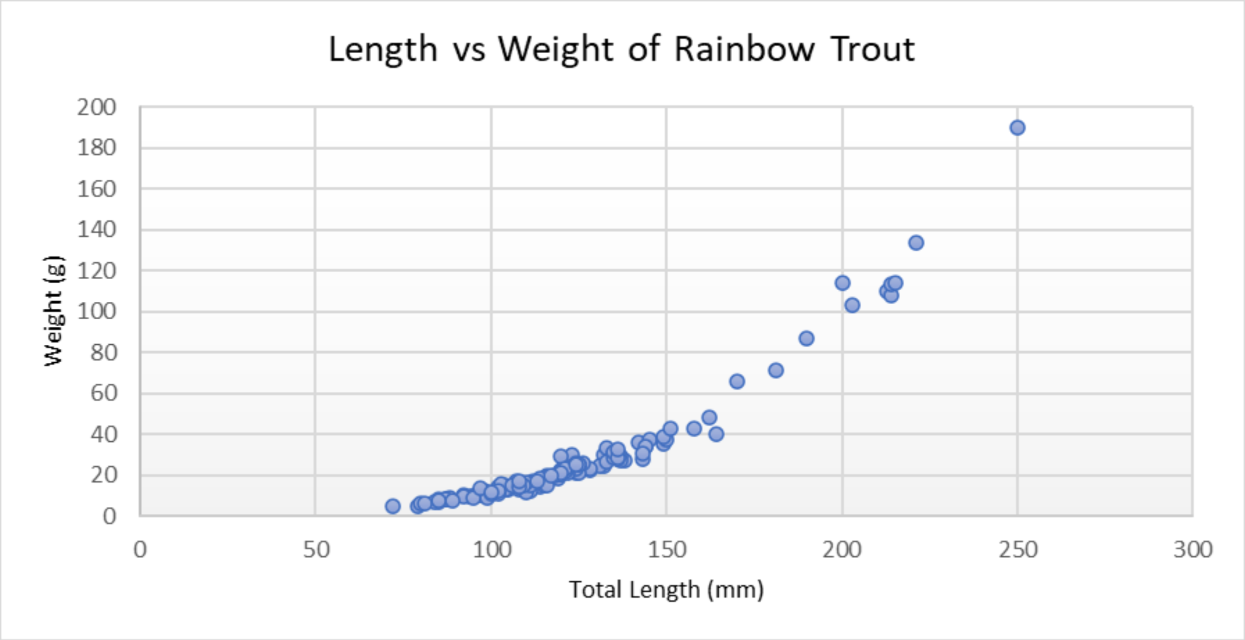


Figure 89. Length vs. weight of Rainbow Trout rescued in the East Fork San Gabriel River and Cattle Canyon Creek.

Figure 90. Photograph of Bridge Fire burn impacts along the East Fork San Gabriel River

Figure 91. Capturing fish in the East Fork San Gabriel River using backpack electrofishers.

Figure 92. Processing fish. Fish were sorted and counted by species. 134 of 466 Rainbow Trout were weighed and measured. All Rainbow Trout had their adipose fin clipped and 30 had tissue samples taken.

Discussion:

Translocating genetically valuable Rainbow Trout from the EFSGR to BSAC offers these fish a chance to thrive in a location with better water quality and spawning habitat. It will also allow recreational angling opportunities in BSAC that had been diminished by the Bobcat Fire. The long-term goal is to have the option to move fish back into the East Fork San Gabriel River once the fire damaged habitat has recovered.

Stream conditions in the EFSGR, Cattle Canyon Creek, BSAC, and WFSGR will continue to be monitored regularly by CDFW, as conditions permit. Follow-up snorkel surveys will be conducted in BSAC during the subsequent field season to monitor the translocated rainbow trout population. Due to the limited mobility of fish caused by the presence of check dams, the survey area will be restricted to the sections of BSAC between the check dams where the trout were released.

<u>Piru Creek, Ventura County</u>

Survey Dates: 2/15/2024, 3/21/2024, 4/23/2024, 5/1/2024, 5/15/2024, 5/30/2024, 6/11/2024, 8/23/2024, 9/18/2024, 9/24/2024, 10/24/2024

Overview:

Piru Creek, located approximately one hour north of Los Angeles (within Ventura and Los Angeles Counties), is a major tributary of the Santa Clara River. Piru Creek is generally divided into three sections; upper (upstream of Pyramid Lake), middle (downstream of Pyramid Lake and upstream of Lake Piru), and lower (downstream of Lake Piru to the Santa Clara River confluence).

Upper Piru Creek drains a watershed of approximately 198 square miles with its headwaters originating near Mount Pinos and San Guillermo Mountains at elevations ranging from 7000 to 8800 feet. Piru Creek then flows southeast for an estimated 39 miles and empties into Pyramid Lake. Upper Piru Creek is designated as a Heritage Trout Water.

Middle Piru Creek begins at the base of Pyramid Dam and flows approximately 18.25 miles before terminating in Piru Reservoir. Middle Piru Creek's hydrology is primarily regulated by dam release flows with exceptions occurring during winters of high rainfall. High flow events can occur anytime during the months of December through April in years of high rainfall. Two primary tributaries, Agua Blanca Creek and Fish Creek, will also contribute to Middle Piru Creek's hydrology during high rainfall events.

Objective:

Multiple surveys were conducted in 2024 by CDFW staff in the Piru Creek watershed area with the objective of documenting stream habitat conditions and aquatic fauna. The surveys focused on upper and middle Piru Creek covering the main stem of Piru Creek, as well as several of its tributaries including Buck Creek, Lockwood Creek, and Agua Blanca. More in depth surveys were planned to take place in upper Piru in 2024 but the Post Fire, which broke out on June 15, 2024, burned 15,563 acers partially overlapping and coincided with the survey area and dates. Due to this, the survey was canceled due to safety concerns.

Methods:

Fish and herpetofauna presence were determined by streambank observation as well as hook and line survey. Photographs and GPS points were taken at regular intervals to document the stream channel, riparian habitat, and potential fish migration barriers. Water quality was measured at designated sights using a YSI ProDSS water quality meter. Velocity was measured using the Global Water flow probe and then used to calculate discharge. For streambank observation and hook and line survey methods, see the Big Santa Anita Canyon methods section.

Results:

Piru and Buck Creeks

Two surveys were conducted by CDFW staff on April 23, and September 18, 2024, in the Piru and Buck Creek areas. In both surveys CDFW staff started by the Arizona crossing above Hardluck campground (34.69118°, -118.85140°). Staff then continued downstream Piru Creek 2.6 miles to the Piru/Buck Creek confluence before heading approximately 1 mile up Buck Creek. In the April 23rd survey, flow was recorded in both Piru and Buck Creeks. In both surveys water quality was measured in Piru Creek and a second time in Buck Creek. On the April 23 survey, Buck Creek was fished by 2 people for a combined total of 1.5 hours, catching 5 RBT equating to a CPUE of 3.3.

Figure 93. Map overview of Piru and Buck Creek surveys on 4/23/24 and 9/18/24.


Figure 94. Picture of rainbow trout caught in Buck Creek on 4/23/24


Figure 95. Representation of stream habitat along Buck Creek 4/23/24

Figure 96. Representative picture of burn from Post Fire along Piru Creek between Hardluck and Buck Creek

Table 41. Water quality and stream flow data from 4/23/24 & 9/18/24 Piru/Buck Creek surveys.

Location	Date	Water Temp (°C)	Discharge (ft^3/s)	DO (mg/L)	pH	Turbidity (NTU)
USGS Station	4/23/24	12.5	133	9.6	8.6	73.5
Buck Creek	4/23/24	11.7	13.8	9.8	8.6	0.3
Hardluck Crossing	9/18/24	15.9	5.5	9.4	8.6	0.6
Buck Creek	9/18/24	18.3	N/A	8.4	8.7	0.1

Lockwood Creek

Two reconnaissance surveys were conducted in Lockwood Creek by CDFW Staff on June 11 and September 24, 2024. Flow and water quality were taken by the 8N12 road crossing. 15 rainbow trout in the 4-8" size classes were observed across the two surveys in this area.

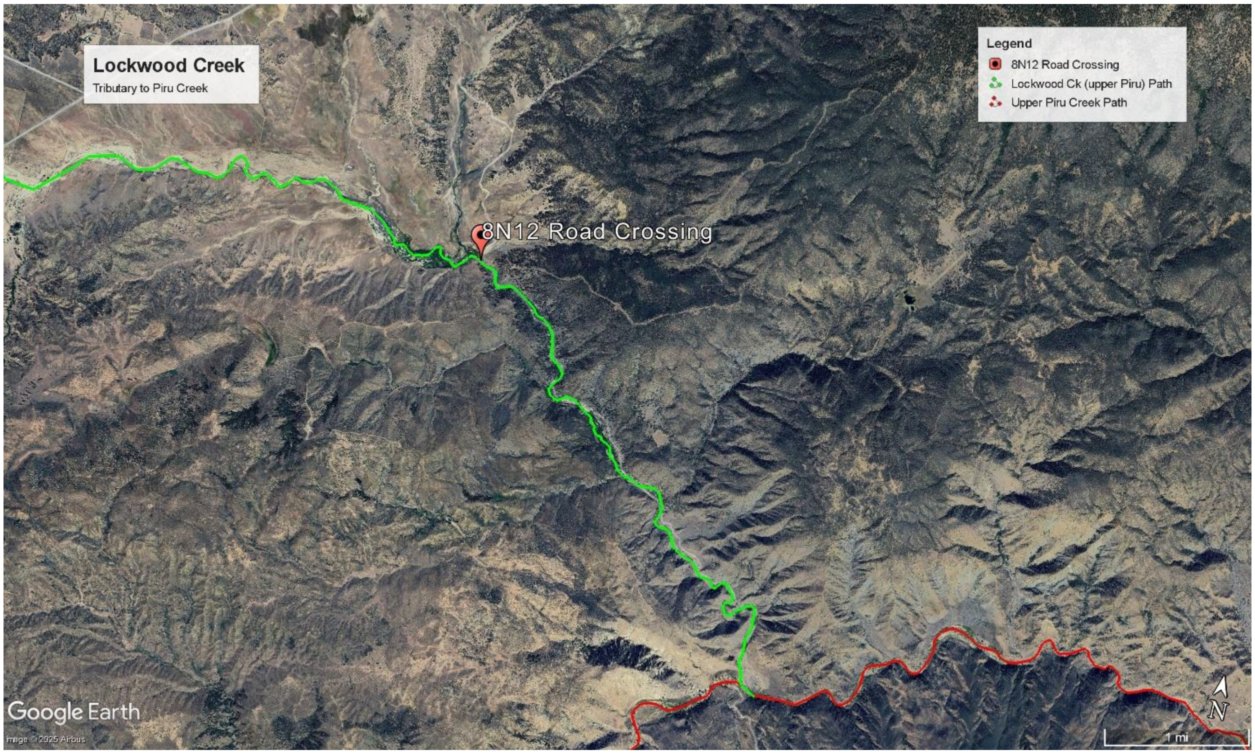


Figure 97. Map overview of Lockwood Creek

Table 42. Water quality and flow data at Lockwood

Location	Date	Water Temp (°C)	Discharge (ft^3/s)	DO (mg/L)	pH	Turbidity (NTU)
Lockwood	6/11/24	17.8	6.3	7.92	8.46	8.0
Lockwood	9/24/24	14.0	3.9	8.18	8.36	0.5

Middle Piru and Agua Blanca Creeks

Several reconnaissance surveys were conducted in Middle Piru throughout 2024 (February 15, March 21, May 1, August 23, and October 24). These surveys focused on the Frenchman's Flat area, the Wild and Scenic segment of Middle Piru (located downstream of Frenchman's Flat and upstream of Piru Lake), and Agua Blanca Creek. During these surveys, flow and water quality data were collected alongside observations of rainbow trout presence.

On August 8, 2024, CDFW staff surveyed the Wild and Scenic section of Middle Piru, beginning at the lower boundary of Frenchman's Flat and traversing 1.3 miles downstream. Habitat types were recorded, and over 106 rainbow trout were observed. On October 24, 2024, CDFW staff surveyed Agua Blanca Creek, starting at its confluence with Middle Piru and progressing 1.2 miles upstream. Approximately 30 rainbow trout were documented during this survey.

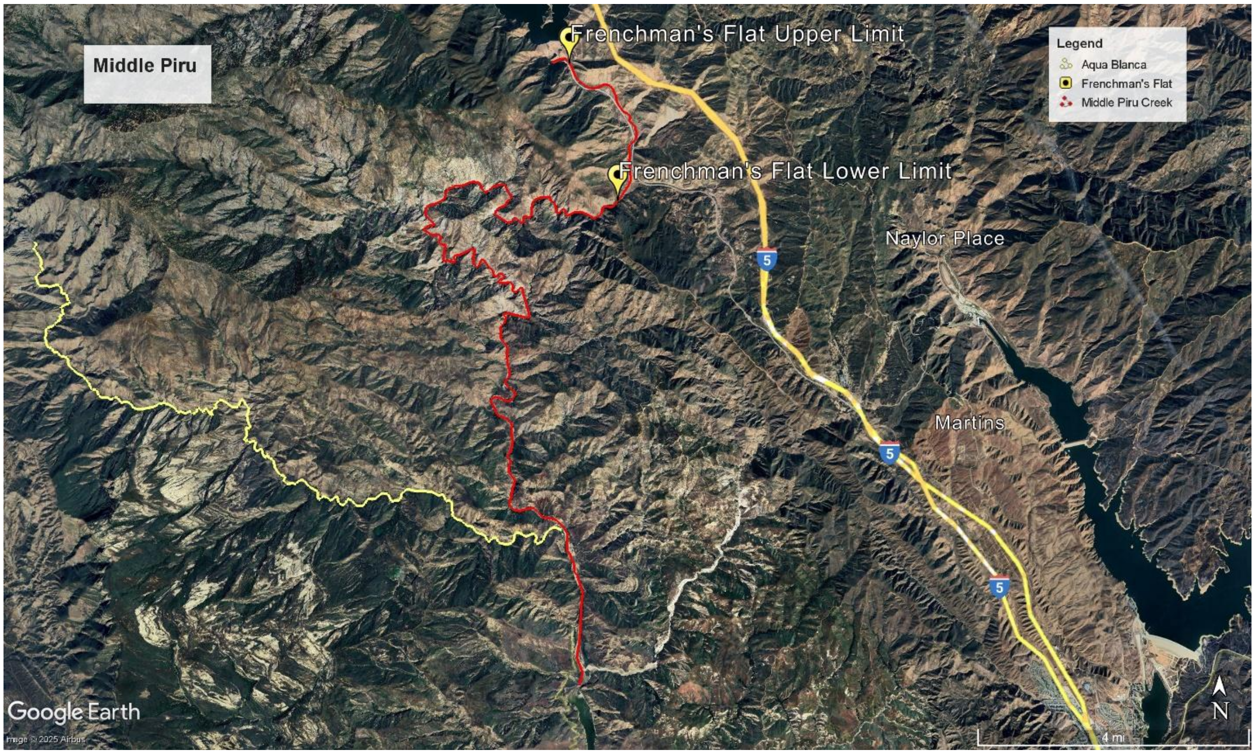


Figure 98. Map overview of middle Piru and Agua Blanca Creeks

Table 43. Water quality and flow data for middle Piru and Agua Blanca Creeks

Location	Date	Water Temp (°C)	Discharge (ft^3/s)	pH	Turbidity (NTU)
Frenchman's Flat	2/15/24	11.8	147.7	8.31	8.25

Location	Date	Water Temp (°C)	Discharge (ft^3/s)	pH	Turbidity (NTU)
Frenchman's Flat	3/21/24	11.4	132	8.24	2.6
Agua Blanca	3/21/24	16.2	n/a	8.77	0.9
Frenchman's Flat	5/1/24	12.1	190	8.32	1.28
Agua Blanca	10/24/24	16.8	1.94	8.59	0.3

Figure 99 Picture showing flow along middle Piru (Frenchman's Flat area) 3/21/24

Figure 100 Example of pool habitat seen along Agua Blanca Creek 10/24/24

Figure 101. Representative of habitat seen along middle Piru (wild and scenic section) 8/23/24

Discussion:

Similar to 2023, Piru Creek and its tributaries saw above average precipitation and flows in 2024. These increased flows once again caused Piru and its tributaries to stay wet year-round.

<u>San Antonio, Los Angeles County</u>

Survey Dates: 8/8/2024, 8/15/2024

Overview:

San Antonio is a tributary to the Santa Ana River, beginning at the headwaters by San Antonio Falls. The stream flows south for 8.6 miles past three Southern California Edison water diversions until reaching San Antonio Dam. San Antonio has historically supported a large population of rainbow trout (*Oncorhynchus mykiss*) as well as containing Brown Trout (*Salmo trutta*) and is an important wild trout fishery.

A monsoonal event in August of 2014 resulted in a significant increase in sediment entering the stream causing an immediate and sharp decline of the trout population. Studies conducted by the California Department of Fish and Wildlife (CDFW) in the following year, 2017, and 2019 found that the trout numbers stayed low, and the stream was in a slow recovery phase. In 2022 habitat and population studies conducted by CDFW found that the habitat and rainbow trout population had recovered significantly and was closer to that which was seen before the monsoonal event in 2014. However, in the following year, 2023, similar surveys showed a drop in estimated trout population after significant flows swept through the system during a higher-than-average rain year.

Objective:

In 2024, direct observation surveys were conducted in the lower reaches of San Antonio using the habitat data gathered in 2023. The purpose of these surveys was to reassess the trout population as the estimated population numbers in 2023 was lower that what would have been expected when looking at the quality of the habitat.

Methods:

Direct observation snorkel survey methods utilized as described in the Arroyo Seco survey methods section.

Results:

Thirteen sites were surveyed via direct observation (snorkel) in San Antonio Creek, resulting in a total of 1892.7 ft snorkeled. All surveyed habitat units were classified as either riffle (5), flatwater (3), or pool (5) sections and were reassessed from the 2023 habitat survey data to record any shifts in habitat typing. It was found that several of the units surveyed that were once entirely a single habitat type in 2023 now contain several different habitat types within that unit. Despite this change, the total combined length of each habitat unit is still assumed to be representative of the total percentage of each habitat type found throughout San Antonio Creek, as it can also be assumed that similar changes occurred throughout the creek. The 2024 total habitat composition of the 13 surveyed sites was 59.5% riffle habitat, 20.8% pool habitat, and 19.7% flatwater habitat.

The average wetted width of the units surveyed ranged from 9.5 to 24.6 ft, with an overall average from all sections of 16.3 ft. Average depths ranged from 0.5 to 2.1 ft, with an overall average from all sections of 1.0 ft.

A total of 674 rainbow trout were observed, resulting in an estimated density of 1881 fish per mile. Rainbow trout were classified by size as 0-2.9 inches, 3-5.9 inches, 6-8.9 inches, 9-11.9 inches, and 12+ inches. No other fish species were observed during this survey.

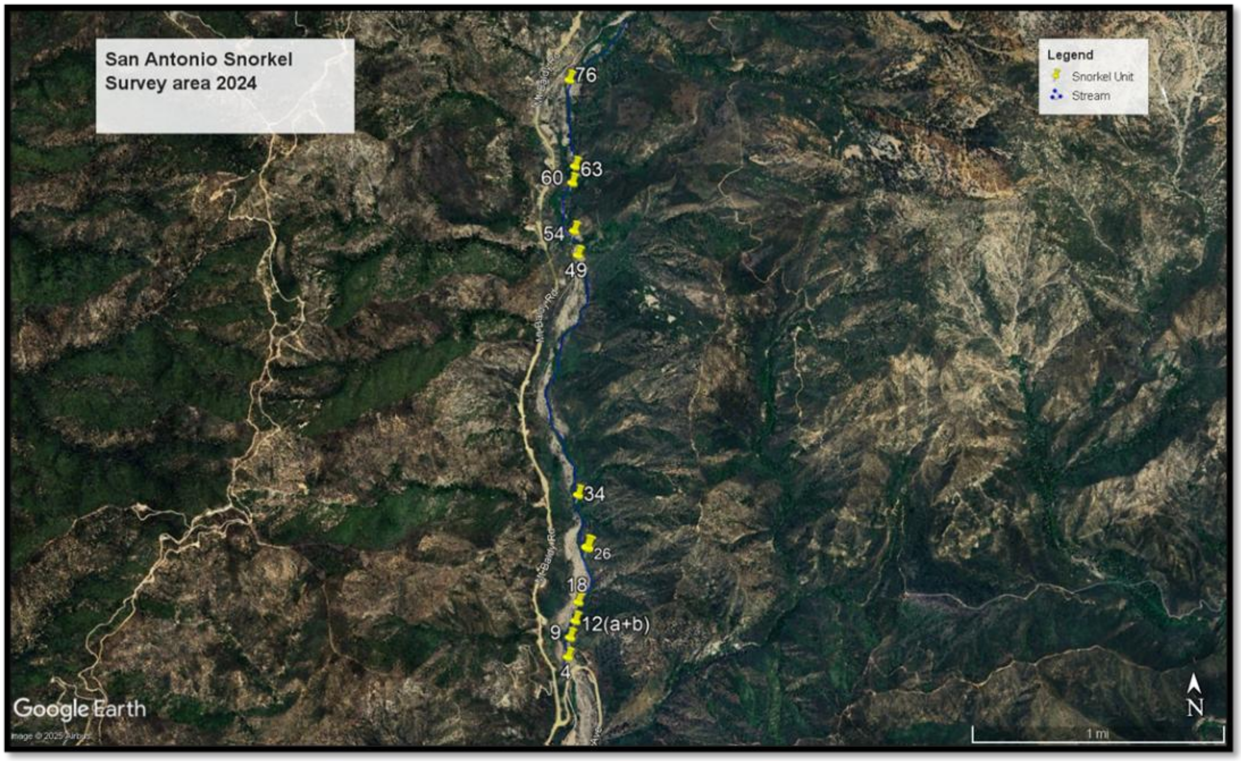


Figure 102. Overview of surveyed San Antonio snorkel sites (13) over 3.0 miles

Table 44. 2024 San Antonio Creek habitat assessment for the 13 snorkeled sections

Section #	Start GPS	Habitat Type(s)	Section Length (ft)	Average Width (ft)	Average Depth (ft)	Max Depth (ft)
4	34.17896°, -117.67590°	Riffle, Pool	155.9	16	0.9	3.2
9	34.17951°, -117.67575°	Flatwater	61	24.6	1	2.1
12 (a)	34.18049°, -117.67556°	Step Pool, Riffle	200	17.9	0.8	2
12 (b)	34.18061°, -117.67550°	Riffle	153	21	0.4	2.3
18	34.18152°, -117.67508°	Pool	18	20.2	2.1	3.7
26	34.18453°, -117.67439°	Riffle	120	13	0.6	2
34	34.18765°, -117.67489°	Riffle, Pool, Flatwater	380	16.3	0.7	2

Section #	Start GPS	Habitat Type(s)	Section Length (ft)	Average Width (ft)	Average Depth (ft)	Max Depth (ft)
49	34.20139°, -117.67439°	Pool, Flatwater	56.5	9.8	1.2	3.5
53	34.20272°, -117.67464°	Pool	29	17.7	1.7	3.4
54	34.20272°, -117.67485°	Flatwater	44	12.7	1.2	2.4
60	34.20554°, -117.67476°	Flatwater	39	9.5	1.1	2.3
63	34.20642°, -117.67437°	Riffle, Pool, Flatwater	597	20.4	0.5	2.8
76	34.21111°, -117.67465°	Pool	12.7	1.1	3.5	12.7

Table 45. 2024 San Antonio snorkel survey data

Section #	Habitat Type	Habitat Length (ft)	RBT 0-2.9"	RBT 3-5.9"	RBT 6-8.9"	RBT 9-11.9"	RBT 12+"	Totals	Estimated RBT Density (fish/mile)
4	Riffle, Pool	155.9	4	20	8	2	0	34	N/A
9	Flatwater	61	6	22	1	0	0	29	N/A
12 (a)	Step Pool, Riffle	200	5	21	2	0	0	28	N/A
12 (b)	Riffle	153	8	15	2	0	0	25	N/A
18	Pool	18	0	18	3	1	2	24	N/A
26	Riffle	120	0	13	6	2	0	21	N/A
34	Riffle, Pool, Flatwater	380	4	51	57	11	5	128	N/A
49	Pool, Flatwater	56.5	14	11	16	5	0	46	N/A
53	Pool	29	5	9	3	5	3	25	N/A

Section #	Habitat Type	Habitat Length (ft)	RBT 0-2.9"	RBT 3-5.9"	RBT 6-8.9"	RBT 9-11.9"	RBT 12+"	Totals	Estimated RBT Density (fish/mile)
54	Flatwater	44	4	6	4	7	1	22	N/A
60	Flatwater	39	0	21	9	2	1	33	N/A
63	Riffle, Pool, Flatwater	597	18	140	51	8	8	225	N/A
76	Pool	12.7	5	23	5	1	0	34	N/A
Total	**n/a**	**1892.7**	**73**	**370**	**167**	**44**	**20**	**674**	**1881**

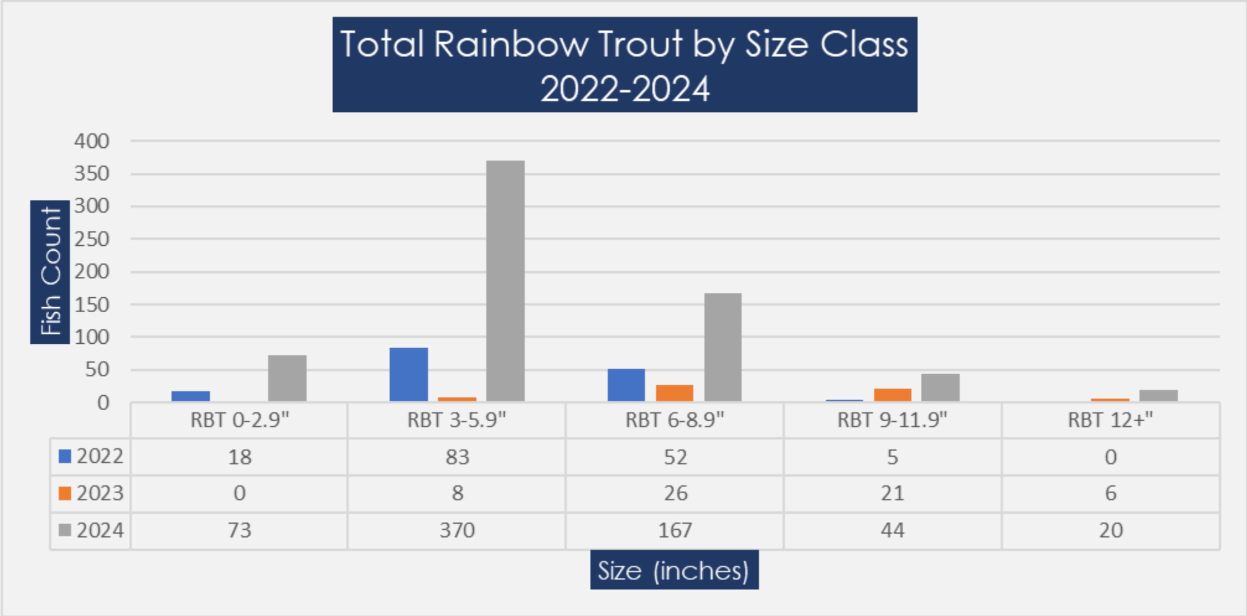


Figure 103. Total number of rainbow trout observed in 2024 compared to rainbow trout observed in 2021 and 2022

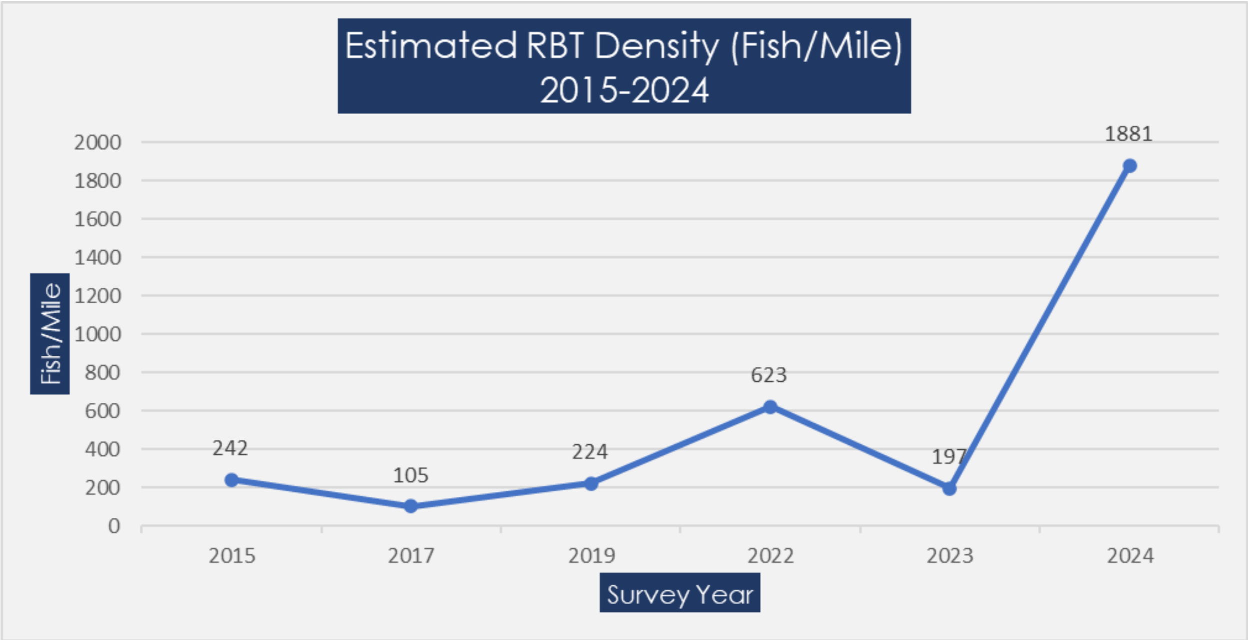


Figure 104. Estimated rainbow trout density in San Antonio from 2015 to 2024

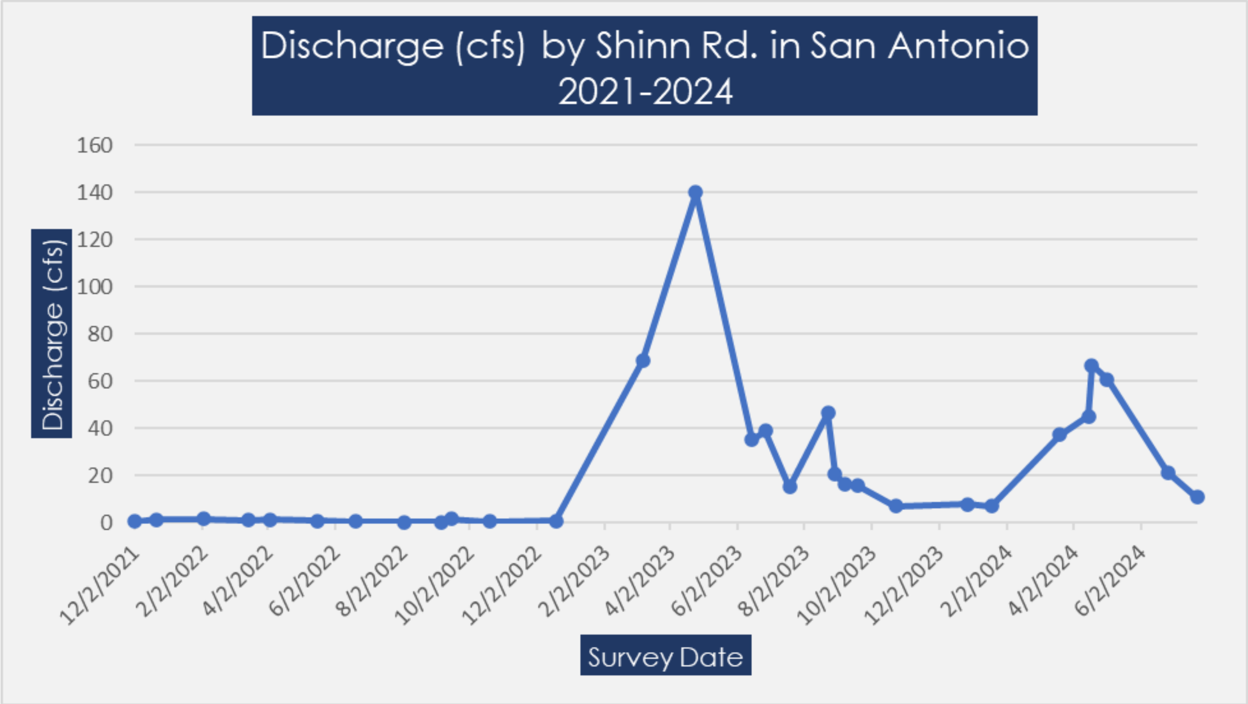


Figure 105. Flow data (cfs) for lower San Antonio from the end of 2021 through the middle of 2024


Figure 106. Representative habitat (riffle) along San Antonio Creek

Discussion:

In the 2024 snorkel survey, 674 RBT were observed—an approximately elevenfold increase compared to the 2023 survey. Extrapolation of this data suggests an estimated 1,881 RBT per stream mile, indicating a robust and thriving population in San Antonio Creek. This estimated density surpasses the pre-2014 monsoon levels, where RBT density ranged between 725 and 981 fish per mile, and is significantly higher than the 2023 estimate of 197 fish per mile. The 2023 water year saw above-average precipitation, resulting in sustained high-flow events that may have disrupted spawning habitats and displaced a portion of the RBT population downstream, contributing to lower observed numbers that year. Despite these adverse effects, the increased flows in 2023 likely scoured the system of residual silt from low flow conditions in previous years, improving overall habitat quality. Coupled with stable, moderate flows and favorable thermal conditions throughout 2024, these factors may have enhanced spawning habitat and contributed to the notable population increase observed during the survey.

Comparing habitat typing changes from the 13 surveyed snorkel sites between 2023 and 2024 reveals increased habitat complexity in 2024. Sites in 2024 often featured multiple habitat units within the same stretch, whereas in 2023, they contained only a single habitat type. Riffle habitat decreased from 86.1% in 2023 to 59.5% in 2024, while pool habitat increased from 8.9% to 20.8%, and flatwater habitat rose from 5.0% to 19.7%.

RBT of all size classes were observed during the 2024 survey. The presence of young-of-year (YOY) individuals and RBT under 2.9 inches indicates successful reproduction within the population. In 2024, the majority of RBT observed were in the 3.0–5.9-inch size class, marking a shift from 2023, when most RBT were in the 6.0–8.9-inch range or larger. This shift is likely attributable to high flows in 2023, which displaced smaller fish and disrupted spawning. Notably, more RBT were observed in every size class in 2024 compared to 2023. The size class distribution data suggests successful recruitment across all size classes.

The South Coast Region of California Department of Fish and Wildlife recommends continued monitoring of the San Antonio Creek rainbow trout population to document changes in abundance over time. It is further recommended that habitat data be regularly updated during future surveys, as the snorkeled sections in 2024 exhibited significant changes in habitat complexity. While current water availability has improved and drought conditions have decreased, fluctuations in drought conditions are anticipated in the coming years. Therefore, maintaining the frequency of survey techniques and locations is advised to ensure effective tracking of population and habitat dynamics in response to variable environmental conditions.

Inland Deserts Region

Population Management and Planning

Bear Creek (San Bernardino County)

Date Approved: NA

Summary:

Bear Creek is a second order stream located in the USFS San Bernardino National Forest northeast of Los Angeles. The stream originates from Bear Valley dam at an elevation of approximately 6,660 feet. It flows 8.75 miles in a southerly direction through a steep, narrow canyon and in its lower portion, down a broad sandy wash to its confluence with the Santa Ana River at an elevation of 3,460 feet. With a watershed of about 9,000 acres, the stream is considered a major tributary to the Santa Ana River. The lower end of Bear Creek is accessible by road, and the middle and upper reaches are accessible by trail. There are no established access routes, however, that parallel the stream for recreators and anglers.

The Department designated the entire length of Bear Creek from Bear Valley Dam to its confluence with the Santa Ana River (8.75 miles) as a Wild Trout Water in 1989. Bear Creek is considered to be an excellent wild trout fishery which has exceptional value due to its proximity to the state's largest metropolitan area. Studies have shown that trout production and angling opportunities offered by this stream are comparable to other designated semi—remote streams. Fishing is considered the primary recreational activity along Bear Creek.

Bear Creek supports wild populations of rainbow trout *(Oncorhynchus mykiss)* and Brown Trout *(Salmo trutta)*. CDFW conducted a population assessment to provide an update to Addendum No 1 to the Bear Creek Wild Trout Management Plan (Deinstadt et al 1993) that followed the first Bear Creek Wild Trout Management Plan (Hoover and Deinstadt 1989). The monitoring sites oriented from upstream to downstream were; Glory Ridge (shown as Section 2, green dots on Figure 107), Siberia Creek (shown as Section 1, blue dots on Figure 107), Slide Creek (shown as Section 6, red dots on Figure 107), and near the Santa Ana River Confluence (shown as Section 3, orange dots on Figure 107). Data was collected via multi-pass depletion electrofishing surveys.

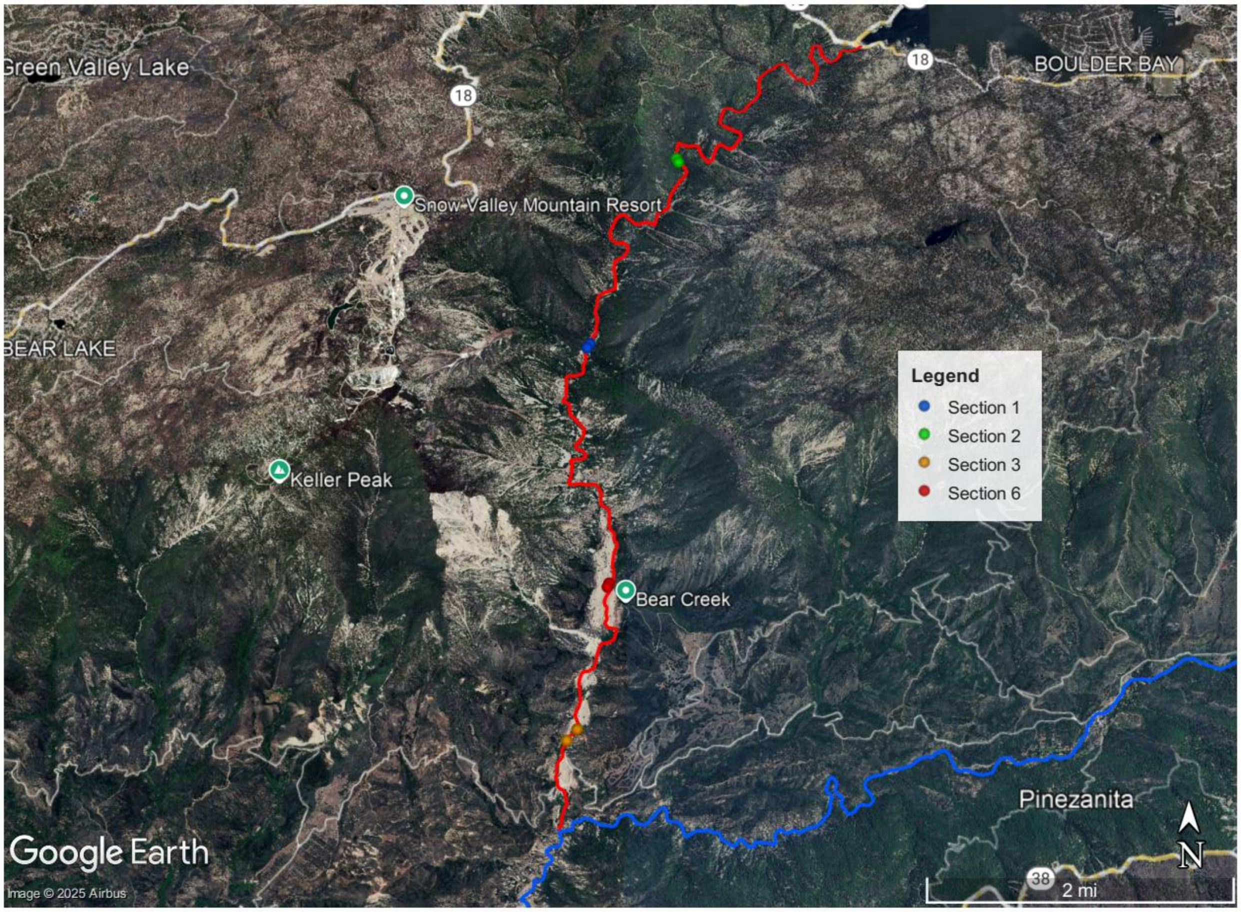


Figure 107. Map of 2024 electrofishing locations on Bear Creek (red line represents Bear Creek Wild Trout-designated area; blue line represents Santa Ana River).

In 1986 three surveys were completed in Bear Creek. One occurred near Glory Ridge Trail off California State Highway 18 and the two remaining surveys occurred near Slide Creek off 1N09. In 1987 four surveys were completed. Two surveys occurred at Glory Ridge, 1 at Slide Creek, and 1 survey near the Santa Ana River Confluence (Hoover and Deinstadt 1989).

For the Addendum, summary data includes the 1987 surveys but used only one of two sampled sections near Glory Ridge and the survey near Slide Creek while omitting their completed survey near the Santa Ana River (Deinstadt et al 1993). Summary data also includes data from four surveys conducted in 1988-1989, two surveys conducted in 1990 (Deinstadt et al 1993), and four surveys conducted at Glory Ridge and Slide Creek in 1992 (Deinstadt 1992). Additional data included in this summary was collected in 1993-2024 and includes four surveys conducted at Glory Ridge and Slide Creek in 1993 (Deinstadt 1993), six surveys at Glory Ridge, Slide Creek and near the Santa Ana River in 1995, and four surveys at

Glory Ridge and Slide Creek in 1999. For the 1999 analysis, this summary does not include the data from the fifth survey near the Santa Ana River because it was not representative of the historical location. The analysis also includes data from three surveys at Glory Ridge and Slide Creek in 2008 (Weaver and Mehalick 2008) and four surveys at Glory Ridge, Siberia Creek off CA-18, Slide Creek, and near the Santa Ana River in 2024 (Hemmert 2025).

An angler survey was conducted in 2024 by CDFW staff near the confluence of Santa Ana River and Bear Creek (Figure 107). Eleven anglers fished and produced a Catch Per Unit Effort (CPUE) of 0.35 fish/hour. The angler survey boxes for all of Bear Creek in 2023 had 54 anglers who produced a CPUE of 0.72 fish/hour. The 2024 results may reflect the lower angling ability of our staff with approximately half of the group having no previous experience of fly fishing while the anglers submitting forms to the angler survey boxes are likely experienced anglers. In 2024, staff mostly captured rainbow trout (94%) and few Brown Trout (6%). Approximately 25% of these fish measured 6-7.9 inches, 38% measured 8-9.9 inches, and 31% measured 10-11.9 inches total length (TL). For 2023, 70% of all captured fish were rainbow trout and 30% were Brown Trout. Approximately 24% of these fish measured 6-7.9 inches, 33% measured 8-9.9 inches, 18% measured 10-11.9 inches, 3% measured 12-13.9 inches and 1% measured 14+ inches TL. Fishing in Bear Creek is excellent with plenty of 8-10 inch fish readily taking both dry and wet flies.

Density estimates for both rainbow trout and Brown Trout were calculated for each section sampled using an unknown statistical program for 1986-1993. Population estimates for each survey after 1995 were calculated using MicroFish (Van Deventer and Platts, 1985). Table 46 shows the calculated trout densities. Microfish estimates the population of each section using a maximum-likelihood estimator and multiple pass depletion data. The population estimate for each survey is then divided by the total length of the surveyed section converted to miles to get trout per mile. This was done for both rainbow trout and Brown Trout.

Across all years, the estimated number of fish/mile at each section sampled fluctuated significantly (Table 46). In the upper elevation site near Glory Ridge, Brown Trout were the only sampled species. The survey near Siberia Creek produced more Brown Trout than rainbow trout in 2024. The surveys near Slide Creek revealed Brown Trout were more abundant than rainbow trout for all years, except 2008. The site near the Santa Ana River had the greatest number of rainbow trout sampled during all surveys.

Table 46. Summary of trout population data from Bear Creek electrofishing surveys from 1986-2024.

Year	Section Length (ft)	Total # rainbow trout captured	Total # Brown Trout captured	Estimated Rainbow Trout Density (fish/mile)	Estimated Brown Trout Density (fish/mile)
1986	NA	NA	NA	0	1,261
1986	NA	NA	NA	401	380
1986	NA	NA	NA	115	548
1987	115	0	47	0	2,204
1987	227	8	340	163	8,676
1988	115	0	52	0	2,709
1988	225	18	215	424	5,500
1988	155	0	51	0	1,782
1988	227	14	233	328	5,934
1989	126	0	51	0	2,137
1989	227	30	189	727	4,602
1989	155	0	59	0	2,077
1989	227	15	208	402	5,191
1990	155	0	42	0	1,567
1990	227	11	222	298	5,521
1992	133	0	43	0	1,707
1992	225	21	215	469	5,420
1992	150	0	84	0	3,062
1992	240	5	159	132	3,740

Year	Section Length (ft)	Total # rainbow trout captured	Total # Brown Trout captured	Estimated Rainbow Trout Density (fish/mile)	Estimated Brown Trout Density (fish/mile)
1993	135	0	42	0	1,642
1993	251	13	124	252	2,671
1993	172	0	62	0	1,903
1993	227	3	85	23	2,139
1995	140	0	27	0	1,018
1995	314	8	85	134	1,496
1995	166	0	51	0	1,622
1995	220	6	51	144	1,296
1995	148	1	21	35	749
1995	135	2	14	78	547
1999	137	0	51	0	2,004
1999	400	6	125	79	1,795
1999	170	0	53	0	2,329
1999	225	6	89	141	2,300
2008	135	0	33	0	1,330
2008	238	85	62	2,551	1,398
2008	200	68	49	2,086	1,769
2024	169	0	88	0	3,031
2024	358	48	72	841	2,183
2024	635	271	39	3,002	358

Table 47. Average population estimates (total trout/mile) from 1987-2024 in Bear Creek. Note this includes both rainbow and Brown Trout.

Survey Year	Estimated density (total trout/mile)
1987	5,522
1988	4,169
1989	3,784
1990	3,693
1992	3,632
1993	2,158
1995	1,187
1999	2,162
2008	3,062
2024	3,138
Average	3,251

Average trout estimated densities were calculated by adding trout densities of rainbow trout and Brown Trout from each survey (Table 46) to get total trout densities, then total trout densities for all sections sampled were averaged to get a fish/mile for each respective year. Then, each of these yearly averages were combined and averaged to obtain an overall average for all years surveyed from 1987-2024 (Table 47)

The average trout population estimate for all years was 3,251 (range 1,187-5,522) total trout per mile (Table 47).

In 2024, the survey near Siberia Creek had an unsuccessful depletion from Pass 1-2 for Brown Trout and so failed to generate a population estimate. This survey was completely removed from the 2024 overall population estimate. Instead of having four depletion surveys with population data, only three were included in this analysis.

Bear Creek is a productive wild trout stream. Brown Trout dominate the fishery at the higher elevations while rainbow trout become more numerous at the lowest elevation. Bear Creek has many similarities to other southern California streams facing impacts from climate change, forest fires, and periods of extended drought.

The population estimate analysis of this report provides the Department's conclusion that stream conditions and fishing are good in Bear Creek. There are multiple access points that can be difficult to get to, limiting fishing to those capable of driving the rough roads or hiking the miles and elevation, which make the fishing even better for the wild trout. The trout fishery has been able to provide the high standard of angling opportunities for both rainbow trout and Brown Trout within the forest that is in close proximity to many metropolitan areas in Southern California. The Management goals for Bear Creek are stated together with Department programs and policies to protect, maintain and enhance (1) stream habitat, (2) self-sustaining trout populations, and (3) streamside environment. A schedule for implementing these programs goals is considered necessary to manage the resource, and recommendations are included for trout population monitoring, including additional tasks such as habitat typing, snorkel surveys, and continued electrofishing surveys.

<u>Mill Creek, Mono County translocation to Big Den Creek, NV</u>

Date Approved: NA

Summary:

Mill Creek in Mono County, CA contains the most abundant population of Walker-strain Lahontan Cutthroat Trout (*Oncorhynchus henshawi*, "LCT"). Big Den Creek is a small desert creek in Nevada, whose habitat is now recovered from a wildfire that resulted in the creek becoming fishless. The Nevada Department of Wildlife (NDOW) determined the habitat sufficient to host a refuge population of Walker Basin LCT. To establish this new population of LCT, NDOW and CDFW collaborated to translocate LCT from Mill Creek to Big Den Creek.

On October 8th, staff from CDFW and NDOW backpack electrofished Mill Creek to collect LCT for translocation at the end of Mill Creek Road, coordinates 38.4344° -119.4843°. NDOW translocated the captured LCT, following standard procedures, to Big Den Creek later that day. NDOW staff recorded length and weight measurements from all translocated fish. Body condition (K-factor) was calculated using Fulton's condition factor: $K = (100{,}000\ x\ weight)/length^3$.

Staff captured a total of 41 LCT from Mill Creek, ranging from 65-170mm in fork length; an estimated 10 additional LCT were captured but not measured. All LCT were captured within a 700m survey stretch. The translocated LCT averaged 105mm in fork length and 0.98 in K-factor (Table 48). All individuals survived translocation and were energetic when released into Big Den Creek.

This collaboration between CDFW and NDOW made it possible to establish a second population of Walker Basin LCT in Nevada. Redundancy and geographic diversity are incredibly important for strengthening refuge populations against the impact of stochastic events. The distance of Big Den Creek from other LCT refuges is important to manage for the continued existence of Walker Basin LCT.

Future translocations are recommended from either a different area along Mill Creek or a different LCT population to increase genetic diversity and success of the established Big Den Creek population. It is likely that translocated individuals were related since all LCT came from one location of Mill Creek.

Table 48. Length, weight, and condition of translocated Mill Creek LCT.

Fork length (mm)	Weight (g)	K-factor
151	43.9	1.28
164	45.4	1.03
146	29.8	0.96
73	2.8	0.73
76	4.3	0.97
144	28.4	0.95
122	17.0	0.94
75	4.3	1.01
73	4.3	1.09
65	2.8	1.03
73	4.3	1.09

Fork length (mm)	Weight (g)	K-factor
110	14.2	1.06
129	21.3	0.99
87	5.7	0.86
122	18.4	1.01
120	15.6	0.90
86	5.7	0.89
80	5.7	1.11
73	4.3	1.09
80	5.7	1.11
155	34.0	0.91
170	41.1	0.84
158	36.9	0.93
167	41.1	0.88
156	41.1	1.08
121	17.0	0.96
85	5.7	0.92
84	5.7	0.96
85	5.7	0.92
74	4.3	1.05
74	4.3	1.05
75	4.3	1.01
115	15.6	1.03

Fork length (mm)	Weight (g)	K-factor
152	25.5	0.73
115	14.2	0.93
84	5.7	0.96
114	12.8	0.86
73	4.3	1.09
72	4.3	1.14
74	2.8	0.70
71	4.3	1.19

Resource Assessment and Fishery Monitoring

Plunge Creek, San Bernardino County

Survey Date: January 10, 2024

Overview:

This report describes an electrofishing survey of Plunge Creek. On January 10, 2024, California Department of Fish and Wildlife (CDFW) conducted a single-pass electrofishing survey. Located in the San Bernardino National Forest, 17 miles east of the city of San Bernardino, Plunge Creek is fed by the tributaries of Little Mill and Fredalba creeks. Fredalba Creek flows into Little Mill Creek, and Little Mill Creek confluences into Plunge Creek (Figure 108). Plunge Creek is a tributary that was historically connected to the Santa Ana River located to the south that has a watershed of 2,650 square miles (6,900 km^2). Currently, Plunge Creek is diverted into the North Fork Canal of the local water district. There is likely one or more population(s) of native Santa Ana Speckled Dace (*Rhinichthys osculus ssp.*) within this drainage, including in this creek.

Plunge Creek is part of the San Bernardino National Forest and was accessed by roadways of the local water district. Plunge Creek was evaluated for trout presence/absence. Genetic samples of rainbow trout would be taken if fish were present. No previous surveys have been conducted in this section of Plunge Creek.

Objective:

Conduct an electrofishing survey and take genetic samples of rainbow trout from Plunge Creek.

Methods:

The survey consisted of single pass electrofishing, measuring and weighing captured fish, and collecting fin clips. Four staff and three partner agency staff participated in the one-day survey, and all used electrofishing equipment in one group. One staff member handled the electroshocking backpack unit, three people netted stunned fish, one person handled an aerated fish backpack for trout, and one person handled an aerated bucket for native fish (Figure 109). The backpack electrofishing unit was set at 125-250V, 25Hz, 25% duty cycle. Captured fish were identified to species and measured for total and fork lengths (millimeters) (Figure 109) and weighed to the nearest gram. Measured trout were returned to the stream and fin clips were taken from the caudal fin (Figure 109).

The survey section’s starting and end points are described by nearby points of interest, such as a stream confluence, place, mountain peak, or road crossing. Plunge Creek was electrofished above its confluence with North Fork Canal, and the survey moved upstream in a northerly direction. One habitat unit was electrofished in Plunge Creek (Figure 108). Figure 109 shows examples of riffle, run, cascade, and pool habitats looking upstream.

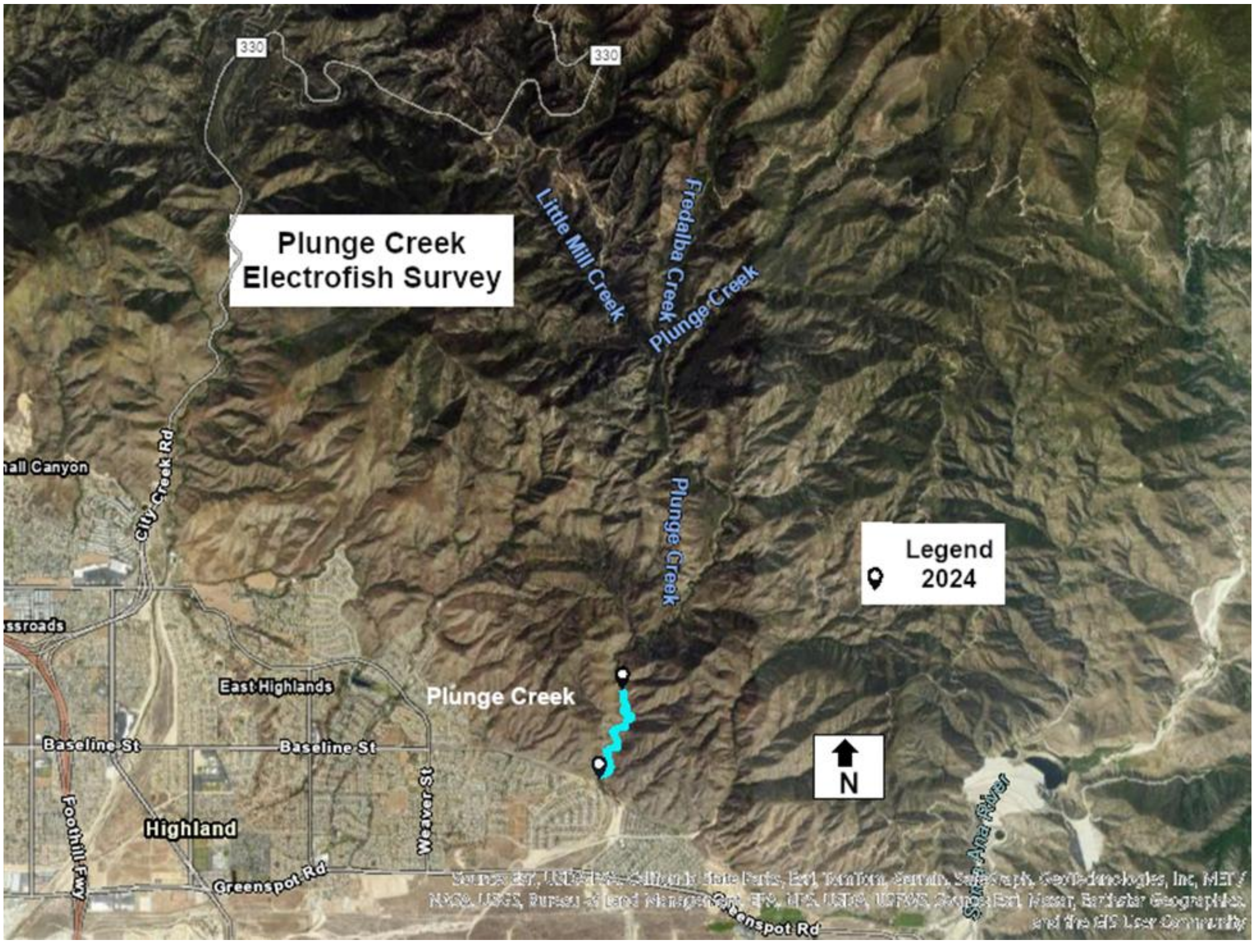


Figure 108. Map of 2024 electrofishing survey location on Plunge Creek. Credit – NAIP imagery ESRI.

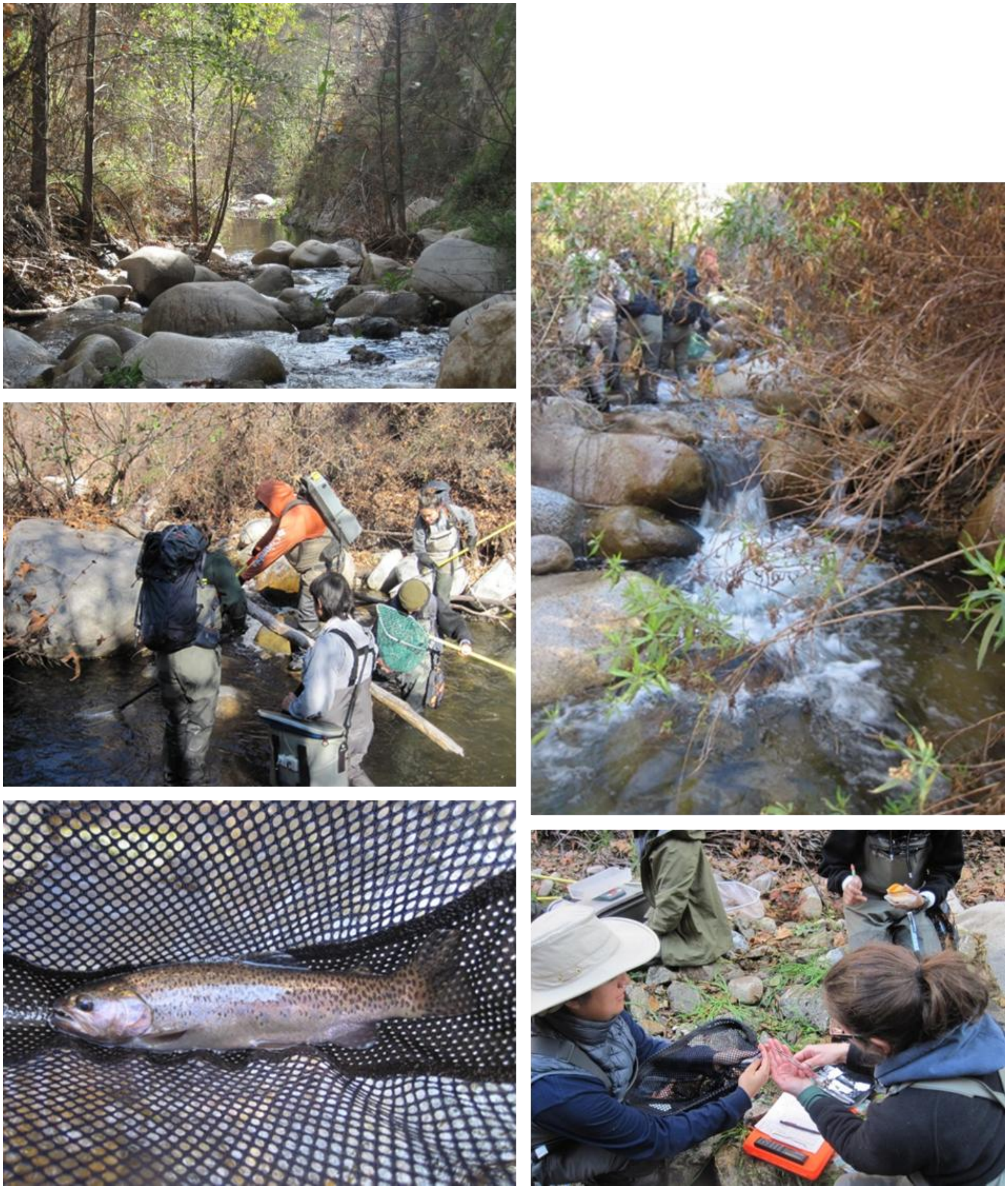


Figure 109. Site photos of riffle and run habitat and a cascade into a pool. Photos of the crew electrofishing, staff taking measurements and fin clips, and a rainbow trout.

Results:

The section surveyed contained rainbow trout throughout the sampled reach. Santa Ana Speckled Dace were collected, and this data was reported separately by the CDFW Native Fish Biologist. A total of 30 rainbow trout were collected, and the average size was 154 mm TL (range 105-269 mm, 4.1-10.6 inches) and 145 mm FL (range 98-250 mm, 3.9-9.8 inches).

Figure 110 shows the length frequency of rainbow trout collected in Plunge Creek. All of the rainbow trout collected were $\leq$ 10 inches FL, 67% were <5 inches FL, and 20% were 230-250 mm FL (9.0-9.8 inches) (Figure 110).

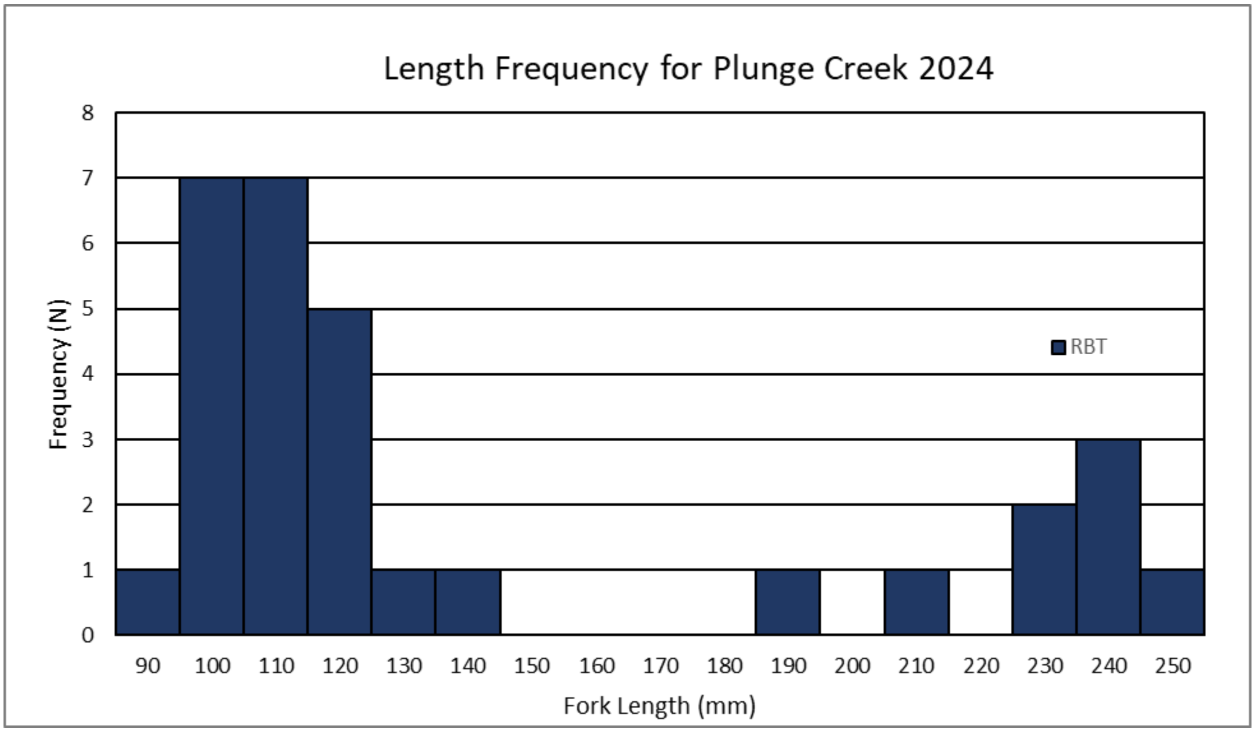


Figure 110. The length frequency plot of rainbow trout from Plunge Creek.

Figure 111 shows the relative weights (Wr) of rainbow trout from 2024. Wr describes variation in expected weights for a fish at a given length, and it indicates body condition of the fish. A Wr of 100 indicates a healthy specimen.

Relative weights are based on the TL and weights of rainbow trout $\geq$120 mm (Simpkins and Hubert 1996). Relative weight ranged from 78-109 in 2024, while the average Wr is 93. Five of thirty measured rainbow trout (17%) have Wr $\geq$100. A scatter plot of Wr (Figure 111) indicates a decrease in condition as rainbow trout reach larger sizes.

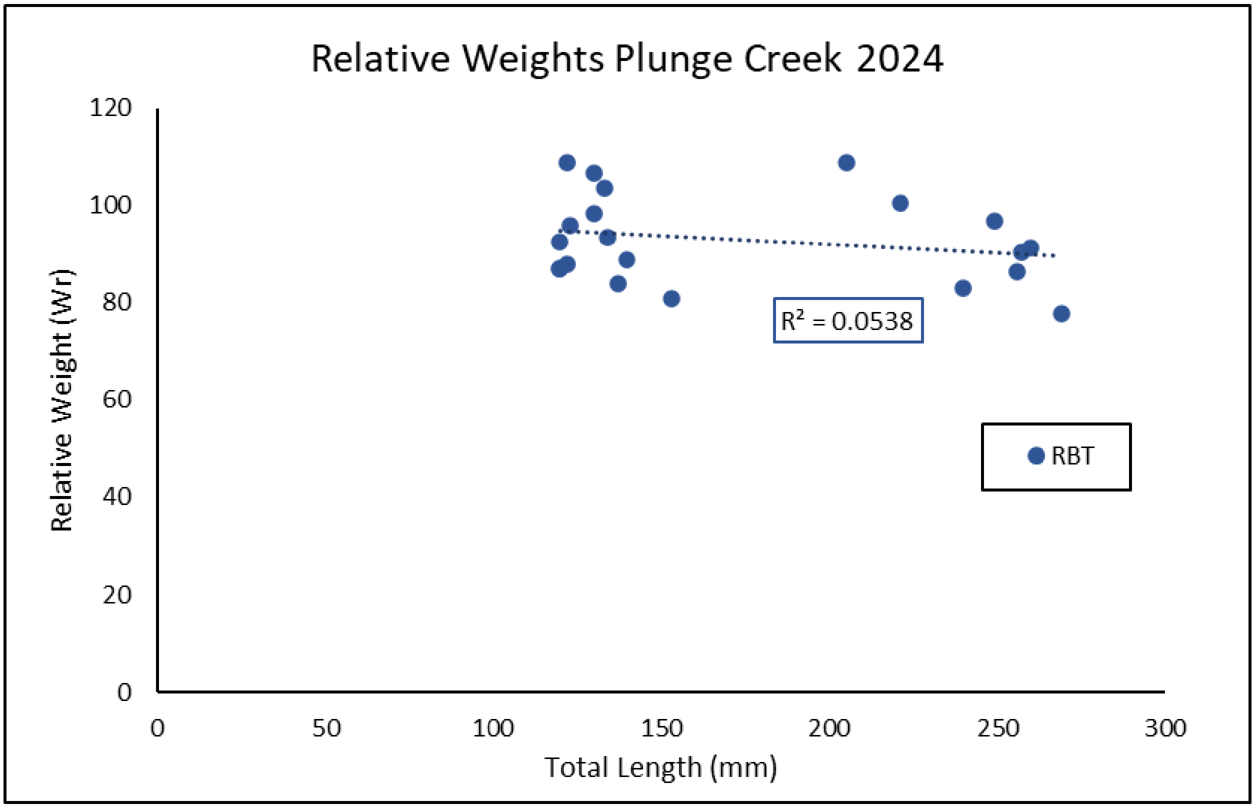


Figure 111. Scatter plot of relative weight data for rainbow trout (RBT) of Plunge Creek in 2024.

Discussion:

Only rainbow trout were captured during this survey. Genetics were collected to determine if these fish are native. All of the rainbow trout collected were ≤ 10.5 inches TL (269 mm), and most were 4-5 inches TL (100-129 mm TL).

The average Wr of rainbow trout from 2024 is an initial baseline of length-weight data in Plunge Creek. This data shows a correlation between fish length and weight, and as fish length increased, there was decreased body condition. This demonstrates that the environmental conditions are possibly less suitable for continued rainbow trout growth. When Wr is below 100, problems may exist with food availability, feeding conditions, competition, or habitat. A Wr of 100 represents fish in an "above-average" condition. The Wr target range of 95-105 is often recommended for fish populations, but there are difficulties in defining "optimal or good" condition. The Wr average for Plunge creek was 93 and is slightly below the target range.

Historically, some of these creeks were believed to have resident wild trout populations. Nearby Alder (DFG 1932) and Keller (DFG 1930) creeks were stocked in 1930 and in subsequent years. Both are streams to the west of Plunge

Creek and can be accessed from the same road. It is undocumented by CDFW if Plunge Creek received stocked trout.

The recommendation is to continue to monitor the trout population and stream conditions. The next step is to continue electrofishing upstream towards the headwaters and downstream to understand the extent of occupied habitat in Plunge Creek. Continued monitoring is important considering over 90% of the Plunge Creek Watershed burned in the 2024 Line Fire. Additionally, electrofishing further upstream in Little Mill, Alder, and Hemlock creeks is recommended. This could help illustrate the area of the watershed occupied by rainbow trout, and collecting fin clips from the upper watersheds would determine if any of the rainbow trout populations are native.

Mill Creek, San Bernardino County

Survey Date: April 23, 2024

Overview:

This report describes a presence/absence electrofishing survey in Mill Creek. On April 23, 2024, California Department of Fish and Wildlife (CDFW) conducted a single-pass electrofishing survey. Located in the San Bernardino National Forest, Mill Creek is 13 miles east of San Bernardino. Mill Creek is a tributary historically hydrologically connected to the Santa Ana River located to its northwest. The Santa Ana River has a watershed of 2,650 square miles (6,900 km^2) that runs from the mountains through urban water diversions and cities to terminate into the Pacific Ocean. Urban development disconnected Mill Creek from the Santa Ana River. Beginning in the 1800’s and continuing through today, both Mill Creek and Mountain Home Creek were captured for power generation, human consumption, and agriculture.

Historically, this creek had resident trout from years of stocking by past private and State-owned hatcheries located on Mill Creek and in the San Bernardino National Forest (Atchley 2024). Three different fish hatcheries opened on Mill Creek beginning in 1913, but all succumbed to winter storms by 1965, while other hatcheries existed on Big Bear Lake and Jenks Lake (Atchley 2024).

In the early 2010’s, native fish rescues were performed by CDFW for Santa Ana speckled dace (*Rhinichthys osculus ssp.*) in Mill Creek because of drying habitat, water quality issues, and fish stranding. A visual assessment was performed for native fishes in September 2021, and trout were reported as present upstream at

Thurman Flats Picnic Area in Mill Creek. A previous electrofishing survey conducted downstream in the main channel showed no trout in 2023.

Objective:

Conduct an electrofishing survey and take genetic samples of rainbow trout from Mill Creek.

Methods:

See details in previous survey.

Three CDFW staff participated in the one-day survey, and all used electrofishing equipment in one group. Temperatures were taken with a handheld digital thermometer. One staff member handled the electroshocking backpack unit with two netters, and one of the two netters handled an aerated bucket (Figure 113).

Mill Creek was electrofished in the village of Mountain Home and the survey started near the first home. The survey headed upstream towards its confluence with Mountain Home Creek, and staff did a visual assessment of each stream's water clarity at the confluence. The main channel was electrofished in 2023 and a side channel of Mill Creek was electrofished in 2024. Transects are shown for the stream surveys in 2023 and 2024 for both Mill and Mountain Home creeks (Figure 112). Figure 113 shows a view looking upstream at the opaque gray main channel of Mill Creek and clear water of Mountain Home Creek at its confluence.

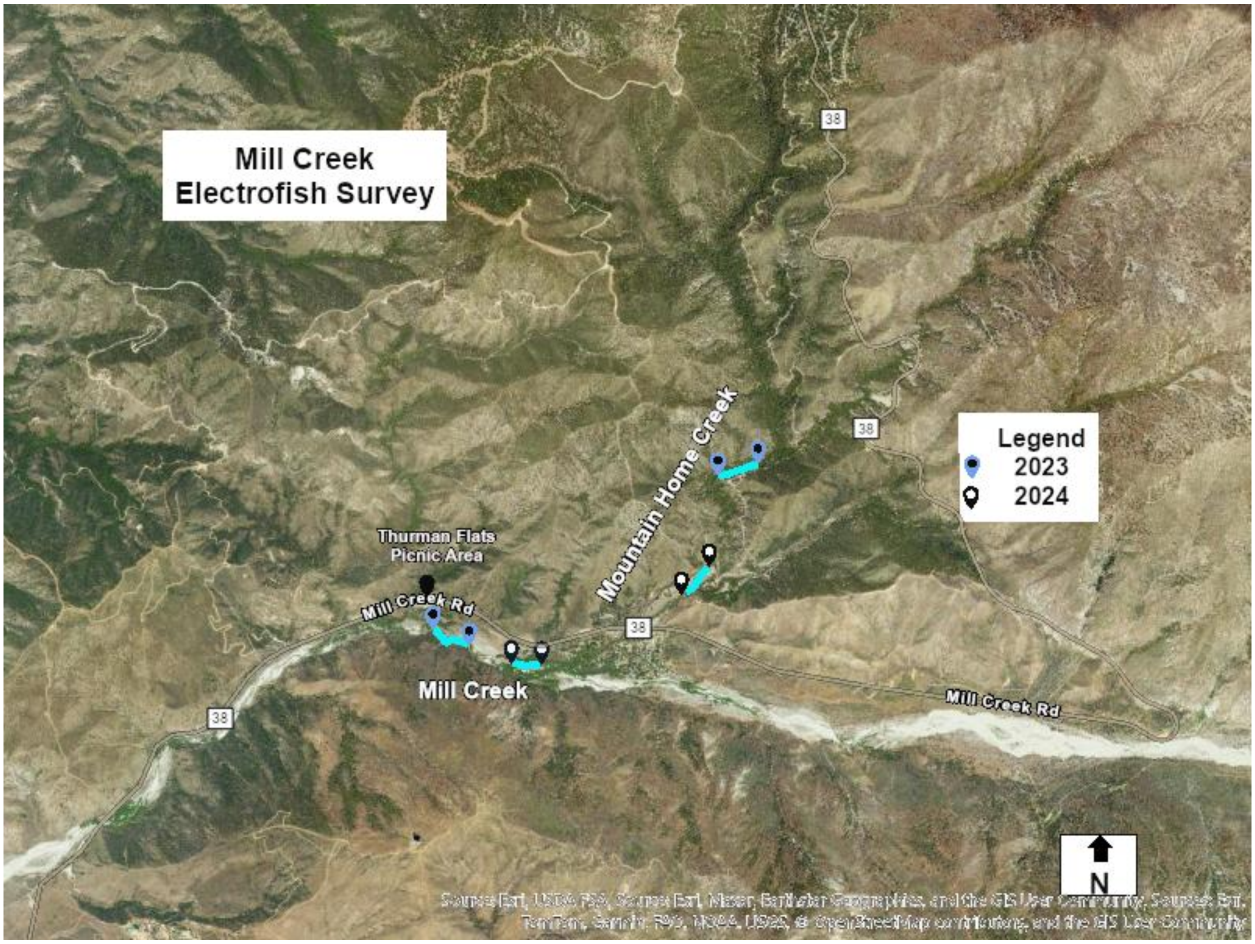


Figure 112. Map of electrofishing survey locations on Mill Creek and Mountain Home Creek for 2023 and 2024 and Thurman Flats Picnic Area. Credit – NAIP imagery ESRI.

Figure 113. Mill Creek water with high turbidity, slower clear side channel riffle habitat, electrofishing of side channel, and a view looking upstream at the confluence of Mill and Mountain Home creeks.

Results:

The section surveyed contained no rainbow or Brown Trout. Santa Ana Speckled Dace were not captured in the sampled reach. The main channel was swift in velocity and colored gray by high concentrations of suspended sediment (Figure 113). This turbid water is not suitable for fish. The side channel had slower clear water (Figure 113). The starting water temperature was 8.1 C and ending water temperature was 8.7 C.

Discussion:

Based upon the survey, Mill Creek's side channel contained no rainbow or Brown Trout, and the main channel was not sampled due to high flows.

Likely in the 1960's, any stocked trout would have died from the intense storms that destroyed the hatcheries. Severe weather patterns have a reoccurring history in the canyon possibly creating fish mortality events, such as by high turbidity viewed during this survey of Mill Creek. Other droughts, fires, and floods have affected the watershed, water quality conditions, and fish population of Mill Creek.

Mill Creek is a narrow stream in a normal water year with a very wide floodplain. Surface water can spread out and can go subsurface under stacked cobbles and boulders. The two CDFW surveys were upstream and downstream of poor trout habitat. The length of trout habitat is limited with few riparian willows and trees and no spawning substrate. It is further reduced during droughts, which occurred from 2020-2022.

The El Dorado Fire burned the north and south canyons in September 2020. The Apple Fire burned the eastern ridgeline in its headwaters from July-November 2020. Its riparian areas were not directly burned by the fires, but heavy winter rains occurred behind these fires, including tropical Storm Hilary (2022). The sediments eroded from the canyons into the creek (Hatfield pers. comm.). Mill Creek is less than ideal for trout or native fishes because it is a flashy system that can produce high velocity flows, can move significant amounts of rocks and debris during these high flow events, and can exhibit high turbidity for substantial periods of time.

The recommendation is to monitor stream water quality conditions. This is to understand baseline water quality of Mill Creek. The next recommendation is to continue to electrofish within the area. More investigations are needed to understand the extent of trout in the tributaries of Mountain Home and East Fork Mountain Home creeks.

<u>Marion Creek, Riverside County</u>

Survey Dates: May 23 and 28-29, 2024

Overview:

This report describes an electrofishing survey for rainbow trout (*Oncorhynchus mykiss*) in Marion Creek. Marion Creek is where Coldwater Canyon Creek (Coldwater) native rainbow trout were relocated to on April 19, 2019 (Hemmert 2020). Coldwater is one of three native rainbow trout populations remaining in Southern California and has genetics unique to the area (Abadia-Cardoso et al 2016). On May 23 and 28-29, 2024, California Department of Fish and Wildlife (CDFW) conducted a single-pass electrofishing survey.

Rainbow trout were extirpated from Coldwater Canyon Creek by the Holy Fire. The fire burned from August 18 - September 13 of 2018. Subsequent debris flows prompted by storms in late 2018 into early 2019 decimated the fish population (Hemmert 2020).

In November 2020, CDFW reintroduced rainbow trout to Coldwater Canyon Creek. Of the approximately 200 fish reintroduced, 100 were descendants of Coldwater Canyon Creek rainbow trout and 100 were from the West Fork San Gabriel River. Genetic samples were taken from every rainbow trout relocated into Coldwater Canyon Creek (Hemmert 2022). For this 2024 survey, CDFW is re-evaluating the rainbow trout after four and a half years of residency in Marion Creek.

Marion Creek is in the San Bernardino National Forest and San Jacinto Wilderness located 24 miles east of Hemet and 57 miles southeast of Riverside, CA. Marion Creek is within a rural area of Riverside County in the mountain town of Idyllwild-Pine Cove. The watershed receives inputs from Marion Mountain and Suicide Rock which supply the creek with perennial flows (Hemmert 2020). Land access is restricted by private parcels at the confluence of Marion and Strawberry creeks. The forest-bordering private parcels are part of a conservation easement with the USFS (Hemmert 2020).

Marion Creek is a tributary to Strawberry Creek, which is a tributary to Dry Creek. During wetter years, Dry Creek connects to the South Fork San Jacinto River. Historically the San Jacinto River flowed to Temescal Creek (Temescal Wash), and Temescal Wash connected to the Santa Ana River. Urban development of the Inland Empire region, the creation of Lake Elsinore, and water diversions disconnect Temescal Wash from the Santa Ana River. The Santa Ana River has a watershed of 2,650 square miles (6,900 km^2). Previously, electrofishing and visual surveys had occurred to monitor the Coldwater rainbow trout in Marion Creek.

Objective:

Conduct an electrofishing survey of rainbow trout in Marion Creek.

Methods:

See details in previous survey.

Water quality parameters were taken with a handheld YSI meter in transect one, and only water temperature was taken within subsequent transects. The number of participants varied per survey day, and all used electrofishing equipment in one group for Marion Creek. Fish were identified to species, measured for total and fork length (millimeters) and weighed to the nearest gram (Figure 115).

The survey started from a bridged road crossing heading in a northerly direction towards Suicide Rock (Figure 114). Figure 115 shows run, pool and different types of cascade habitats, including large woody debris (LWD), single boulder and stacked boulders. There are many barriers within the channel.

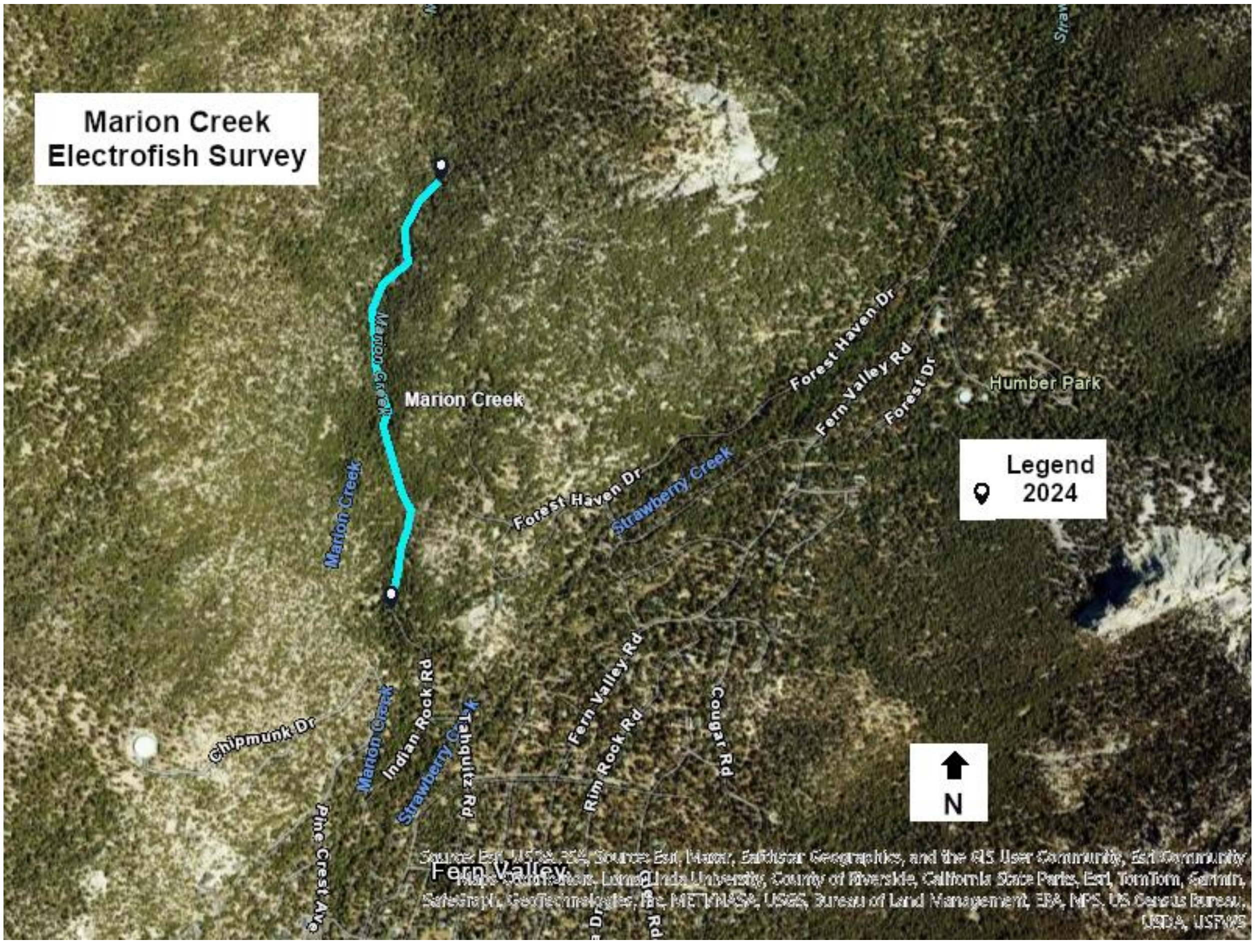


Figure 114. Map of 2024 electrofishing survey location on Marion Creek. Credit – NAIP imagery ESRI.

Figure 115. Site photos of run habitat, LWD wall, 25-foot-tall falls off a boulder, 15-foot-tall cascade from stacked boulders, pool habitat below 5-foot-tall boulder, electrofishing the channel, and Coldwater rainbow trout.

Results:

The section of Marion Creek surveyed contained rainbow trout. A total of 47 rainbow trout were collected during this survey. Measured rainbow trout averaged 136 mm TL (range 73–239 mm, 2.9-9.4 inches TL), 130 mm FL (range 69–225 mm, 2.6-8.9 inches FL) and 6% of the trout were YOY/juveniles ≤ 3 inches TL (76 mm).

Figure 116 shows the length frequency of rainbow trout collected in Marion Creek for both the 2019 and 2024 surveys. All of the rainbow trout collected were ≤ 9 inches FL for both surveys. In 2024, 49% of trout were 2.8-4.7 inches FL (70-119 mm) and 45% of the trout collected were ≥ 5.1 inches FL.

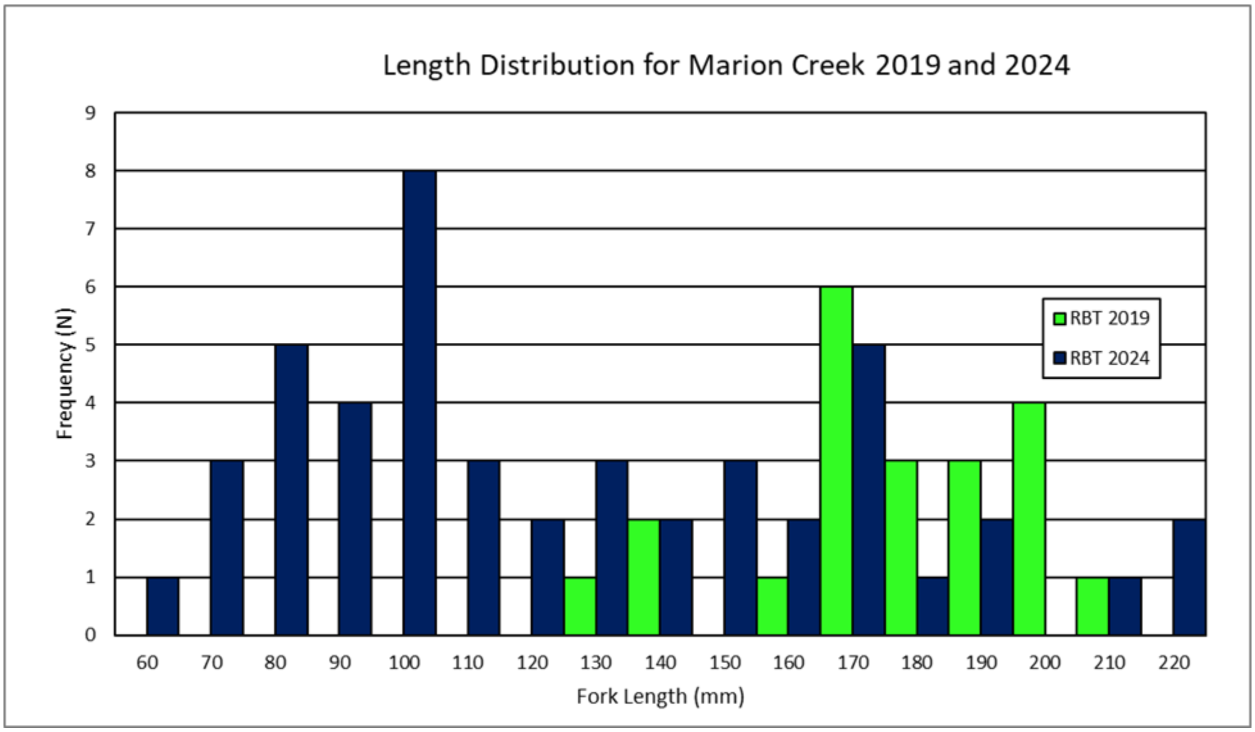


Figure 116. The length frequency plot of rainbow trout from Marion Creek. The 2019 fish are shown in green and the 2024 fish are shown in blue.

Figure 117 shows the relative weights (Wr) of Coldwater rainbow trout from both 2019 and 2024. Wr describes variation in expected weights for a fish at a given length, and it indicates body condition of the fish. A Wr of 100 indicates a healthy specimen.

The relative weights are based on the TL and weights of rainbow trout ≥120 mm (Simpkins and Hubert 1996). The relative weight ranges were 80-121 in 2024 and 81-108 in 2019. The average Wr was 104 in 2024 and 94 in 2019. Sixteen of twentythree measured rainbow trout (70%) had Wr ≥100 in 2024. In 2019, two of sixteen measured rainbow trout (13%) had Wr ≥100).

Wr was plotted for all rainbow trout ≥120 mm (Figure 117). A single fish from 2019 with a Wr of 64 was excluded as this is likely measurement/recording error. Wr data from both 2019 and 2024 are grouped with minimal overlap, and the 2024 data shows a markedly better condition for fish in 2024 (Figure 117).

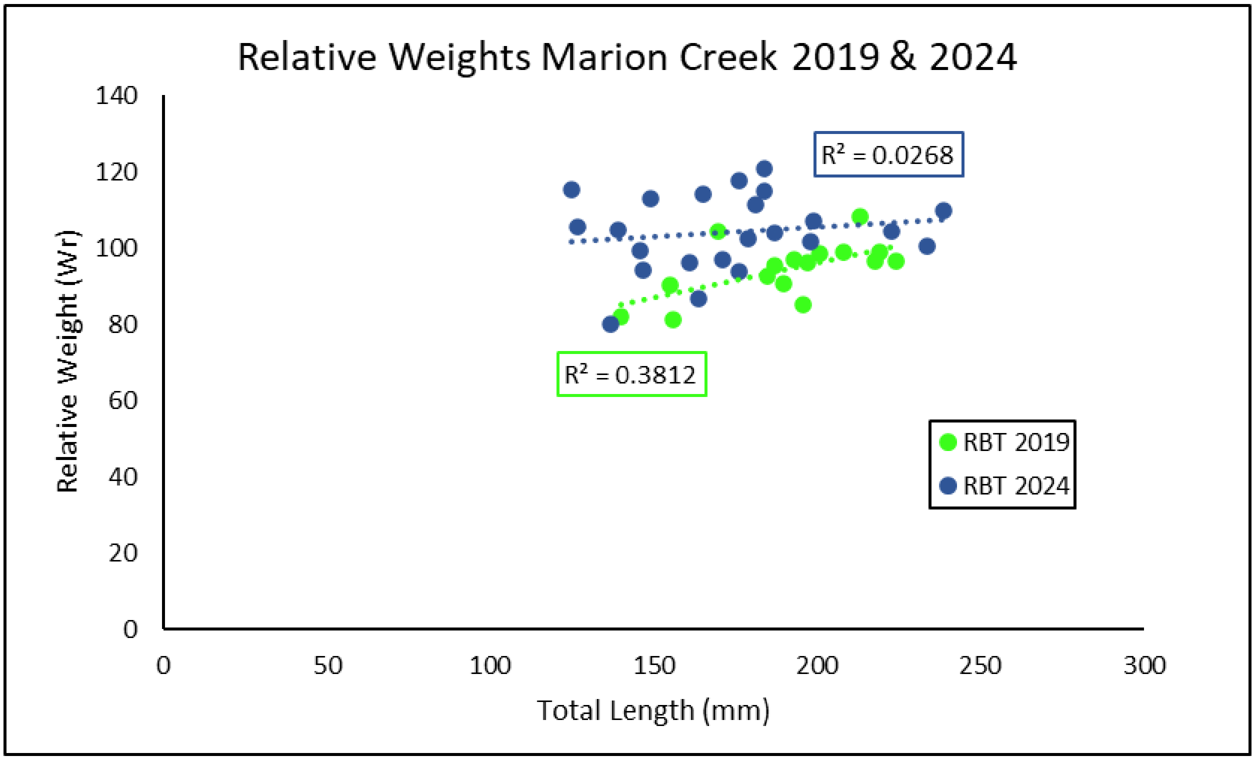


Figure 117. Scatter plot of relative weight data for rainbow trout (RBT) of Marion Creek in 2019 (green) and 2024 (blue).

The starting water temperature ranged from 8.5-9.4 C and the ending water temperature ranged from 9.4-11.2 C for the 3-day survey. The pH was 7.9, specific conductivity was 93.5 µs/cm, dissolved oxygen was 9.07 mg/L, and total dissolved solids were 61.0 ppm.

Discussion:

Based upon this survey, Marion Creek contains rainbow trout. In 2019, larger sized trout were observed in the creek because these are the fish that survived in the CDFW hatchery and were translocated. In 2019, 99% of the natal brood-stock trout ranged from 80-190 mm TL (3.1-7.5 in) (Hemmert 2020) and no juvenile rainbows were relocated. It is unknown why fish of a larger size (average > 7 inches TL) survived at the hatchery. The decision to relocate these fish to

Marion Creek was made with the goals of increasing survival and having reproductive success. Both of these goals were met.

The survey in 2024 revisited the rainbow trout in Marion Creek to gather data after a period of whiplash conditions with both extreme droughts and unprecedented high flows from a tropical storm. The 2024 data shows that rainbow trout spawned, based on the presence of YOY, and the variation of collected sizes indicates multiple generations of fish. Measured rainbow trout averaged 192 mm TL (range 140–224 mm, 5.5-8.8 inches TL) and 182 mm FL (range 132-212 mm, 5.2-8.3 inches FL) in 2019. In 2019, 38% of trout were 6.7-7.8 inches FL (170-199 mm), and all of the rainbow trout collected were ≥ 5.1 inches FL (130 mm) (Figure 116). In the 2024 survey, 1/3 of the rainbow trout sampled were greater than 6 inches, while the remainder of the fish were less than 6 inches. The total number of fish captured increased in 2024 (47) from the 2019 survey (21). Size classes collected shifted to include YOY and likely 2–3-year-old fish based on size. 5-7 pairs of actively spawning rainbow trout pairs were observed in the creek during the 2024 survey.

The average Wr of the rainbow trout from the 2019 survey is an initial baseline of length-weight data in Marion Creek. The average Wr of the rainbow trout population for the 2024 survey increased to 104 from 94 (2019). The data shows a positive correlation between fish length and weight, whereas fish length increased, there was better condition (greater body weight) in both surveys. This demonstrates that the environmental conditions are suitable for continued rainbow trout growth. Other environmental factors such as water quality, habitat complexity, prey availability, and spawning gravels are adequate for rainbow trout. When Wr is below 100, problems may exist in food availability, feeding conditions, competition, or habitat. A Wr of 100 represents fish in an "above-average" condition for certain species of fish. The Wr target range of 95-105 is often recommended for fish populations, but there are difficulties in defining "optimal or good" condition.

The recommendation is to continue to monitor stream conditions and electrofish this same transect of stream for rainbow trout. This will provide data on the size distribution and condition of rainbow trout in Marion Creek. The last recommendation is electrofishing downstream of the relocation area in Marion Creek towards its confluence with Strawberry Creek, and possibly within Strawberry Creek itself. The purpose of this is to determine if any rainbow trout from Marion Creek have been able to survive in Strawberry Creek.

Little Mill Creek, San Bernardino County

Survey Date: July 23, 2024

Overview:

This report describes an electrofishing survey to investigate rainbow trout (*Oncorhynchus mykiss*) and Brown Trout *(Salmo trutta)* in Little Mill Creek. On July 23, 2024, California Department of Fish and Wildlife (CDFW) conducted a single-pass electrofishing survey. Located in the San Bernardino National Forest 16 miles east of the city of San Bernardino, Little Mill Creek is a tributary to Plunge Creek. Little Mill Creek was historically connected to the Santa Ana River located to the south. Currently, these streams flow into the North Fork Canal of the local water district. Urban development and water diversions of the Inland Empire region disconnect the creek to the Santa Ana River. The Santa Ana River has a watershed of 2,650 square miles (6,900 km^2) and flows from the mountains through urban water diversions and cities, terminating in the Pacific Ocean. There is likely a population of Santa Ana speckled dace (*Rhinichthys osculus ssp.*) within this drainage.

The Little Mill Creek survey started west of Old City Creek Road (1N09) upstream of an unnamed trail and headed upstream towards its headwaters. A second transect started downstream of the trail. Little Mill Creek was electrofished above its confluence with Fredalba Creek upstream towards the lake (Figure 118). Genetic samples of rainbow trout would be taken if fish were present. No previous surveys have been conducted in this section of Little Mill Creek.

Objective:

Conduct an electrofishing survey and take genetic samples of rainbow trout from Little Mill Creek.

Methods:

See details in previous survey.

Four staff and four partner agency staff participated in the one-day survey, and all used electrofishing equipment in one group for two sections of Little Mill Creek. One staff member handled the electroshocking backpack unit with four netters, one person handled an aerated fish backpack, and one person handled an aerated bucket (Figure 119). Fish would be identified to species and measured for total and fork lengths (millimeters) and weighed to the nearest gram (Figure 119). Figure 119 shows habitat with moderate turbidity observed while looking upstream.

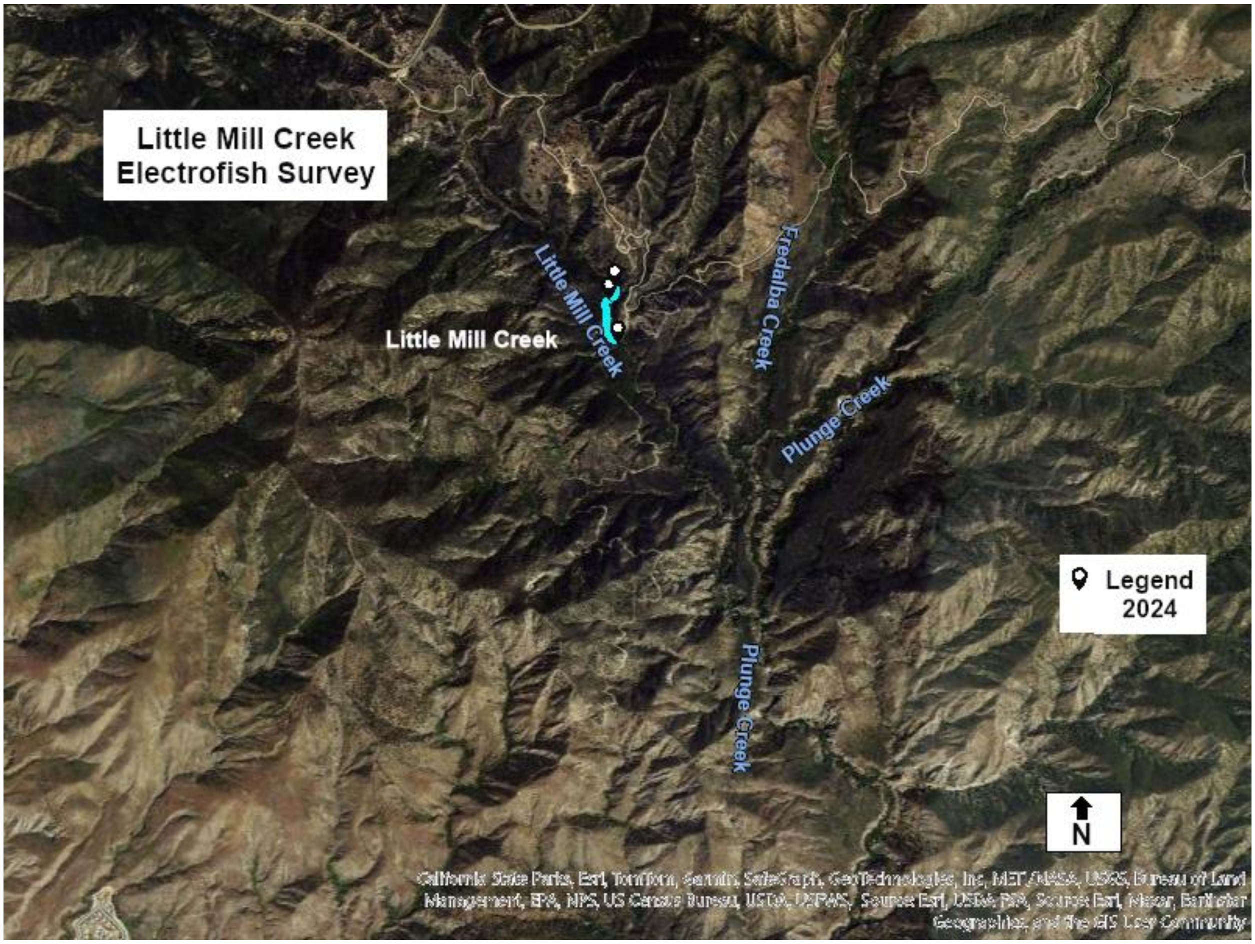


Figure 118. Map of 2024 electrofishing survey location on Little Mill Creek. Credit – NAIP imagery ESRI.

Figure 119. A site photo of habitat, shallow pool with turbid water, crew electrofishing, and a collected rainbow trout.

Results:

The section of Little Mill Creek surveyed contained rainbow trout throughout the sampled reaches. A total of 36 rainbow trout were collected, and the average size was 108 mm TL (range 55-313 mm, 2.2-12.3 inches TL) and 103 mm FL (range 52-299 mm, 2.0-11.8 inches FL). All fish collected from the upstream transect were less than 4 inches TL. The transect downstream of the trail produced 2 rainbow trout that measured 7.5–8.0 inches TL, and 4 fish that were 11.7–12.3 inches TL.

Figure 120 shows the length frequency of rainbow trout collected in Little Mill Creek. All of the rainbow trout collected upstream were ≤12 inches in fork length and 83% of trout were 2.0-3.6 inches FL (52-92 mm) (Figure 120).

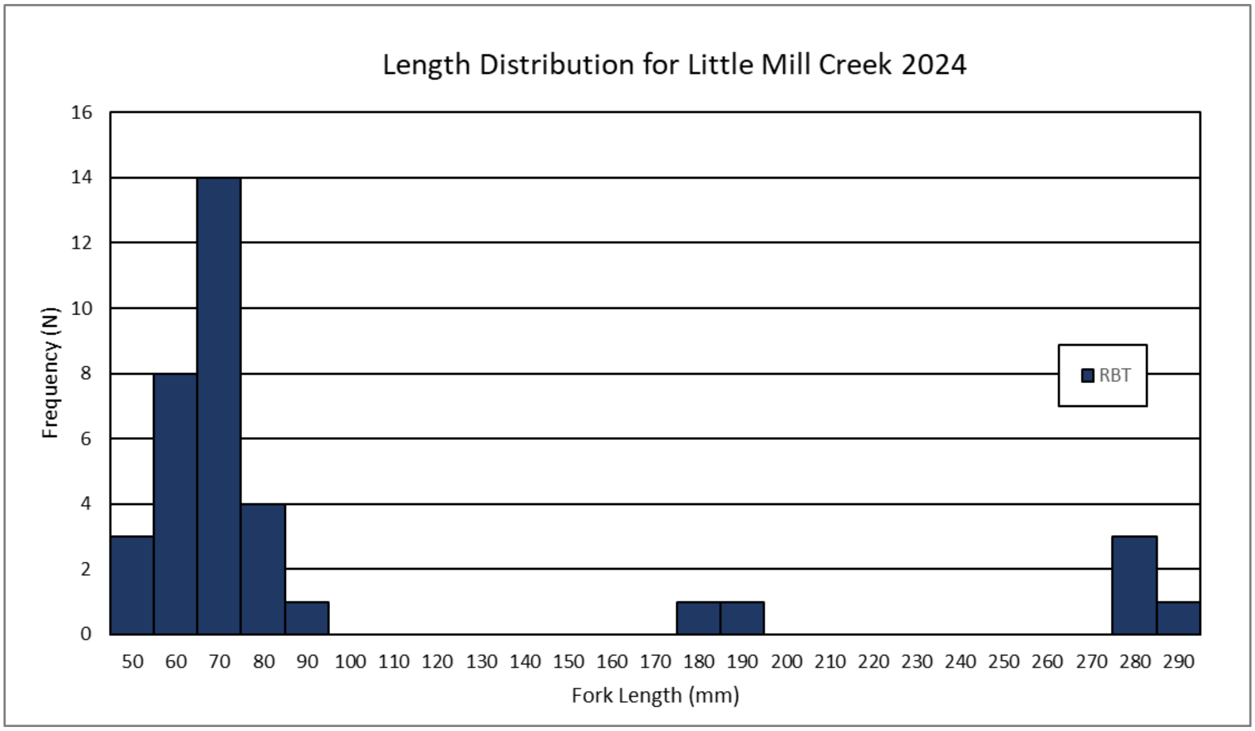


Figure 120. Length frequency plot of rainbow trout from Little Mill Creek.

Figure 121 shows the relative weights (Wr) of rainbow trout from 2024. Wr describes variation in expected weights for a fish at a given length, and it indicates body condition of the fish. A Wr of 100 indicates a healthy specimen.

The relative weights are based on the TL and weights of rainbow trout ≥120 mm (Simpkins and Hubert 1996). The average relative weight was 97 (range 89-121) in 2024. One of six measured rainbow trout (17%) had a Wr ≥100. The trendline is a gradual downward slope, indicating as a fish gets larger its condition decreases. However, our sample size was limited to six fish, making inferences difficult.

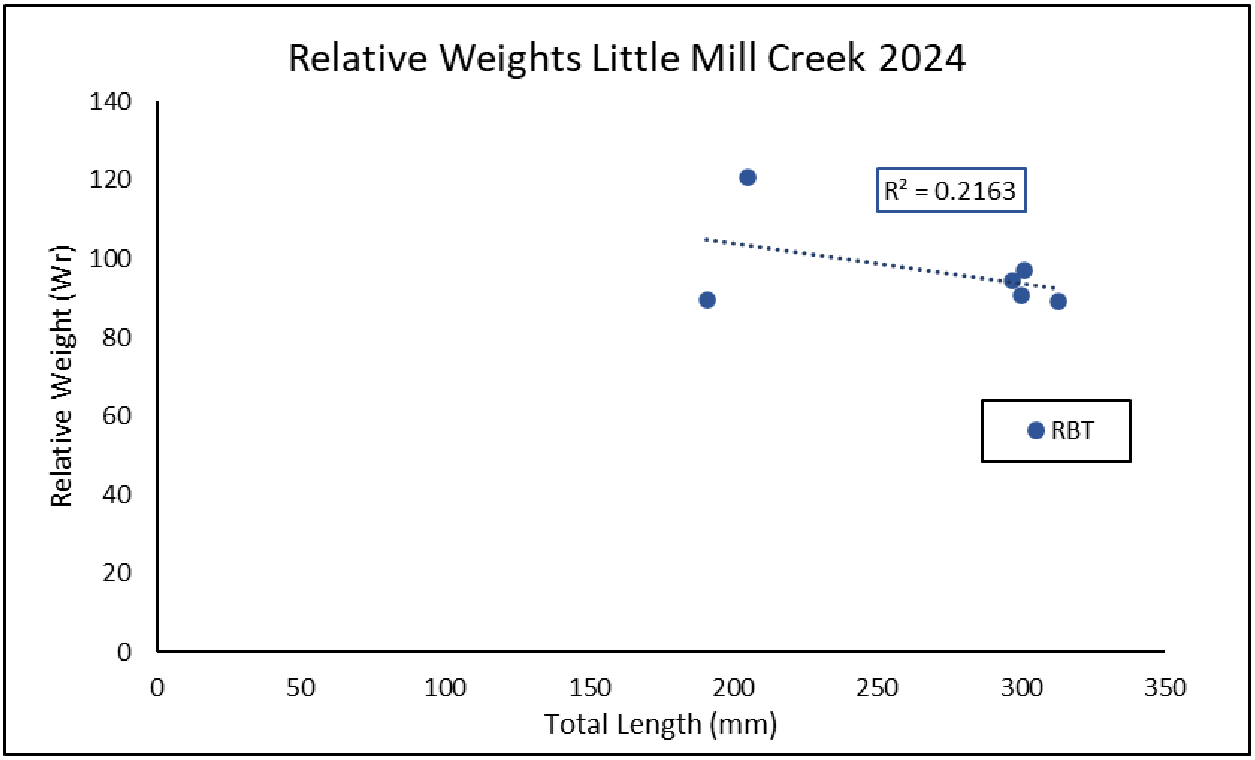


Figure 121. Scatter plot of relative weight data for rainbow trout (RBT) of Little Mill Creek in 2024.

The starting water temperature was 19.3 C and the ending water temperature was 21.8 C for the 1-day survey. The specific conductivity was 240 µs/cm, dissolved oxygen was 6.45 mg/L, and total dissolved solids were 156 ppm.

Discussion:

Little Mill Creek contains rainbow trout based on this survey. Genetics were collected to determine if these fish are native. In 2024, only larger sized trout were observed downstream of the trail, and smaller fish were upstream of it. The varying sized trout in nearby areas could be related to the trail dividing the habitat for fish of different sizes. The larger fish could utilize the deeper habitat below the barrier, while smaller fish possibly use the shallower habitat above the barrier.

The average Wr of rainbow trout from the 2024 survey is an initial baseline of length-weight data in Little Mill Creek. The data shows a negative correlation between fish length and weight, whereas fish length increased, there was poorer condition with a downward sloping trendline. When Wr is below 100, problems may exist in food availability, feeding conditions, competition, or habitat availability. A Wr of 100 represents fish in an "above-average" condition for certain species of fish. The Wr target range of 95-105 is often recommended for fish populations, but there are difficulties in defining “optimal or good” condition. For the survey, the Wr average of 97 is within this target range.

The recommendation is to continue to monitor the trout population and stream conditions. The next step is to continue electrofishing upstream towards the headwaters to understand the extent of occupied habitat in Little Mill Creek.

<u>Hemlock Creek, San Bernardino County</u>

Survey Date: August 13, 2024

Overview:

This report describes a presence/absence electrofishing survey in Hemlock Creek. On August 13, 2024, California Department of Fish and Wildlife (CDFW) conducted a single-pass electrofishing survey. Located in the San Bernardino National Forest, Hemlock Creek is 24 miles east of San Bernardino. Hemlock Creek is fed by the intermittent tributary of East Fork Hemlock Creek and flows into Alder Creek (Figure 122). Alder Creek is captured by the water district before it enters the Santa Ana River. Alder Creek is a tributary that is connected to the Santa Ana River, which has a watershed of 2,650 square miles (6,900 km^2). There is likely one or more populations of Santa Ana speckled dace (*Rhinichthys osculus ssp.*) within this drainage.

Hemlock Creek is in the US Forest Service San Bernardino National Forest and was accessed from CA-330 off Forest Service Road 1N09. Genetic samples of rainbow trout would be taken if fish were present. No previous surveys have been conducted in this section of Hemlock Creek.

Objective:

Conduct an electrofishing survey and take genetic samples of rainbow trout from Hemlock Creek.

Methods: See details in previous survey.

Five staff and three partner agency staff participated in the one-day survey, and all used electrofishing equipment in one group. One staff member handled the electroshocking backpack unit, four people netted stunned fish, one person handled an aerated fish backpack for trout, and one person handled an aerated bucket for native fish (Figure 123).

Hemlock Creek was electrofished below its confluence with East Fork Hemlock Creek, and the survey moved upstream in a northerly direction towards forest service road 1N09. One habitat unit was electrofished east of Keller Meadows (Figure 122). Figure 123 show examples of low gradient cascade habitat and a 10-foot-tall cascade above a shallow pool. Figure 123 shows a view looking downstream from the road of a steep gradient barrier within the channel.

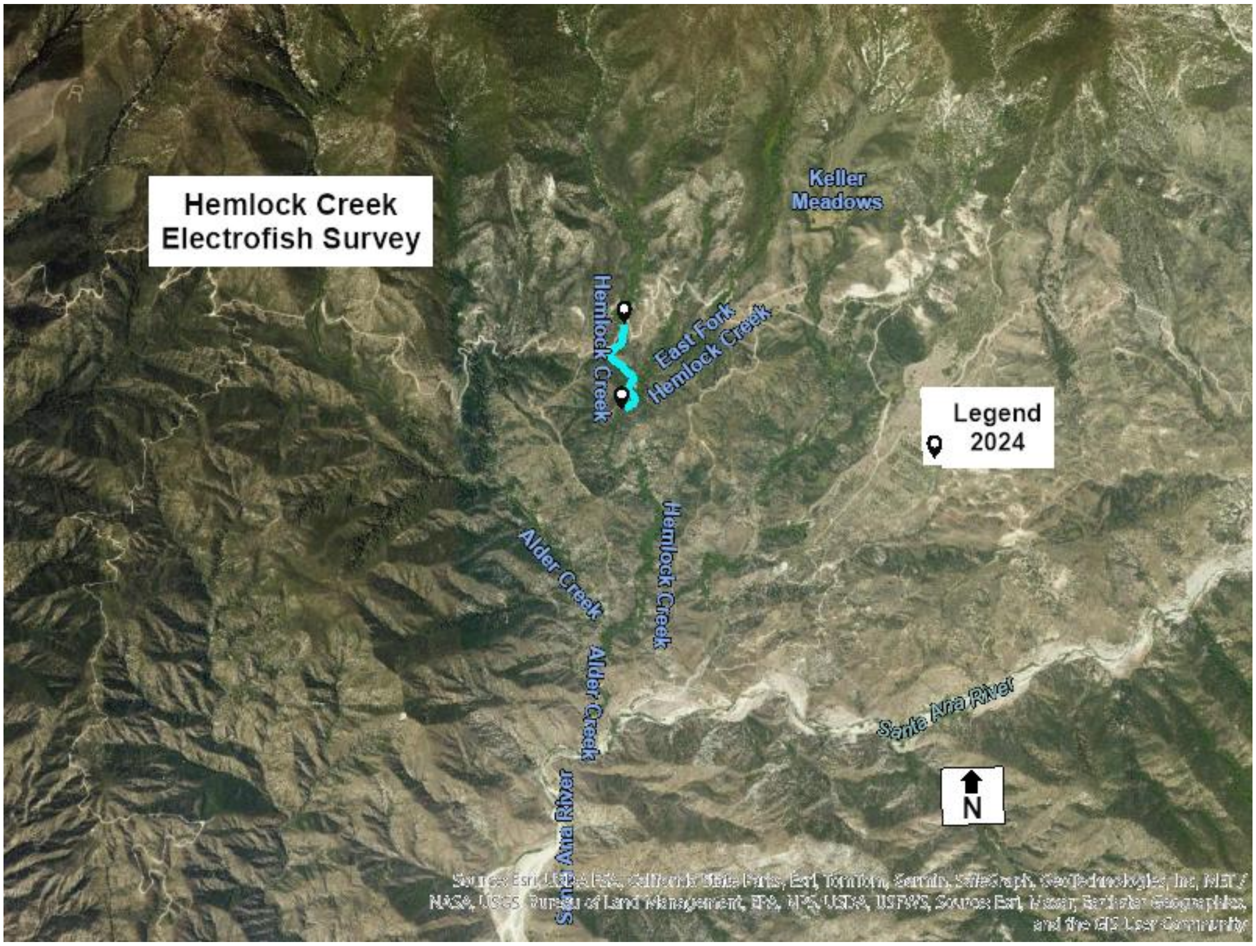


Figure 122. Map of 2024 electrofishing survey location on Hemlock Creek. Credit – NAIP imagery ESRI.

Figure 123. Site photos of cascade and run habitat, 10-foot-tall cascade above a shallow pool, electrofishing the channel while looking upstream, and a view looking downstream from the forest service road.

Results:

The section surveyed contained no rainbow trout or Brown Trout. Santa Ana Speckled Dace were captured in limited numbers throughout the sampled reach, and this data was reported separately by the CDFW Native Fish Biologist.

The starting water temperature was 16.8 C and the ending water temperature was 19.9 C. The pH was 9.0, conductivity was 300 µs/cm, and dissolved oxygen was 4.99 mg/L.

Discussion:

Based upon the survey, Hemlock Creek appears to contain no rainbow trout or Brown Trout.

Nearby Alder (DFG 1932) and Keller (DFG 1930) creeks were stocked in 1930 and in subsequent years, and both are <1.3 miles to the east or west of Hemlock Creek on the same road. It is undocumented by CDFW if Hemlock Creek received stocked trout. Additionally, volunteers of the Forest Resource Volunteer Corps (FRVC) stated that rainbow trout are likely in Hemlock and East Fork Hemlock creeks. They provided information polled from personal fishing experiences (Craig pers. comm.). The USGS could not confirm information about trout presence in Hemlock Creek but did confirm trout in nearby Alder Creek (Backlin pers. comm.).

Continued monitoring is recommended and is even more important considering 100% of the Hemlock Creek Watershed burned in the 2024 Line Fire. It started on September 5, 2024, in Highland, CA by arson, and it burned 43,978 acres. The fire was contained on December 23, 2024. The headwaters of Hemlock Creek were reported as high soil burn severity, where most or all the pre-fire ground cover and surface organic matter (litter, duff, and fine roots) are generally consumed. Soil structure is often altered and less stable at the surface (USFS Line BAER Soil Burn Severity Map 2024). Hemlock Creek had moderate soil burn severity, where up to 80 percent of the pre-fire ground cover may be consumed (USFS Line BAER Soil Burn Severity Map 2024), at its confluence with East Fork Hemlock Creek heading south and along Alder Creek to the Santa Ana River.

Additionally, electrofishing further upstream in Hemlock, Little Mill, Fredalba, Plunge, Alder, East Fork Hemlock, and Keller creeks are recommended. This could help illustrate the area of the watershed occupied by rainbow trout, and collecting fin clips from the upper watershed would determine if any of the rainbow trout are native within the watershed.

Mountain Home Creek, San Bernardino County

Survey Date: August 14, 2024

Overview:

This report describes a presence/absence electrofishing survey in Mountain Home Creek. On August 14, 2024, California Department of Fish and Wildlife (CDFW) conducted a single-pass electrofishing survey. Located in the San Bernardino National Forest 24 miles east of the city of San Bernardino, Mountain Home Creek is a tributary to Mill Creek. Mill Creek is a tributary historically connected to the Santa Ana River that is located to its northwest. The Santa Ana River has a watershed of 2,650 square miles (6,900 km^2) that runs from the mountains through urban water diversions and cities terminating in the Pacific

Ocean. Urban development and water diversions of the Inland Empire region disconnect the creek from the Santa Ana River. No previous surveys have been conducted in this section of Mountain Home Creek.

The Mill Creek basin is highly modified for power generation and water resources. Beginning in the 1800's, both Mill Creek and Mountain Home Creek were captured for power generation (two diversion sites), human consumption, and agriculture uses (FERC 2003). In the 1990's, a flowline and diversion structure were decommissioned at the confluence of Mill and Mountain Home creeks after being destroyed or damaged by an earthquake and floods (FERC 2003). CDFW suggested a base flow recommendation of 20 cfs below the Mill 3 diversion, but currently no base flows are provided. The Federal Energy Regulation Commission (FERC) under the Federal Power Act (FPA) requires only seepage flow from Mill 3 in the headwaters of Mill Creek for the power company's licensing agreement (FERC 2003). Mill Creek dried completely downstream of Mill 3 during low water years. Historically, some information is available that this creek had wild trout from years of stockings in the San Bernardino National Forest. Three different fish hatcheries opened on Mill Creek beginning in 1913 but all succumbed to winter storms by 1965, while other hatcheries existed on Big Bear Lake and Jenks Lake (Atchley 2024).

Objective:

Conduct an electrofishing survey and take genetic samples of rainbow trout from Mountain Home Creek.

Methods:

See details in previous survey.

Five CDFW staff participated in the one-day survey, and all used electrofishing equipment in one group for Mountain Home Creek. Temperatures were taken with a handheld digital thermometer. One staff member handled the electroshocking backpack unit with three netters and one person handled an aerated bucket (Figure 125). Fish would be identified to species, measured for total and fork length (millimeters) (Figure 125) and weighed to the nearest gram.

Mountain Home Creek was electrofished from the Loch Leven Camp and Retreat Center property to above its confluence with Mill Creek. The survey moved upstream in a northerly direction towards East Fork Mountain Home Creek (Figure 124). Figure 125 show views looking upstream from the survey's starting point and examples of cascade and riffle habitats.

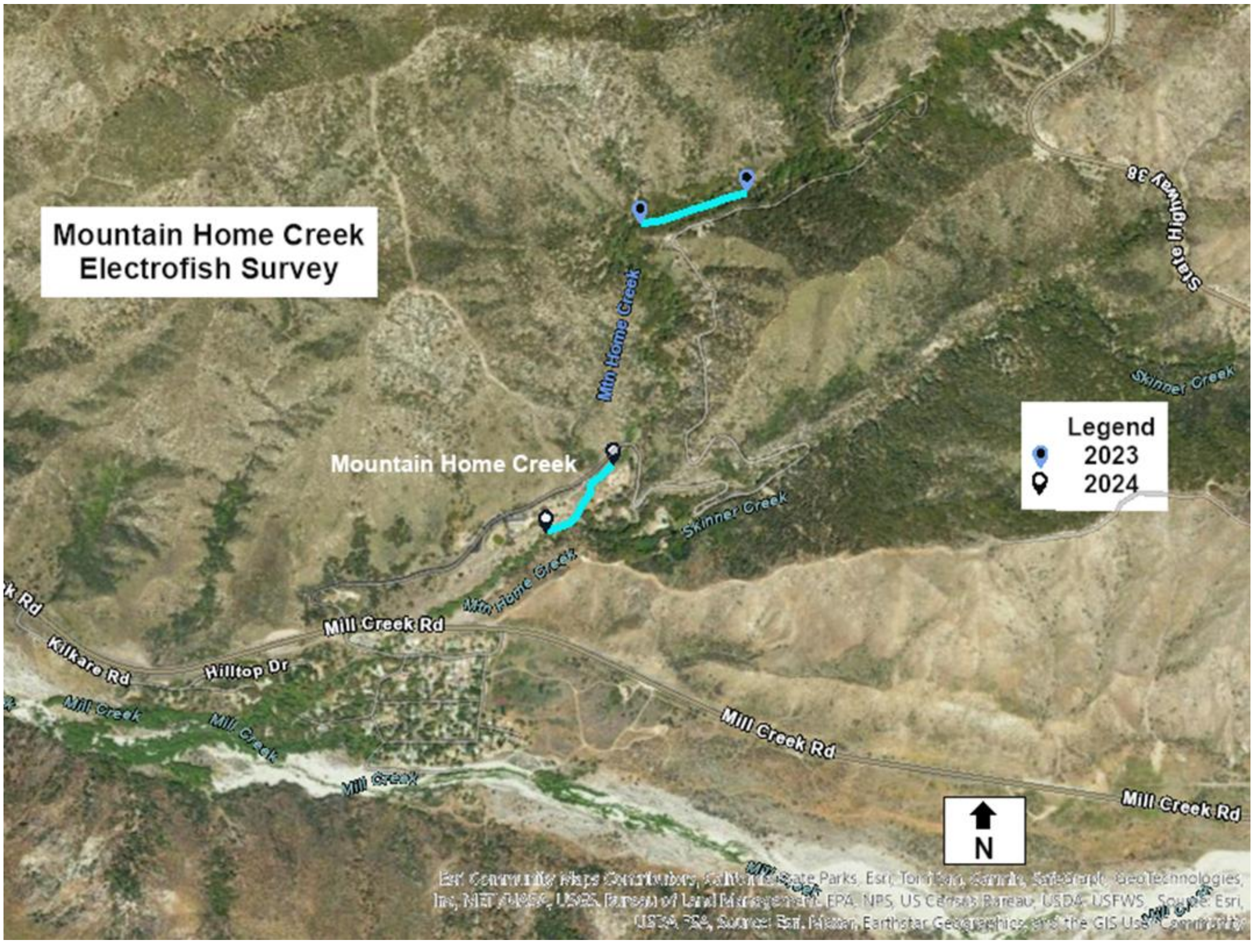


Figure 124. Map of 2023 and 2024 electrofishing survey locations on Mountain Home Creek. Credit – NAIP imagery ESRI.

Figure 125. Site photos of the stream starting point under a footbridge, cascade and riffle habitat, crew electrofishing, and a rainbow trout for the survey of Mountain Home Creek.

Results:

The section of Mountain Home Creek surveyed contained rainbow trout. Genetic material was taken from 30 of 35 measured rainbow trout. An additional 10 rainbow trout were missed while electrofishing, which resulted in a total of 45 rainbow trout seen during the survey. Measured rainbow trout averaged 76 mm TL (range 59–105 mm, 2.3-4.1 inches TL) and averaged 73 mm FL (range 56-102 mm, 2.2-4.0 inches FL). Figure 126 shows the length frequency of rainbow trout collected in Mountain Home Creek. All of the rainbow trout collected were $\leq$ 4 inches FL and 83% of trout were 2.4-3.5 inches (60-89 mm) FL (Figure 126).

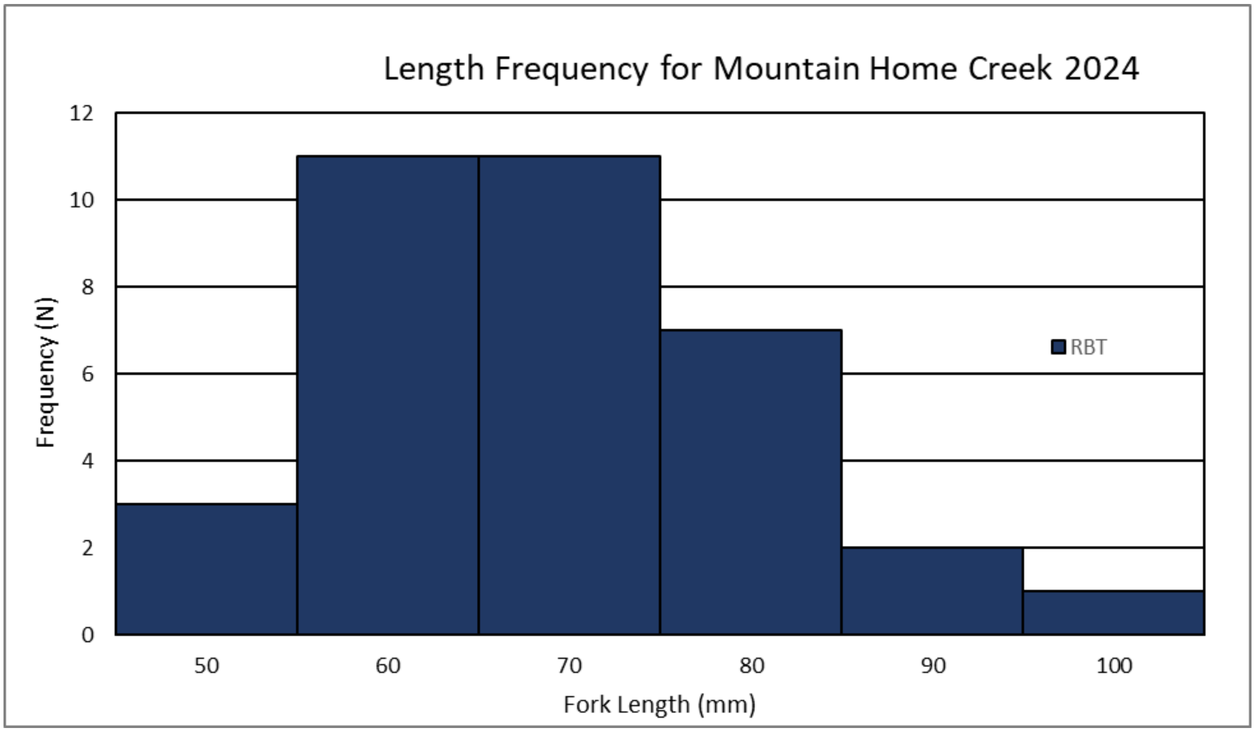


Figure 126. Length frequency plot of rainbow trout from Mountain Home Creek (2024)

The starting water temperature was 15.9 C and ending water temperature was 17.0 C.

Discussion: Based upon this survey, Mountain Home Creek contains rainbow trout. As such, caudal fin clips were taken to determine if these fish are native rainbow trout. The reason only smaller trout were observed could be related to the amount of perennial habitat available. Recent extended droughts occurred from 2020-2022. Mountain Home Creek is a narrow stream in a normal water year, and perennial habitat is further reduced during droughts. It could be that there are impacts on fish sizes and survivorship from recent fire(s) and a couple exceptional winter years with high velocity flows in the narrow canyon. The recent El Dorado Fire burned the eastern canyon of the watershed in September 2020. The riparian area was spared direct fire impacts, but heavy winter rains occurred behind this fire during winter 2022, and tropical Storm Hilary occurred in 2023. Fine sediments could have eroded from the eastern canyon into the creek (personal communication local homeowner, March 2023). There could also be regular sediment inputs from a decommissioned Old Control Road, which is a continuation of Mountain Home Creek Road behind water district gates that parallel the creek.

The recommendation is to continue to monitor stream conditions, continue to electrofish further upstream towards its headwaters, and downstream to Mountain Home Village. This would help to understand the extent of occupied fish habitat of Mountain Home Creek. More investigations need to be done to know the extent of trout in Mountain Home Creek and if its tributary of East Fork Mountain Home Creek may also have trout.

South Fork Santa Ana River, San Bernardino County

Survey Date: August 21, 2024

Overview:

This report describes an electrofishing survey for Brown Trout (*Salmo trutta*) in South Fork Santa Ana River. On August 21, 2024, California Department of Fish and Wildlife (CDFW) conducted a single-pass electrofishing survey. The South Fork Santa Ana River is in the San Bernardino National Forest located 39 miles east of San Bernardino, CA. The South Fork Santa Ana River is within a rural area of San Bernardino County in the mountain town of Angelus Oaks. The watershed receives input from Poopout Hill, Charlton Peak, and Dry Lake, which supply the creek with perennial flows. Recreational fishing access is off CA-38 at the confluence of the South Fork Santa Ana River and the Santa Ana River. A higher elevation access is off Jenks Lake Road turning onto forest service road 1N62Y to a private gated camp. A trail is maintained by the camp for water filtration that services every camp property in the area. South Fork Santa River is a tributary to the Santa Ana River and has no tributaries. The Santa Ana River has a watershed of 2,650 square miles (6,900 km^2). Previously, electrofishing and visual surveys had occurred to monitor the Brown Trout in the South Fork Santa Ana River.

Objective:

Conduct an electrofishing survey of Brown Trout in the South Fork Santa Ana River.

Methods:

See details in previous survey.

A 6–person group of CDFW staff participated in the one-day electrofishing survey and all used electrofishing equipment in one group. During the survey, one staff person handled an electroshocking backpack unit with four netters, and one person handled an aerated bucket. Fish would be identified to species, measured for total and fork length (millimeters) and weighed to the nearest gram (Figure 128).

Access to this survey is from a forest service road onto private property of a camp that leases the land from the US Forest Service. The survey began east of Poopout Hill from a trail access point and headed in a southerly direction towards Dry Lake (Figure 127). The riparian zone is recovering well following the 2015 Lake Fire. The canyon hillsides have remnants of burned trees, some leaf litter, and low-lying scrub preventing erosion. There are no barriers within the channel. Figure 128 show run, cascade and pool habitats, including deep pools within the narrow stream.

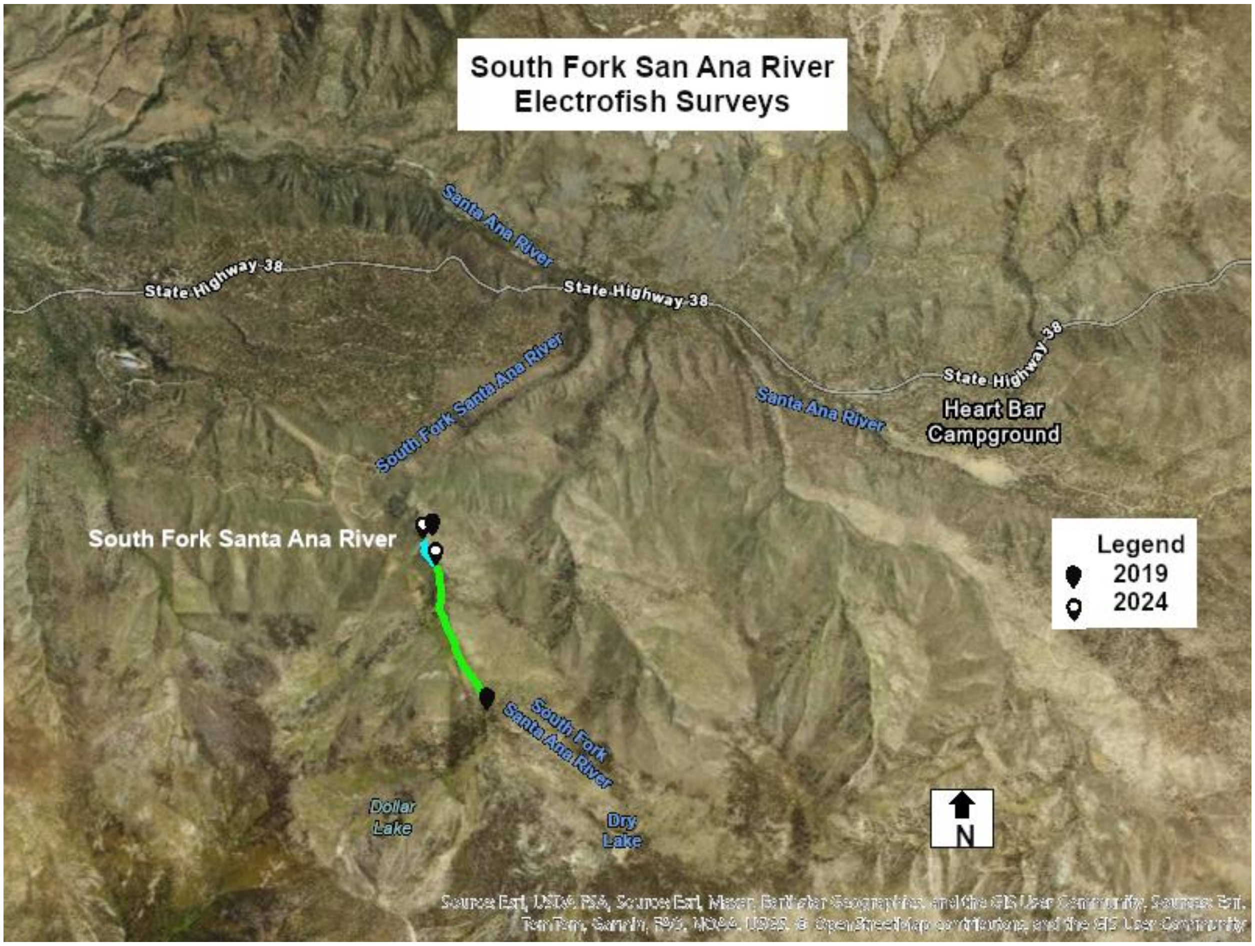


Figure 127. Map of 2019 and 2024 electrofishing survey locations on South Fork Santa Ana River. Credit – NAIP imagery ESRI. The solid black markers with green

line are 2019 survey. The black with white inner circle markers with blue line are 2024 survey.

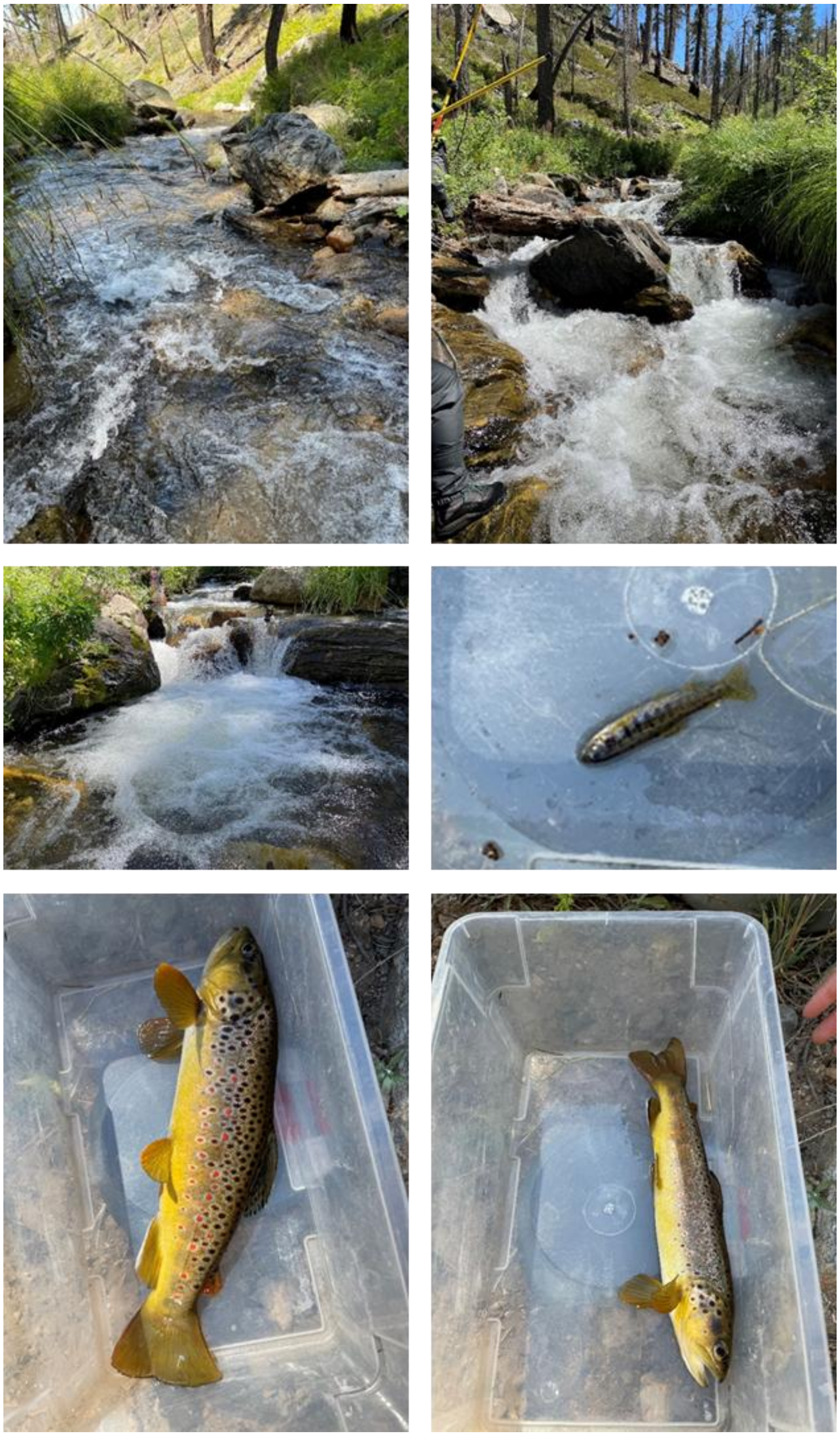


Figure 128. Site photos of run, cascade, and pool habitats, riparian area surrounded by past fire damaged hillsides with thinned tree densities, and Brown Trout.

Figure 129. Electrofishing the channel.

Results:

The section of South Fork Santa Ana River surveyed contained Brown Trout. A total of 36 Brown Trout were collected during this survey. Measured Brown Trout averaged 190 mm TL (range 48–325 mm, 1.9-12.8 inches) and averaged 182 mm FL (range 46-315 mm, 1.8-12.4 inches) in 2024. In 2024, 3% of the trout were YOY and juveniles $\leq$ 3 inches TL (76 mm).

Figure 130 shows the length frequency of Brown Trout collected in the South Fork Santa Ana River for both surveys. All of the Brown Trout collected were <13 inches in fork length. In 2024, 69% of trout were 150-219 mm FL (5.9-8.6 inches). In 2019, 43% of captured fish were 120-179 mm FL (4.7-7.0 inches) and 36% were 60-99 mm FL (2.4-3.9 inches). In 2024, 81% of the Brown Trout collected were $\geq$ 5.9 inches FL while in 2019 63% of the Brown Trout collected were <5.9 inches FL (150 mm) (Figure 130). However, it is important to note that in 2019, a longer transect of 6,217 feet was electrofished, while in 2024, 1,027 feet were electrofished.

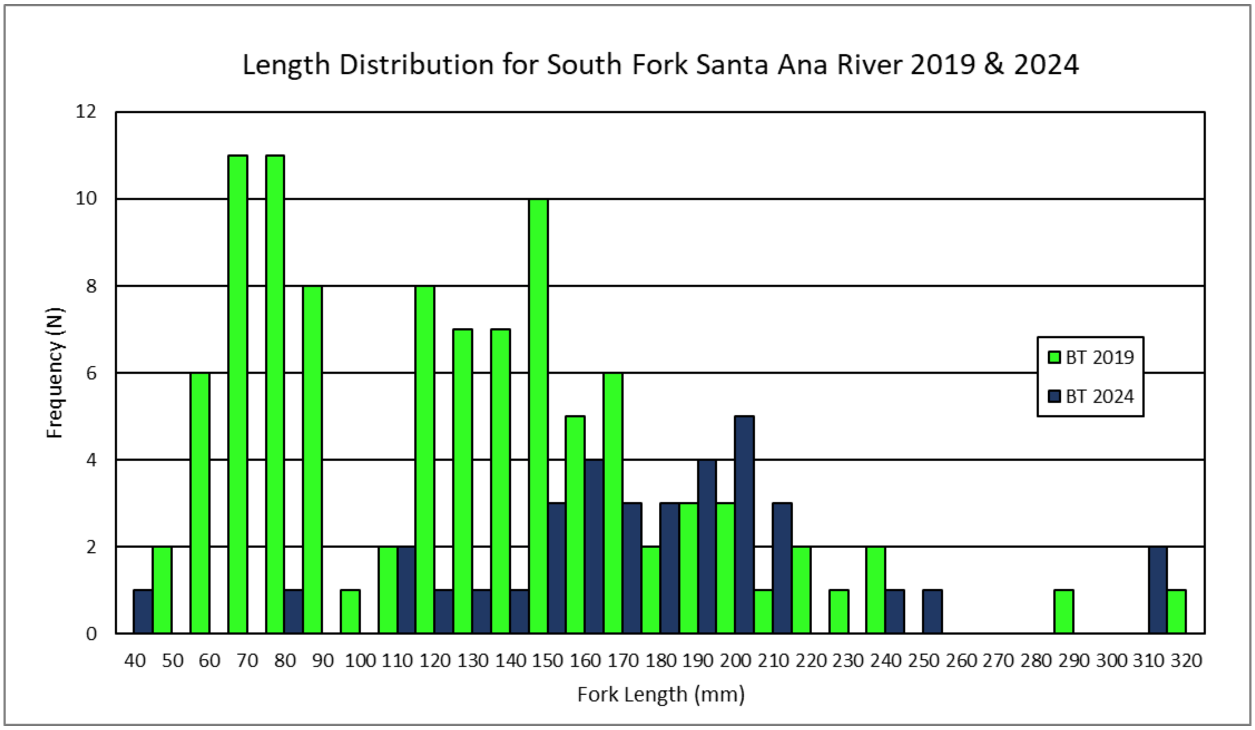


Figure 130. Length frequency of Brown Trout from South Fork Santa Ana River. The 2019 fish are shown in green and the 2024 fish are shown in blue.

Figure 131 shows the relative weights (Wr) of Brown Trout from 2024. Wr describes variation in expected weights for a fish at a given length, and it indicates body condition of the fish. A Wr of 100 indicates a healthy specimen.

Relative weights are based on the TL and weights of Brown Trout $\geq$140 mm (Milewski and Brown 1994). Relative weight ranged from 80-125 in 2024, while the average Wr was 95. Ten of thirty-one measured Brown Trout (32%) had Wr $\geq$100, and eight of thirty-one trout (26%) were in the range of 95-105. The trendline has a minimal slope with R^2 of 0.001.

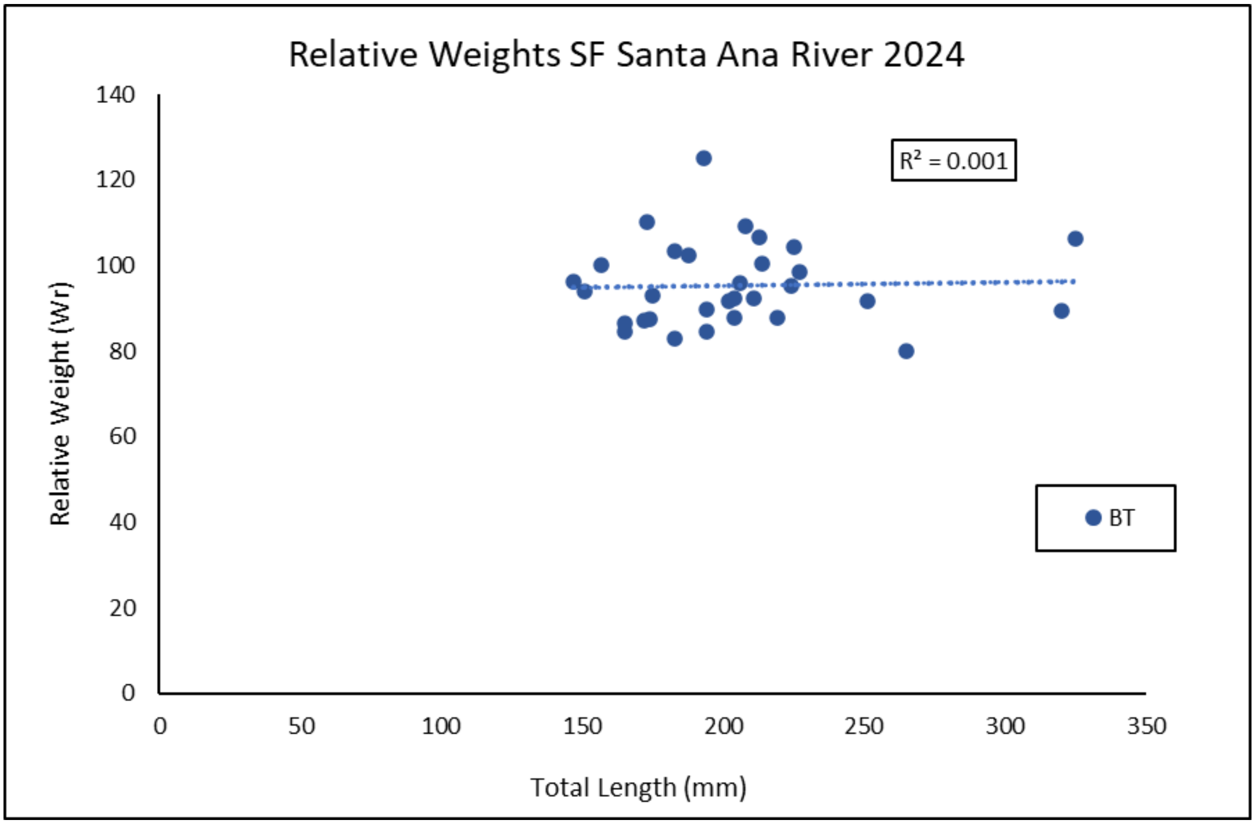


Figure 131. Scatter plot of relative weight data for Brown Trout of South Fork Santa Ana River in 2024.

The starting water temperature was 11.0 °C and the ending water temperature was 12.2 °C for the survey.

Discussion:

Based upon this survey, the South Fork Santa Ana River contains Brown Trout. The total number of fish captured decreased in 2024 (36) from the 2019 survey (100), but the transects sampled were of significantly differing lengths. The 2024 survey sampled 1,027 ft while the 2019 survey sampled 6,217 feet. No Brown Trout were missed during this survey while 105 were missed in 2019.

The survey in 2024 revisited the Brown Trout in South Fork Santa Ana River to gather data after a period of whiplash conditions with both extreme droughts and unprecedented high flows from a tropical storm. The higher quantities of large trout collected at ≥6 inches FL could be related to fish growth occurring from 2019 to 2024, where possibly they had access to complex perennial habitat due to more surface water in the stream. The variation in the sizes of larger trout collected indicates multiple generations of mature fish. The 2024 survey had 78% of the Brown Trout sampled at ≥6 inches, while the 2019 survey had only 34% of the Brown Trout sampled at ≥6 inches. Measured Brown Trout averaged 138 mm TL (range 57–328, 2.2-12.9 inches) and averaged 133 mm FL (range 55-320, 2.2-12.6 inches) in 2019.

The stream relies on both surface and sub-surface water sources with a montane meadow in its headwaters. The surrounding forest landscape in the watershed is still continuing to recover from the Lake Fire (2015). South Fork Santa Ana River is a narrow stream in a normal water year, and perennial habitat is further reduced during droughts. Visual surveys conducted by CDFW between these two fish surveys showed the amount of wet habitat was reduced during drought years. Impacts on fish survival also may have resulted from a couple of exceptional winter years with high velocity flows in the narrow canyon. These high winter flows coupled with Tropical Storm Hillary in 2023 may have washed younger fish downstream below the survey area. The 2024 data resulted in fewer small-sized trout collected.

The average Wr of Brown Trout from the 2024 survey provides an initial baseline of length-weight data in the South Fork Santa Ana River, and no weights were measured in 2019. The data shows no correlation between fish length and condition. When Wr is below 100, problems may exist in food availability, feeding conditions, competition, or habitat availability. A Wr of 100 represents fish in an "above-average" condition for certain species of fish. The Wr target range of 95-105 is often recommended for fish populations, but there are difficulties in defining "optimal or good" condition. For the survey, the Wr average of 95 is in this target range for the South Fork Santa Ana River.

The recommendation is to continue to monitor stream conditions and electrofish areas within its extended transect every year. This will provide data on the size distribution of Brown Trout in the South Fork Santa Ana River and allow us to track population metrics. The last recommendation is to electrofish downstream towards the confluence with the Santa Ana River. The public has roadside access in this area, and if Brown Trout are present here, they could be impacted by public recreation.

North Fork San Jacinto River, San Bernardino County

Survey Date: September 25, 2024

Overview:

This report describes an electrofishing survey for Brown Trout *(Salmo trutta)* in North Fork San Jacinto River. On September 25, 2024, California Department of

Fish and Wildlife (CDFW) conducted a single-pass electrofishing survey. North Fork San Jacinto River is in the San Bernardino National Forest and San Jacinto Wilderness located 24 miles east of Hemet and 48 miles southeast of Riverside, CA. North Fork San Jacinto River is within a rural area of Riverside County in the mountain town of Idyllwild-Pine Cove. The watershed receives inputs from San Jacinto Peak and Folly Peak which supply the river with perennial flows. Access is from forest service road 5S09 after crossing Logan and Stone creeks, tributaries to North Fork San Jacinto River. Water is also provided by the northern tributaries of Fuller Mill and Black Mountain creeks, which are occupied by the endangered mountain yellow-legged frog *(Rana muscosa)*. North Fork San Jacinto River also has mountain yellow-legged frog in its headwaters (Figure 133).

Historically the San Jacinto River flowed to Temescal Creek (Temescal Wash), and Temescal Wash connected to the Santa Ana River. Urban development of the Inland Empire region, the creation of Lake Elsinore, and water diversions disconnect Temescal Wash from the Santa Ana River. The Santa Ana River has a watershed of 2,650 square miles (6,900 km^2). Previously, electrofishing and drought surveys had occurred to monitor Brown Trout in the North Fork San Jacinto River.

Objective:

Conduct an electrofishing survey of Brown Trout in the North Fork San Jacinto River.

Methods:

See details in previous survey.

All participants used electrofishing equipment in one group for North Fork San Jacinto River. A group of three CDFW staff participated in the one-day electrofishing survey. During the survey, one staff person handled an electroshocking backpack unit with 2 netters, where 1 netter also handled an aerated bucket. Fish would be identified to species and measured for total and fork length (millimeters) (Figure 134)

Access to the stream is off San Jacinto Ridge Truck Trail (5S09), and the survey started downstream of the road but above its confluence with Stone Creek. The survey continued upstream heading in a northerly direction and stopped before 5S09 (Figure 132). Figure 133 shows run and pool habitats, an example of a large boulder in the channel, and habitat of a steeper gradient. The road crossing is a fish barrier.

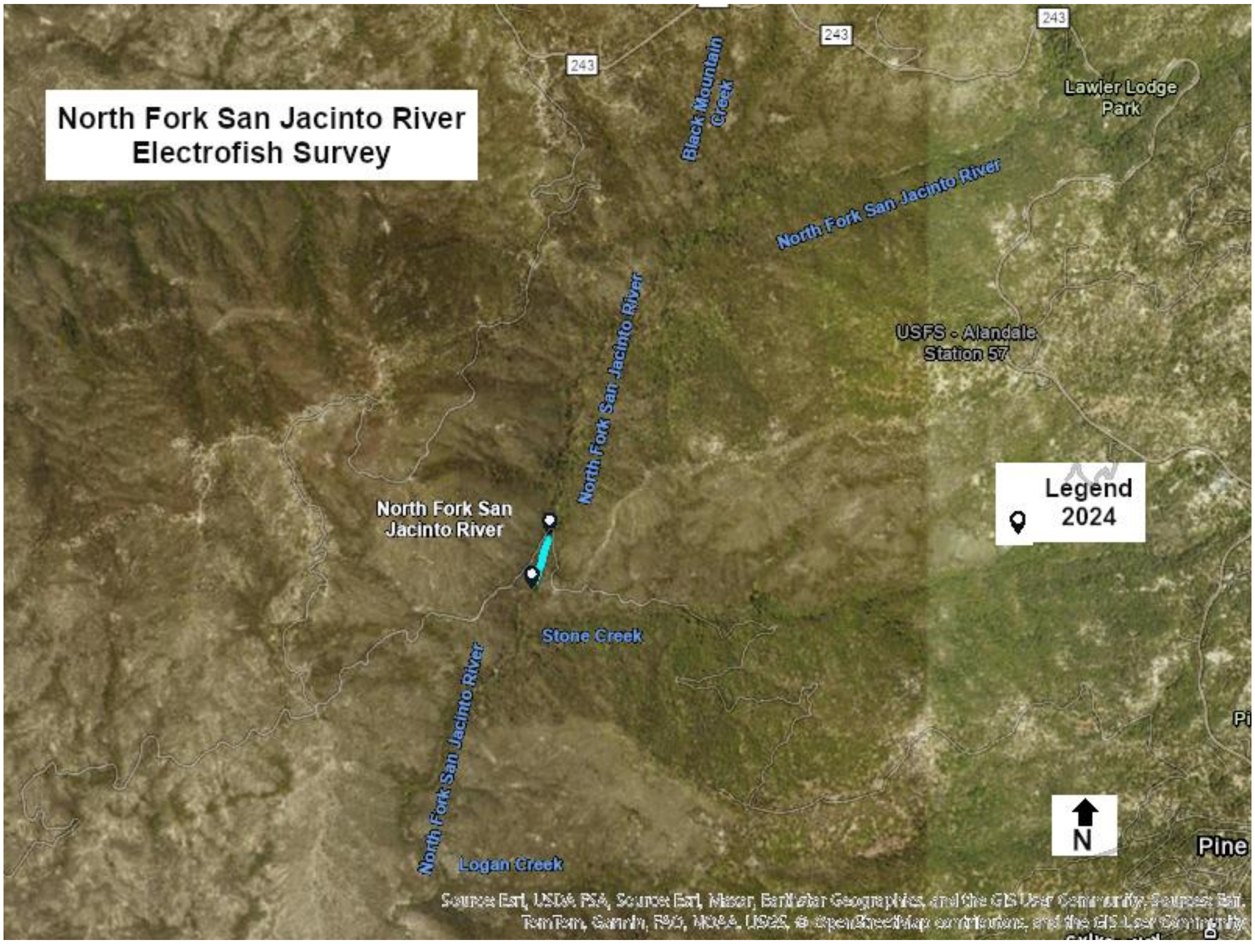


Figure 132. Map of 2024 electrofishing survey location on North Fork San Jacinto River. Credit – NAIP imagery ESRI.

Figure 133. Site photos of run and pool habitats, boulder in the channel, steeper gradient habitat, and US Forest Service Mountain Yellow-Legged Frog habitat signage.

Figure 134. Brown Trout sampled.

Results:

The section of North Fork San Jacinto River surveyed contained Brown Trout. A total of 64 Brown Trout were collected during this survey and 28 were missed during electroshocking. Measured Brown Trout averaged 105 mm TL (range 56–300, 2.2-11.8 inches) and averaged 101 mm FL (range 54-290, 2.1-11.4 inches).

Figure 3 shows the length frequency of Brown Trout collected in North Fork San Jacinto River. All of the Brown Trout were <11.5 inches in fork length, 75% were 2.4-3.5 inches FL (60-89 mm) and 14% were 9.1-11.4 inches FL (230-290 mm). Some of the larger Brown Trout were considered sexually mature, since Brown Trout mature between 2-3 years old or approximately 100-150 mm in length (Belica 2007).

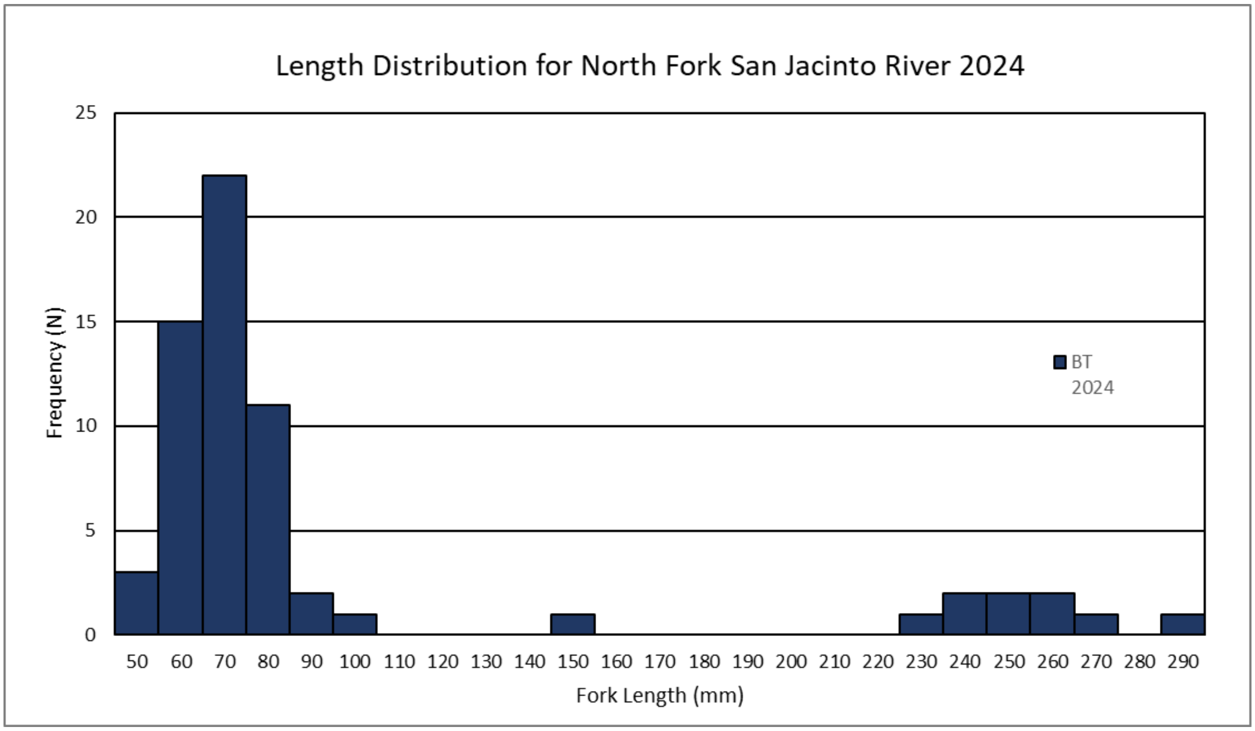


Figure 135. Length frequency of Brown Trout from North Fork San Jacinto River.

The starting water temperature was 13.4 °C and the ending water temperature was 13.6 C.

Discussion:

Based upon this survey, the North Fork San Jacinto River contains Brown Trout. There was another electrofishing survey conducted June 4, 2018, of North Fork San Jacinto River. The total number of fish captured increased in 2024 (64) from the 2018 survey (27). In the 2018 survey, measuring nets were used to estimate total lengths in inches, and collected fish were aggregated into size ranges. The goal was to identify fish to species and collect estimated size measurements within the ranges of 0-1 inches (4%), 1-2.9 inches (0%), 3-5.9 inches (37%), 6-8.9 inches (41%), 9-12 inches (15%) and >12 inches (4%) TL.

There were significant differences in sizes of Brown Trout at 1.0-2.9 inches TL (26-76 mm) and 6.0-8.9 inches TL (153-228 mm) for 2018 and 2024. The greatest number of trout (45%) sampled were 1.0-2.9 inches TL in 2024 and were absent from the 2018 survey. The range of 6.0-8.9 inches TL (153-228 mm) were absent from the 2024 survey, while the greater number of Brown Trout (41%) sampled in 2018 were in this range. All of the other size ranges were similar for the 2018 and 2024 surveys.

The survey in 2024 revisited a Brown Trout population in North Fork San Jacinto River to gather data after a period of whiplash conditions of both extreme droughts and unprecedented high flows. In North Fork San Jacinto River, fish size classes shifted to include more first generation young-of-year and more 1-year-old fish in 2024. Based on these sizes, they are probably last year's cohort. The Brown Trout collected were mostly under 4.5 inches, but some reproductively mature Brown Trout ≥4 inches were captured and did successfully spawn during this year. The lack of fish ranging from 110-219 mm FL could indicate reproductive difficulties in the prior year.

The stream relies on both surface and sub-surface water sources. North Fork San Jacinto River is a narrow stream in a normal water year, and perennial habitat is further reduced during droughts. Visual surveys conducted by CDFW between these two surveys showed the amount of wet habitat was limited in years of drought. During CDFW drought monitoring, water temperature checks of the NF San Jacinto River showed water temperature increased from July 2021at 18.6 C (65.4 F) to August 2021 at 23.2 C (73.9 F), where the average depth was approximately 6 inches at the same site.

The recommendation is to continue to monitor stream conditions and electrofish this transect of stream for Brown Trout. This will provide data on the size distribution of Brown Trout in North Fork San Jacinto River. The last recommendation is to electrofish in areas upstream and downstream of this survey. The purpose of these surveys is to determine the extent of habitat occupied by Brown Trout in North Fork San Jacinto River.

<u>East Twin Creek, San Bernardino County</u>

Survey Date October 1, 2024

Overview:

This report describes a presence/absence electrofishing survey for rainbow trout *(Oncorhynchus mykiss)* in East Twin Creek. On October 1, 2024, California Department of Fish and Wildlife (CDFW) conducted a single-pass electrofishing survey. Located in the San Bernardino National Forest, East Twin Creek is 9 miles north of San Bernardino. East Twin Creek is within a rural area of San Bernardino County on the tribal property of the San Manuel Band of Mission Indians and access is through gates on private roads. The watershed receives input from multiple groundwater springs which supply the creek with perennial flows. Surface water is also provided by the eastern tributary of Strawberry Creek (Figure 136). Historically East Twin Creek connected to the Santa Ana River, but urban development of the Inland Empire region and water diversions currently prevent connection. The Santa Ana River has a watershed of 2,650 square miles (6,900 km^2). No previous surveys have been conducted in the two sections of East Twin Creek surveyed.

Objective:

Conduct an electrofishing survey for rainbow trout in East Twin Creek and end the survey in Strawberry Creek.

Methods:

See details in previous survey.

All participants used electrofishing equipment in one group for East Twin Creek. The eight-person group consisted of five CDFW staff, three partner agency staff, and two additional biologists from the tribe observed from the streambank. During the survey, one staff person operated an electroshocking backpack unit with five netters, and two people carried an aerated bucket and fish backpack.

The survey had two transects at one high elevation and another at a lower elevation. The private roads were off of East 40th Street and CA-18 to get to the two stream access points. The upper survey started from Arrowhead Springs Road off CA-18 and headed upstream into Strawberry Creek (Figure 136). The second transect started off of East 40th street through water district gates. Figure 137 shows a water gauging station, cascade habitat, riffle and run habitats, riffle habitat with no canopy cover, and Strawberry Creek above this survey's end point.

Figure 136. Map of 2024 electrofishing survey locations in East Twin Creek. Credit – NAIP imagery ESRI.

Figure 137. Site photos of the upper elevation water gauging station, run and riffle habitat, lower elevation riffle habitat with limited riparian plants, and Strawberry Creek above its confluence with East Twin Creek.

Figure 138. Electrofishing pool habitat.

Results:

The section surveyed contained no rainbow trout. The starting water temperature was 23.2 C, and the ending water temperature was 25.0 C.

Discussion:

East Twin Creek contains no rainbow trout based on this survey. The survey also shows that there are no trout at the confluence of Strawberry Creek. There are no recommendations to continue to survey for trout or to monitor stream conditions. There is no need to continue electrofishing upstream in East Twin Creek or Strawberry Creek towards their headwaters to understand the extent of unoccupied habitat. The tribal biologists said that they had not seen any trout in East Twin or Strawberry creeks, but no surveys had confirmed this data by CDFW.

<u>Angler Survey Box (ASB) Monitoring Program</u>

Dates: Ongoing

Summary:

The ASB monitoring program is a long-standing monitoring effort that utilizes a self-reporting angler census/creel. ASBs in the Inland Deserts Region South are serviced by HWTP staff and volunteers multiple times per year. Data collected is reviewed for completeness and errors by multiple staff and is entered into an

Access database for Region 6. ASB data provided by the public allows fisheries managers to assess angler catch rates and user statistics. In addition, this data is used to monitor fishery health and angling trends over time. A summary of all Region 6 South ASB data will be provided when the data is analyzed.

During 2024, the Heritage and Wild Trout (HWT) section of Deep Creek remained closed by the US Forest Service (USFS) Order that was initiated as of May 2020 until rescinded. This USFS Order governing forest land use was related to health and safety issues of recreators with emergency services unable to access injured parties due to a density of visitor's parking in the area. A Deep Creek Comprehensive River Management Plan (CRMP) was written by the USFS in May 2024. HWT Section of Bear Creek was closed for part of 2024 due to the Line Fire by a Forest Service Order that was initiated in early September 2024 until rescinded. Although both of these streams had recreational closures, angler forms were submitted via the angler survey boxes and provided data for analysis of catch rate and user statistics. Inland Deserts Region South Environmental Scientist for Riverside and San Bernardino counties collected and is summarizing ASB data for the following waters:

- Bear Creek
- Deep Creek

<u>Parker Lake, Mono County</u>

Survey Dates: 3/2/2024

Overview:

Parker Lake is a 23-acre lake located in Mono County near the June Lake Loop. It was designated as a Wild Trout Water in 2011 because of the trophy Brown Trout (*Salmo trutta*) and fast action Brook Trout (*Salvelinus fontinalis*) fishery it supports. After a 2022 survey, CDFW staff determined the Parker Lake fishery was in decline. A regulation change proposal to restrict harvest was adopted by the Fish and Game commission in 2023. In 2025, the new regulations were changed to a 2 trout and 14-inch minimum size limit to minimize angling impacts.

Objective:

On March 27, 2024, CDFW staff backcountry skied into Parker Lake with sonar and ice auguring equipment to survey the trout population. The goal of this survey was to determine the efficacy of winter sonar surveys. We hypothesized that due to the immobility of fish during winter, conducting sonar surveys during winter would produce a more accurate population estimate than during summer when fish are more active.

Methods:

We augured four holes in the ice covering Parker Lake to conduct four point count sonar surveys, measuring water quality at each point (Figure 139). The sonar technology we used was "LiveScope" mode (real-time imagery) on a Garmin ECHOMAP UHD 93SV. For each point count, staff set the sonar at a fixed distance and rotated the transducer 360°, counting any fish detected on the screen.

Results:

We decided to conduct only four point counts because one third of the lake was melted through and we deemed the ice near the melted area unsafe to walk on or augur through. We concentrated all of our points on the southern side of the lake near the outlet where ice appeared the thickest.

At first, we set the sonar distance to 10ft, but decreased the setting to 5ft, because we found it difficult to visually detect anything in the water column. Despite this change, it remained difficult to discern which sonar blips were fish or vegetation/debris on the lake bottom during each of the point counts. The fish data we collected is therefore unreliable (Table 49).

Additionally, we measured water quality at each point by suspending the probe about halfway in the water column at 3-4ft depending on sonar depth measurement (Table 50). All recorded measurements are within the livable range for both Brown and Brook trout, but below optimal growth temperatures (Moyle, 2002).

Table 49. Fish data at each point count.

Point Count	Time	Fish	Depth (ft)	Surface Area Surveyed (ft^2)
1	12:26	0	7	314
2	12:50	5	6	79
3	13:10	2	8	79
4	13:30	1	8.5	79

Table 50. Water quality at each point count.

Point Count	Temperature (°C)	DO %	DO (mg/L)	Conductivity (µm/cm)	Depth of Probe (ft)
1	4.3	89.5	8.57	66.5	3
2	3.9	90.4	8.78	66.0	3
3	3.8	96.5	8.93	66.0	4
4	4.1	91.8	8.85	65.8	4

Figure 139. Pictures of sampling locations at Parker Lake.

Discussion:

We originally hypothesized that the sedentary nature of trout during the winter would create a more accurate population estimate when conducting sonar surveys. It is possible the immobility of fish during this season made it difficult to visually detect fish on the sonar device. It is also plausible that there is a low density of fish in Parker Lake at this time since prior survey data showed a decline in the fishery. Winter sonar surveys could be an effective option if the surveyor is extremely familiar with Garmin LiveScope technology, therefore minimizing user error.

<u>Laurel Lakes, Mono County</u>

Survey Dates: 5/29/2024 and 6/19-6/20/2024

Overview:

The Laurel Lakes are located south-east of the town of Mammoth Lakes in Mono County. The two lakes were designated as a Wild Trout water in 1990 for their ability to grow trophy-sized California Golden Trout (*Oncorhynchus aguabonita*). Recent angler survey box data and brief angling surveys, suggest the Laurel Lakes fishery supports fewer California Golden Trout than it used to and they are difficult to catch. CDFW regional staff determined further investigation into the status of the Laurel Lakes fishery was necessary and conducted a three-day sonar and angling survey of both lakes and surrounding stream habitat.

Objective:

On May 29th and June 19th-20th, 2024, two CDFW Region 6 staff hiked into the Laurel Lakes to conduct sonar surveys and angling surveys of both lower and upper Laurel Lakes.

Methods:

Sonar Surveys

Sonar surveys consisted of conducting point counts using the "LiveScope" mode (real-time imagery) on a Garmin ECHOMAP UHD 93SV mounted to a "boogie board". One person operated and towed the device from a float tube to conduct each survey (Figure 145). Staff enumerated fish at 4 different point count locations on Lower Laurel and 16 different points on Upper Laurel. At each point location, staff rotated the sonar device 360° while scanning at a 20ft radius. Data collected at each point included: the number of fish identified in each circle and recorded coordinates, depth at point, and duration of survey.

Point count data were used to estimate the total population size of California Golden Trout in both lakes through two ratios. The proportion of lake surface area surveyed (*a*) and number of fish (*n)* for each point count was compared to the overall surface area (*A*) of the lake to calculate total fish (*N*) in the lake: $N = \frac{A \times n}{a}$. A population estimate was calculated for each survey site, then the estimates were averaged to account for differences in fish distribution throughout the lake. Additionally, standard error and upper and lower limits were calculated for a 95% confidence interval. The same calculations were performed using volume of water surveyed compared to volume of water in the lake for each point count survey. Lake volume was estimated by multiplying lake surface area by the average depth measurement.

Angling Surveys

Staff conducted angling surveys around Upper Laurel Lake, Lower Laurel Lake, and the connector stream between the two lakes using fly rods. For each survey, staff recorded the following data: start and end times, species captured, length (mm), and weight (g).

We used angling data to calculate catch per unit effort for each survey area, number of age classes and evaluate the condition of California Golden Trout in the Laurel Lakes. We used the following standard weight equation for California Golden Trout: $\log_{10} W_s = -5.088 + 3.041 \log_{10} TL$.

Stocking

Following these surveys, Bishop Field Office staff decided to supplementally stock California Golden Trout into Upper Laurel Lake. On October 22nd, staff from both the Statewide and Region 6 North Heritage and Wild Trout Program received 5,000 California Golden Trout fingerlings from Region 4's Moccasin Creek Hatchery and successfully planted upper Laurel Lake.

Results:

Sonar Surveys

Point count surveys indicate the population size of Upper Laurel Lake is between 208 and 304 fish and the population size of Lower Laurel Lake is between 260 and 333 fish. Both calculations have large margins of error, likely due to the patchiness of fish throughout each lake. In a previous survey of California Golden Trout in the Cottonwood Lakes Basin, sonar surveys suggested that the surface area point count population estimates most closely correlate with mark/recapture population estimates (McConnell and Agerholm, 2023).

Table 51. 2024 population estimates of California Golden Trout in the Laurel Lakes.

Calculation method	Lake	Population Estimate (N)	Upper Confidence Limit	Lower Confidence Limit	Standard Error
Volume	Upper Laurel	304	1,443	0	141
Volume	Lower Laurel	333	663	2	84

Calculation method	Lake	Population Estimate (N)	Upper Confidence Limit	Lower Confidence Limit	Standard Error
Surface Area	Upper Laurel	208	702	0	61
Surface Area	Lower Laurel	260	404	116	37

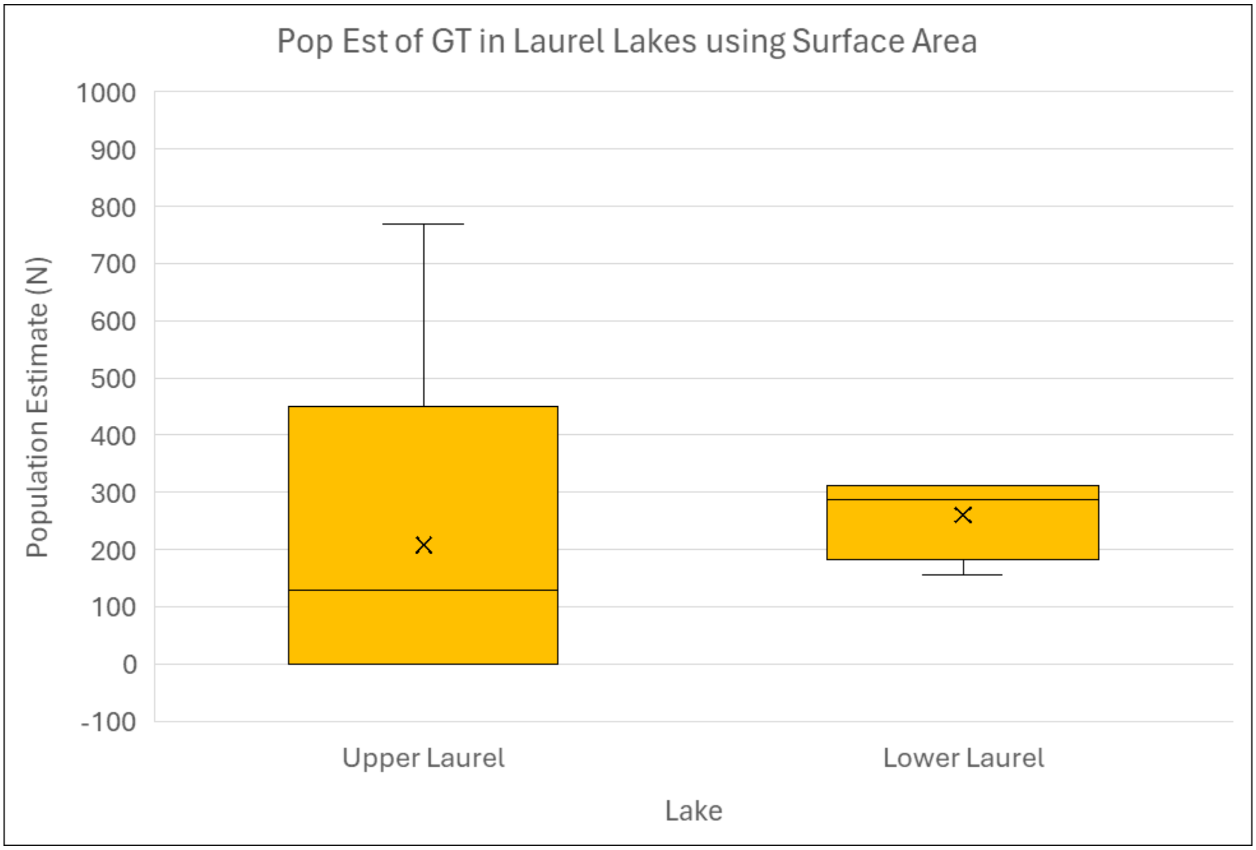


Figure 140. Population estimates of California Golden Trout in the Laurel Lakes from 2024 sonar surveys calculated using surface area.

Angling Surveys

We caught the most California Golden Trout in Lower Laurel Lake and the creek connecting the two lakes. No fish were captured in Upper Laurel Lake during angling surveys. Staff had the most angling success in the late afternoon/evening. The connector stream between the two lakes had the highest capture efficiency (Table 52). While conducting angling surveys, staff noticed California Golden Trout in the connector stream exhibiting spawning behavior. It appeared that stretch of creek contained the only suitable spawning habitat of all the streams surrounding the Laurel Lakes.

Lower Laurel Lake and its inlet contain three age classes of California Golden Trout (Figure 141). The size classes containing fish under 150mm and between 200mm and 250mm are absent from the population. The largest California Golden Trout we caught was 381mm or 15 inches.

Most of the California Golden Trout captured were in good condition when compared to Hyatt and Hubert's standard weight equation for California Golden Trout (Figure 142). Larger California Golden Trout (especially the largest two) were in poor condition and therefore under the expected standard weight for their lengths (Figure 143).

All lake inlets and outlets had suitable water quality levels for California Golden Trout (Table 53).

Table 52. Catch per unit effort of California Golden Trout during 2024 angling surveys.

Location	CPUE (fish/hr)
Upper Laurel Lake	0
Lower Laurel Lake	0.8
connector stream	1.2

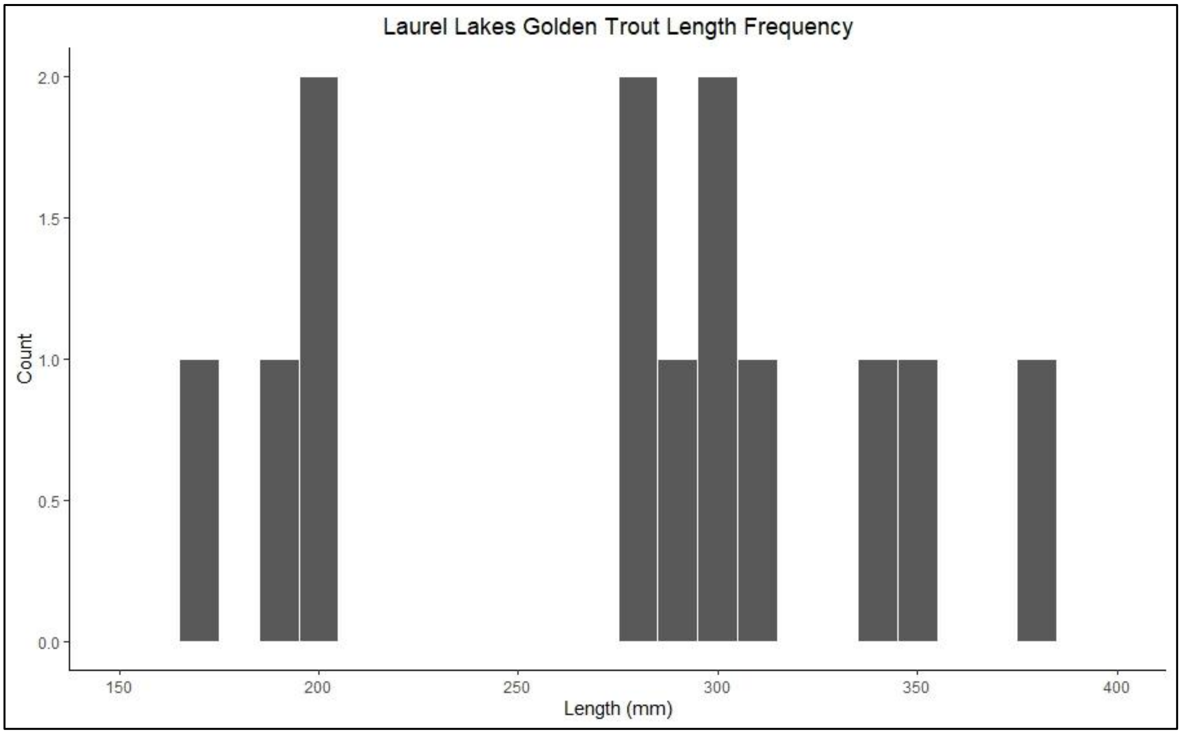


Figure 141. Length frequency histogram of California Golden Trout captured in the Laurel Lakes during 2024 angling surveys.

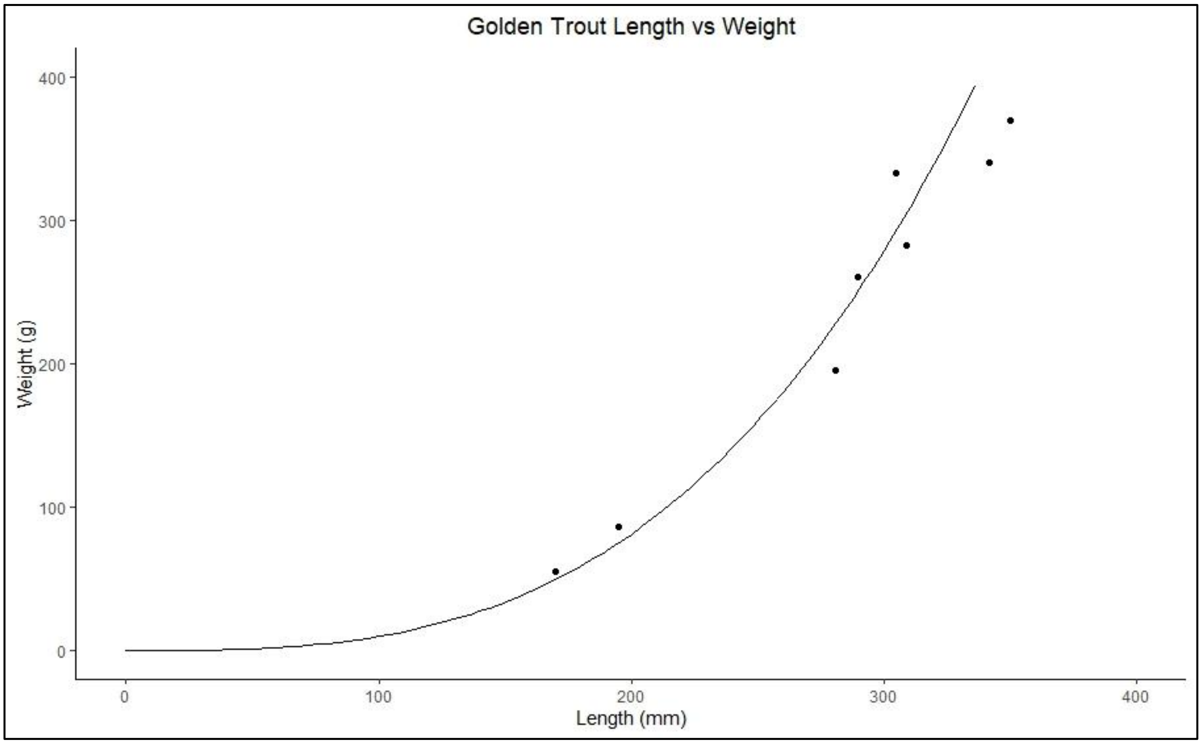


Figure 142. Length vs. weight ratio of California Golden Trout captured in the Laurel Lakes during 2024 angling surveys. The line represents standard weight for

California Golden Trout and points represent individual California Golden Trout captured during surveys.

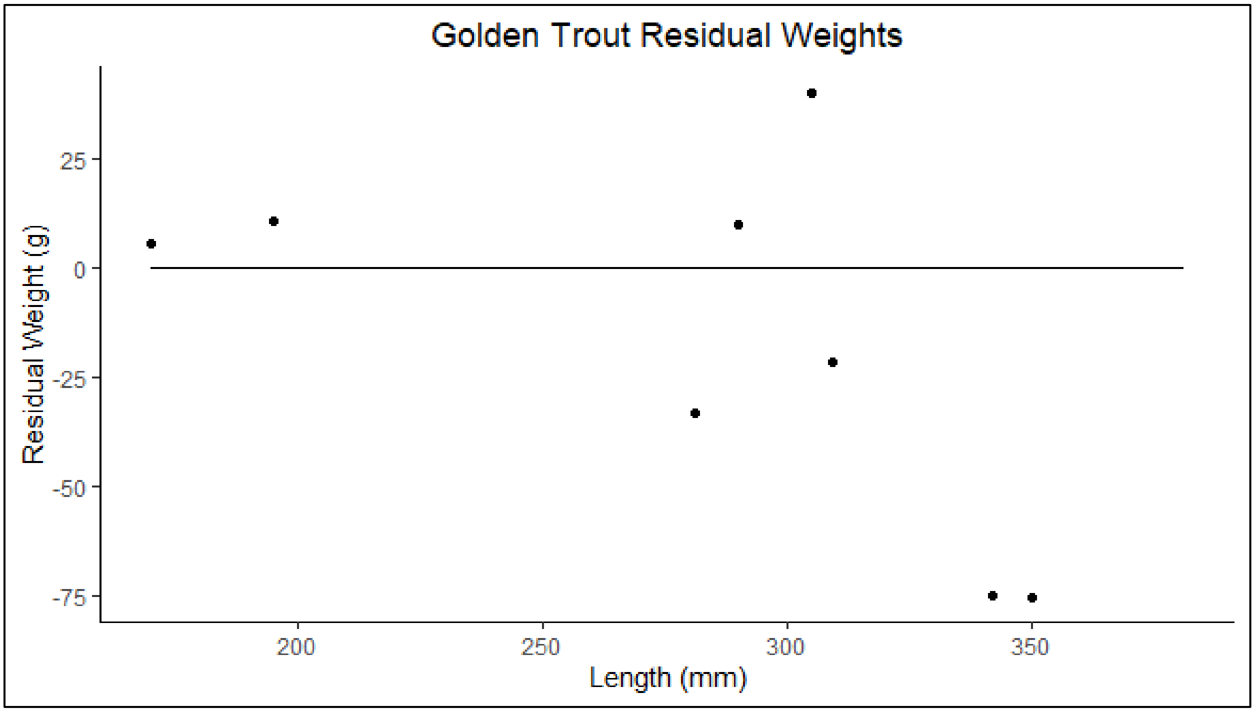


Figure 143. Residual weights of captured California Golden Trout in the Laurel Lakes from 2024. Points calculated by subtracting standard weight from measured weight of captured trout.

Water Quality: 6/19/2024

Table 53. Water quality of the Laurel Lakes' inlets and outlets during 2024 surveys.

Location	Temperature (°C)	DO (mg/L)	DO (%)	Conductivity (mS/cm)
Upper Laurel Lake Inlet	5	12.2	134.1	0.0617
Upper Laurel Lake Outlet	10.4	9.96	124.8	0.0592
Lower Laurel Lake Inlet	12.5	8.57	113.2	0.0654
Lower Laurel Lake Outlet	9.8	9.34	115.1	0.0634

Stocking: 10/22/2024

Staff drove up Laurel Lakes Road as far as possible and backpacked in buckets of California Golden Trout, planting approximately 4,800-4,900 fingerlings in upper Laurel Lake (Table 54). Mortalities were caused by the rough road and some fish not acclimating well to the cold water temperature.

Table 54. Total California Golden Trout stocked in Upper Laurel Lakes in 2024.

Species	Hatchery	Size	Allotment	Mortalities
California Golden Trout	Moccasin Creek	Fingerling	5,000	100-200

Discussion:

Despite Upper Laurel Lake's far larger size, the population of California Golden Trout remains similar to or smaller than that of Lower Laurel Lake. This is potentially due to fish traveling downstream into Lower Laurel Lake and then out of the system via the outlet cascade that acts as a fish barrier. It is also possible that Lower Laurel provides better habitat for California Golden Trout, but future surveys are needed to confirm this hypothesis.

We only detected larger California Golden Trout during our surveys, likely due to sampling bias of sonar and angling surveys, a lack of reproduction, or predation. Despite detecting only larger fish, no trophy-sized (≥18inches or 457mm) California Golden Trout were captured, suggesting a decline not only in abundance, but also size.

The planted fingerlings will supplement the lack of recruitment in the Laurel Lakes' population. Angler Survey Box data and CDFW surveys in 2025 and 2026 will quantify this stocking event's impact on the fishery.

Due to the decline in the Laurel Lakes fishery, further investigations into the health and fishing pressure of Upper Laurel Lake are warranted. It is possible that semi-regular supplemental stocking might be necessary to bolster the population. Another option is to expand spawning habitat in the surrounding creek area.

Images

Figure 144. California Golden Trout captured during angling surveys.

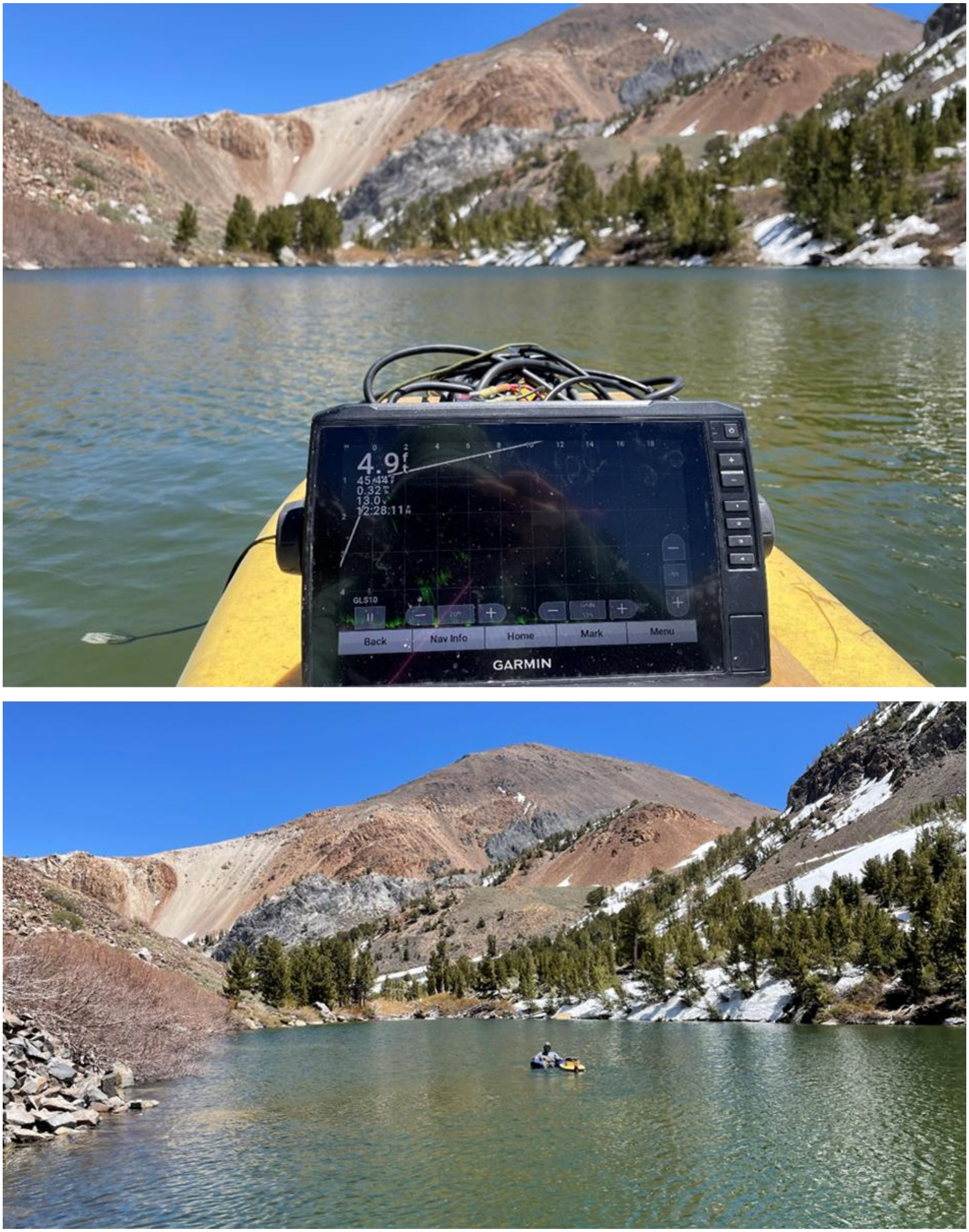


Figure 145. Staff conducting sonar surveys on Lower Laurel Lake.

Robinson Creek, Mono County

Survey Dates: 10/20/2024

Overview:

Robinson Creek is located southwest of the town of Bridgeport in Mono County, CA. It is a tributary of upper Twin Lake, a popular fishing destination. Twin Lakes became one of the 23 Kokanee Sport Fisheries in California when it was first stocked in 1958. Native to the Pacific Northwest, Kokanee Salmon (*Oncorhynchus nerka*) provide a unique angling experience in an Eastern Sierra landlocked water. Additionally, Twin Lakes are stocked with other non-native trout species, such as Rainbow Trout (*Oncorhynchus mykiss*), Brook Trout (*Salvelinus fontinalis*), and Brown Trout (*Salmo trutta*).

Objective:

On October 20, 2024, CDFW staff from the Bishop Field Office and Statewide Heritage and Wild Trout crew conducted single pass electrofishing surveys to survey the salmonid populations of Robinson Creek.

Methods:

The survey crew consisted of 3 shockers, 3 netters, and 1 live car tender. Staff set the backpack electrofishing units at 30Hz, 30%, and 350V. Following standard electrofishing protocols, staff conducted 3 single pass transects.

Results:

For the duration of the three locations and 150m surveyed, the weather was sunny and clear (Table 55). The species detected in order of abundance were Brown Trout, Brook Trout, Kokanee Salmon, and Rainbow Trout (Table 56). Kokanee salmon were only present in the lower transect closest to the inlet of Upper Twin Lake. In the two downstream transects, staff observed a total of nine redds, most likely Kokanee or Brook Trout due to survey timing (Table 55).

Robinson Creek supports five size classes of Brown Trout with total lengths ranging from 38mm to 438mm (Figure 146). Staff detected three size classes of Brook Trout, total lengths ranging from 102mm to 203mm (Figure 147). The Kokanee that staff captured in the downstream transect contained two size classes, total lengths ranging from 191mm to 292mm (Figure 148). Staff only caught two Rainbow Trout, with total lengths of 127mm and 152mm.

Table 55. Locations and effort of survey transects at Robinson Creek.

Section	Survey Time	Effort (seconds)	Distance (m)	Start Coordinates	Redd Count
1	10:25 – 11:00	1727	100	38.14466° -119.38749°	7
2	11:21 – 11:38	2148	25	38.14448° -119.38879°	0
3	11:59 – 12:06	1818	25	38.14511° -119.38167°	2

Table 56. Total fish captured during electrofishing surveys at Robinson Creek

Species:	Brook Trout	Brown Trout	Rainbow Trout	Kokanee Salmon
Total Count:	38	52	2	16

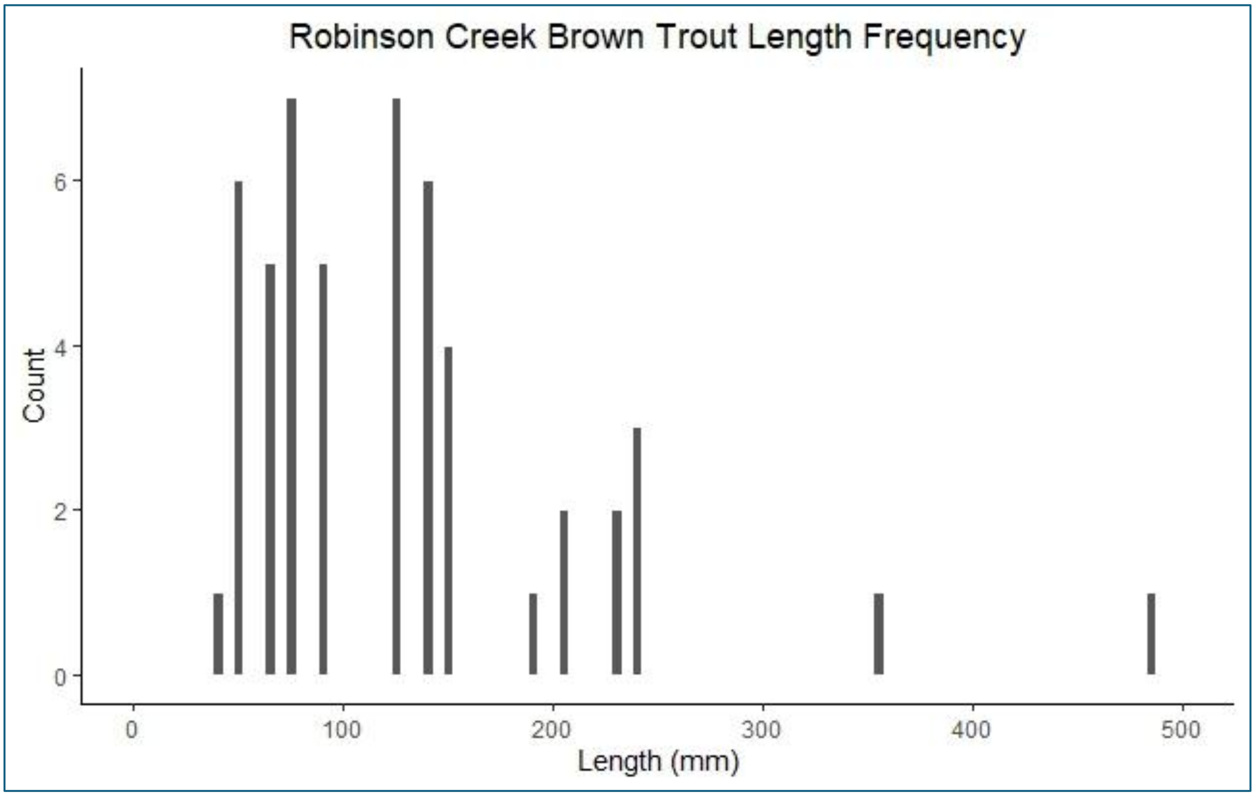


Figure 146. Length frequency histogram of Brown Trout in Robinson Creek.

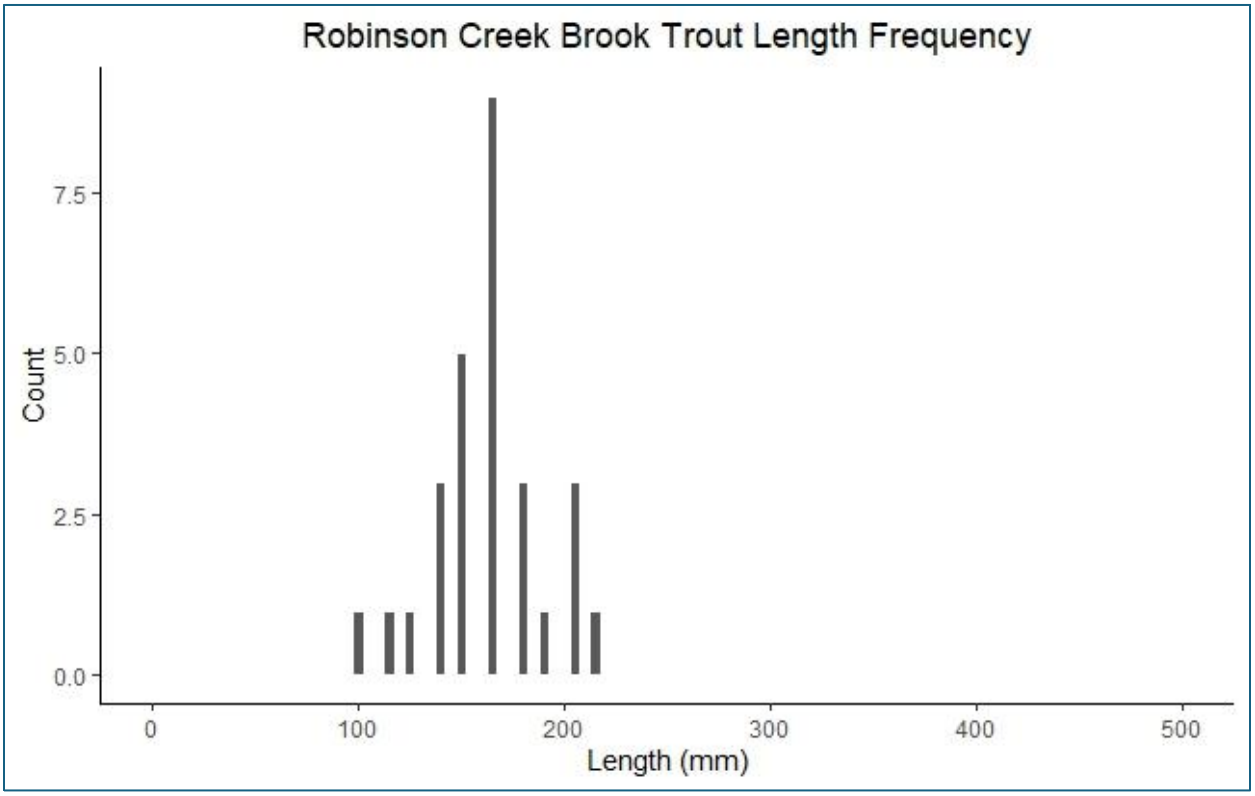


Figure 147. Length frequency histogram of Brook Trout in Robinson Creek.

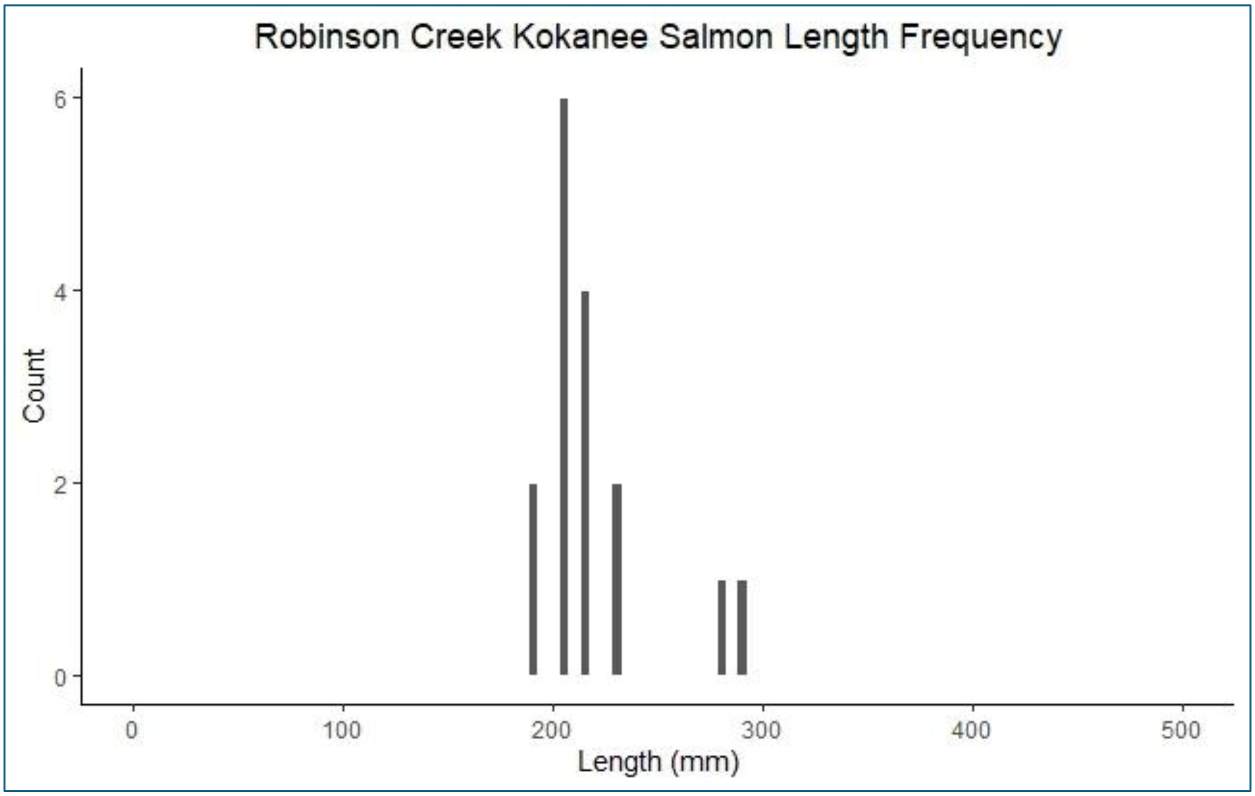


Figure 148. Length frequency histogram of Kokanee Salmon in Robinson Creek.

Discussion:

Overall, staff detected all stocked species during the surveys of Robinson Creek. Twin Lakes and surrounding habitat remain suitable for all detected species. The redds observed in each transect suggest some of these salmonid populations are self-sustaining, but current details regarding the survival and recruitment of wild trout in this area are unknown and have not been investigated since the late 1960s. Future surveys could be conducted to gather further information on existing wild salmonid populations at Twin Lakes.

Habitat Improvement

<u>Silver Creek Brook Trout Removal</u>

Project Status: In Progress, final stages

Project Overview:

The Lahontan Cutthroat Trout (*Oncorhynchus henshawi*, "LCT") are the largest native inland trout species in North America. They historically inhabited the streams of Southern Oregon, Nevada, and Eastern California that drained into the pluvial Lake Lahontan. Beginning around the turn of the last century, non-native trout were stocked into LCT-occupied waters to augment recreational fishing opportunities. These non-native trout outcompeted and replaced the native trout so that very few LCT remained in their native range by the 1950s. Consequently, the LCT gained the protection of the Endangered Species Act in 1970 and have been classified as threatened since 1975.

The Carson, Tahoe, and Walker Basin LCT populations in eastern California and Nevada comprise the Western Geographic Management Unit (GMU). Within this GMU, the Walker Basin LCT are the most isolated and the most genetically distinct. Unfortunately, it was also the most imperiled: Walker Basin LCT were presumed extirpated around World War 2. The future of Walker LCT began to improve in 1977, when a small population was discovered in marginal habitat outside of Bridgeport. Subsequent restoration efforts yielded an additional five Walker Basin LCT populations to date.

Today, the Walker Basin LCT population is still at risk of extirpation and remains a high priority for conservation efforts. Of the six extant LCT populations within the Walker Basin, only one is considered potentially resilient in the face of climate change. The 2019 Updated Goals and Objectives for the recovery of LCT in the Walker Basin require the establishment of three additional resilient populations (U.S. Fish and Wildlife Service, 2019). A cost and resource effective way to achieve resilient populations is to convey resilience to the existing non-resilient populations wherever possible. Unfortunately, finding suitable habitat can be challenging. Streams that are good candidates for resilient LCT populations are large enough to withstand drought events, productive enough to provide an ample food supply, free from non-native fish competition, and isolated against non-native fish incursion. Most of the occupied or potential LCT habitat is comprised of small and/or high gradient streams and their corresponding vulnerability to extreme drought events is not easily remedied. However, a non-resilient population of LCT occupies Silver Creek, one of the largest and most productive watersheds in the Upper Walker Basin.

The size and productivity of the Silver Creek watershed have made it a focal site for Walker Basin LCT recovery for over twenty-five years. Unfortunately, these same characteristics probably also encouraged the introduction of non-native trout. Between 1994 and 1996, CDFW (then CDFG) mounted its first effort to eradicate non-native Brook Trout (*Salvelinus fontinalis*) using rotenone and reintroduce LCT to the Silver Creek watershed. Upon project completion, Silver Creek became the largest LCT recovery stream in the Walker Basin. Unfortunately, CDFW staff discovered a reproducing population of Brook Trout in Silver Creek in 2004.

Since then, CDFW and its conservation partners have attempted manual removal of the non-native Brook Trout every summer using backpack electrofishing units. These efforts culminated in 2016 and 2017 when a dedicated crew of eight staff from CDFW and Trout Unlimited plus additional volunteers were assigned to Silver Creek for the entire summer to conduct these manual removal efforts. These efforts were unsuccessful in eradicating the Brook Trout population due to habitat quantity and habitat complexity, and low water conductivity. Collectively, these factors reduced capture efficiency to a level that made manual removal untenable, and it was determined that other methods were necessary to achieve complete eradication (Duckwall, Buchanan, Hogan, & Weaver, 2017).

Silver Creek itself presents a relatively unique situation: LCT have persisted in the stream as a direct result of the continual suppression of Brook Trout, and by most metrics- such as allelic diversity and population size- the LCT population in Silver Creek is healthy. However, the LCT are entirely dependent on continual intervention and the population is still struggling with non-native competition. Traditional methods have failed to result in the eradication of non-natives, so we implemented a novel approach in 2020 using sequential dewatering in conjunction with backpack electrofishing in the upstream reaches of Silver Creek. This approach will enable us to 1) remove Brook Trout with nearly 100% efficacy, 2) minimize mortality of resident LCT, and 3) avoid the unintentional non-target ecological impacts associated with rotenone treatments. We implemented this method in 2021, until an early snowfall forced an early end to the season. In 2022 we were successful in dewatering the entirety of the target reach of Silver Creek (from the headwaters down to a barrier waterfall). Due to the record snow year and delayed snowmelt in 2023, we were only able to partially dewater the target reach.

Methods

Site Description:

The Silver Creek watershed is comprised of the mainstem of Silver Creek and eight fish-bearing tributaries that cumulatively total 11.5 miles of cold, drought-resistant, perennial stream habitat. The mainstem of Silver Creek flows a total of 9.5 miles from its headwaters to the confluence with the West Walker River. The watershed is owned and managed by the Humboldt-Toiyabe National Forest and the U.S. Department of Defense. The upper four miles of stream are within a designated roadless area, and the entirety of the drainage is utilized as a training ground by the United State Marine Corps Mountain Warfare Training Center (MWTC).

Aside from the presence of Brook Trout, the Silver Creek watershed has relatively unique potential to support an abundant population of large LCT. The watershed contains miles of third-to-fourth-order, sub-alpine, low-gradient habitat that has both significant autochthonous benthic invertebrate production and allochthonous input from adjacent meadows. Silver Creek displays an average gradient of 265 feet per mile (range: 63-525 ft/mi, NASA STM data), which is relatively low for east-slope streams in the central Sierra Nevada. The elevation profile of Silver Creek exhibits a transposed sinusoidal curve, with the highest gradients in the upstream and downstream reaches. This pattern is driven by glacially scraped ridges and a competent andesitic lahar bedrock layer that is resistant to erosion. Silver Creek is isolated from downstream fish populations by two 15-foot waterfalls formed by the lahar upstream of the MWTC.

Timing:

The Silver Creek hydrograph is highly seasonal: snowmelt-driven runoff begins in April and typically peaks in June at about 50 cfs, after which the stream regresses to baseflows (around 8 cfs) by August. This 2024 field season followed an average snow year and spring temperatures allowed for the crew to begin removal on schedule at the end of July.

Baseline surveys:

We began the 2024 project at known fish barriers in the headwaters of Silver Creek and the fish-bearing tributaries. Previous electrofishing and eDNA surveys indicated that these were the upstream limit of trout distribution, and prior to any project activities, we conducted reconnaissance electrofishing surveys to verify the absence of trout.

In addition to LCT, there is a population of the state and federally endangered Sierra Nevada Yellow-legged frog (*Rana sierrae*) in the headwaters. To avoid impacts to Sierra Nevada Yellow-legged Frog, we conducted visual encounter surveys for adult frogs and larvae prior to stream diversion.

Dewatering:

We used small sandbag dams to divert the stream flow into polypipe, a flexible plastic tubing manufactured by Tyco Plastics. We then routed the diverted flow through about 2000-5000 feet of pipe before returning it to Silver Creek. Due to subsurface inflows from adjacent meadows and talus slopes, the diverted channel typically contained a small amount of water, and in some instances minor amounts of flow were present in the channel below the diversion. We used a series of portable, gas-powered pumps to capture accreted flow and dewater any remaining habitat. Following the completion of fish removal, flows were returned to the channel, and we rebuilt the diversion dam immediately downstream of the previously targeted area.

Fish Removal:

We completed a single electrofishing pass immediately prior to stream diversion to reduce LCT mortality due to stranding. Once the stream was diverted, we captured stranded fish by hand or dipnet where possible. We used a Smith-Root backpack electrofishing unit to capture fish within wetted portions of the diverted reach immediately following flow diversion. We placed captured fish into an aerated bucket, estimated the length of all captured trout to the nearest inch, identified fish to species, and recorded the number of each size class. All LCT were re-identified by a CDFW staff member and translocated above the project area while Brook Trout were euthanized in a humane manner or translocated to a nearby recreational fishery, depending on logistical feasibility. Following electrofishing removal, staff conducted visual inspections of the dewatered channel to capture and remove any stranded fish. We estimated capture efficiency using a maximum likelihood regression model, run in the FSA package in R (Ogle et al. 2025).

Environmental DNA:

We collected environmental DNA (eDNA) samples throughout the project area over several days after staff had completed removal efforts. The eDNA collection followed the Genidaqs standard protocol. We collected samples starting at the upstream-most extent of the project, moving downstream to the fish barrier at end of the project area. Additionally, we sampled three additional areas below the fish barrier for positive Brook Trout controls. Prior to daily sample collection, we filtered bottled water to determine if there was field contamination. We collected samples in 150-200m intervals for a total of 85 eDNA samples (not including daily controls) from both the mainstem and tributaries.

Tagging Efforts:

After completing removal efforts, we used FLOY tags to mark both Brook Trout and LCT from Silver Creek falls (38.36267° -119.51983°) upstream to the waterfall barrier marking the end of the removal area (38.37238° -119.53364°). Tagging fish in this area enables us to determine if any individuals move upstream into the removal area.

Two teams surveyed varying stream habitats throughout the 1.2-mile area between the waterfalls at full flow. Each team consisted of two electrofishing units and two netters. We only tagged fish greater than 6 inches and euthanized all captured Brook Trout that were too small to tag.

Results

In 2024, a field crew of 5-15 individuals dewatered 5.9 miles of Silver Creek and 1.6 miles of tributaries (Figure 149). This totaled 7.5 miles of stream (89% of all trout habitat in Silver Creek, and 100% of all trout habitat above the first waterfall). The specific reaches and dewatered habitats are listed below.

Table 57. 2024 diverted sections.

Section	Reach Length	Starting Elevation (relative of MSL)	Total Brook Trout Captured (% change from 2023)
1	641m (0.40 miles)	7942 ft.	1 *(67% reduction)*
Tributary 1	569m (0.35 miles)	8455 ft.	0 *(100% reduction)*
Tributary 2	780m (0.48 miles)	8399 ft.	0 *(100% reduction)*
2	1809 (1.12 miles)	8169 ft.	3 *(84% reduction)*
3	2441m (1.52 miles)	8761 ft.	0 *(100% reduction)*

Section	Reach Length	Starting Elevation (relative of MSL)	Total Brook Trout Captured (% change from 2023)
4	1638m (1.02 miles)	8913 ft.	1 *(75% reduction)*
5	2916m (1.81 miles)	9643 ft.	1 *(80% reduction)*
Tributary 3	75m (0.05 miles)	9160 ft.	0 *(no fish caught in 2023)*
Tributary 4	162m (0.10 miles)	9047 ft.	0 *(no fish caught in 2023)*
Tributary 5	172m (0.11 miles)	9160 ft.	0 *(no fish caught in 2023)*
Tributary 6	529m (0.33 miles)	9378 ft.	0 *(no fish caught in 2023)*
Tributary 7	104m (0.06 miles)	9175 ft.	0 *(no fish caught in 2023)*
Chango Creek	219m (0.14 miles)	8845 ft.	0 *(no fish caught in 2023)*
Total	*12,055m (7.5 miles)*	*NA*	*6 (87% reduction from 2023)*

We removed at least 90% of the water in the channel, using a combination of flow diversion and active pumping. This enabled us to completely expose the streambed and reduce any possible refugia for trout. In some instances, erosive features, such as undercut banks, extended over four feet beyond the apparent shoreline, acutely demonstrating the habitat complexity and the advantages of dewatering (Figure 153). We also documented several undocumented springs and groundwater discharge locations.

For the first time since 2022, we were able to reach the waterfall overwinter barrier (Figure 151). This was unattainable in 2023 due to the record water year. The percent reduction in Brook Trout from 2023 to 2024 was 87% throughout the project area, which is lower than previous years' 99% reduction. This is likely due to the inability to properly dewater Silver Creek in 2023, resulting in a lower capture efficiency of Brook Trout throughout the project area.

Overall, we captured and translocated 1,367 LCT within the project area and removed 6 Brook Trout (compared with 47 Brook Trout in 2023). We captured a greater number of larger (9 inches and over) LCT than in 2023 and 2022. The LCT length-frequency distributions are more evenly distributed than in all previous years, suggesting the lack of Brook Trout competition is allowing LCT to recruit into larger size classes (Figure 154- Figure 158). Anecdotally, LCT appeared to be in better condition than previous years when Brook Trout were more abundant (Figure 152). The Brook Trout length-frequency diagrams show an unclear trend due to so little fish remaining in the system (Figure 154-Figure 158). Most remaining Brook Trout individuals were between 3-4 inches, which is typical of a 1-year-old fish that was undetected as a young of year (YOY) last season. We captured most Brook Trout (4 individuals) in the lower half of the removal area, Sections 1 and 2 (Table 57). The location and size of the captured Brook Trout is most likely due to difficulty dewatering those sections in 2023, resulting in the crew missing Brook Trout YOY that season. The Brook Trout found in Sections 4 and 5 were likely individuals migrating upstream.

No yellow-legged frogs were documented during the 2024 project, but a single frog was observed in 2021 at the end of the season near the outlet of Chango Creek. This frog was not detected during the dewatering operation, and presumably it migrated into Silver Creek in search of overwinter habitat.

Removal:

We used removal data from 2022 to assess the capture efficiency in seven reaches to compare dewatering to multiple-pass electrofishing in this reach. This estimate was based on single-pass-catch once the channel was dewatered, and we placed block nets at the upstream and downstream ends of the reaches to prevent immigration or emigration. We used these capture efficiency estimates to fit an exponential probability distribution (MASS and vcd packages in r) and determined the likelihood that a fish was missed during our efforts (Figure 161). The calculated chances of missing a fish after three electrofishing passes was between about 77% and 10%, depending on flow and habitat types; however, the chances of missing a fish using dewatering was reduced to less than 0.1% (which means about 1 in 700 fish will be missed).

We estimated our removal efficiency on each pass to be 80% (0.95 CI: 54-95%). This is about 2.5-times more efficient than the electrofishing with block-nets

(Figure 160), which only captured 40% (0.95 CI: 22%-58%) of the trout present in a reach on each pass.

Environmental DNA:

The 2024 eDNA sampling results were inconclusive due to field and potentially lab contamination. It is likely the temporal proximity of eDNA sampling to removal efforts was too close to produce accurate eDNA results. Staff will recollect eDNA samples throughout the project area in 2025 to reassess Brook Trout removal success.

Tagging Efforts:

On October 18th and 19th, we were able to survey approximately 60% of the stream habitat throughout the 1.2-mile reach. Dense vegetation and time restrictions prevented us from surveying the reach in its entirety.

We floy tagged a total of 146 Brook Trout and 17 LCT that were over 6 inches; we euthanized an additional 28 Brook Trout that were too small to tag. During the tagging efforts, we identified three smaller 15-foot waterfalls and changed floy tag colors between each of the smaller sections (Table 58). This will enable staff to determine how fish move throughout the entire area.

Discussion

Despite over two decades of removal effort, CDFW has been unsuccessful in removing Brook Trout from Silver Creek. In fact, demographic data we collected suggests that in 2021 Brook Trout had a more stable population than LCT despite suppression efforts. The failure of manual removal exemplifies the management paradox presented by large, high quality trout streams: the advantage of these streams is that they are large and complex, making them ideal restoration candidates; but the disadvantage of these streams is also that they are large and complex, making non-native removal difficult.

2024 successes:

We removed Brook Trout from approximately 90% of the Silver Creek watershed in three months using the combination of methods outlined above, ending at a waterfall that will prevent recolonization of the treated area. We also captured and salvaged non-target species from the dewatered reaches, reducing the potential for unintentional impacts to the stream and lethal take of listed species. Stream diversion was time and labor intensive; however, dewatering did reduce the stream habitat enough to make the physical removal of the entire fish population possible as the small remanent pools rarely had good hiding locations and were easy to remove fish from.

The removal efficiency, estimated by follow-up electrofishing passes through partially re-watered habitats, strongly suggests that complete eradication of Brook Trout is possible. This allows us to shift the paradigm from suppression of non-natives to the eradication of non-natives.

At this time, it appears that Brook Trout removal efforts have been successful. Future monitoring efforts are needed to confirm success.

Lessons learned:

Seasonal start dates/ variation in water years: In 2022 and 2024, lower flows enabled us to remove fish at a rate where we could successfully reach the downstream fish barrier before winter. Both years were average or below average water years, which resulted in a manageable amount of discharge to move efficiently through the system. In 2023 we were not able to reach the overwinter barrier as planned (ending about 0.8 miles short) due to unmanageably high flows. The 2023 season had record snowpack in addition to delayed snowmelt, pushing back the start date 1.5 months. The combination of abnormally high flows and a later start date prevented the complete dewatering of the creek to the barrier. In the future, dewatering of Silver Creek's size will not be possible with a snow year greater than three times the median. In 2021, early snowfall in October combined with a later start (in August) presented another challenge. Heavy precipitation and snow accumulation in October is relatively rare (occurring in less than 10% of years), but it can ultimately shut down fish removal efforts. Future efforts need to account for potential early season precipitation by starting as soon as Silver Creek reaches base flow (about one month after the snowpack reaches zero). From previous years, we learned to approximate start dates using March 1 and April 1 snowpack estimates from remote sensing data as well as flow measurements during abnormal snow years.

From knowledge gained throughout the five years of this project, we have determined that 10cfs is the estimated maximum discharge where dewatering is efficient at Silver Creek. At normal base flows, the crew needs approximately 3 months between the start of base flows and winter onset to successfully remove fish down to the fish barrier (~7mi).

Diversion Construction: In average or drought years (2020-2022 and 2024), constructing multiple diversions when flows were lower created substantially more work than was warranted to dewater the creek. Conversely, in 2023 with three times more water in the system, building more frequent diversions was more time efficient. With such high flows, pipeline durability became the limiting factor. More frequent mainstem dams were essential to successfully dewater the creek once the upstream pipeline developed too many holes to transport water. The number of diversions needed for dewatering fluctuates based on the seasonal differences in baseflows of the creek.

Wildfires: The 2020 project was delayed until early October due to poor air quality and nearby wildfires. This resulted in sub-zero weather at the end of the project when work was occurring near the weir. This hard freeze caused ice formation within the pipes that resulted in damage when the ice melted and clogged the pipe. By avoiding work in extreme cold the potential for ice damage can be reduced; however, complete avoidance of icing conditions may not be possible because this project needs to occur in the low flow conditions of fall. Air quality concerns can be mitigated by outfitting field crews with air quality sensors and appropriate respiratory equipment in case conditions become unhealthy.

Next Steps:

By eradicating, rather than suppressing, Brook Trout, we remove the need for annual Brook Trout suppression in the future, saving costs. In doing so, we appear to have met a priority recovery goal for Walker Basin LCT for the first time in 25 years. This is an opportunity to secure a major conservation victory for native trout recovery in California.

It appears that as of 2024, removal efforts have been successful. Future eDNA sampling will inform staff of any remaining Brook Trout in Silver Creek. If Brook Trout have not been completely eradicated during dewatering treatments, targeted electrofishing efforts will take place to remove remaining individuals and eDNA will be recollected.

Figures

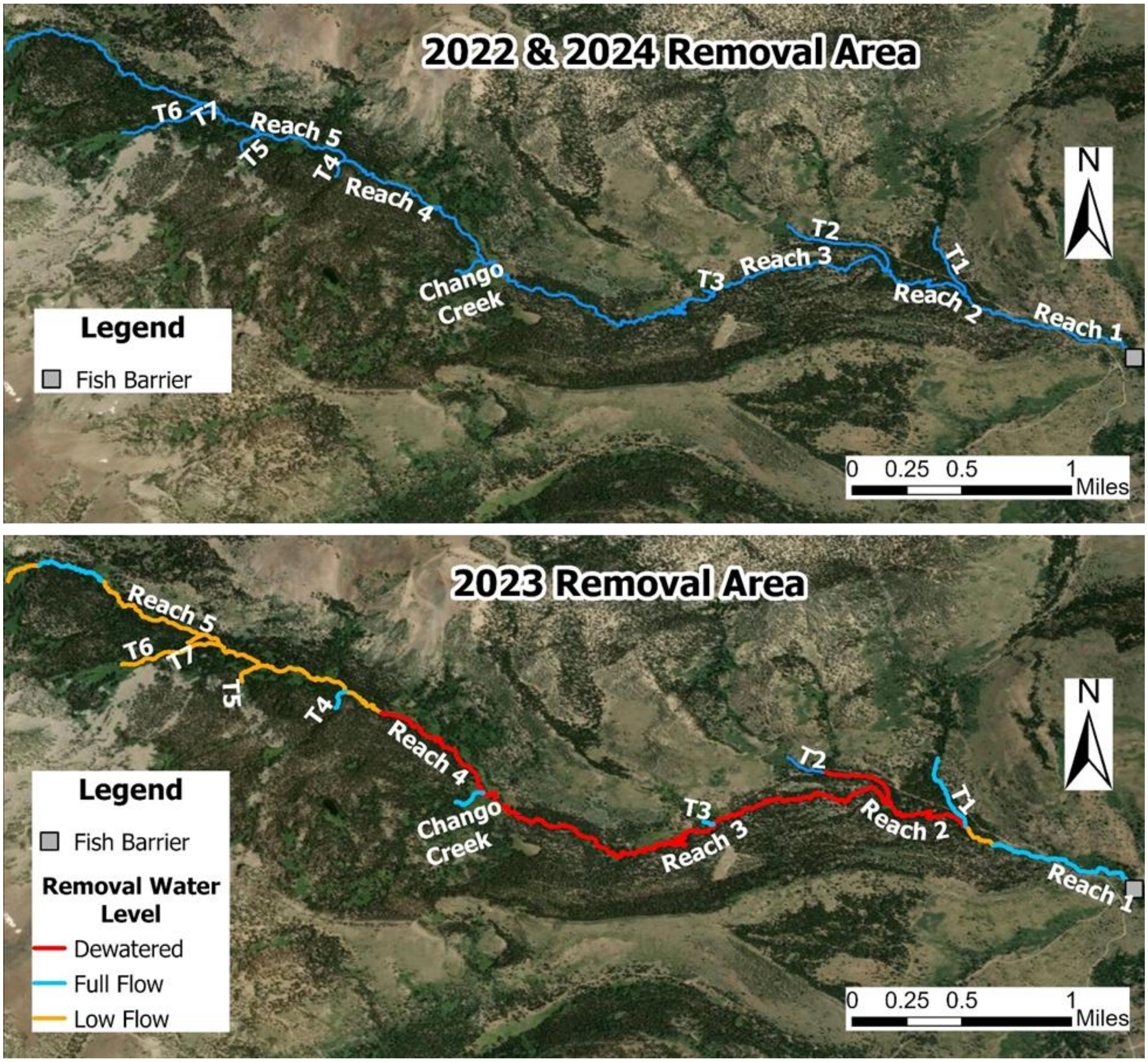


Figure 149. Overview map of the Silver Creek project area in 2022, 2023, and 2024.

Figure 150. Map of the location and sex of the 6 Brook Trout removed in 2024.

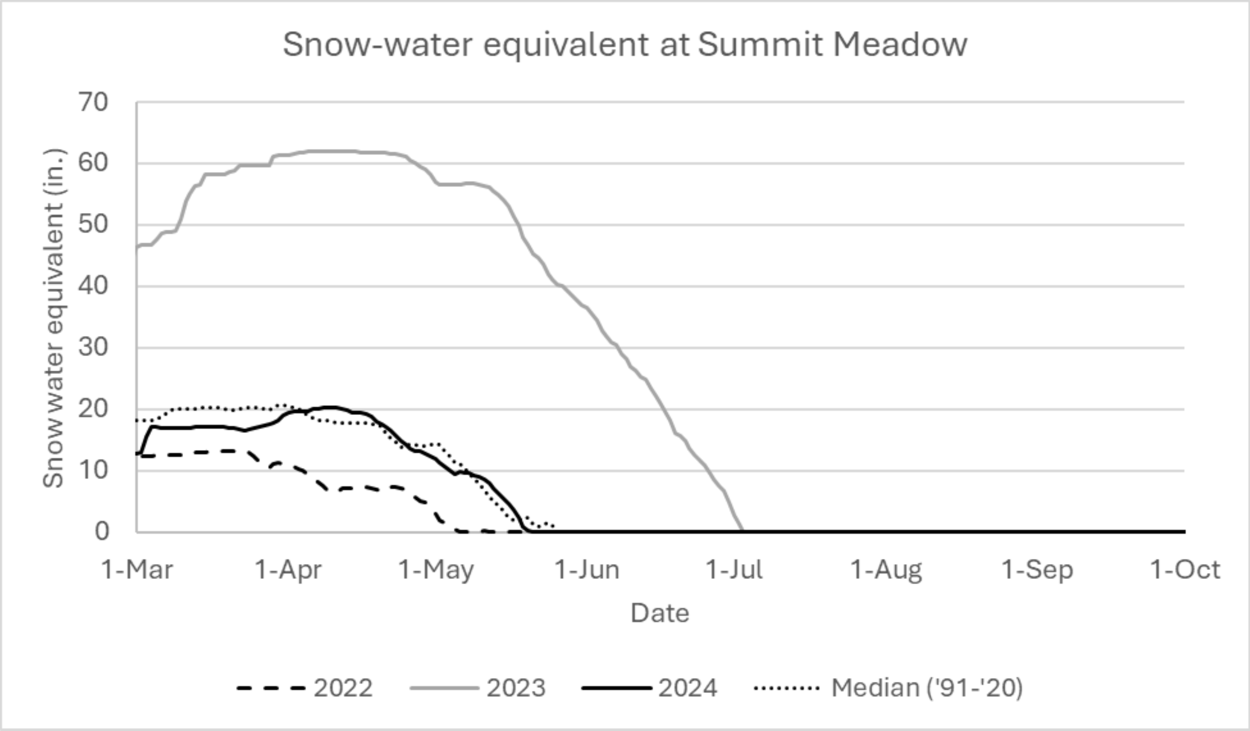


Figure 151. Snow water equivalent in 2024 compared to 2023, 2024, and median values.

Figure 152. Change in LCT condition from 2021 to 2024.

Figure 153. Example of undercut banks and pockets under boulders in dewatered creek.

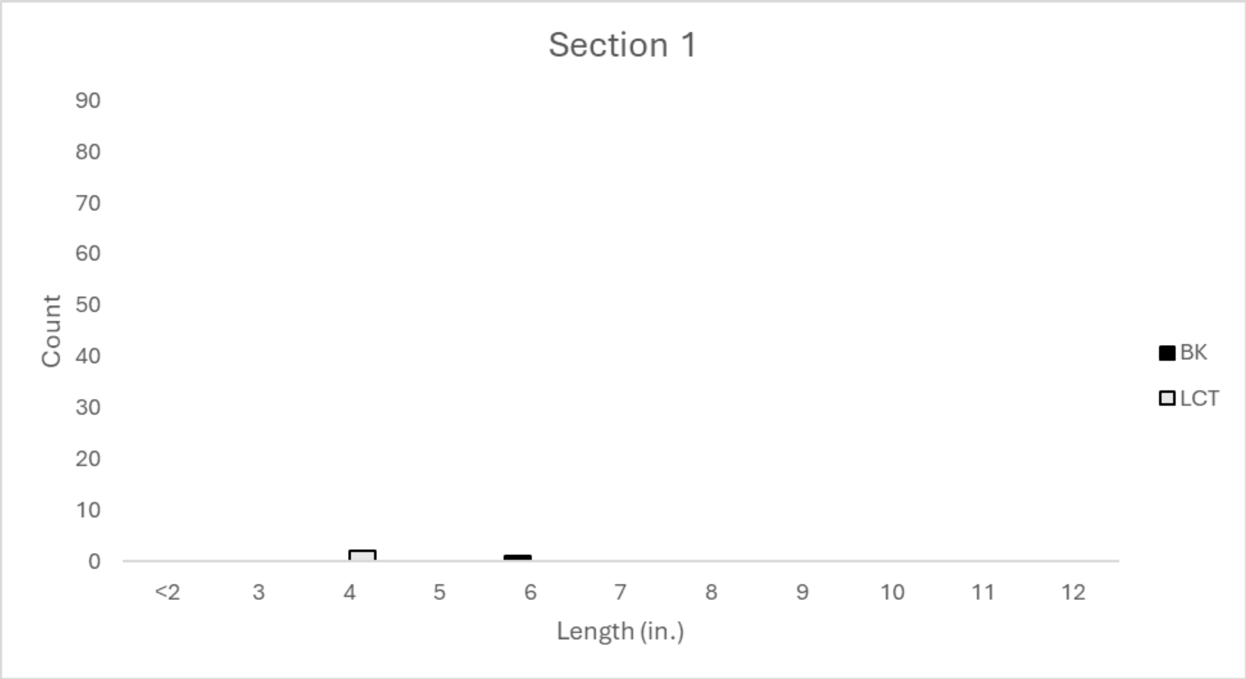


Figure 154. Length frequency histogram of LCT and Brook Trout in Section 1.

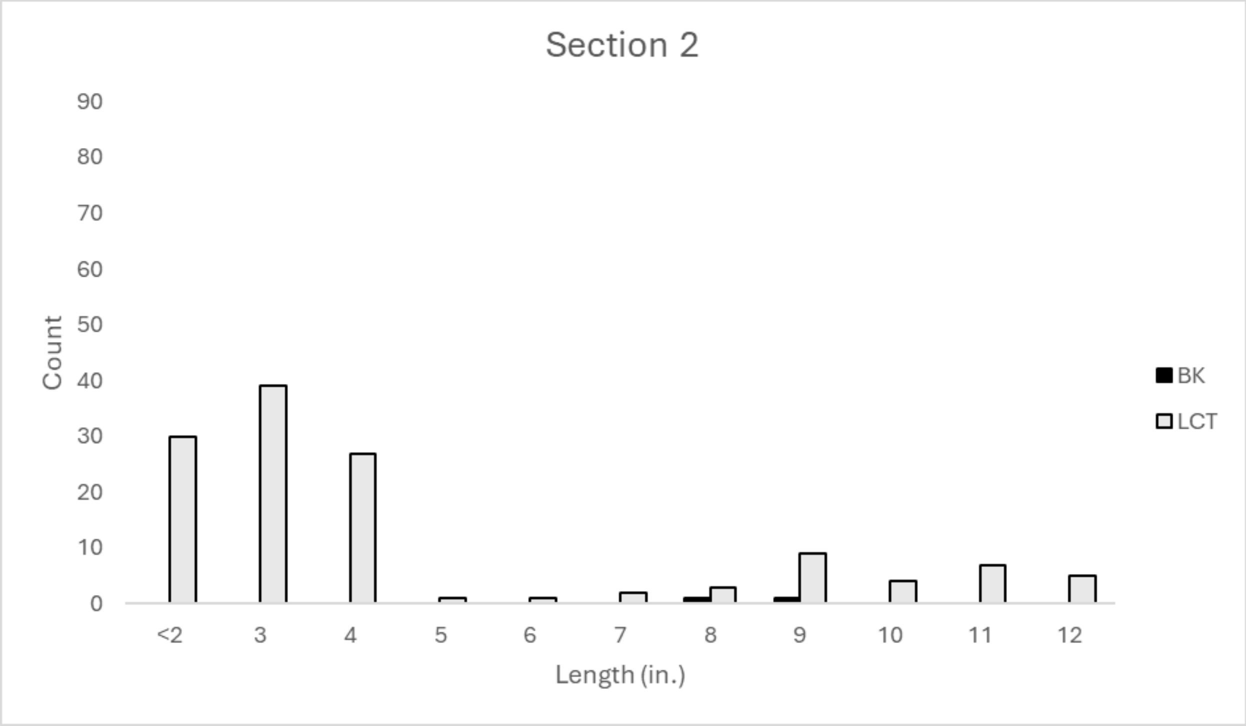


Figure 155. Length frequency histogram of LCT and Brook Trout in Section 2.

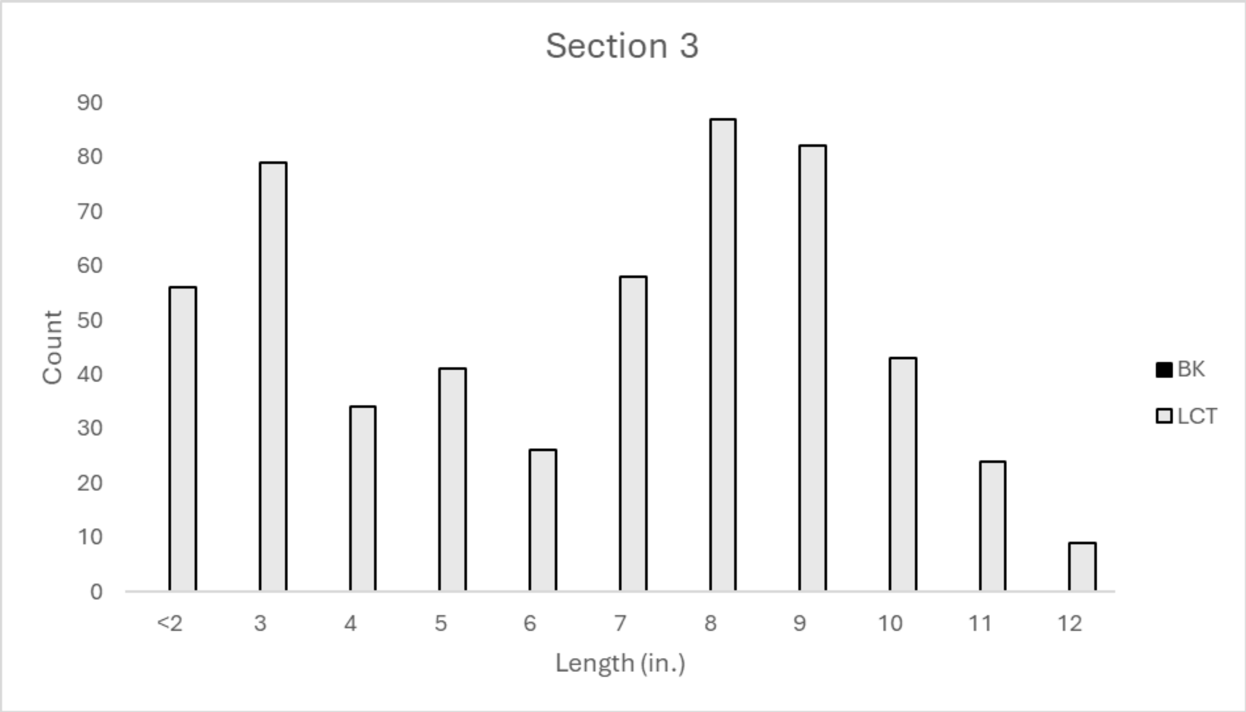


Figure 156. Length frequency histogram of LCT and Brook Trout in Section 3.

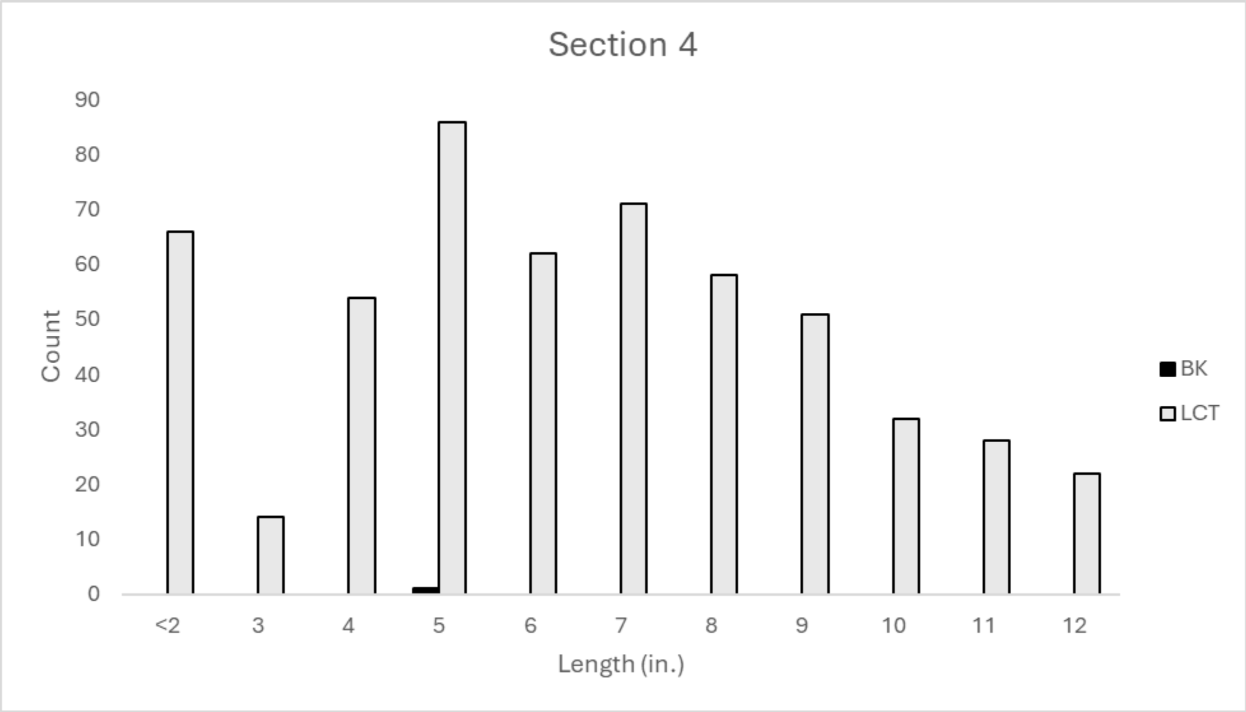


Figure 157. Length frequency histogram of LCT and Brook Trout in Section 4.

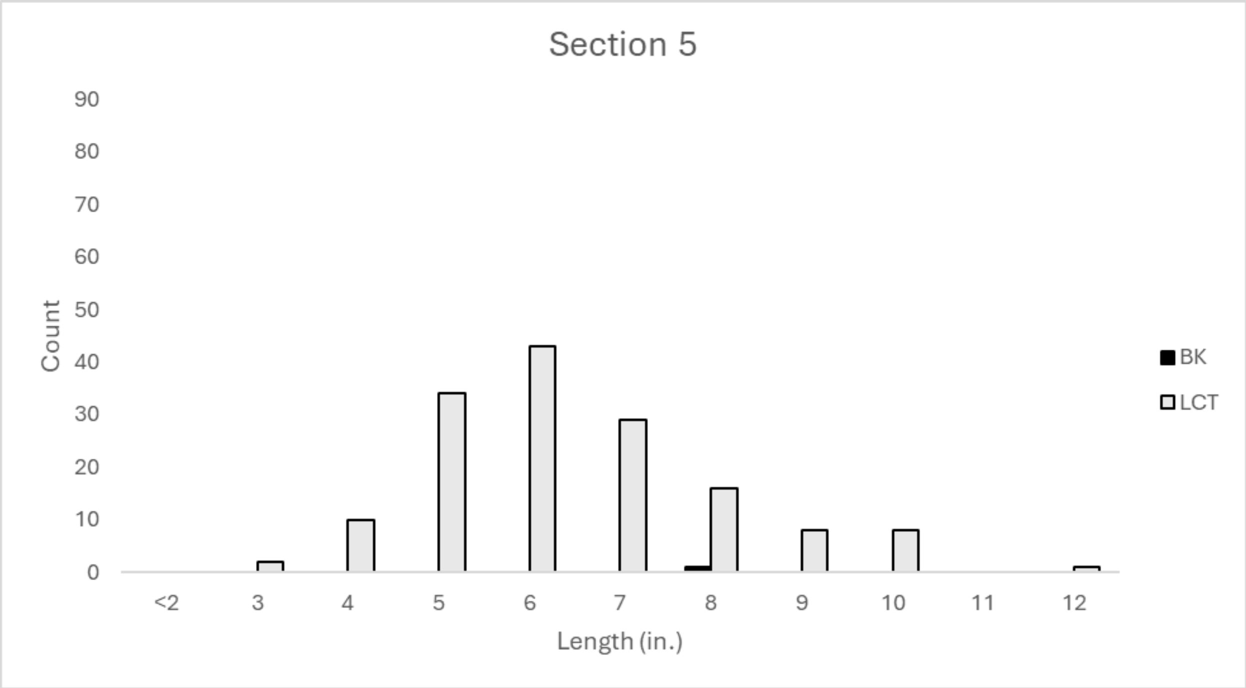


Figure 158. Length frequency histogram of LCT and Brook Trout in Section 5.

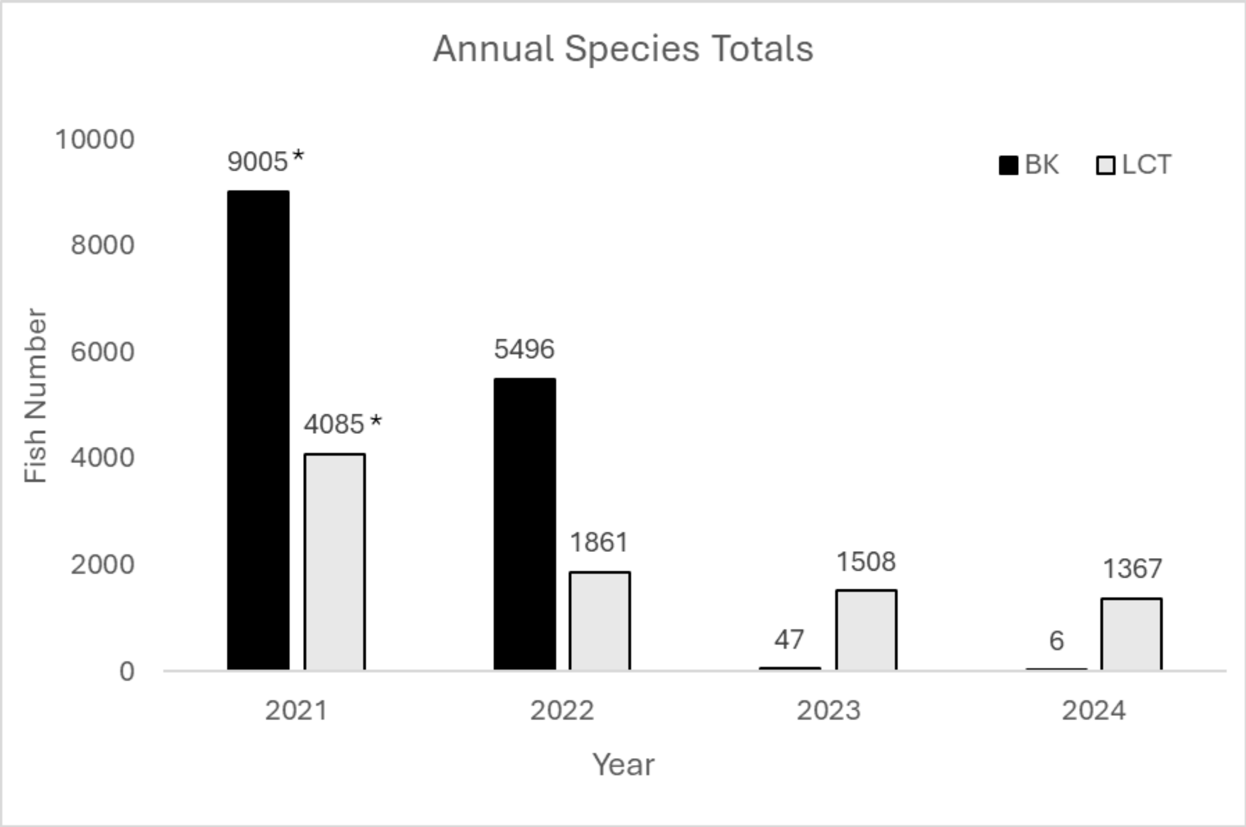


Figure 159. Silver Creek species totals for each dewatering year. *Dewatering efforts did not reach the barrier in 2021.

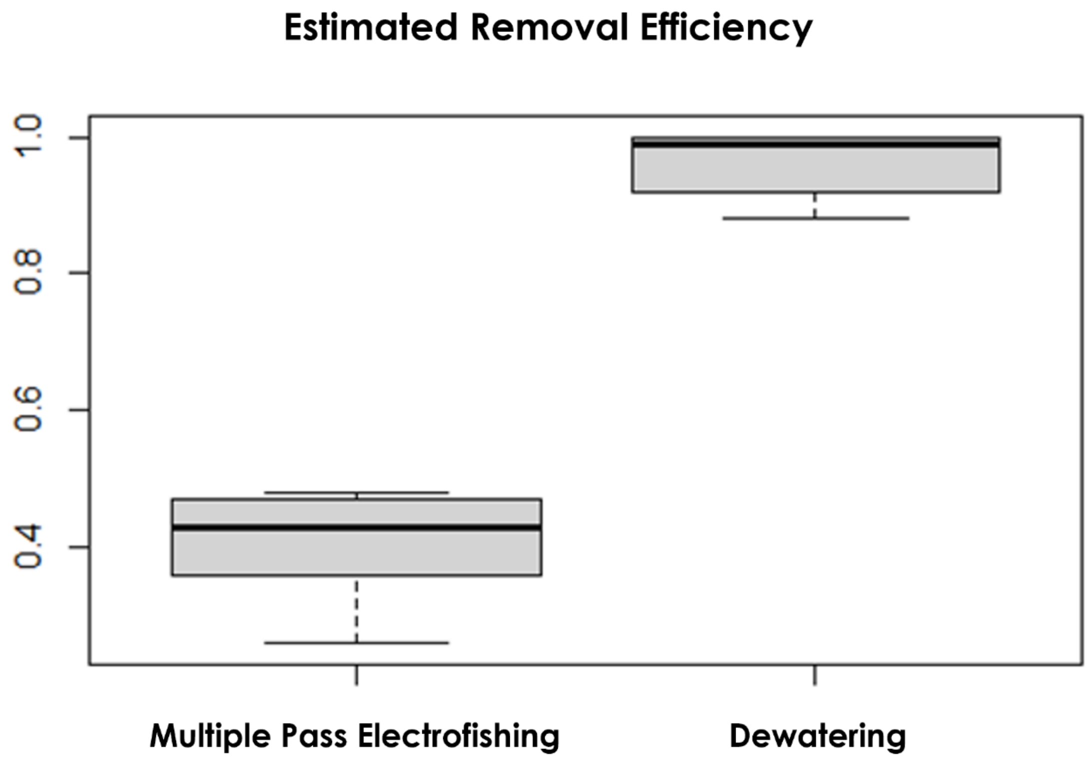
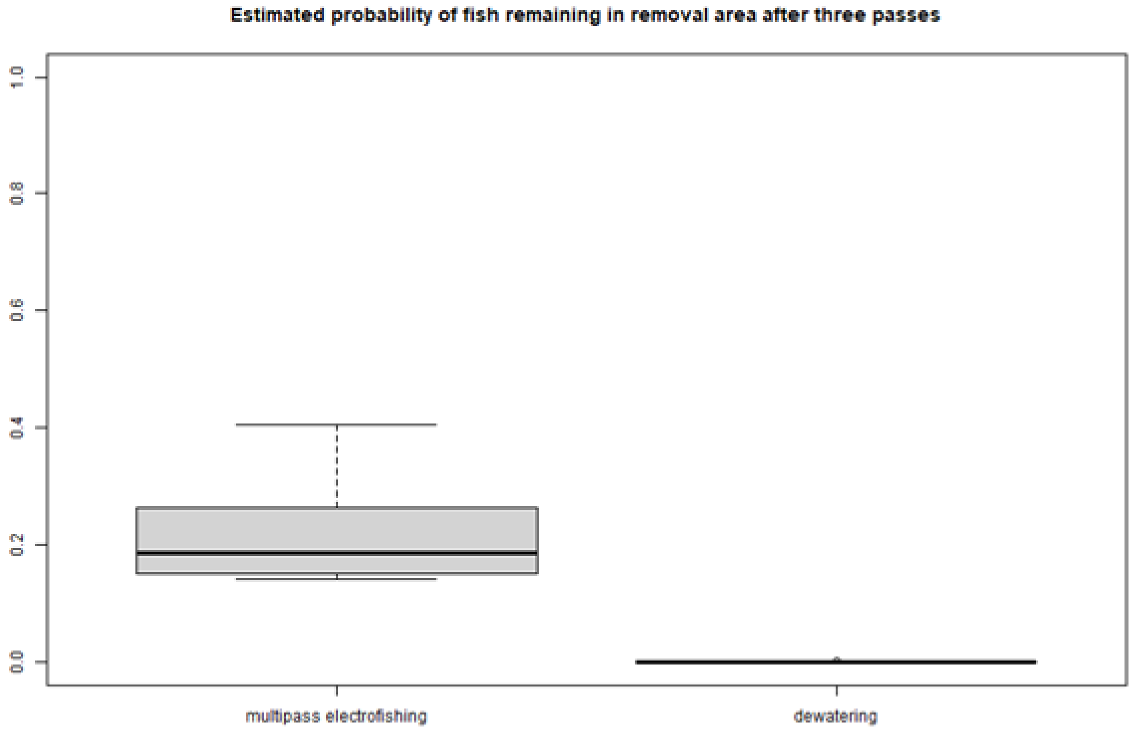


Figure 160. Estimated removal efficiency.



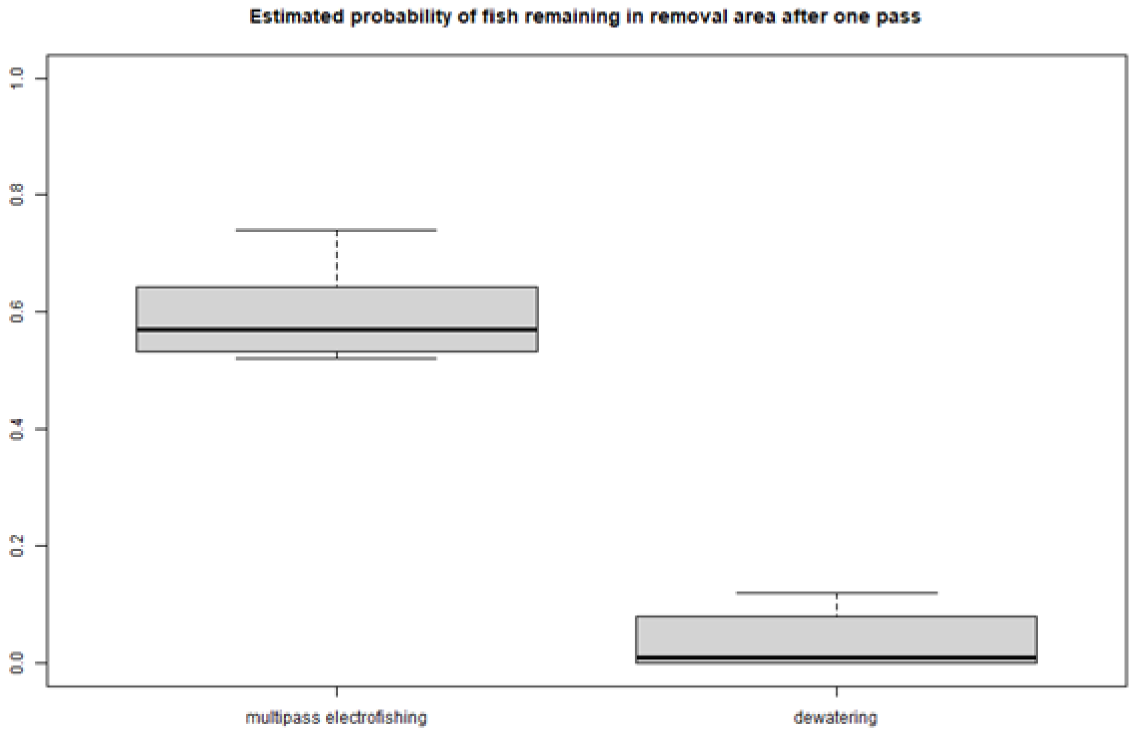


Figure 161. Estimated probability of missing a fish (or a fish remaining in the sample area).

Table 58. Floy tagging areas and fish totals for each. *= Fish numbers already included in the total count for Cascade Falls to Lower Culvert.

Section	Floy Color	Brook Trout Tagged	Lahontan Cutthroat Trout Tagged
Silver Falls: 38.36267° -119.51983°to Cascade Falls: 38.36219° -119.52018°	Pink	10	4
Cascade Falls: 38.36219° -119.52018°to Lower Culvert: 38.36575° -119.52792°	Dark Blue	92	12
Cascade Falls: 38.36219° -119.52018°to Adipose Falls: 38.36483° -119.52552°*	Dark Blue + Adipose fin clip*	5*	0*
Lower Culvert: 38.36575° -119.52792°to Removal Barrier: 38.37238° -119.53364°	Gray + Light Blue	44	1
Total	Total	146	17

Public Outreach and Education

Fisheries Resource Volunteer Corps' Annual Appreciation Meeting

Date: January 20, 2024

Format: In-person presentation titled "Heritage and Wild Trout Program & Projects to Volunteer for in Partnership with the FRVC"

Personnel: Jennifer Hemmert (HTWP)

Objective:

Interact with the volunteer group under the US Forest Service by discussing and answering questions about trout species and recreational management, Heritage Wild Trout Program (HWTP), regional fish survey projects, volunteer opportunities, online resources of CDFW and aquatic invasive species.

1. management of recreational trout and trout species under Heritage and Wild Trout Program (HWTP)
2. ways that you can get involved with HWTP as FRVC volunteers
3. CDFW online website resources, including fishing regulations and licenses, Heritage and Wild Trout Challenge, and reporting invasive species

These events offer important opportunities for CDFW personnel to express our appreciation for natural resource volunteers – to answer their questions, hear their concerns, and provide information on our various programs. It is also an excellent volunteer recruitment opportunity for the Department.

Location: Glendora, CA

Bart Hall Show

Date: January 28, 2024

Format: Sportsman's Show for Fishing, Boating, Hunting, Travel, Outdoor Recreation

Objective:

Interact with the public to discuss and answer questions about Inland Fisheries and sportfish regulations.

Overview:

These events offer important opportunities for CDFW personnel to express our appreciation for California hunters and anglers – to answer their questions, hear their concerns and provide information on our various programs. They also provide an opportunity to publicly celebrate our accomplishments and promote programs.

Location: Long Beach, CA

Teachers for the Classroom Aquarium Education Program Workshop

Dates: February 3 and 28, 2024

Format: Presentation

Objective:

As guest presenter within another SFRA program, the goal is to educate teachers about different types of threats and impacts to trout species in the environment and discuss trout monitoring.

Overview:

During virtual presentations, 6-12 teachers attended informational sessions as part of the required workshop for Trout in the Classroom Program. Teachers learned about human and environmental impacts on fish and different survey techniques used to monitor trout populations. The goal was to provide knowledge for teachers to share with students in their classrooms, while their classes raise trout from eggs. Presented information can be taught to their students about how the Department monitors trout under the Heritage and Wild Trout Program. They were able to ask a trout biologist questions via a virtual classroom setting.

Location: Virtual

<u>Fisheries Resource Volunteer Corps Cleanup Event on Lytle Creek</u>

Date: June 29, 2024

Format: Onsite community service event and informal networking with volunteer group

Objective:

Interact with the volunteer group under the US Forest Service by discussing and answering questions about trout and stream ecology. During the community service event, we removed trash and recycling from the stream and surrounding drainage with informal networking to fly fishing group.

Location: Lytle Creek, CA

<u>Fisheries Resource Volunteer Corps Recreational Dams Removal and Cleanup Event on Mill Creek</u>

Date: July 29, 2024

Format: Onsite presentation to Camp Mountain Chai 7th and 8th graders and volunteer group at an educational community service event

Objective:

Interact with the kids from the camp and volunteer group under the US Forest Service to discuss and answer questions about trout, fish surveys, and stream ecology. I taught the kids and volunteers about backpack electrofishing equipment used for trout surveys. During the community service event, we removed recreational rock dams from the stream and removed trash and recycling from the stream and surrounding drainage.

Location: Mentone, CA

<u>Streamborn Flyfishers Club presentation</u>

Date: November 3, 2024

Format: In-person presentation titled "Fly fishing for Trout in So Cal & CDFW Management of Wild Trout"

Objective:

Interact with the fly fishing club members by discussing and answering questions about the trout fishing informational resources on CDFW website and sportfish regulations, where to fish for trout in the local area waters, regional trout survey projects, and Heritage Wild Trout Program (HWTP).

1. overview on how to find streams and lakes for trout fishing in So Cal from CDFW online resources, including regulations and licenses.
2. trout waters to fish in Riverside and San Bernardino counties based on CDFW trout surveys.
3. different types of projects under HWTP and ways that you can get involved in Region 6 South.
4. background on the staff management of designating heritage and wild trout fisheries.

These events offer important opportunities for CDFW personnel to express our appreciation for California anglers – to answer their questions, hear their concerns and provide information on our various programs. It is also an excellent volunteer recruitment opportunity for the Department.

Location: Rancho Cucamonga, CA

CDFW Bishop Local Fishing Guides Meeting

Date: 3/30/2024

Format: Presentation and Q&A

Summary: Prior to opening weekend, Bishop staff conducted a presentation on the fisheries program and status of fishing locations in Inyo and Mono Counties. After the presentation, fishing guides and other community members in attendance had the opportunity to ask questions of the Heritage and Wild Trout staff, recreational fishing staff, and hatcheries staff.

Location: Tri County Fair Grounds, Bishop CA

Backcountry Hunters and Anglers Volunteer at Silver Creek

Date: 9/20-9/22/2024

Format: Field work

Summary: Region 6 Heritage and Wild Trout Program staff hosted roughly 15 volunteers from the Backcountry Hunters and Anglers (BHA) at Silver Creek during Brook Trout removal efforts. The Region 6 North HWTP Environmental Scientist gave a brief talk on Lahontan Cutthroat Trout (LCT) in the Walker Basin, LCT fishing opportunities, and the purpose and status of the Silver Creek restoration project. Afterwards, BHA volunteers assisted CDFW staff with removal efforts and project clean-up for the duration of the weekend.

Location: Silver Creek, Humboldt-Toiyabe National Forest, Mono County

Crowley Lake Angler Surveys and Public Outreach

Date: May and June, 2024

Format: Angler surveys

Summary: From opening weekend through the end of June, Bishop office Heritage and Wild Trout staff conducted angler surveys every weekend at Crowley Lake, Mono County. These surveys provided an opportunity to educate the public on the variety of fishing opportunities, including designated Heritage and Wild Trout waters, throughout Inyo and Mono counties. Staff spoke to thousands of anglers during this period.

Location: Crowley Lake South Landing, Mono County

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Appendix A: Phased Approach Catch Per Unit Effort Data

Water	County	Region	Survey Dates	Phase	CPUE (fish per hour)	Species Captured	Size Classes Captured
Patrick Creek	Del Norte	1	5/22 – 5/29	2	0.6	Coastal Rainbow Trout	Small, Medium, Large
Lower Diamond Creek	Del Norte	1	5/22 – 5/29	2	0	None captured	None captured
Upper Diamond Creek	Del Norte	1	5/22 – 5/29	2	0.2	Coastal Rainbow Trout, Coastal Cutthroat Trout	Small, Medium
North Fork Smith River	Del Norte	1	5/22 – 5/29	2	1.1	Coastal Rainbow Trout	Small, Medium
Little Jones Creek	Del Norte	1	5/22 – 5/29	2	1.5	Coastal Cutthroat Trout	Small, Medium
North Fork Mokelumne River	Alpine	2	6/3	2	0	NA	NA
Lower Highland Lakes	Alpine	2	7/12	2	2.8	Brook Trout	Small, Medium

Water	County	Region	Survey Dates	Phase	CPUE (fish per hour)	Species Captured	Size Classes Captured
Blue Creek	Alpine	2	7/30	2	12	Brook Trout	Medium
Deer Creek	Alpine	2	7/30	2	6	Brook Trout	Medium
South Fork Stony Creek	Colusa	2	5/14 – 5/16	4	0.6	Coastal Rainbow Trout	Small, Medium
South Fork Stony Creek	Colusa	2	5/14 – 5/16	4	4.3	Coastal Rainbow Trout	Small, Medium
Willow Creek	Alpine	2	6/4	2	1.8	Brook Trout	Small, Medium
Upper Laurel Lake	Mono	6	May 29th, June 19th-20th	4	0	California Golden Trout	None
Lower Laurel Lake	Mono	6	May 29th, June 19th-20th	4	0.8	California Golden Trout	Medium, Large

Appendix B: 2024 Angler Survey Box Summary Data

Water	County	Region	Number of Forms	CPUE (fish per hour)	Overall Satisfaction	Species Present
Antelope Creek	Shasta	1	1	1.00	2.00	Rainbow Trout/steelhead
Big Lagoon	Shasta	1	2	0.00	-1.00	Rainbow Trout/steelhead, Coastal Cutthroat Trout
Burney Creek	Shasta	1	2	0.00	1.00	Rainbow Trout, Brown Trout, Brook Trout
Butte Lake	Shasta	1	0	n/a	n/a	Rainbow Trout, Brook Trout
Clear Lake	Shasta	1	37	2.02	1.50	Rainbow Trout, Brown Trout, Brook Trout
Fall River	Shasta		1	1.50	2.00	Rainbow Trout, Brown Trout
Hat Creek	Shasta	1	59	0.92	0.88	Rainbow Trout, Brown Trout, Brook Trout

Water	County	Region	Number of Forms	CPUE (fish per hour)	Overall Satisfaction	Species Present
Klamath River	Siskiyou	1	7	0.47	1.33	Rainbow Trout/steelhead, Brown Trout
Lassen Creek	Modoc		21	1.45	1.50	Goose Lake Redband
Manzanita Lake	Siskiyou	1	10	1.16	1.10	Rainbow Trout, Brown Trout, Brook Trout
Lower McCloud River	Del Norte	1	85	1.33	1.23	Rainbow Trout, Brown Trout, Brook Trout
Pit River	Humboldt	1	41	3.16	1.18	Rainbow Trout, Brown Trout
Smith River	Humboldt	1	31	1.11	1.07	Rainbow Trout/steelhead, Coastal Cutthroat Trout
Stone Lagoon	Modoc	1	3	0.16	1.33	Rainbow Trout, Coastal Cutthroat Trout

Water	County	Region	Number of Forms	CPUE (fish per hour)	Overall Satisfaction	Species Present
Upper Sacramento River	Modoc	1	51	2.22	1.36	Rainbow Trout, Brown Trout, Brook Trout
Yet Atwam Creek	Tehama	1	32	1.64	1.17	Rainbow Trout, Brown Trout, Brook Trout