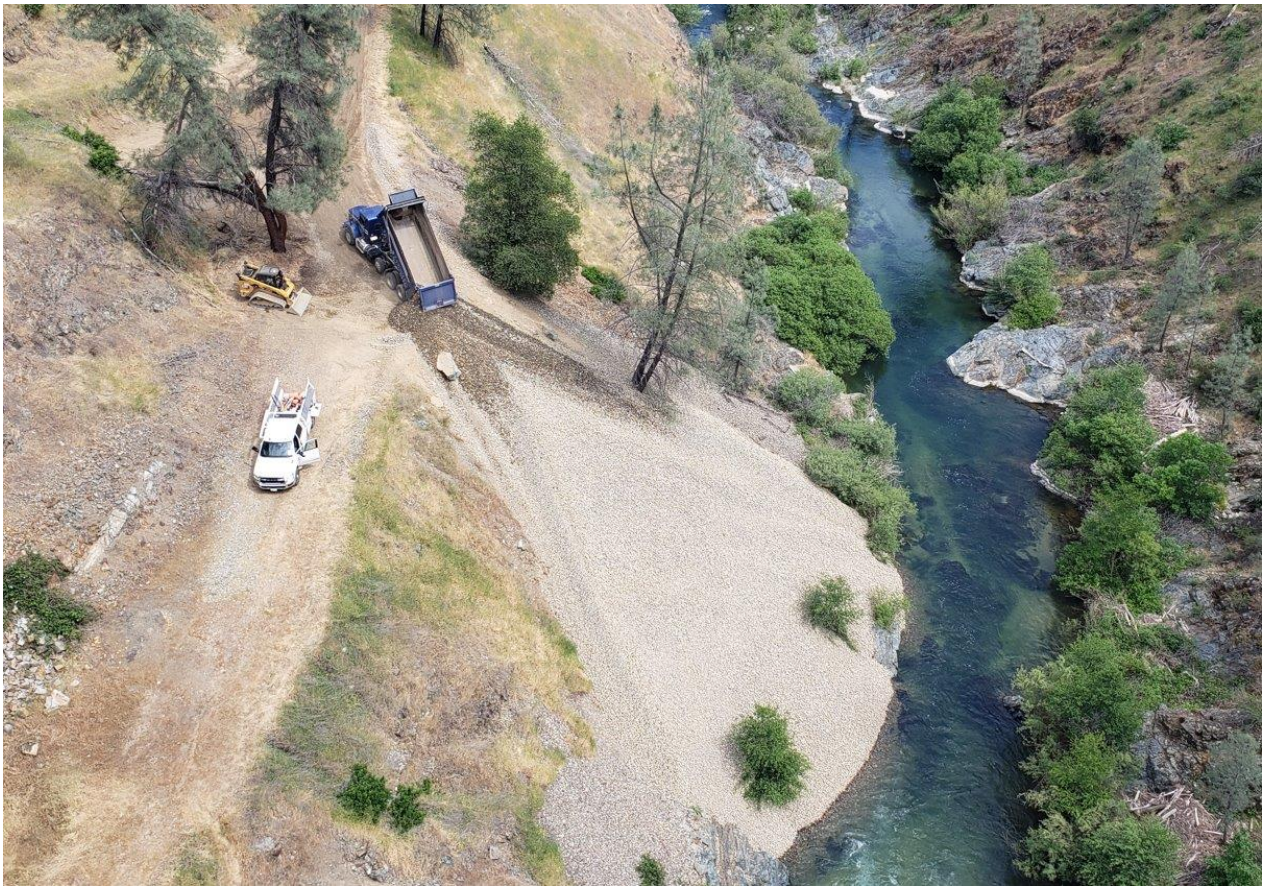
BUREAU OF RECLAMATION

# Clear Creek Technical Team Summary of Activities for Water Year 2025



Cover Photo: Clear Creek gravel augmentation at Placer Road Bridge (John Stafford)

U.S. Department of the Interior

8 September 2026

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## Acronyms and Abbreviations

| | |
|---|---|
| ACID | Anderson-Cottonwood Irrigation District |
| BDA | Beaver Dam Analogue |
| BLM | Bureau of Land Management |
| BO | Biological Opinion |
| CCV | California Central Valley |
| CCRP | Clear Creek Restoration Program |
| CCTT | Clear Creek Technical Team |
| CDFW | California Department of Fish and Wildlife |
| CDWR | California Department of Water Resources |
| CLTO | Coordinated Long-term Operation |
| cfs | Cubic feet per second |
| CV | Central Valley |
| CVO | Central Valley Operations |
| CVP | Central Valley Project |
| CVPIA | Central Valley Project Improvement Act |
| ESA | Endangered Species Act |
| GRANDTAB | Grand Table (A CDFW compilation of Chinook Salmon escapement estimates in the Central Valley) |
| LCCFRP | Lower Clear Creek Floodway Restoration Project |
| LTO | Long-Term Operations |
| NMFS | National Marine Fisheries Service |
| NPS | National Park Service |
| PA | Proposed Action |
| PALS | Post Assisted Log Structure |
| RBFWO | Red Bluff Fish and Wildlife Office |
| Reclamation | U.S. Bureau of Reclamation |
| RM | River Mile |
| RPM | Reasonable and Prudent Measure |
| RWQCB | Regional Water Quality Control Board |
| SWP | State Water Project |
| USFWS | U.S. Fish and Wildlife Service |
| USGS | U.S. Geological Service |
| WSRCD | Western Shasta Resource Conservation District |
| WY 2025 | Water Year 2025 |

# CHAPTER 1. BACKGROUND

**Clear Creek and the Technical Team**

Since 1995, the Central Valley Project Improvement Act (CVPIA) and the CALFED Bay-Delta Program have undertaken anadromous salmonid habitat and flow restoration actions in Clear Creek. These actions have re-established Central Valley (CV) spring-run Chinook Salmon (*Oncorhynchus tshawytscha*) and California Central Valley (CCV) steelhead (*O. mykiss*) within the Clear Creek watershed (Figure 1). The Clear Creek Technical Team (CCTT) has been working together since 1996 to facilitate implementation of these CVPIA and CALFED restoration actions. Most issues and projects which the CCTT has facilitated involved physical habitat restoration of lower Clear Creek (i.e., the stream downstream of Whiskeytown Dam to its confluence with the Sacramento River) and proposing flow recommendations.

This WY25 Seasonal Report supplements the WY24 Seasonal Report for Clear Creek operations and actions. During the first three months of WY25 (October 1 – December 20, 2024), the U.S. Bureau of Reclamation (Reclamation) operated consistent with the 2019 National Marine Fisheries Service (NMFS) Biological Opinion (#WCRO-2016-00069) and in accordance with Reclamation's 2024 Interim Operation Plan (IOP). Starting December 20, 2024, and continuing through the remainder of WY25 (which ended September 30, 2025), Reclamation operated consistent with the 2024 NMFS Biological Opinion (#WCRO-2024-02917) adopted under the 2024 Record of Decision (ROD) for the Coordinated Long-Term Operation (LTO) of the Central Valley Project (CVP) and State Water Project (SWP). This seasonal report documents Reclamation's actions toward implementing Reasonable and Prudent Measure (RPM) #2 in NMFS's Biological Opinions which pertains to Clear Creek, as well as adherence to operational commitments identified in the 2024 IOP and subsequent 2024 LTO ROD.

Since being formally established in 1992 by CVPIA, the Clear Creek Restoration Program identified and implemented a variety of actions to improve salmon and steelhead habitat and the ecosystem on which these species depend. Past and continued actions include increased minimum flows, summer, and fall water temperature control through flow management, removal of a low-head dam, large-scale stream and floodplain restoration, gravel augmentation, spring and early summer pulse flows, and erosion control. The effects of these actions have been positive and have resulted in:

- greater than a four-fold increase in escapement of fall-run Chinook Salmon to Clear Creek (population estimate average = 1,749 from 1967 to 1991, and 7,718 from 1998–2024);

- re-established use of Clear Creek by Federal Endangered Species Act (ESA) listed threatened spring-run Chinook Salmon and threatened CCV steelhead;
- re-initiated sediment transport and stream channel movement processes, in some reaches, which help create and maintain fish habitat;
- an increase in the quality and quantity of streamside and floodplain riparian habitat; and
- increases in the amount of salmonid spawning habitat.

**Active Members in Water Year 2025**

Kristin Begun, NMFS
Tricia Bratcher, USFWS
Matt Brown, USFWS
Leslie Bryan, Redding Electric Utility
Charles Chamberlain, USFWS
Natasha Wingerter, USFWS
Kyle DeJulio, Yurok Tribe
Dave Gaeuman, Yurok Tribe
Amy Lyons, Dept. of Water Resources (DWR)
Neal McIntosh, NMFS
Ross Perry, Western Shasta Resource Conservation District (WSRCD)
Derek Rupert, Reclamation
Maureen Teubert, WSRCD
Russ Weatherbee, National Park Service (NPS)
Tobias Felbeck, Bureau of Land Management (BLM)

Additional people from various agencies and entities participate on a less frequent basis (e.g., Redding Rancheria, Clear Creek Community Service District, Horsetown-Clear Creek Preserve, and members of the public).

CCTT meetings in WY 2025 were facilitated by Kerns & West (Jackson Gould). They also produced CCTT meeting summaries.

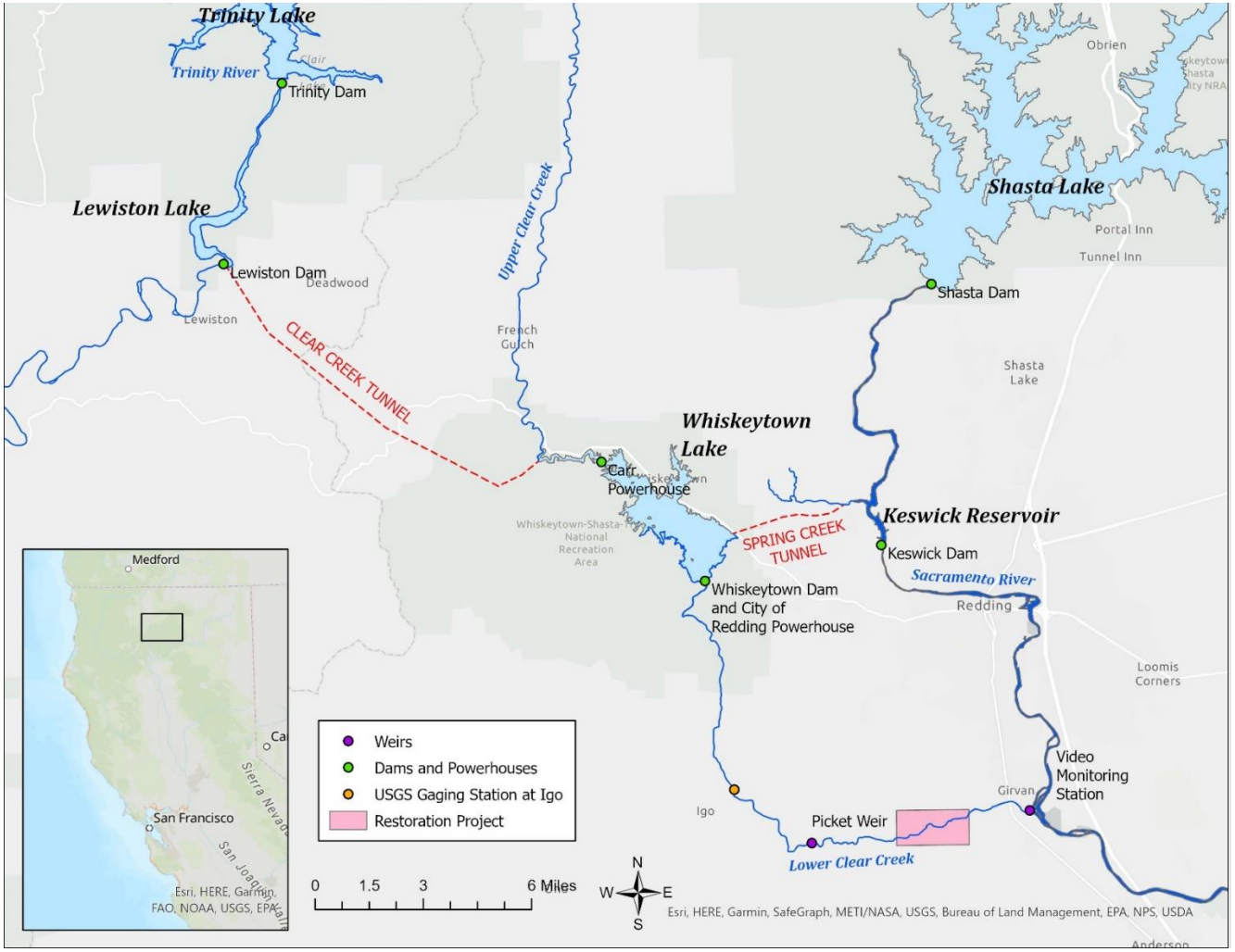



Figure 1. Location of Lower Clear Creek in Northern California, showing Trinity, Whiskeytown, and Shasta reservoirs and related CVP facilities.

The figure is a map of the Central Valley Project water system showing Trinity Lake, Lewiston Lake, Shasta Lake, Whiskeytown Lake, and Keswick Reservoir with associated powerhouses, dams, tunnels, and the Sacramento River and Clear Creek watersheds. The map also depicts a legend indicating weirs, dams and powerhouses, USGS gaging station at Igo, and the Clear Creek restoration project area.

**List of Clear Creek Technical Team Discussions**

The following CCTT meetings, with an abridged list of discussions, occurred in water year (WY) 2025 (and since the 2024 CCTT Summary Report). The individual CCTT meeting notes provide considerably more detail than the synopsis here.

**December 12, 2024**

- WSRCD staff presented information on the China Gardens fuels reduction project.
- WSRCD staff and their contractor, NHC, presented the 65% design concepts for the ACID Siphon Fish Passage Project.
- FWS and CDFW staff provided fisheries monitoring updates for the rotary screw traps, video weir, and snorkel surveys.
- CDFW staff provided an overview of the 2024 spring run Chinook Salmon hatch box incubators used to supplement eggs into Clear Creek.
- BLM staff provided information on the Shooting Galley lead remediation project.
- Reclamation staff provided an overview of water operations for Whiskeytown Dam and Reservoir.
- FWS staff provided a presentation on their Clear Creek Spawning Area Mapping project.
- YTFP staff provided an overview of the action completed in 2024 under the Clear Creek Adaptive Restoration Project grant agreement.
- Reclamation staff provided an update and overview of the new Proposed Action for the LTO of the CVP and SWP, specific to Clear Creek operations and how the CCTT will make recommendations.

**March 20, 2025**

- Reclamation staff provided an overview of the operations of Whiskeytown Dam and Clear Creek and provided an update on hydrologic conditions.
- FWS staff provided fisheries monitoring updates, including information on rotary screw traps, redd surveys, and spawning area mapping.
- CDFW staff provided a final update on the spring run Chinook Salmon hatch box incubators supplementation in Clear Creek, with final survival estimates.
- WSRCD staff provided an update on the ACID Siphon Fish Passage Project.
- YTFP staff provided an update on the Clear Creek Adaptive Restoration Project, including Horsetown project data collections and planning for the 2025 gravel augmentations.

**June 18, 2025**

- Reclamation staff provided a update on Whiskeytown Dam operations and hydrologic conditions.

- USFWS staff provided fisheries monitoring updates, including information on rotary screw traps, carcass surveys, and redd surveys.
- USFWS staff provided a presentation on the video weir monitoring project, including history, fish counts, and operational overview.
- WSRCD staff provided an update on the ACID Siphon Fish Passage Project.
- Reclamation provided an overview of the 2025 gravel augmentation project, completed by the YTFP.
- USFWS staff solicited feedback from the CCTT on how to better communicate with the public, particularly when it comes to signage for monitoring projects and pulse flow releases.

**September 18, 2025**

- WSRCD staff and their contractor, NHC, presented on the 90% designs for a nature-based fishway at the ACID siphon.
- Reclamation staff provided an update on operations of Whiskeytown Dam and Clear Creek.
- USFWS staff provided a presentation on the spring-run Chinook Salmon holding data collected before and after the spring pulse flows and through the summer months.
- Kerns and West staff provided an overview of the new Sharepoint site created to house CCTT information, such as meeting notes, agendas, flow proposal, etc.
- YTFP staff and design team participants provided several presentations on the early design concepts for the Horsetown Project – Phase 1.
- FWS and CDFW staff provide updates on the fisheries monitoring project on Clear Creek, including rotary screw trapping, spawning surveys, and video weir monitoring. Additionally, CDFW spoke on the low likelihood of hatch boxes being used in the winter of 2025 due to lack of broodstock and other priority watersheds.

# CHAPTER 2. CLEAR CREEK STATUS

**Water Year Characteristics**

The water year classification for Clear Creek is determined through the Sacramento River Water Year Type Index (SVI). The water year classification has important implications for the management of Clear Creek (see CHAPTER 3). The SVI as of May 1, 2025, revealed an "Above Normal" water year type (registering an 8.75 SVI, at 90% exceedance).

In WY2025, Clear Creek flows as measured at the Igo gage (USGS 11372000) saw several larger flow events through the winter and spring months. In total there were 14 days where the mean daily flows exceeded 800 cfs at the Igo Gage station (Figure 2). An uncontrolled spill event in conjunction with heavy precipitation occurred in February 2025, leading to the highest flows of the water year, peaking at instantaneous flow of 5,990 cfs at the Igo gage. The implementation of a new release schedule at Whiskeytown Dam helped maintain higher than normal flows in Clear Creek through the winter months, with 41% of days in this water year (149 of 365 days) exceeded a mean daily flow at Igo gage of 300 cfs or more (which includes the managed pulse flows). Importantly, flows at the Igo gage remained at or above 300 cfs for 128 consecutive days.

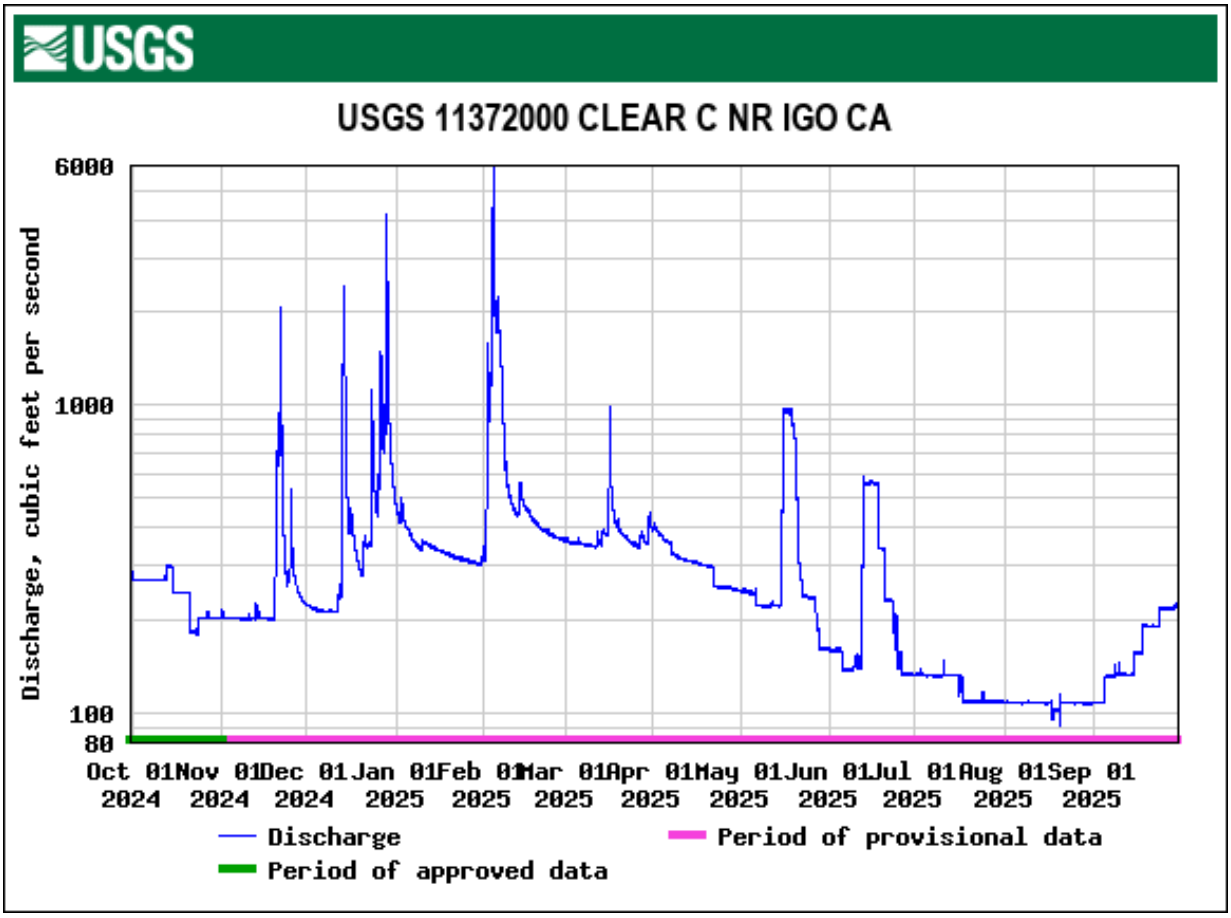



Figure 2. Instantaneous flow on Clear Creek at Igo gage during WY2025. Data courtesy of [USGS National Water Dashboard.]

The figure is a USGS hydrograph for Clear Creek at Igo, California showing stream discharge in cubic feet per second from October 2024 through September 2025, with peak flows exceeding 5,000 cfs in winter and base flows dropping to approximately 100 cfs in late summer.

**Glory Hole Spill**

Uncontrolled releases can occasionally occur through Whiskeytown Dam's gloryhole spillway. These spills can have positive geomorphic impacts on Clear Creek which improve salmonid habitat.

In WY 2025, Whiskeytown Dam saw a 4-day uncontrolled spill event, occurring from February 5 to 8, 2025. During this event the mean daily maximum spill reached 1,241 cfs (Figure 3). One of the major contributors to this spill event, beyond heavy precipitation in the watershed, was that one of the two Spring Creek Powerplant's generators was down for repairs. This limited the amount of water that could be exported from Whiskeytown Reservoir. With the reduced export capacity, the Whiskeytown Dam spill event had an increased duration and magnitude of spill. WY 2025 marked the third consecutive year with uncontrolled spill at Whiskeytown Dam.

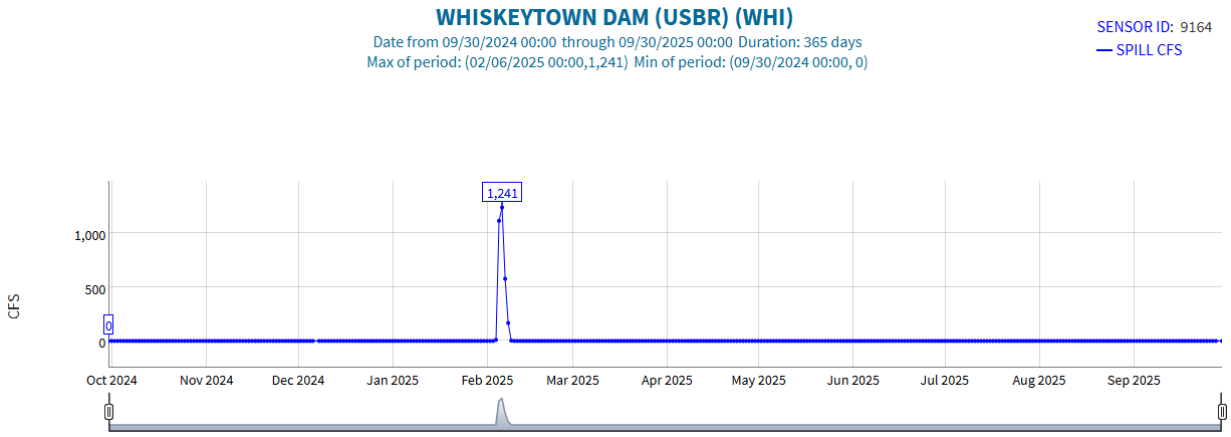



Figure 3. Whiskeytown Dam mean daily spillway discharge in Water Year 2025. Data courtesy of CDEC station map.

The figure is a hydrograph for Whiskeytown Dam spillway discharge in cubic feet per second, for Water Year 2025 from September 30, 2024 through September 30, 2025 on the x-axis. The y-axis shows cubic feet per second from 0 to approximately 1,250 where values are 0 except for a single sharp peak spill event of 1,241 cfs on February 6, 2025.

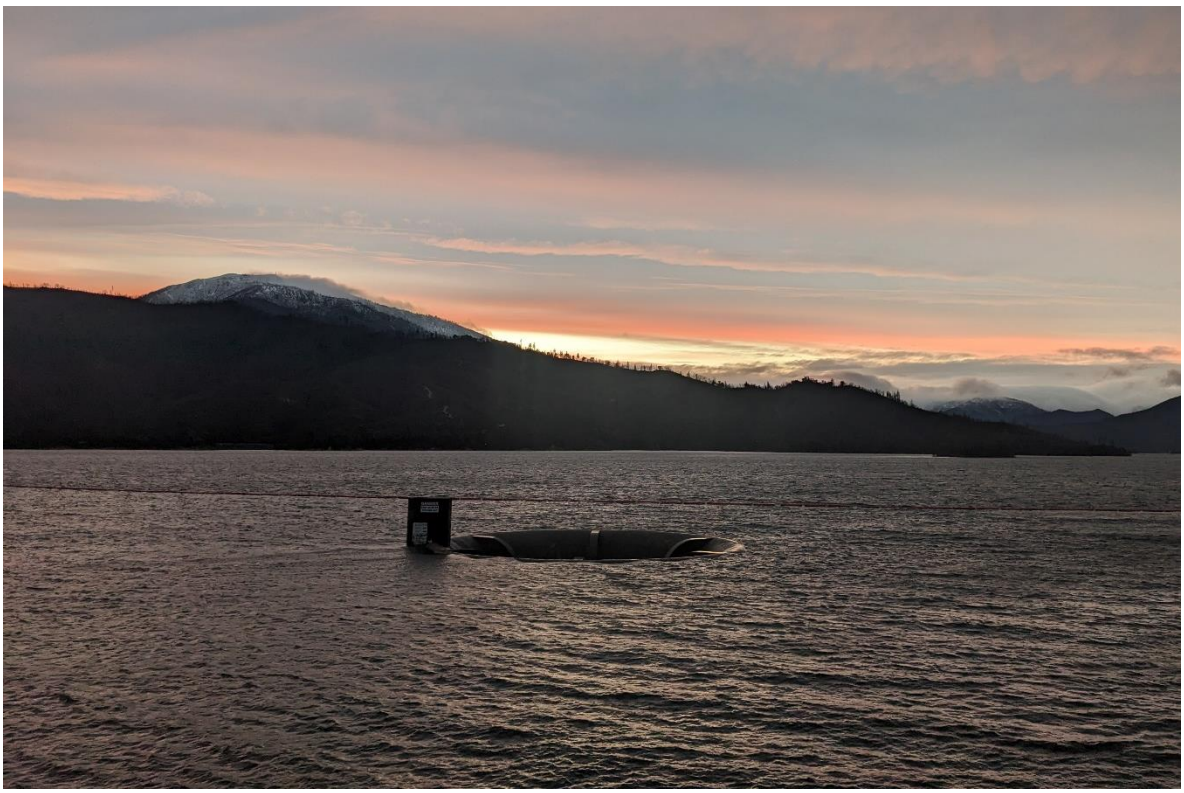


Figure 4. The Whiskeytown Dam spillway during the February 2025 gloryhole spill event. Photo credit: D. Rupert (Reclamation).

The figure is a picture of Whiskeytown Lake at sunrise from Whiskeytown Dam in February 2025 including the gloryhole spillway.

# CHAPTER 3. CLEAR CREEK MANAGEMENT ACTIONS

The following sections highlight the management actions that occurred in Clear Creek during WY 2025 (October 1, 2024–September 30, 2025). Occasionally, additional information is included that covers other water years (i.e., WY 2026) for continuity, as some actions cross water years (e.g., water temperature management). With significant precipitation in Northern California in first half of WY 2025, the Water Year was designated as "Above Normal" (see Section 0) allowing for the full spring pulse flow volume to be utilized.

The following Table 1 is a summary of the management actions from WY 2025:

Table 1. Summary of WY 2025 management actions, Clear Creek

| Management Action Item | | Progress in WY 2025 |
|---|---|---|
| 1. | Minimum Base Flows | Completed |
| 2. | Water Temperature Management | Implemented with some excursions |
| 3. | Spring Attraction Flows | Completed |
| 4. | Fish Habitat Restoration and Management ("Gravel Augmentation") | Completed |
| 5. | Fisheries Monitoring | Completed |

**Minimum Base Flows**

***Objective:*** *Provide flows to allow for sufficient spawning, incubation, rearing, and migration for salmon and steelhead.*

***Action (covers October 1, 2024 through December 19, 2025):*** *"Reclamation proposes a minimum base flow in Clear Creek of 200 cfs from October through May and 150 cfs from June to September in all year types except Critical year types. In Critical years, Clear Creek base flows may be reduced below 150 cfs based on available water from the Trinity Reservoir." (Section 4.10.2.4. of the PA).*

***Action (cover December 20, 2025 through September 30, 2025)****: "Reclamation will release water through Whiskeytown Dam to provide intra-annual variation to emulate natural processes. […] flows will oscillate over a 1-year period, with releases transitioning from 300 cfs in the winter, down to 100 cfs in the summer, and back to 300 cfs by the following winter. In critical years, Reclamation will target an average 150 cfs based on available water from Trinity Reservoir and attempt to maintain above 100 cfs."*

**Results:** In WY 2025, Clear Creek's minimum base flow goals transitioned between two flow regimes, with a newly developed hydrograph starting on December 20, 2024. Minimum flows were met across the water year with minor exceptions (Figure 5). Whiskeytown Dam can provide controlled releases of water to Clear Creek via the City of Redding powerhouse and/or the power bypass outlets. The bypass outlets' coarse level of control makes fine adjustment changes difficult. As such, CVO makes coarse bypass adjustments which are often followed up by several smaller adjustments for fine-tuning of flows. There are also measurement discrepancies between the Whiskeytown Dam flow gage and the USGS Igo gage, with the CCTT's preference placed on the Igo gage's readings (due to the USGS's continual gage calibrations). Several times in WY 2025, CVO made flow adjustments to ensure that flows at Igo gage remained consistent when switching between the powerhouse and the bypass releases, and deviances from minimum flow were corrected quickly.

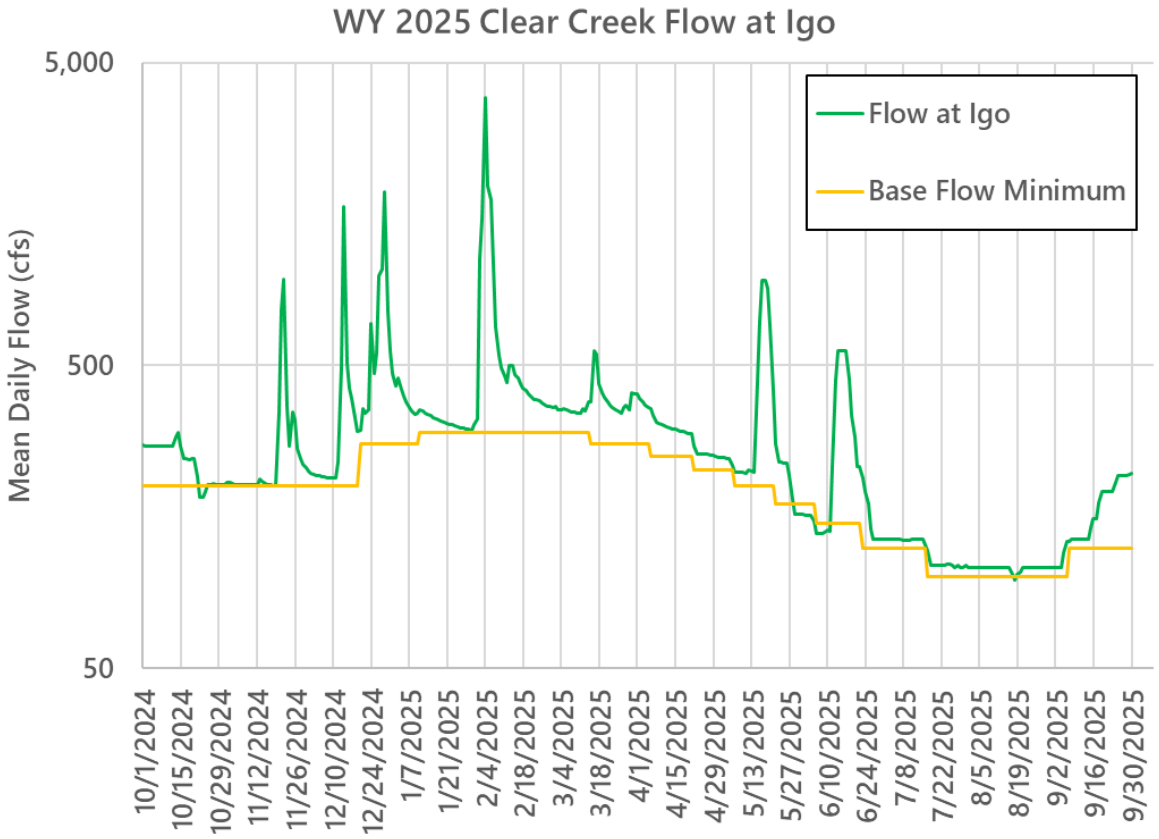



Figure 5. Mean daily flow on Clear Creek during WY 2025, reported by the USGS Igo gage.

The figure is a hydrograph of Water Year 2025 mean daily flow at Clear Creek near Igo, California, from October 1, 2024 through September 30, 2025, showing a green line for observed flow and an orange line for the Base Flow Minimum requirement, with multiple storm peaks reaching up to nearly 5,000 cfs in winter, spring pulse flows in May and June, and flows declining to base flow minimum in late summer.

**Water Temperature Management**

***Objective:*** *To reduce thermal stress to over-summering steelhead and spring-run during holding, spawning, and embryo incubation.*

***Action (covers October 1, 2024 through December 19, 2024): "****Reclamation proposes to manage Whiskeytown releases to meet a daily average water temperature of:*

*(1) 60°F at the Igo gauge from June 1 through September 15; and*

*(2) 56°F at the Igo gauge from September 16 to October 31.*

*Reclamation may not be able to meet these temperatures in Critical or Dry water year types. In these years, Reclamation will operate to as close to these temperatures to the extent possible."*

***Action (cover December 20, 2024 through September 30, 2025):*** *"Reclamation proposes to manage Whiskeytown releases to meet a daily average water temperature of:*

*(1) 61°F at the Igo gauge from June 1 through August 15*

*(2) 60°F at the Igo gauge from August 16 through September 15; and*

*(2) 56°F at the Igo gauge from September 16 to November 15.*

*Reclamation may not be able to meet these temperatures in Critical or Dry water year types. In these years, Reclamation will operate to as close to these temperatures to the extent possible."*

**Results:** In WY 2025, water temperature criteria were met at Igo gauge with varying levels of compliance. Mean daily water temperatures were met across the June 1 to September 15 timeframes. However, minor temperature excursions occurred as Clear Creek entered the 56°F mean daily water temperature criteria period on September 16.

In WY 2025, CVO transitioned Whiskeytown Dam releases to Clear Creek from the lower guard gates on July 10 (opposed to a blend of upper and lower guard gate water), which provides the coldest possible water to the creek. In many of the previous years, this transition was made in mid-September, with the start of the 56 °F mean daily temperature criteria. With the new flow regime's lower flows through the summer (i.e., 100 cfs releases) colder water was needed to meet temperature criteria. This operational change appeared to have worked successfully, as water temperatures at Igo remained well below the 61 and 60 °F criteria through the summer, even with the lower flows and high air temperatures. Importantly, cold water resources did not appear to be significantly different than other years in the September-October timeframes when Whiskeytown Reservoir is at its warmest.

Following the temperature exceedances in mid-September, Reclamation made several flow increases to reduce in-stream temperatures. Those changes were made as follows:

Table 2. Flow changes (cfs) from Whiskeytown Dam for water temperature management in WY 2025.

| Date | Time | From | To |
|---|---|---|---|
| 9/15/2025 | 900 | 125 | 150 |
| 9/18/2025 | 900 | 150 | 200 |
| 9/24/2025 | 900 | 200 | 225 |

These flow changes were able to reduce in-stream temperatures below the mean daily 56 °F criterion. In total 9 days experience temperature exceedances in the Fall of 2025, but those days remained within one degree (F) of the target (Figure 7).

Water temperature management on Clear Creek is highly dependent of trans-basin deliveries of cold water from the Trinity River. In WY 2025, CVO maintain relatively consistent diversions through the Carr Tunnels. CVO's Water Temperature Management Plan estimated roughly 477,000 acre feet of water would be delivered through the Carr Tunnels between May and September 2025.

WY 2025's Clear Creek temperature management performed better than anticipated. CVO's Temperature management Plan's forecast (90% exceedance – L3MTO 25% Meteorology; Figure 6) had shown some potential temperature excursion in July and August, which did not manifest during the water year. The modeling results predicted temperature exceedances starting in mid-September, with the start of the 56°F mean daily temperature criteria. However, the actual temperature data for WY 2025 showed the exceedances had a shorter duration and were less significant in magnitude than the pre-season modeling (Figure 7).

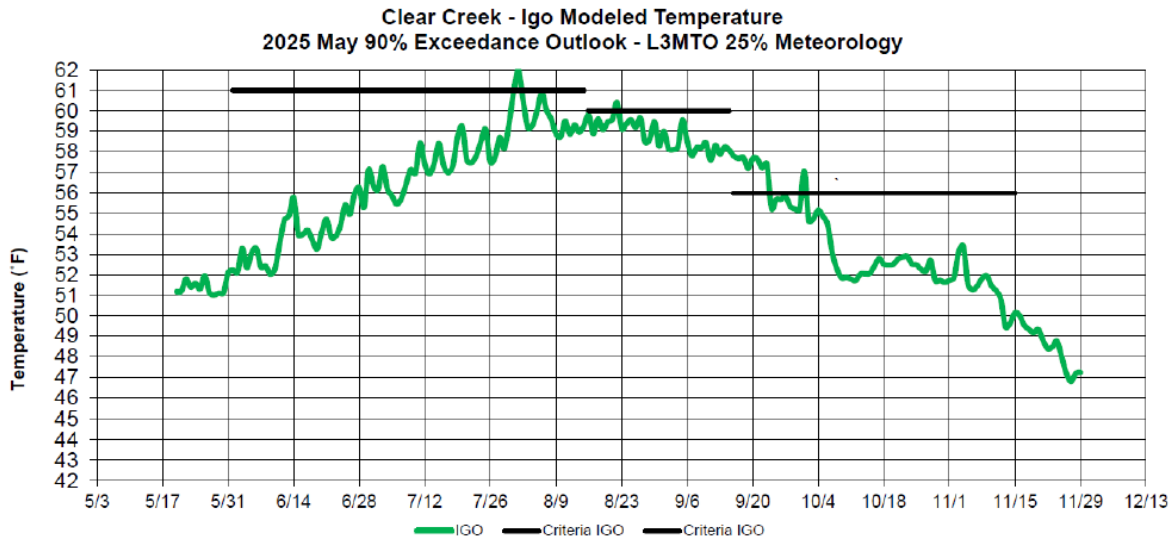



Figure 6. Clear Creek Igo Modeled Temperature – May 2025 90%-Exceedance Water Outlook – L3MTO 25% Meteorology (Reclamation 2025).

The figure is a line chart of modeled water temperature at Clear Creek near Igo, California, from May through December under a 2025 May 90% Exceedance Outlook with L3MTO 25% Meteorology, showing temperatures rising from about 51°F in late May to a peak near 61°F in late July, then declining to approximately 47°F by late November, with three stepped temperature criteria thresholds shown as horizontal black lines.

Mean daily water temperatures at Igo gauge remained below 61°F for 100% of the 31-day adult spring-run Chinook Salmon migration and holding period (June 1–August 15, 2025; Table 3 and Figure 4). Similarly, mean daily water temperatures at Igo remained below 60°F for 100% of the adult spring run chinook salmon holding period (August 16 – September 15, 2025).

The mean daily water temperature criterion decreases to 56°F for the spawning/egg incubation period of September 16 to November 15 (previously, September 16 to October 31 under the NMFS 2019 Biological Opinion). It is important to note that the 56°F mean daily water temperature criteria cross water years (Water Year 2025 runs from October 1, 2024 to September 30, 2025). During October 1 to 31, 2024, the 56°F criteria were met for 23 of 31 days (74%). From September 16 through September 30, 2025, the 56°F criteria were met for 6 of 15 days (40%). Overall, in WY 2025, the 56° F criteria were met for 29 of 46 days (63%; Table 2). For Fall of 2025 (Calendar year), which crosses water years, the 56°F criteria were met 52 of 61 days (85%; Table 4, Figure 7).

The Oak Bottom and Spring Creek Temperature Control Curtains remained in place and operational during WY 2025. This curtain discourages the mixing of cold water coming from the Carr Tunnels with the warm epilimnion of Whiskeytown Reservoir, helping to extend the cold-water pool resource through the summer months (Figure 8). The temperature curtains have deteriorated recently, and they are not functioning as designed.

Table 3. Proportion of days that water temperatures at Clear Creek IGO gauge met the criteria, during water years. Note: that the September 16 to October 31 temperature criteria crosses water years in a single spawning season, and WY 2025 saw the implementation of a new Proposed Action with changed temperature criteria periods.

| Water Year | Spawning Temperature ≤56°F October 1-31 | Migration and Holding Temperature ≤61°F June 1-August 15 (2025) | Holding Temperature ≤60°F June 1-September 15 August 16 – September 15 (2025) | Spawning Temperature ≤56°F September 16-September 30 |
|---|---|---|---|---|
| WY 2011 | 44% (12 of 27 days)* | | 100% (107 of 107 days) | 0% (0 of 15 days) |
| WY 2012 | 94% (29 of 31 days) | | 100% (107 of 107 days) | 33% (5 of 15 days) |
| WY 2013 | 81% (25 of 31 days) | | 100% (107 of 107 days) | 93% (14 of 15 days) |
| WY 2014 | 100% (31 of 31 days) | | 100% (107 of 107 days) | 0% (0 of 15 days) |
| WY 2015 | 0% (0 of 31 days) | | 100% (107 of 107 days) | 0% (0 of 15 days) |
| WY 2016 | 0% (0 of 31 days) | | 98% (105 of 107 days) | 33% (5 of 15 days) |
| WY 2017 | 6% (2 of 31 days) | | 100% (107 of 107 days) | 100% (15 of 15 days) |
| WY 2018 | 100% (31 of 31 days) | | 99% (106 of 107 days) | 100% (15 of 15 days) |
| WY 2019 | 87% (27 of 31 days) | | 99% (97 of 98 days)* | 13% (2 of 15 days) |
| WY 2020 | 94% (29 of 31 days) | | 99% (103 of 104 days)* | 33% (5 of 15 days) |
| WY 2021 | 94% (29 of 31 days) | | 100% (105 of 105 days)* | 47% (7 of 15 days) |
| WY 2022 | 97% (30 of 31 days) | | 93% (100 of 107 days) | 20% (3 of 15 days) |
| WY 2023 | 10% (3 of 31 days) | | 100% (107 of 107 days) | 100% (15 of 15 days) |
| WY 2024 | 97% (30 of 31 days) | | 100% (107 of 107 days) | 0% (0 of 15 days) |
| WY 2025 | 74% (23 of 31 days) | 100% (76 of 76 days) | 100% (31 of 31 days) | 40% (6 of 15 days) |

* Data missing due to gage malfunctions or vandalism

Table 4. Proportion of days that water temperatures at Clear Creek IGO gauge met the criteria, during calendar years.

| Calendar Year | Migration and Holding Temperature ≤61°F June 1 - August 15 (2025) | Holding Temperature ≤60°F June 1 - September 15 (Pre-2025) August 16 - September 15 (2025) | Spawning Temperature ≤56°F September 16 - October 31 (Pre-2025) September 16 - November 15 (2025) |
|---|---|---|---|
| 2011 | | 100% (107 of 107 days) | 63% (29 of 46 days) |
| 2012 | | 100% (107 of 107 days) | 65% (30 of 46 days) |
| 2013 | | 100% (107 of 107 days) | 98% (45 of 46 days) |
| 2014 | | 100% (107 of 107 days) | 0% (0 of 46 days) |
| 2015 | | 100% (107 of 107 days) | 0% (0 of 46 days) |
| 2016 | | 98% (105 of 107 days) | 15% (7 of 46 days) |
| 2017 | | 100% (107 of 107 days) | 100% (46 of 46 days) |
| 2018 | | 99% (106 of 107 days) | 91% (42 of 46 days) |
| 2019 | | 99% (97 of 98 days)* | 67% (31 of 46 days) |
| 2020 | | 99% (103 of 104 days)* | 72% (33 of 46 days) |
| 2021 | | 100% (105 of 105 days)* | 80% (37 of 46 days) |
| 2022 | | 93% (100 of 107 days) | 15% (7 of 46 days) |
| 2023 | | 100% (107 of 107 days) | 98% (45 of 46 days) |
| 2024 | | 100% (107 of 107 days) | 50% (23 of 46 days) |
| 2025 | 100% (76 of 76 days) | 100% (31 of 31 days) | 85% (52 of 61 days) |

* Data missing due to gage malfunctions or vandalism

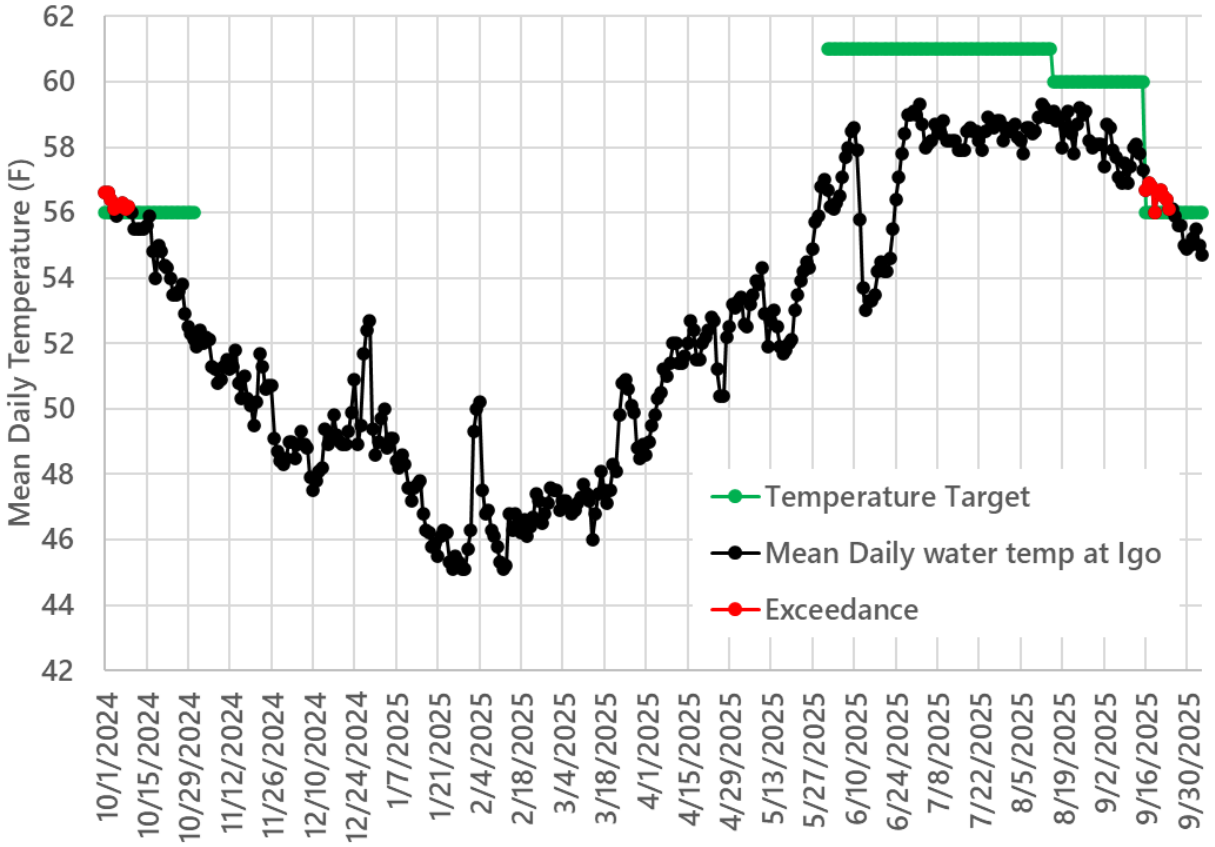



Figure 7. Mean daily water temperature on Clear Creek at the Igo gaging station in Water Year 2025 compared to the mean daily temperature criteria for spring-run Chinook Salmon holding (61°F from June 1 to August 15, and 60°F from August 16 F to September 15) and spawning and incubation (56°F from October 1 to 31 and September 16 to September 30). Red dots highlight days of temperature criteria exceedances.

The figure is a time-series chart of mean daily water temperature at Clear Creek near Igo, California for Water Year 2025, showing observed temperatures, stepped seasonal temperature targets, and highlighted exceedance periods, with temperatures ranging from a winter low near 44°F to a summer high near 60°F. Temperature exceedances occur in early October 2024 and again in mid-September 2025 at the 56°F temperature target.

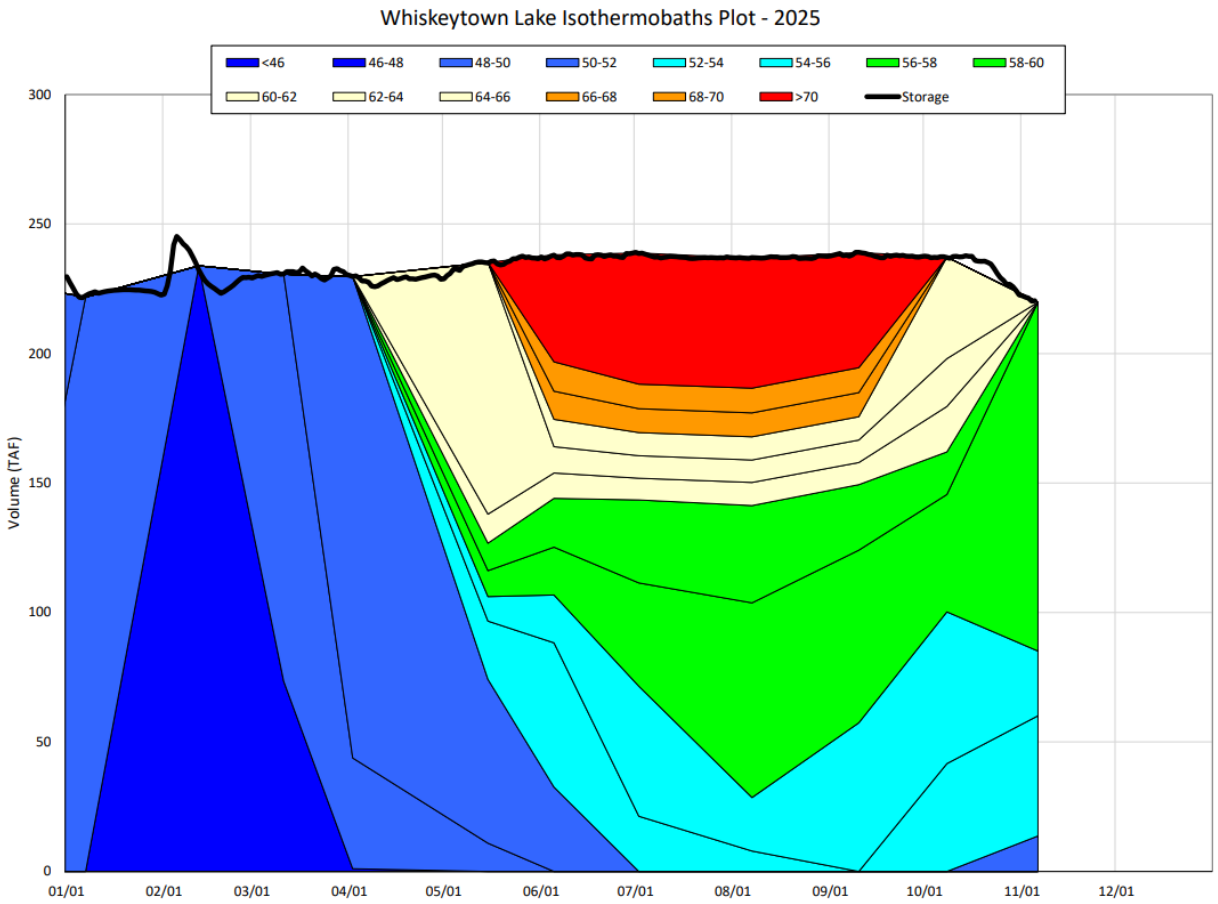



Figure 8. The isothermobath from Whiskeytown Reservoir in 2025 as of November 4, 2025.

The figure is a Isothermobath plot for Whiskeytown Lake in 2025, showing the volume of water on the y-axis in thousand acre-feet (0-300) within each temperature band from January 1 through November 1. Cold water below 50°F dominates winter storage, transitioning to warmer layers with surface temperatures greater than 70°F with limited volume of 52-56°F persisting at depth, and a black line tracking total reservoir storage throughout the year.

**Spring Attraction Flows**

***Objective:*** *Encourage spring-run migrate to upstream Clear Creek habitats for holding and spawning.*

***Action: "****Except in years with significant uncontrolled spill, Reclamation will release up to 10,000 acre-feet from Whiskeytown Dam for channel maintenance, spring attraction flows, and to meet other physical and biological objectives. In critical years [SVI <5.4], Reclamation will release up to 5,000 acre-feet. Reclamation, through CCTT, will develop pulse flow schedules, which include measures (e.g., nighttime down ramping, slow down ramping rates, coordination with natural precipitation events) to mitigate for potential risks (e.g., potential juvenile fish stranding). The pulse flows are not to exceed safe outlet works capacity of Whiskeytown Dam, currently 840 cfs, and will be scheduled on or after February 1."*

**Results**: The CCTT produced an annual proposal for spring pulse flows in the early 2025 for implementation of the spring attraction flows in Clear Creek (Figure 9). The CCTT deliberated on the timing and peak(s) of the pulse flow(s) actions and produced a set of pulse flows for different water year designations with their formal proposal to CVO. The intent of the spring pulse flow(s) is to encourage spring-run Chinook Salmon to enter Clear Creek and ascend into the upstream-most reaches of the system. With the final "Above Normal" water year type determination, 10,000 acre-feet of water volume was available to use towards spring pulse flows in Clear Creek. The CCTT's proposed pulse flows would be slightly modified prior to implementation to ensure Reclamation staff would be able to make flow changes at Whiskeytown Dam.

Adult spring-run Chinook Salmon enter Clear Creek from late April through early July, with peak migration in May and June. In WY 2025, two pulses provided from Whiskeytown Dam were developed to coincide with previously observed peak adult spring-run Chinook Salmon migration into Clear Creek and replicate the spring-run Chinook Salmon attraction success observed during past pulse flows.

Two spring pulse flows were released in WY2025. The first pulse began on May 15 and reached a peak of 800 cubic feet per second May 18. Flow rates was reduced to 175 cfs by May 28. The second pulse begin on June 12 and reached a peak of 500 cfs of June 13. The second pulse ended on June 26 with Whiskeytown Dam releases dropping to 125 cfs.

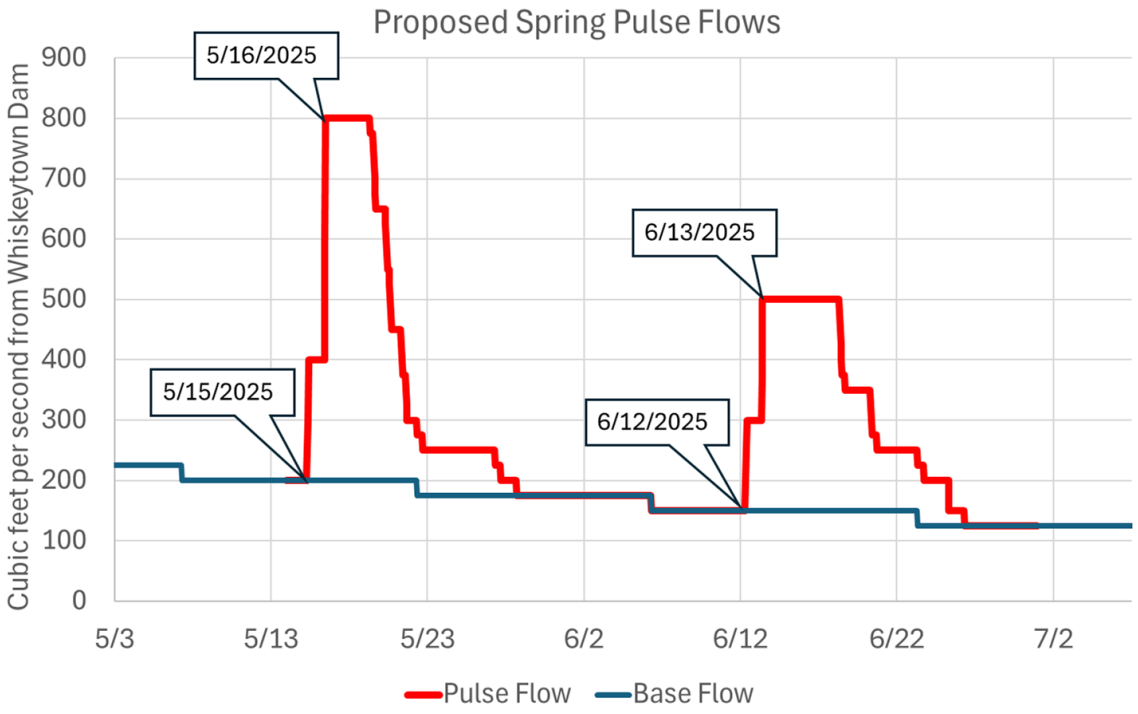



Figure 9. Proposed release schedule for 2025 spring pulse flow from Whiskeytown Dam.

The figure is a line chart of proposed spring pulse flows and baseflows from Whiskeytown Dam in cubic feet per second from May 3 through July 7, 2025. The figure shows two pulse flow events — a first pulse peaking at 800 cfs beginning May 15 and a second pulse peaking at 500 cfs beginning June 13 — and a declining base flow ranging from approximately 220 cfs in early May to 120 cfs in early July.

The rapid increase in flows associated with any pulse flow action on Clear Creek can be disturbing to unknowing public users. The CCTT has previously received criticisms from users that were caught unaware of the flow changes. As such, the CCTT aims to improve communications with the public about all future pulse flows. The CCTT produced posters describing the pulse flow and timing. These posters were then posted at all the popular access points and trailheads on Clear Creek. Also, the CCTT has added a small flow bench (300 or 400 cfs) to the pulse flow to act as a warning that flows are increasing. The cold water and increased turbidity occurring with this flow bench should discourage recreation in the creek.

Snorkel surveys were conducted by USFWS before and after each pulse flow to help determine the response of spring-run Chinook Salmon to the flow action. These surveys provided an index of abundance of adult spring-run Chinook Salmon and spatial information on the distribution of adults within Clear Creek (see CHAPTER 4).

**Fish Habitat Restoration and Management**

***Objective:*** *Enhance and maintain previously degraded habitat for anadromous salmonids, through the placement of desirable materials such as coarse sediment ("gravel") and large wood.*

***Action:*** *The CVPIA's Science Integration Team's Near-Term Restoration Strategy (2020) recommended two Restoration Actions for Chinook Salmon in Clear Creek:*

*Action 6. Juvenile habitat restoration in Clear Creek*

*"Clear Creek has consistently produced fall-run and spring-run Chinook salmon and the SIT recognizes that it has the potential to increase the natural production of both runs. The DSM results indicated that Clear Creek was included in the candidate strategies with the greatest increases in natural production and was frequently chosen for juvenile habitat restoration during the optimal spring-run and fall-run strategies. Based on the strategies, juvenile habitat restoration in Clear Creek has the greatest potential to increase productivity in the Northwestern California diversity group. The SIT also assumed that the juvenile habitat restoration would consist of a mixture of both in-channel and floodplain habitats based on the opportunities available at the restoration areas."*

*Action 9. Maintain existing spawning habitats in Upper Sacramento, American, and Stanislaus Rivers; Clear and Butte Creeks*

*"During the strategy simulations, the best performing strategy for fall Chinook salmon contained the caveat that spawning habitat in several tributaries would be maintained during the simulation period. In keeping with the desire of the SIT to show progress (i.e., not go backward), the SIT prioritized the maintenance of spawning habitat in Upper Sacramento, American, and Stanislaus Rivers; as well as Clear and Butte Creeks."*

**Results:** Habitat restoration efforts continued in WY 2025, through the Yurok Tribe's Clear Creek Adaptive Restoration Project (a CVPIA-funded grant).

Late in WY 2025, the Yurok Tribe's design team initiated the design process for the Horsetown channel restoration project – Phase 1. This project looks to rehabilitate a reach of Clear Creek that has been heavily impacted by mining and lacks quality habitat for juvenile salmon rearing and adult spawning. The Yurok Tribe's design team provided the CCTT with an existing conditions report in September 2025 and anticipates providing the 30% design document in early 2026. Construction for this project is scheduled to begin in 2027.

The Lower Clear Creek Anadromous Fish Habitat Restoration and Management Project (aka Gravel Augmentations) was completed in WY 2025. The Yurok Tribe, in cooperation with Reclamation, completed gravel augmentations at five sites, which were prioritized by the CCTT. Approximately 12,000 tons of gravel were added to Clear Creek in 2025, increasing the long-term project total to 215,853 tons (1996-2025). Below is a brief description of the five sites completed in 2025.

Guardian Rock: The Guardian Rock site is found on NPS lands and required close coordination with NPS staff. This lateral berm style augmentation received 2,487 tons of "fish rock" and four large boulders (Figure 10). Implementation occurred from June 9 to 11, 2025. The berm had previously been completely evacuated, and this effort restored the berm for future gravel recruitment.



Figure 10. The Guardian Rock gravel augmentation site and the lateral berm completed in 2025.

The figure is a picture of Clear Creek at the Guardian Rock gravel augmentation site showing the lateral berm created by the augmentation event.

Placer Bridge: The Placer Bridge site is located on privately owned land and required coordination with the landowner. This talus cone style augmentation received 3,650 tons of "fish rock." Implementation occurred from May 7 to 9, 2025. The site had previously been completely evacuated by high flows, and this effort restored the cone for future gravel recruitment.

Clear Creek Road Bridge: The Clear Creek Road Bridge site is located on BLM lands and is a commonly utilized gravel augmentation site because of its easy of access and relatively small size. The Talus Cone style augmentation received 1,054 tons of "fish rock." Implementation occurred between April 28 and May 1, 2025. The site had previously been completely evacuated, and this effort restored the small cone for future gravel recruitment.

Above Phase 3A: The Above Phase 3A site is located on BLM lands. This year, in coordination with BLM staff, a new trail/road alignment was built to allow access from the Gold Dredge trailhead to the site. The old trail/road alignment had become too overgrown, and the creek channel was encroaching to the point it could no longer be utilized. The lateral berm style augmentation received 2,503 tons of "fish rock." Implementation occurred from June 5 to 6, 2025. The site had previously been completely evacuated by high flows, and this effort restored the berm for future gravel recruitment.

Phase 2A/Gold Dredge: The Gold Dredge site is located on BLM lands, at river mile 3.5. This riffle supplementation style augmentation received a total of 2,372 tons of gravel consisting of small gravel, "fish rock", and cobble. Additionally, six boulders and 10 pieces of large wood were placed (Figure 11). Implementation occurred from June 2 to 5, 2025. This year's augmentation was the third time that a novel riffle supplementation style was implemented at this site, with the process of supplementing 5 transverse bars within the site, where each year adds a new layer to the top of the bars. This highly successful method is showing immediate results, with a high habitat-building response and greatly improved local floodplain activation and inundation duration (Figure 12).



Figure 11. The Gold Dredge gravel augmentation site under construction in 2025.

The figure is a picture of gravel augmentation activities at the Gold Dredge augmentation site in 2025.



Figure 12. Habitats adjacent to the Gold Dredge gravel augmentation site have improved floodplain activation and inundation duration after construction.

The figure is a picture of inundated floodplain habitat adjacent to the Gold Dredge gravel augmentation site showing how increased augmentation can increase floodplain inundation.

# CHAPTER 4. FISHERIES MONITORING

***Objective:*** *Monitor and evaluate the response of fisheries to the restoration actions occurring in Lower Clear Creek.*

***Action:*** *The USFWS monitors salmonid habitat and adult and juvenile life history of salmonid populations in Clear Creek. The CDFW monitors the escapement of fall-run in Clear Creek.*

**Juvenile Production Monitoring**

The USFWS operates rotary screw traps at two locations on Clear Creek, at RM 8.4 (Upper Clear Creek [UCC]) and RM 1.7 (Lower Clear Creek [LCC]). The UCC trap produces a juvenile spring run Chinook Salmon passage index (JPI), while the UCC trap captures all anadromous salmonid species of Clear Creek. The juvenile passage indices for fall run Chinook Salmon, late-fall run Chinook Salmon, and *O. mykiss* (Rainbow Trout/steelhead) are calculated from catch at the LCC trap. In WY 2025, the two traps were on the water and operated from October 20, 2023, to June 30, 2024. The preliminary brood year 2023 juvenile passage estimates at LCC were: 822,063 fall-run Chinook Salmon (Figure 13), 20,188 *O. mykiss* (Figure 14). The brood year 2023 juvenile spring run Chinook Salmon passage index at UCC was 5,878 fish (Figure 15). There were no redds observed above the separation weir and below the UCC trap. The UCC trap did not operate for part of the spring-run Chinook Salmon out-migration period, so the JPI is most certainly lower than the actual passage (Figure 16). Similarly, the LCC trap did not operate for parts of the fall-run Chinook Salmon out-migration (Figure 17). The USFWS's Clear Creek Brood Year 2024 Juvenile Report is in progress.

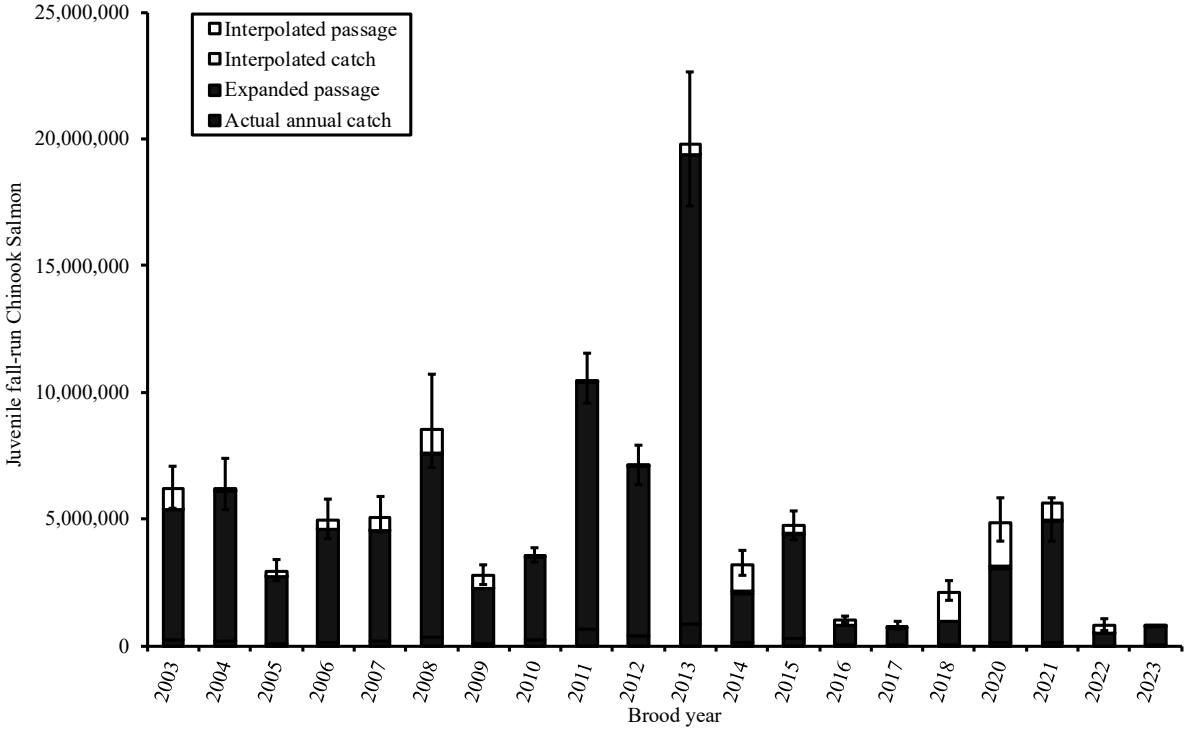



Figure 13. Annual passage indices of juvenile fall run Chinook Salmon by brood year at the lower Clear Creek rotary screw trap from 2003 to 2023. Passage data from brood year 2019 are being summarized at the time of this report; delays in report development were due to COVID-19 related issues. USFWS-Red Bluff unpublished data.

The figure is a stacked bar chart of juvenile fall-run Chinook Salmon estimates by brood year from 2003 through 2023 at the lower Clear Creek rotary screw trap from 0 to 25,000,000 on the y-axis. The graph shows four components — interpolated passage, interpolated catch, expanded passage, and actual annual catch — with the largest year-class in brood year 2013 approaching nearly 20 million juveniles, strong years in 2008 and 2011, and notably low production in brood years 2016, 2017, 2022, and 2023. There is no passage index provided for brood year 2019 because the trap was not in use due to the COVID-19 pandemic.

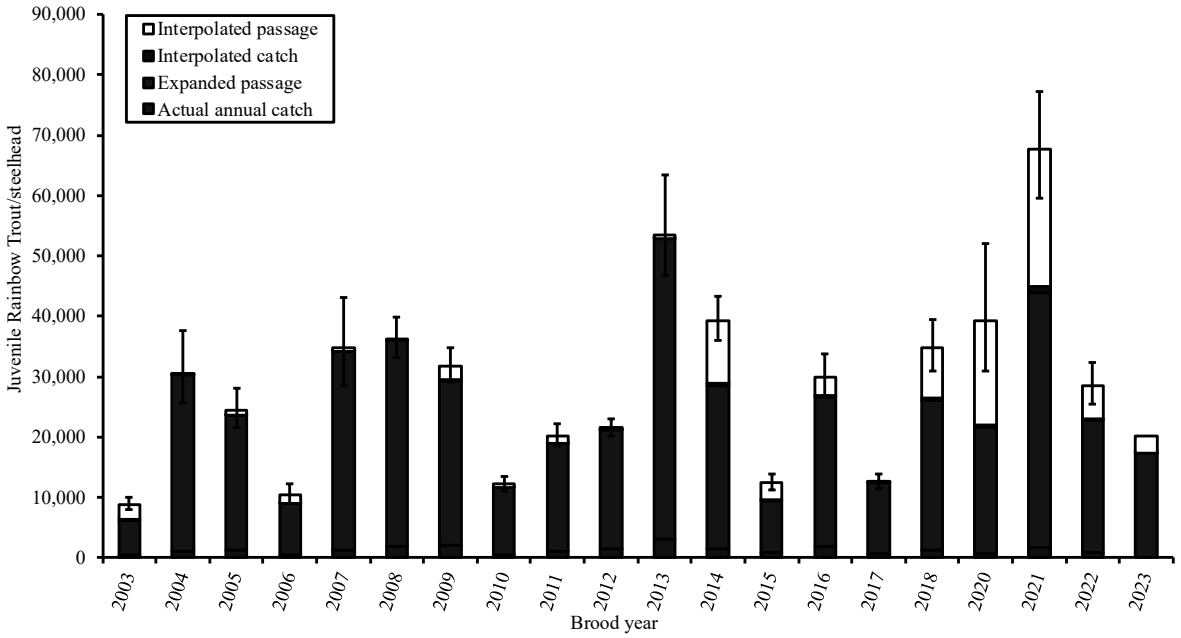



Figure 14. Annual passage of juvenile Rainbow Trout/steelhead by brood year at the lower Clear Creek rotary screw trap from 2003 to 2023. There is no passage index for brood year 2019 because the trap was not fished during peak out-migration due to COVID-19 stay at home orders. USFWS-Red Bluff unpublished data.

The figure is a stacked bar chart of juvenile Rainbow Trout/steelhead estimates by brood year from 2003 through 2023, at the lower Clear Creek rotary screw trap from 0 to 90,000 on the y-axis. The figure contains four components — interpolated passage, interpolated catch, expanded passage, and actual annual catch — with the largest year-class in brood year 2021 approaching nearly 68,000 fish, a secondary peak in 2013 near 54,000, and notably low production in brood years 2003, 2006, 2010, 2015, and 2017. There is no passage index provided for brood year 2019 because the trap was not in use due to the COVID-19 pandemic.

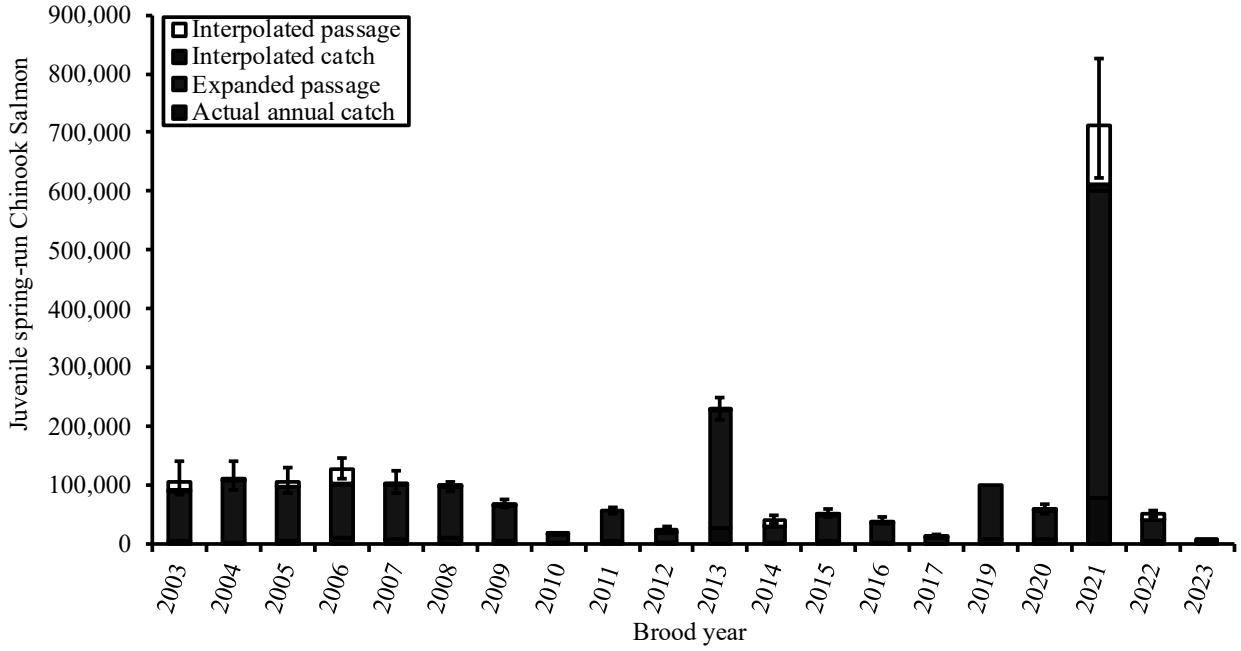



Figure 15. Annual passage of juvenile spring run Chinook Salmon by brood year at the upper Clear Creek rotary screw trap from 2003 to 2023. USFWS-Red Bluff unpublished data.

The figure is a stacked bar chart of juvenile fall-run Chinook Salmon estimates by brood year from 2003 through 2023 at the upper Clear Creek rotary screw trap from 0 to 900,000 on the y-axis. Brood year 2018 is omitted from the figure. The graph shows four components — interpolated passage, interpolated catch, expanded passage, and actual annual catch — with the largest year-class in brood year 2021 approaching nearly700,000 juveniles, a strong year in 2013, and notably low production in brood years 2010, 2012, 2017, and 2023.

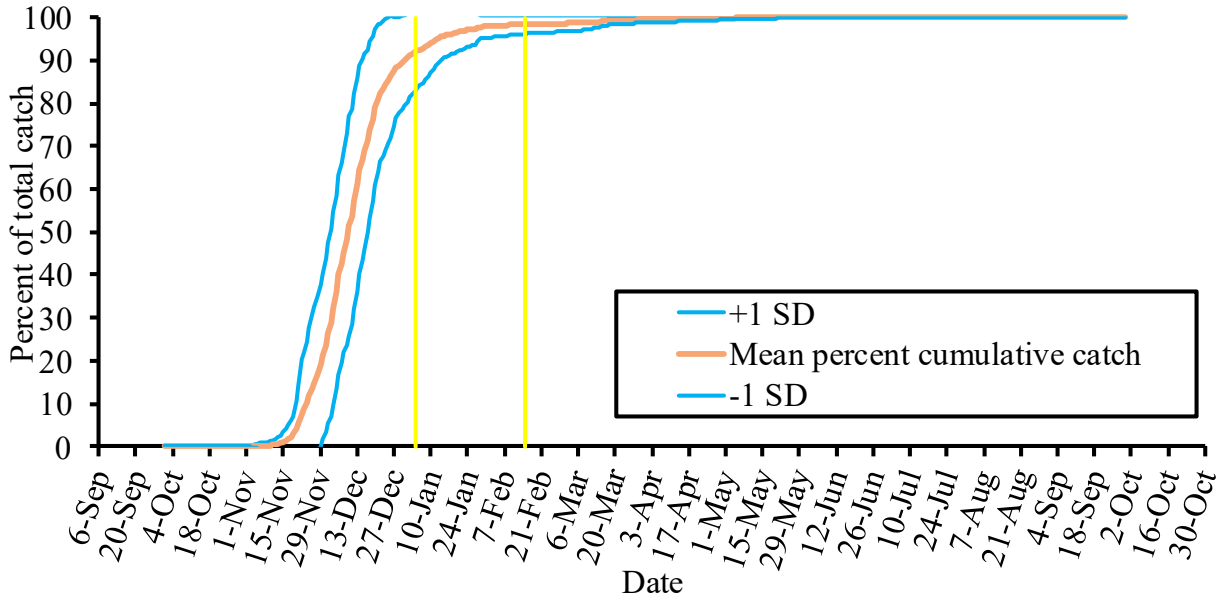



Figure 16. The mean percent cumulative of the annual catch for brood years 2003–2023, one standard deviation. Between the two vertical yellow bars is a significant offline period of the upper Clear Creek rotary screw trap during the brood year 2023 spring-run Chinook Salmon out-migration period.

The figure is a cumulative catch curve showing mean percent of total catch and plus/minus one standard deviation for the upper Clear Creek rotary screw trap, from September through October, with the mean cumulative catch rising steeply from near zero in mid-November to nearly 100% by late January. Two vertical yellow lines mark the time period, from mid-January to mid-February where the trap was offline.

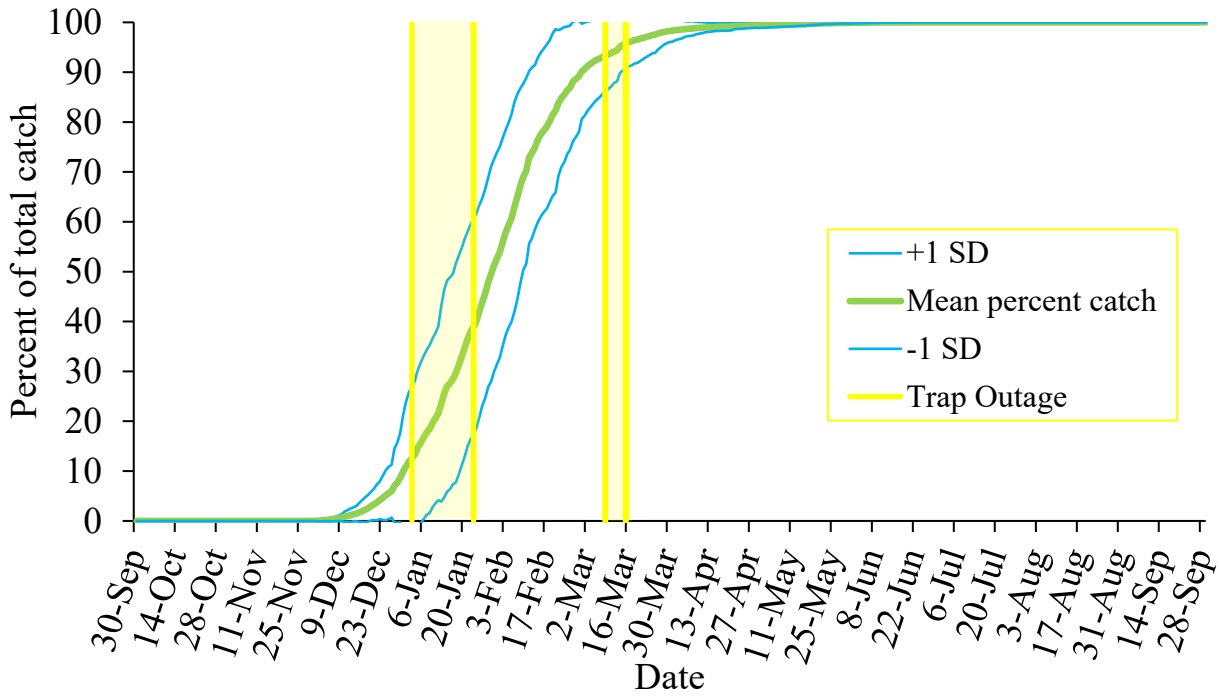



Figure 17. The mean percent cumulative of the annual catch for brood years 2003–2023, one standard deviation, and significant times the lower Clear Creek rotary screw trap was not operated during the brood year 2023 fall-run Chinook Salmon out-migration period.

The figure is a cumulative catch curve showing mean percent of total catch and plus/minus one standard deviation for the lower Clear Creek rotary screw trap, from September 2024 through October 2025, with the mean cumulative catch rising steeply from near zero in December to nearly 100% by mid-March. Two sets of vertical yellow lines mark the time periods, from early to mid-January and mid-March, where the trap was offline.

**Adult Escapement**

USFWS and CDFW jointly operate a video weir at the mouth of Clear Creek (RM 0.1). In WY 2023, CDFW operated the weir from the start of the water year (October 1, 2024) to December 19, 2024. USFWS operated the weir from December 19, 2024, to August 15, 2025. CDFW operated the weir again from August 15, 2025, through the end of the water year (September 30, 2025).

**Spring-run Chinook Salmon**

Adult spring-run Chinook Salmon upstream passage into Clear Creek is monitored at a video station near the confluence with the Sacramento River and sometimes estimated via snorkel survey when weir data are insufficient. Figure 18 shows the adult population estimates from 2003 through 2025. Video data are being evaluated by the Red Bluff USFWS office to characterize spring-run Chinook Salmon passage through the entire emigration period and to look for a detectable response to the spring pulse flows. Final estimates for BY 2025, 69 spring-run Chinook Salmon stayed in Clear Creek. The first few weeks of the season were missed due to a large storm that resulted in a high flow event and glory hole

spill for much of February. The storm knocked out the video capture of the weir until being restored by March 5. From March 5 until the end of the season there were no other flow events that damaged the weir and prevented fish passage monitoring. Ten spring-run Chinook Salmon were observed during the 2025 August Index snorkel survey from August 25–28, which has served as an alternative population estimate in the past.

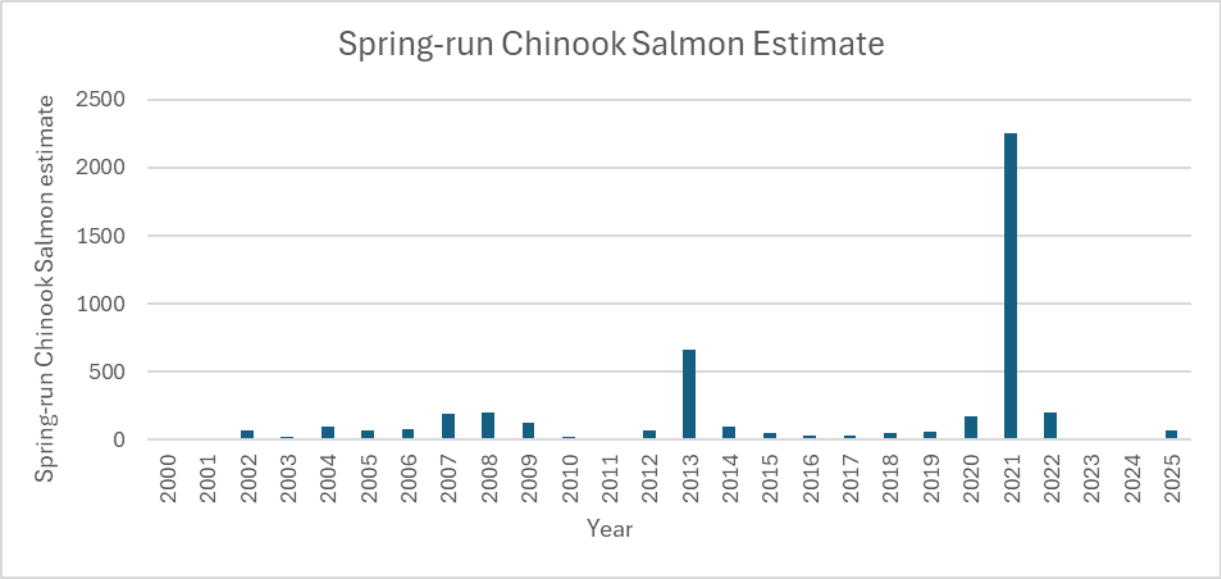



Figure 18. Clear Creek spring-run Chinook Salmon escapement reported to GrandTab for the years 2000 through 2025 created by USFWS Red Bluff.

The figure is a bar chart of annual Clear Creek spring-run Chinook Salmon population estimates from 2000 through 2025 on the x-axis. The y-axis documents the Spring-run Chinook Salmon estimates from 0 to 2,500. The figure shows generally low counts below 200 fish for most years, a moderate peak of approximately 650 fish in 2013, and a record high of approximately 2,250 fish in 2021, followed by a sharp decline through 2023–2024 and a slight recovery in 2025.

**Fall-run Chinook Salmon**

The adult fall-run Chinook Salmon estimate is produced by CDFW based on the Clear Creek video weir passage. CDFW reported 2,997 fall-run Chinook Salmon entered Clear Creek in 2022 (Azat 2023, Figure 19) and 1,110 fall-run Chinook salmon entered for 2023.

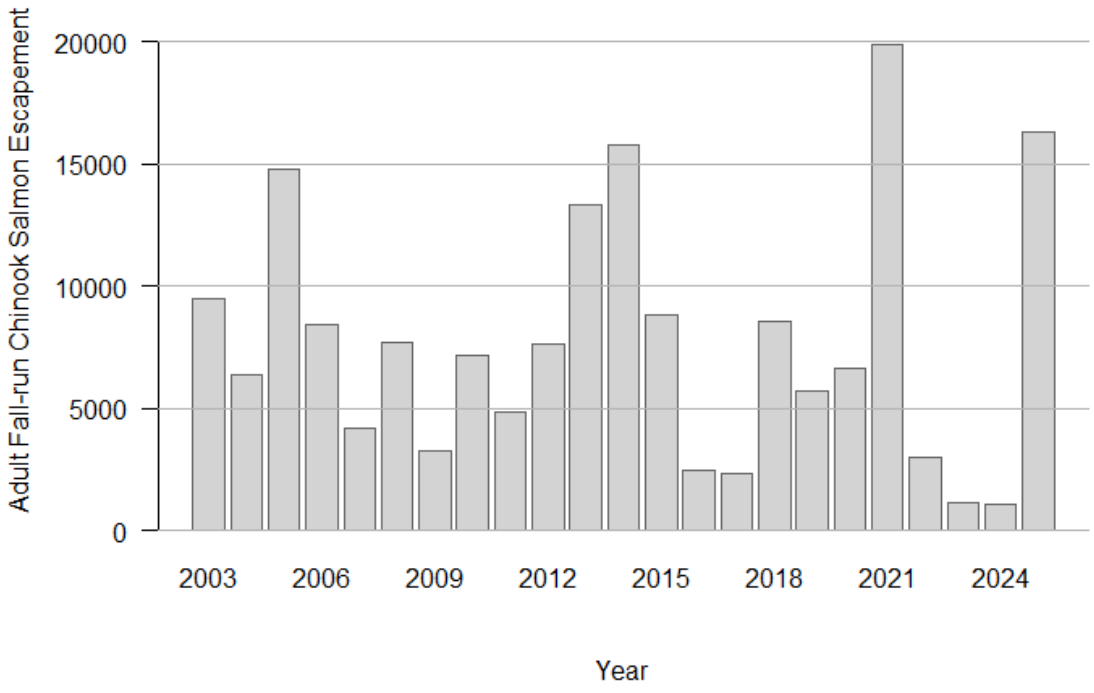



Figure 19. Clear Creek Fall-run Chinook Salmon Escapement Reported to GrandTab for the years 2003 through 2025 (Azat 2025).

The figure is a bar chart of Clear Creek adult fall-run Chinook salmon escapement estimates from 2003 through 2025 on the x-axis and adult escapement from 0 to 20,000 on the y-axis. The figure depicts high variability ranging from approximately 1,000 to 20,000 fish, with notable peaks in 2005, 2014–2015, 2021, and 2025, and low escapement in 2009, 2016-2017, and 2022-2024.

**Late-fall-run Chinook Salmon**

The estimated late fall-run Chinook Salmon population was 27 adults (Figure 20). This number was calculated by applying an expansion factor of 2.75 on the 10 late–fall-run Chinook Salmon redds that were observed during the survey season (December 17, 2024–April 10, 2025). The team was able to have 7 complete survey periods, with an 8th partial survey period due to some late season O. mykiss redd detection.

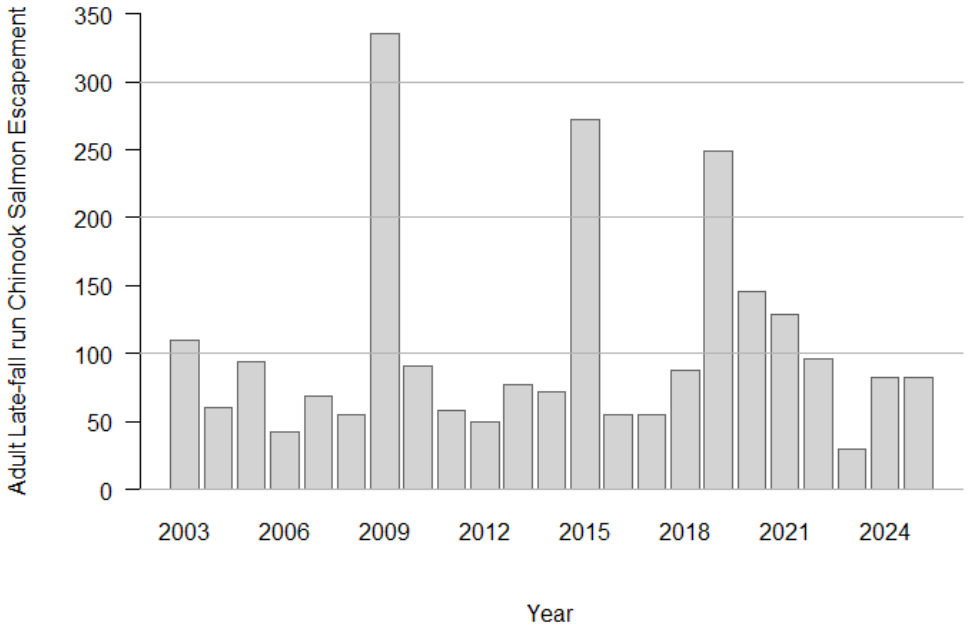



Figure 20. Clear Creek Late-fall run Chinook Salmon escapement reported to GrandTab for the years 2001 through 2025 (Azat 2025).

The figure is a bar chart of Clear Creek adult late-fall run Chinook Salmon escapement estimates from 2003 through 2025 on the x-axis and adult escapement from 0 to 350 on the y-axis. The figure depicts high variability ranging from approximately 30 to 340 fish, with notable peaks in 2009, 2015, and 2019, and low escapement in 2023.

**Steelhead**

The resolution for adult "steelhead" numbers in Clear Creek is poor due to complicated *O. mykiss* life histories. CDFW estimates a net gain of >16-inch fish into Clear Creek during their operation period (August to December). During the USFWS monitoring period (December to August) more >16-inch fish leave the system than enter (post-spawn runbacks). CDFW has been monitoring life history dynamics of Clear Creek via acoustic tag and radio antennae equipment since 2020 and has shared some preliminary results during CCTT meetings. A final report is pending.

**Separation Weir**

The USFWS operated a separation weir at RM 7.62 to prevent fall-run Chinook Salmon from negatively impacting spring-run Chinook Salmon upstream of the weir. The weir is typically operated from the end of August through the beginning of November. In 2025, the weir was installed on August 19 and closed to upstream fish passage on September 11. The weir was partially removed November 3 and fully removed on November 4 after completion of spring-run Chinook salmon spawning surveys. Ten spring-run Chinook salmon carcasses were retrieved from the weir during its operation. Nine were males, and one was a spawned female. All Chinook carcasses had present adipose fins. Three *O. mykiss* carcasses were retrieved and all had unknown sex.

**Spawning Habitat Evaluations**

USFWS completes an annual survey of Clear Creek's potential spawning habitat available to salmon and steelhead. Data collected in July 2025 yielded a total of 349,031 $ft^2$ of available spawning habitat, continuing the downward trend that indicates significant changes in Clear Creek's spawning habitat. Much of the change is attributable to the historic and protracted discharge event in January 2023. Some areas of the creek still retain sand, perhaps indicating a continued "recovery" of spawning habitat area following the fine sediment inundation from the 2018 Carr Fire. In general, gravel injection sites in the upstream reaches of Clear Creek were depleted of gravel and much of the suitable spawning attributable to the gravel was found farther downstream. Sand continues to accumulate in the lower reaches of Clear Creek, though there is some evidence it is transporting out of the key spawning areas in "Renshaw Riffle" (RM 5.0–5.5).

The 2025 Potential Spawning Area Mapping Survey faced some unique challenges. A Whiskeytown Reservoir change order took effect on July 17, dropping flows from 125 cfs to 100 cfs, resulting in flows at the Igo gauge going from 141 cfs to 116 cfs. This change occurred in the middle of the survey period and altered the suitable spawning habitat depth criterion to a range of 1.2 – 55.2 inches, which was previously set at 3.6 – 57.6 inches. USFWS completed one replicate survey on the upper-most reach to compare what fell under suitable spawning habitat with the new depth limit. USFWS mapped ~30% less habitat in the replicate survey on R1 (69,028 ft2 compared to 101,008 $ft^2$). Aside from change in flow and resulting depth of spawning habitat, possible reasons for this reduction could include user error, personnel differences between surveys, or some combination of the two.

From 2021 to 2025, a decrease in total spawning area was mapped in Clear Creek (2025- 349,031 ft2; 2024- 425,383 ft2; 2023- 710,840 ft2; 2022- 837,560 ft2; 2021- 907,569 ft2) (Figure 21). The mapped habitat is less than that of 2019 following the Carr fire (573,051 $ft^2$) and is the lowest measurement obtained from a full-stream survey since 2012. In Reach 1, there was a measured reduction in spawning habitat in most 1000-ft breaks. The spawning gravel that was previously in these areas was pushed to downstream locations. At the top end of Reach 2 and downstream of the Guardian Rock gravel augmentation site, a noted reduction in habitat was found, similar to what was seen upstream in Reach 1. Lower in Reach 2 and into the canyon reach, mapped spawning habitat appeared in a new location (RM 14.6– 4.0). It is likely this is the resting place for the injection gravel transported from upstream. Little habitat was mapped in Reach 3; the downstream extent of this reach (above old Placer Bridge) had been an area with growing spawning area over the last few years (RM 11.2). Spawning gravel was transported out of this area, and barely any spawning area was mapped here in 2025. In Reach 4, there was a sizeable reduction in spawning area in the upstream areas and below the Placer Bridge gravel augmentation site. Near the downstream most area of Reach 4, just upstream of the Clear Creek Road Bridge, there was a dramatic increase in spawning habitat, again likely the resting spot of the transported gravel from upstream. A few changes were noted in the downstream reaches of Clear Creek which area primarily used by fall-run Chinook salmon for spawning. "Renshaw Riffle" (RM 5–5.5) continues an increasing trend of spawning habitat following the Carr Fire, though still far shy of the historical spawning habitat that used to persist there.

From the Restoration Reach and downstream, there was much less spawning habitat area than in recent years. It appears much of the decomposed granite that was released from the Clear Creek tributaries following the Carr fire has transported to these reaches where there is less stream power to move it out.

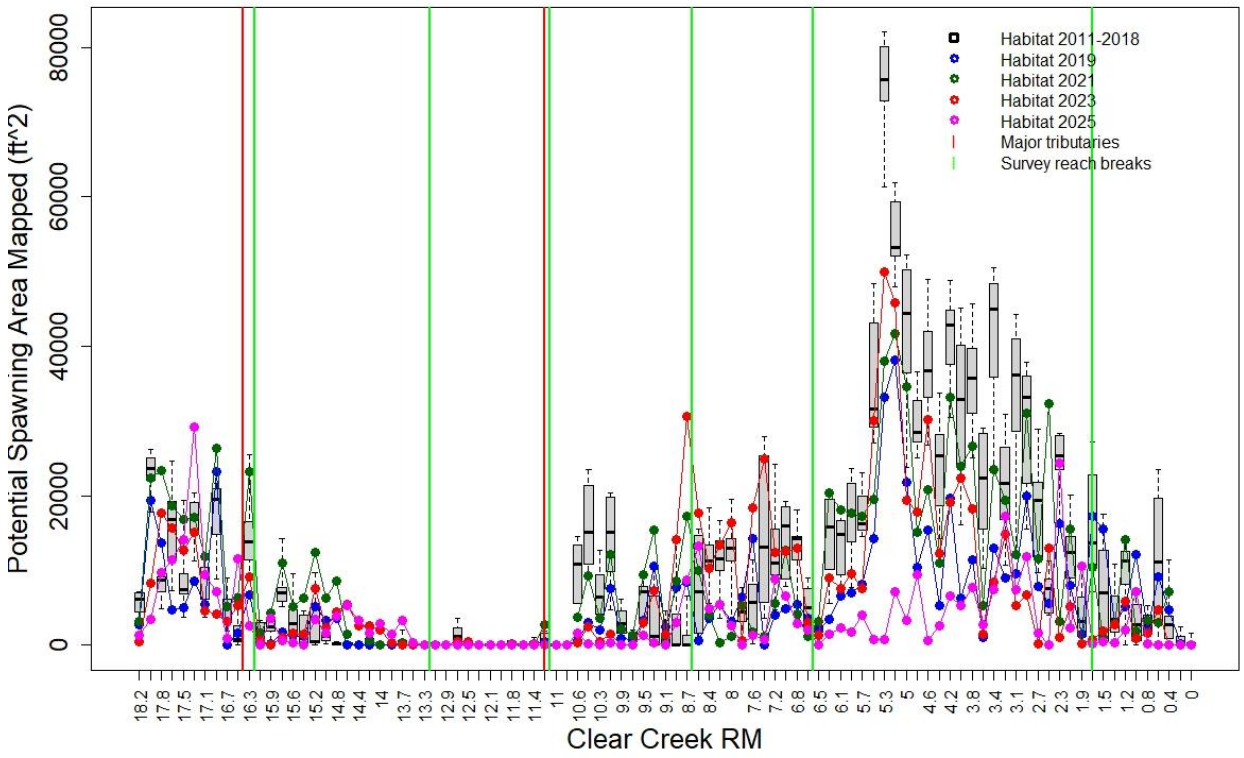



Figure 21. Anadromous fish spawning habitat mapped on Clear Creek 2011–2025. USFWS-Red Bluff unpublished data.

The figure is a scatted and box plot chart of potential spawning area mapping in sq. ft. along Clear Creek by river mile, from mile from 18.2 down to 0. The X-axis indicates river mile breaks of roughly 1,000 ft. The Y-axis indicates the magnitude of habitat within each break. Years 2011–2018 are displayed by boxplot, and 2019-2025 (every two years) are presented as points. In 2020, only a subset of reaches was completed. In all survey years, river miles 13.7 to 11 show very low habitat availability while river miles 10.6 to 0 showcase high but declining habitat availability.

USFWS conducts annual Spawning Area Mapping (SAM) surveys to detect and map fall-run Chinook Salmon redds on Clear Creek. Surveys are carried out in October and December to capture early and late spawning of fall-run Chinook Salmon along the downstream reaches, where spawning primarily occurs. The 2025 SAM surveys began at the 2025 location of the separation weir above the Clear Creek Gorge and finished at the confluence with the Sacramento River (RM 7.62–0). Spawning activity was defined as the area where substrate had been moved by salmon in the process of constructing a redd.

Spawning area for each dataset was calculated for 1,000-foot analysis reaches within the study area. For 2025, the total October-survey SAM area was 556,461 ft2, the most area

mapped since 2013. The total December-survey SAM area was 4,124 ft2 (Figure 22). The total combined SAM area mapped for 2025 was 557,495 ft2. The spawning area mapped in 2025 was far greater than in recent years, as fall-run Chinook Salmon recruitment into Clear Creek in 2025 was very high.

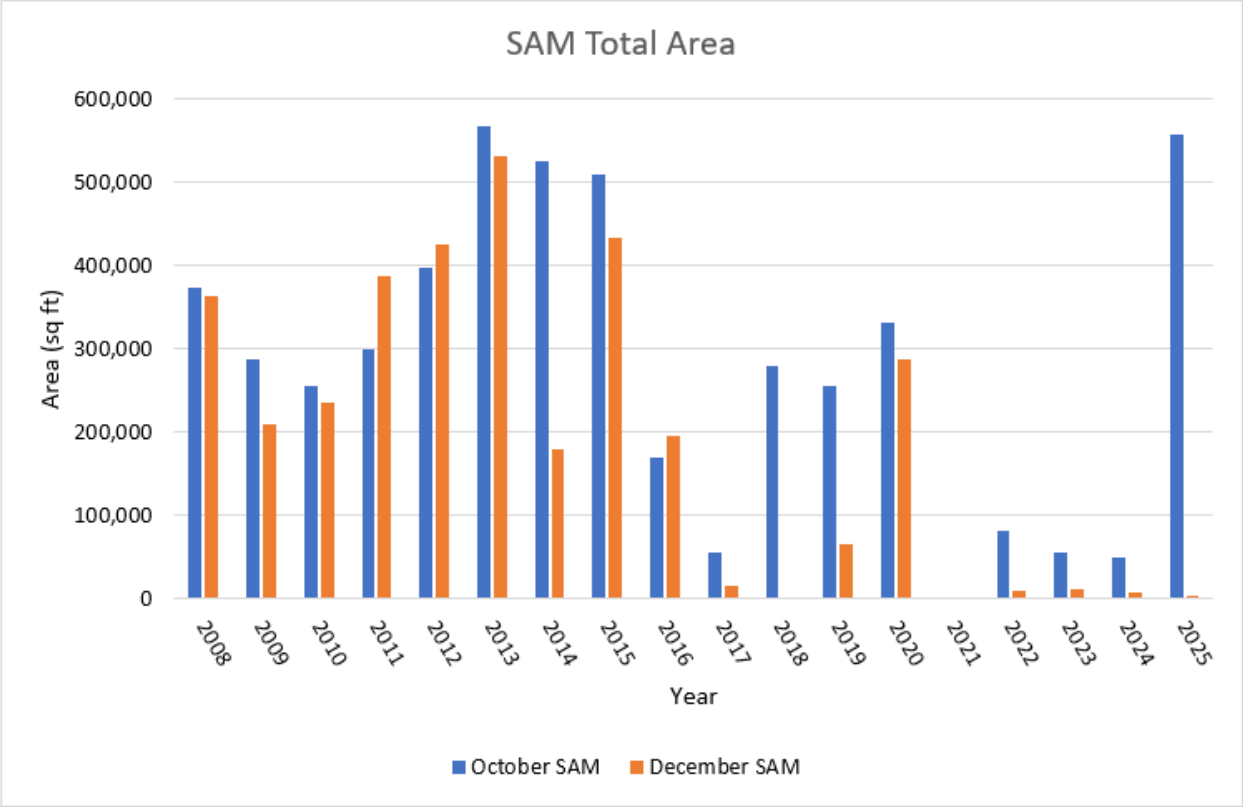



Figure 22. Area of fall run Chinook Salmon spawning by calendar year.

The figure is a grouped bar chart of SAM total area in square feet for October and December surveys - the spawning area mapped in October is represented by blue bars and December is represented by orange bars - from 2008 through 2025 which is on the y-axis. Spawning area peaks in 2013 and generally declines with low points in 2017 and 2022-2024 before spiking in October 2025 and again substantially declining in December 2025.

The gravel augmentation program's influence on spawning habitats in Clear Creek is assessed empirically by: (1) identifying the habitat used by spring-run Chinook salmon and steelhead for spawning; and (2) by annually surveying the amount of habitat available for spawning by these runs/species. Data from 2013 through 2025 show the proportional use of injected gravels vs. native gravels has increased for both spring-run Chinook Salmon and steelhead (Figure 23).

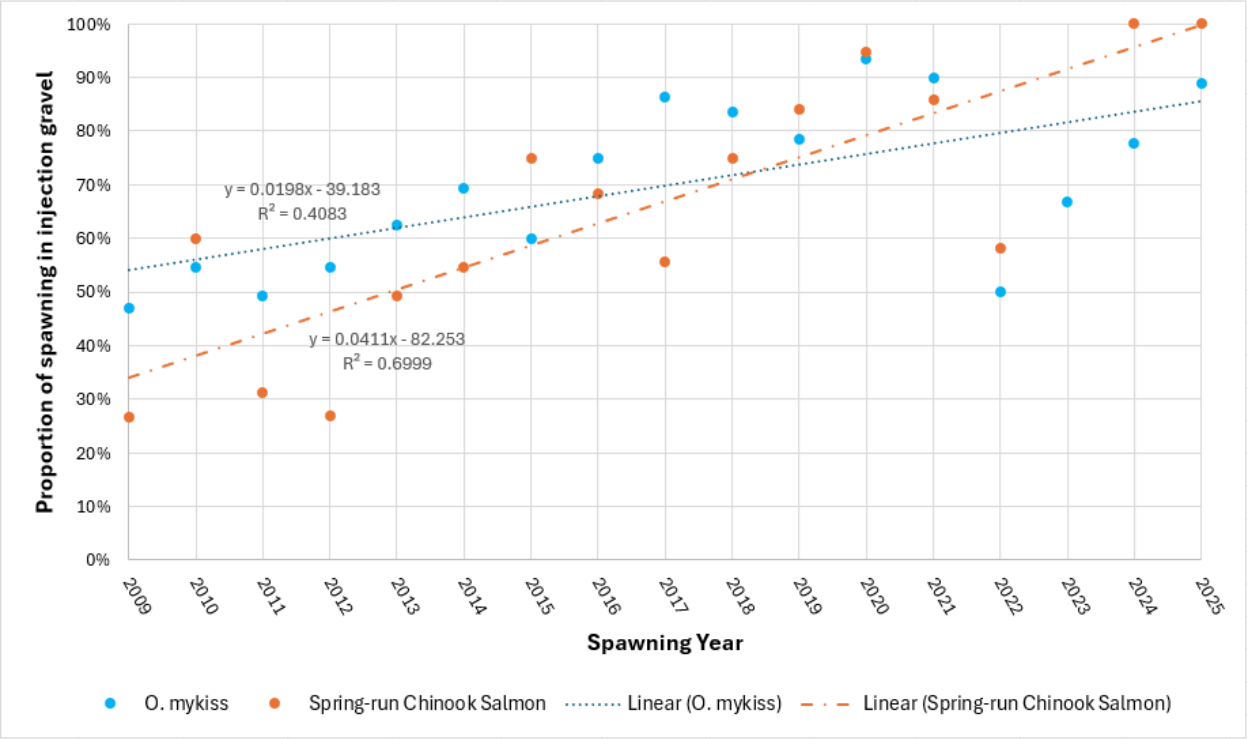



Figure 23. Annual proportion of spring-run Chinook Salmon and steelhead spawning in injection gravels, 2009–2025. Results limited to Clear Creek upstream of the spring and fall run Chinook Salmon segregation weir. USFWS-Red Bluff unpublished data.

The figure is a scatter plot with trend lines showing the annual proportion of spring run Chinook Salmon and steelhead (*O. mykiss*) spawning in injection gravels in Clear Creek displaying the percentage of spawning activity occurring in injection gravel on the y-axis, ranging from 0% to 100%, by spawning year on the x-axis spanning 2009 through 2025. Spring-run Chinook salmon data is represented with orange points and an orange trend line while steelhead is represented by blue points and a blue trendline. Both species show increasing trends over time, spring-run Chinook Salmon increasing more steeply ($R^2$=0.70) from approximately 27% in 2009 to nearly 100% by 2024–2025, and steelhead (O. mykiss) increasing more gradually ($R^2$=0.41) from approximately 47% to approximately 89%.

### Spawning Surveys

USFWS completes two spawning surveys on Clear Creek annually. The “kayak” spawning survey with the intent of quantifying late fall-run Chinook Salmon and steelhead spawning and the “snorkel” spawning survey with the intent of quantifying spring-run Chinook Salmon spawning. In the 2024-2025 kayak season, seven full creek survey and one partial creek surveys were completed between mid-December 2024 and the first week of April 2025. The surveys observed 10 late fall-run-Chinook salmon and 19 steelhead redds. Additionally, four late fall-run Chinook Salmon carcasses were retrieved, one of which was identified to be marked (adipose fin absent), and one unknown adipose fin status. The head from the adipose absent carcass had a coded wire tag code number of 056471 and

determined brood year from 2021 at Coleman National Fish Hatchery. The head from the adipose unknown carcass was too decomposed to get samples from.

During the 2025 snorkel season, four spawning ground surveys were completed between September 15 – October 29. The first survey was a full-length creek survey (RM 18.6–0.2), and the remaining three surveys only covered areas upstream of the separation weir (RM 18.6–6.8). Surveyors observed 20 redds upstream of the separation weir that were attributed to spring-run Chinook salmon (Figure 24). Additionally, no Chinook salmon carcasses were retrieved from snorkel surveys.

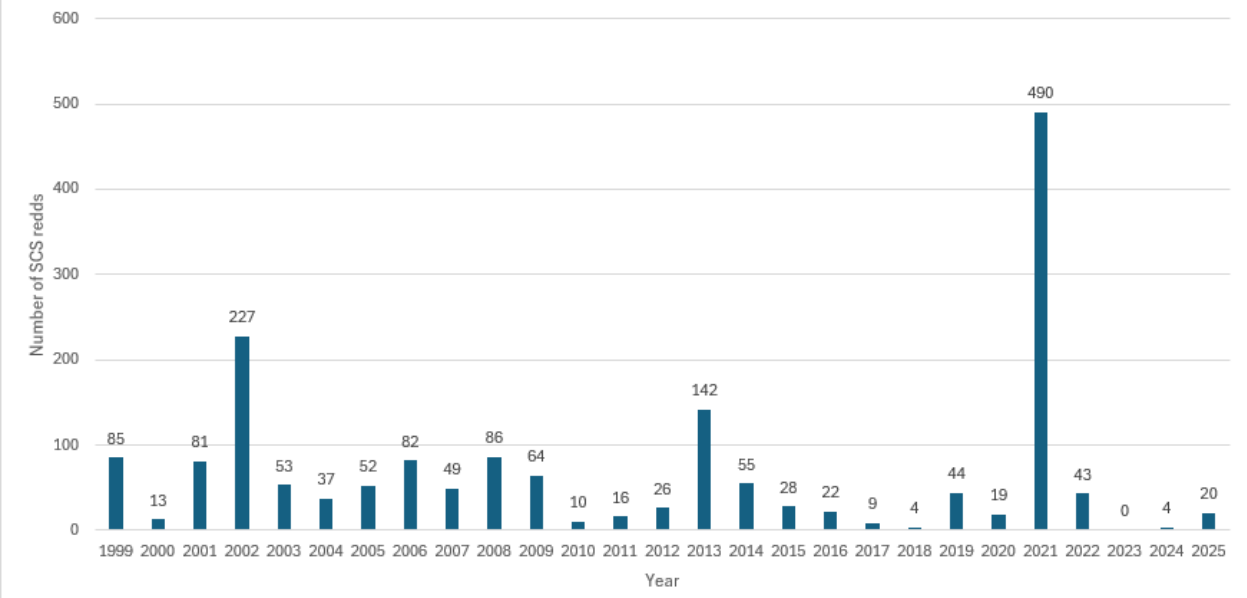



Figure 24. Number of spring-run Chinook Salmon redds observed above the segregation weir on USFWS spawning surveys from 2000- 2025. USFWS-Red Bluff unpublished data.

The figure is a bar chart of annual spring-run Chinook salmon redds observed above the segregation weir and displaying annual spring-run Chinook salmon redd counts on the y-axis, ranging from 0 to 600, by year on the x-axis spanning 1999 through 2025. The figure shows high interannual variability with a high of 490 redds in 2021, secondary peaks of 227 in 2002 and 142 in 2013, persistently low counts below 30 redds from 2015 through 2020 and again in 2022–2024.

# CHAPTER 5. References

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