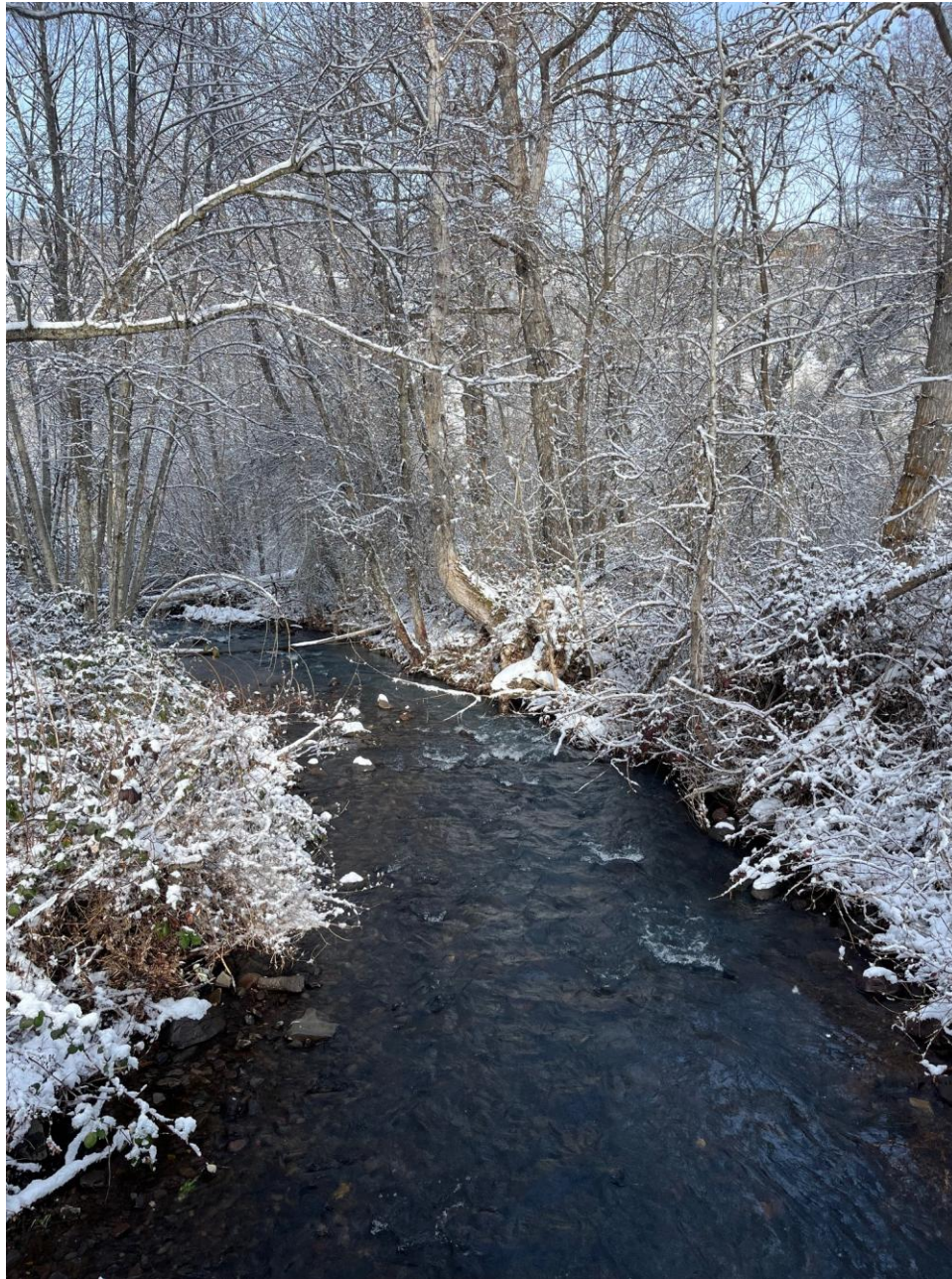


2025 Shovel Creek Adult Salmon Studies Final Report



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Final Report

Abstract

A total of **327** fall run Chinook Salmon (*Oncorhynchus tshawytscha*) were estimated to have entered Shovel Creek during the 2025 spawning season. An underwater video camera operated in the flume of the Shovel Creek Fish Counting Facility (SCFCF) 24 hours a day, seven days a week, from September 15, 2025, to December 15, 2025. The first Chinook Salmon was observed on October 2, 2025, and the last Chinook Salmon on November 16, 2025. Klamath River Project (KRP) staff collected 134 fish to observe and record biological metrics and to determine the presence of hatchery produced fish.

Chinook Salmon carcasses that were sampled as weir wash-backs and collected during spawning ground surveys were used to describe characteristics of the run. KRP staff processed 12 carcasses as weir wash-backs in the 2025 season and 122 carcasses from spawning ground surveys were processed for samples. The run was comprised of 3 grilse (0.92%), and 324 adults (99.08%). Grilse were determined by scale-based aging. The sex composition of the run, based on 122 spawning ground survey carcasses sampled, was 59% (72) female and 41% (50) male. 21 adipose fin clipped (ad-clipped) fish (indicating hatchery origin) were encountered as wash-backs and from spawning ground surveys, an estimate of 151 (46%) hatchery origin fish entered Shovel Creek.

Three Coho Salmon (*Oncorhynchus kisutch*) were estimated to have entered Shovel Creek prior to removal of the weir on December 15, 2025. The SCFCF operated from September 15, 2025, through December 15, 2025, and the three Coho Salmon were observed between October 31, 2025, and December 6, 2025. All Coho Salmon observed were identified as adults and none of them had adipose or maxillary clips indicating hatchery origin.

No steelhead (*Oncorhynchus mykiss*) with a fork length greater than or equal to 40.64 cm (16 inches) were observed passing through the SCFCF in 2025.

Introduction

The KRP of the California Department of Fish and Wildlife is responsible, in cooperation with other State, federal and tribal partners, for estimating the number of Chinook Salmon (*Oncorhynchus tshawytscha*) and Coho Salmon (*Oncorhynchus kisutch*) that return to the Klamath River Basin, excluding the Trinity River Basin, each year. In addition to escapement, objectives include the determination of run timing, spawning distribution, length frequency distribution, sex ratio, and spawn condition for Chinook Salmon and Coho Salmon in Shovel Creek. Scales and coded wire tags are collected to determine the age composition and hatchery contribution to each annual run.

To achieve these tasks the KRP employs several techniques which include a creel survey of sport fishing effort and harvest, recovery of fish returning to Fall Creek Hatchery, completion of cooperative spawning ground surveys in major tributary streams and rivers, and operation of video fish counting weirs on the Shasta River, Scott River, Bogus Creek, Jenny Creek and Shovel Creek. This report summarizes observations of salmonids spawning in natural areas of Shovel Creek.

In 2024 four dams were removed on the Klamath River restoring access for anadromous fish up to and beyond the California-Oregon state line. Shovel Creek is a tributary to the Klamath River and is located approximately 39.79 kilometers (rkm) upstream of the former Iron Gate Dam site. Shovel Creek has a large watershed, and its headwaters originate near Willow Creek Mountain, however only the lowermost 7 rkm were surveyed because there is a large cascade at rkm 7 that prevents adult anadromous fish from migrating upstream of it.



Figure 1: A map of the Shovel Creek watershed.

METHODS

Monitoring of the salmon run within Shovel Creek during the 2025 season was accomplished through three primary efforts: operation of a video weir, spawning ground surveys, and collection of data from salmon carcasses that become impinged on the weir panels as they float downstream (wash-backs).

VIDEO WEIR

The SCFCF consists of a video camera, counting flume, and an Alaska style weir strategically placed in a diagonal across the river channel (Figure 2). Fish immigrating upstream are directed through a narrow flume, which passes in front of an underwater video camera. A SplashCam Delta Vision* black and white underwater camera with a 3.6 mm wide angle lens was used since 2008 for capturing images, and a Speco Technologies D8VN¹ digital video recorder (DVR).



Figure 2: A photo of the Shovel Creek fish counting facility

¹ Use of product names in this report does not imply endorsement by CDFW.

The weir and video camera were installed, and recording began on September 15, 2025. KRP staff performed routine daily maintenance of the SCFCF. This included inspecting the video system to ensure that everything was operating correctly, cleaning weir panels, making any necessary repairs, and processing any wash-back carcasses present. Every weekday the DVR was removed and replaced with another drive. All recording equipment was secured in locked enclosures and access to the site was controlled through a locked gate located on private property.

DVRs with stored video data were immediately returned to the office where each was reviewed by staff in the video lab. During each review, staff recorded the date, time (hour:min:sec), and species of each fish observed. In addition, staff noted the presence of adipose fin-clipped (ad-clipped) fish and recorded the presence of lamprey or any other distinguishable marks that were visible on the footage. Fish were counted as downstream migrants if they entered the flume from the upstream end and exited at the downstream end. If fish entered the flume but backed down without exiting on the upstream end, they were not counted.

Fish for which positive identification could not be made were recorded as “unknown” species. These fish were later reviewed and if identification could not have been determined, the fish were assigned a species based on the daily species proportion of known fish. During video outages passage was estimated based on average passage in the outage time frame from the 3 days before and after the event. All data was then entered into files on a computer, and each data file was edited with corrections made by a second individual prior to commencement of data analysis.

WASH-BACK CARCASSES

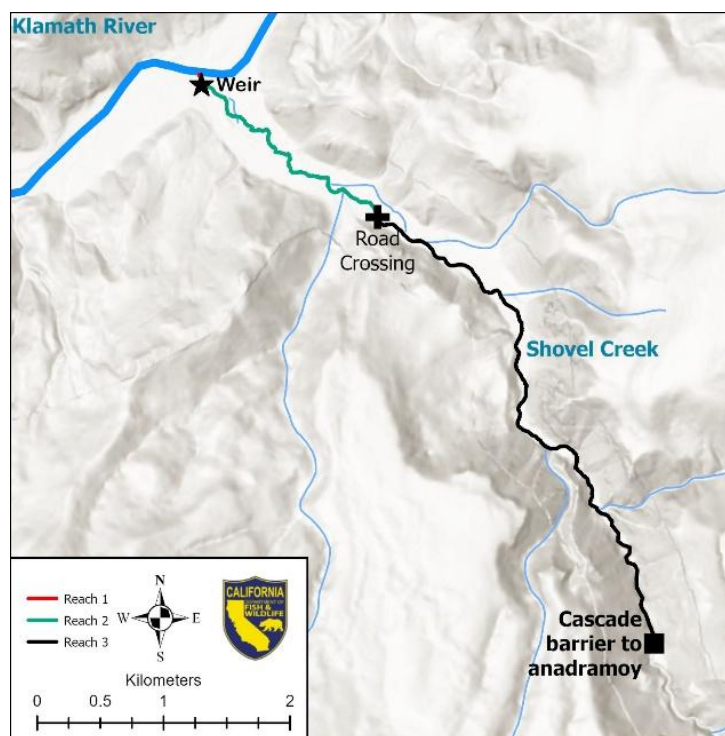
All salmon carcasses that drifted downstream and became impinged on the weir panels were recovered. All Chinook Salmon carcasses were processed. Data collected on these wash-back carcasses included fork length, sex, marks, tags, and the presence of fin clips. Scales were removed from the left side of each carcass at a location posterior to the dorsal fin just above the lateral line whenever possible. Each female carcass was also examined to determine whether successful spawning had occurred. Spawning status was defined as un-spawned (many eggs remaining in the body) or spawned (few or no eggs remaining). In addition to the systematically sampled Chinook Salmon carcasses, all carcasses were examined for ad-clips and heads were collected from all ad-clipped Chinook Salmon carcasses. All Coho Salmon and steelhead carcasses were processed and sampled for biodata. All carcasses were cut in half to prevent sample duplication and returned to the river downstream of the weir.

SPAWNING GROUND SURVEYS

Spawning ground surveys (SGS) were conducted by a two-person team that walked downstream through a stretch of river (usually 2-3 kilometers). During the surveys, crews were looking for and recorded observations of live adult salmon and redds, including marking redd locations on a GPS. Crews were also collecting all adult salmon carcasses to determine sex and length information as well as collect biologic samples.

Table 1: Spawning ground survey reach locations and distances

Reach #	Downstream point	Upstream Point	Distance in KM
1	Confluence with Klamath	Weir	0.06
2	Weir	Dirt Road Crossing	2.27
3	Dirt Road Crossing	Cascade	4.95

**Figure 3: A map of Shovel Creek spawning ground survey reaches.**

CHINOOK SALMON HATCHERY INFLUENCE

All carcasses handled were inspected for ad-clips denoting that those fish have coded wire tags (CWTs) in their snouts and were of hatchery origin. Hatchery influence was calculated by expanding the known CWTs by the production multiplier from RMPC (Regional Mark Processing Center which is a web-based portal that contains CWT mark and release information www.rmhc.org) and expanding that sum by the sampling expansion (of fish checked for ad-clips/total run estimate).

RESULTS

CHINOOK SALMON VIDEO DATA

A net total of 327 Chinook Salmon were estimated to have entered Shovel Creek during the 2025 season. The Chinook Salmon video estimate of 327 was derived by subtracting the number of downstream observations (323) from the number of upstream observations (584) which yields 261 and adding in an estimated 60 Chinook Salmon that were estimated to have passed the video station while the SCFCF was removed for storms. The SCFCF was removed on October 24, 2025, and reinstalled on October 30, 2025, and again removed on November 4, 2025, and reinstalled November 12, 2025, for an outage total of 12 days. The average daily net passage of each species for 3 days before and after each outage was used to estimate passage during the outage (Table 2). Three redds were observed below the SCFCF and were expanded assuming 2 adults per redd (6) plus the proportion of grilse (0.091) from above the SCFCF yielded a redd estimate of 6. Adding the video total (261) plus the outage estimate (60) plus the redd estimate downstream of the SCFCF (6) yields an estimate of **327** Chinook Salmon in Shovel Creek. Most of the run (51.1%) was observed between October 2, 2025, and October 18, 2025. The peak day of the run was October 16, 2025, with a net passage of 29 (9%) Chinook Salmon. The majority of Chinook Salmon (51.5%) passed upstream through the SCFCF during the afternoon between 12:00 and 18:00 hours (Figure 4).

Table 2: SCFCF outage estimates

Date Removed	Date Reinstalled	Total Days Out	Net Chinook Salmon Daily Average from 3 days before and after outage:	Net Coho Salmon Daily Average from 3 days before and after outage:	Net steelhead Daily Average from 3 days before and after outage:	Total Chinook Salmon Added	Total Coho Salmon Added	Total steelhead Added
10/24/2025	10/30/2025	5	12	0	0	60	0	0
11/4/2025	11/12/2025	7	0	0	0	0	0	0

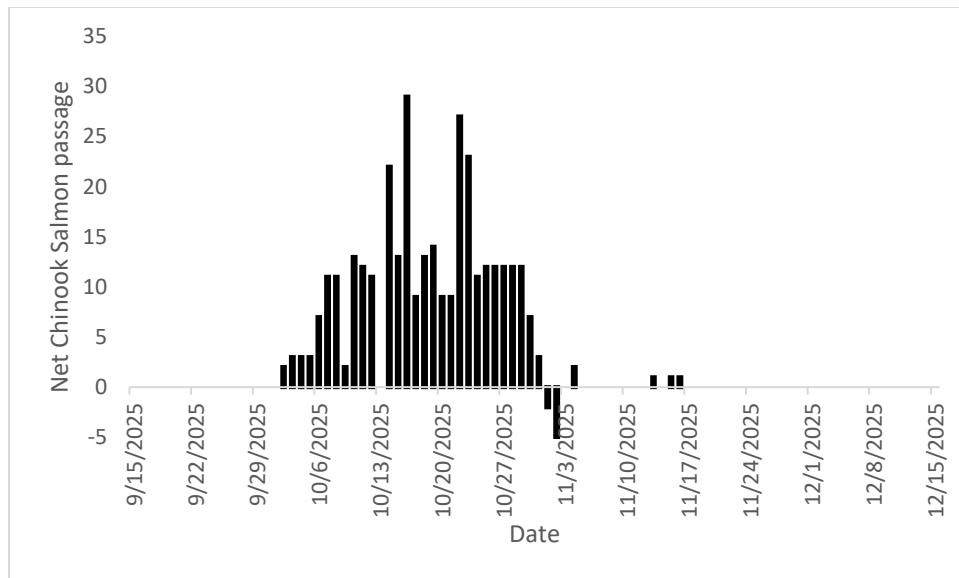


Figure 4: Net Chinook Salmon upstream passage through the SCFCF by date.

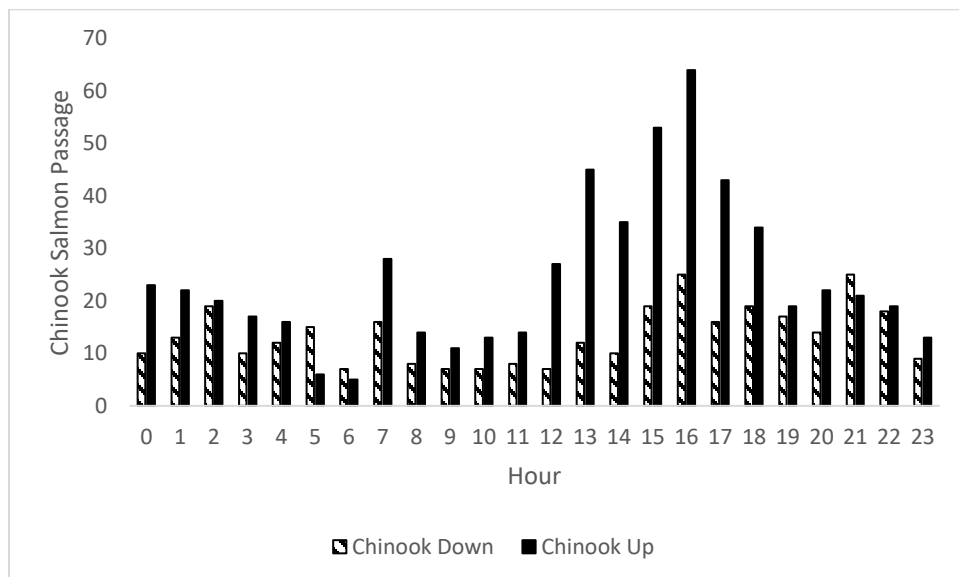


Figure 5: Chinook Salmon passage by hour through the SCFCF.

CHINOOK SALMON WEIR WASH-BACK CARCASSES

A total of 12 Chinook Salmon carcasses washed back on the SCFCF weir, all 12 were collected and sampled. Of the 12 carcasses sampled, 8 (67%) were male and 4 (33%) were female (Table 3).

Table 3: Washback carcass sex ratios at SCFCF.

Year	Total Chinook Salmon	Total Washback	# Sampled	% Male	% Female
2024	287	19	19	68	32
2025	327	12	12	67	33

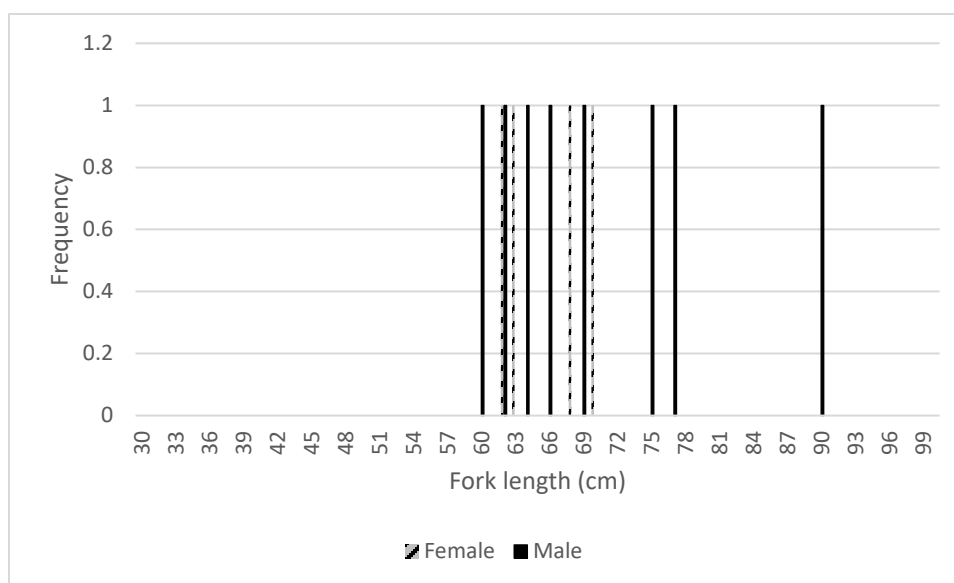


Figure 6: Washback fork length histogram

Spawning Ground Surveys

Spawning ground surveys were conducted throughout the spawning season. Surveys began on October 17, 2025, and were completed on December 10, 2025. 122 Chinook Salmon carcasses were recovered during the spawning ground surveys. 50 (41%) of the carcasses recovered were males with an average fork length of 69.7cm. 72 (59%) of the recovered carcasses were females with an average fork length of 64.5 cm.

Throughout the spawning ground surveys a total of 51 redds were observed, all were assumed to be from Chinook Salmon. Redds are assumed to be from Chinook Salmon and are recorded as such unless a different species of fish is observed near a redd or if the redd is observed outside the typical Chinook Salmon run timing (Figures 6, 7 and 8). Several redds were recorded in reach 3 on December 3, 2025, which is outside of the Chinook Salmon period, however this was the first time reach 3 was surveyed in 2025 so those are assumed to be older Chinook Salmon redds.

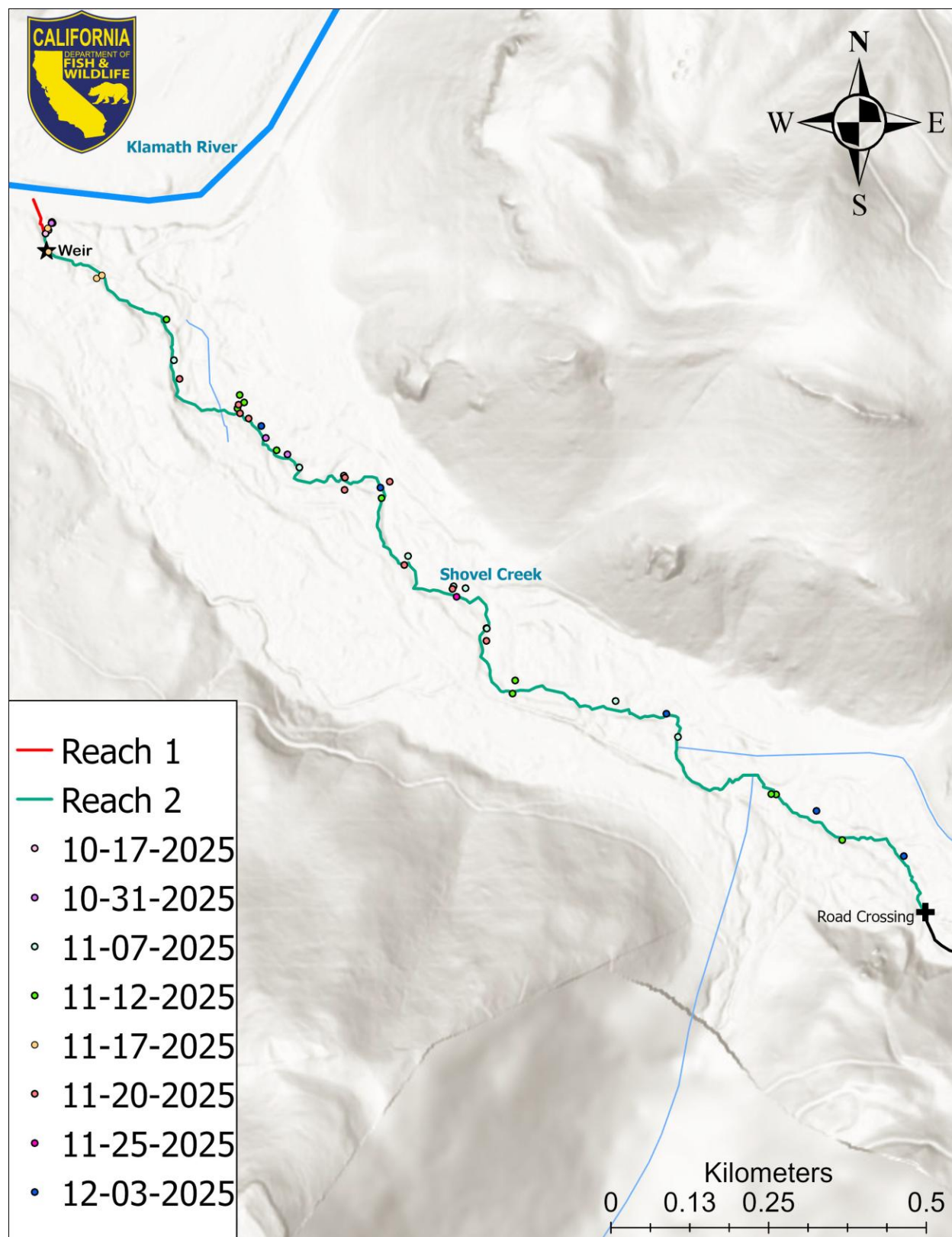


Figure 7: Shovel Creek redd map for reaches 1 and 2

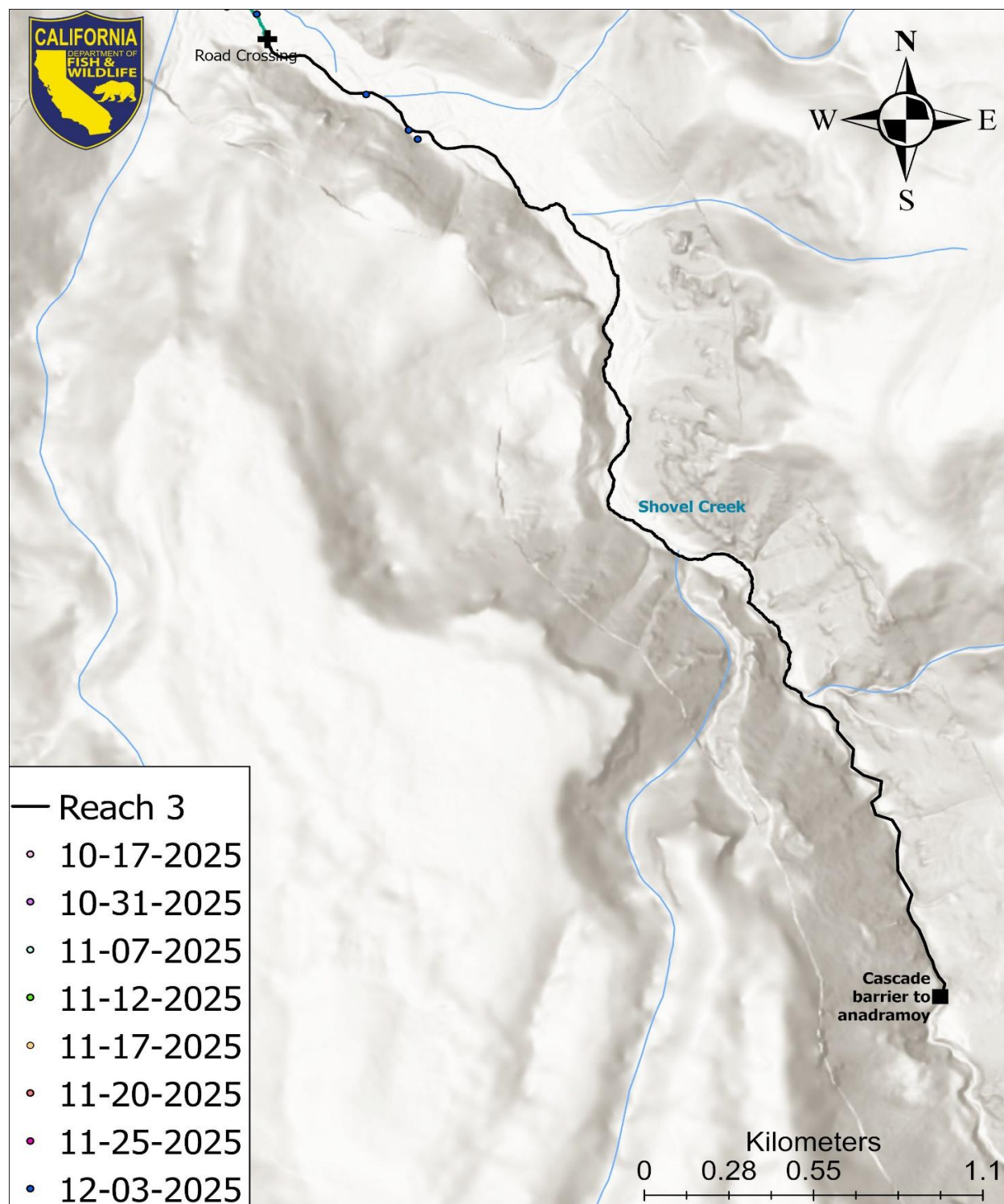


Figure 8: Shovel Creek redd map for reach 3

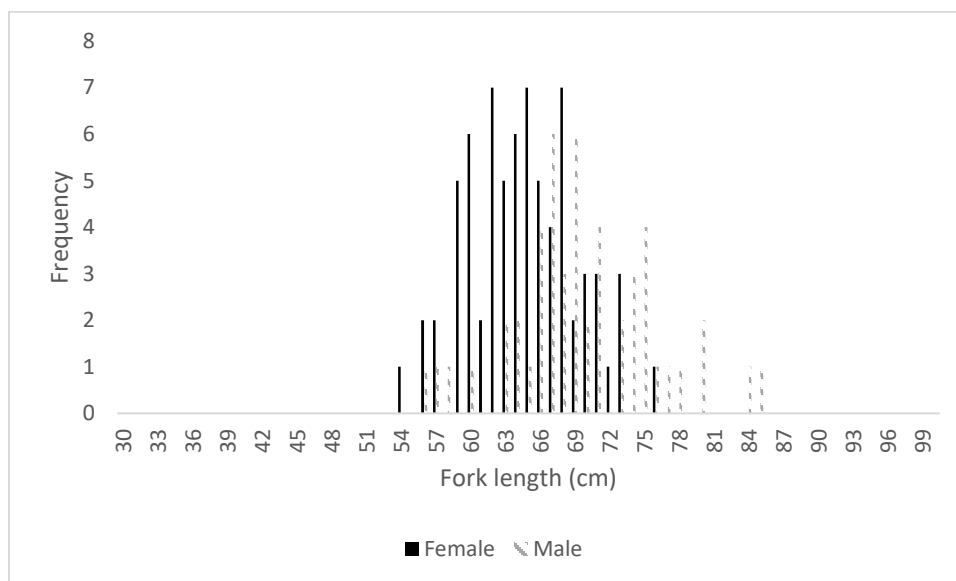


Figure 9: SGS fork length histogram

CHINOOK SALMON AGE COMPOSITION

A preliminary length cutoff separating grilse from adults was estimated to be 57 cm; all Chinook Salmon less than 57 cm were considered grilse and yielded a preliminary estimate of 11 (3.2%) grilse and 316 (96.8%) adults. These estimates were made based on length frequency analysis of SGS carcasses. Final estimates of the age composition of the 2025 run in the Shovel Creek were finalized by the Klamath River Technical Team (KRTT, 2026) using scale age analysis conducted by the Yurok Tribe and U.S. Fish and Wildlife Service (Table 4). The final age estimate was 3 (0.9%) grilse, and 324 (99.1%) adults.

Table 4: Age composition of Chinook Salmon in Shovel Creek from scale age analysis

Year	Age 2	Age 3	Age 4	Age 5	Total Adults	Total Run
2024	36	197	49	5	251	287
2025	3	301	20	3	324	327

CHINOOK SALMON HATCHERY INFLUENCE

In 2025, a net total of 28 ad-clipped Chinook Salmon were observed passing through the SCFCF and were assumed to be of hatchery origin. Due to factors such as turbulence, position of the fish in the flume, and poor visibility because of water quality, the adipose fin is not always visible during video review. As a result, the observed number is likely less than the number of ad-clipped Chinook Salmon that passed through the weir. In the 2025 season, 2 ad-clipped fish were recovered as wash-backs, and 19 ad clipped fish were recovered during SGS. CWTs were recovered from 18 heads collected, the other 3 were found to not have wire in the head and were likely misidentified as ad-clipped due to decomposition. All 18 of the recovered tags were IGH origin fish, three from brood year 2021, and 15 from brood year 2022.

Hatchery composition was calculated by multiplying the number of tags recovered by the production multiplier (from RMIS, equals the number of fish released divided by the number marked for each tag code). This product was then multiplied by the sample expansion (the number of Chinook Salmon estimated to have returned to Shovel Creek divided by the number of carcasses inspected for ad-clips). Resulting in an estimate of 151 Chinook Salmon (46%) of hatchery origin that returned to Shovel Creek in 2025 (Table 5).

Table 5: Hatchery origin estimates for Shovel Creek

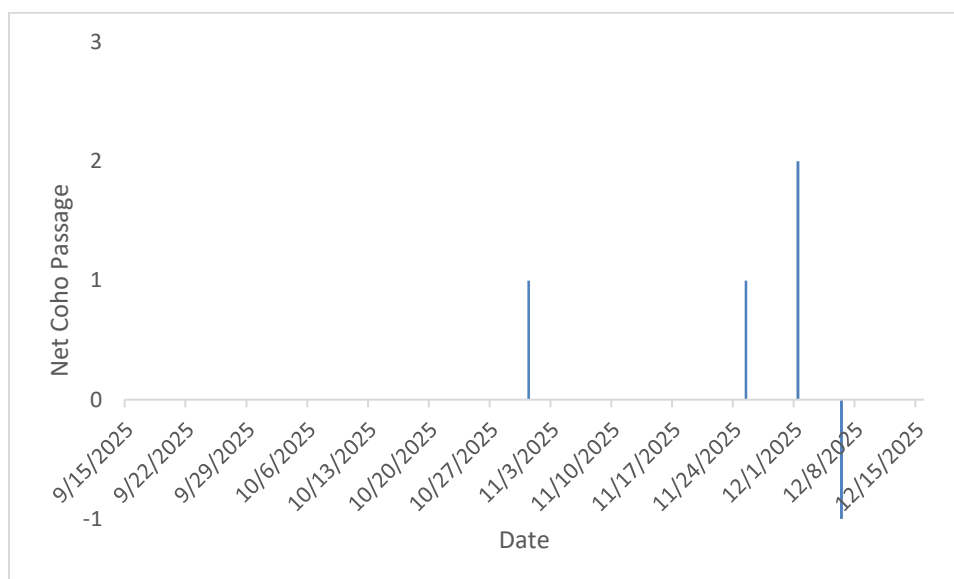
2025 Shovel Creek Reach 1 CWT Estimates											
CWT	Release Location	Brood Year	Age	Release Type*	Number Recovered	Production Multiplier**	Production Estimate	Sample Expansion***	Expanded estimate	Estimate by age	Percent by age
No AD Carcasses Recovered in Reach 1							0.00		0.00	0.00	#DIV/0!
Total Run	327			Number Recovered Subtotal	0				Expanded Estimate Subtotal	0.00	
Estimated Contribution of Unknown CWTs											
200000	CWT Lost				0						
300000	Head Lost				0						
400000	CWT Unreadable				0						
Subtotal					0	Unknown Estimate:	0.00				
R1 Total Estimated Hatchery Contribution							0.00			R1 Hatchery Proportion:	0.0000
2025 Shovel Creek Reach 2-3 CWT Estimates											
CWT	Release Location	Brood Year	Age	Release Type*	Number Recovered	Production Multiplier**	Production Estimate	Sample Expansion***	Expanded estimate	Estimate by age	Percent by age
061546	IGH	2021	4	F	1	1.014608829	1.01	2.377777778	2.41		
060478	IGH	2021	4	AF	1	1.010099783	1.01	2.377777778	2.40		
062271	IGH	2021	4	AF	1	1.018746139	1.02	2.377777778	2.42	7.24	4.7769
060033	IGH	2022	3	F	2	4.115682573	8.23	2.377777778	19.57		
060034	IGH	2022	3	F	1	4.019925832	4.02	2.377777778	9.56		
060035	IGH	2022	3	F	1	4.028601389	4.03	2.377777778	9.58		
060036	IGH	2022	3	F	1	4.025807809	4.03	2.377777778	9.57		
060032	IGH	2022	3	AF	10	4.036336788	40.36	2.377777778	95.98	144.26	95.22314513
Total Run	327			Number Recovered Subtotal	18				Expanded Estimate Subtotal	151.49	
Estimated Contribution of Unknown CWTs											
200000	CWT Lost				0						
300000	Head Lost				0						
400000	CWT Unreadable				0						
Subtotal					0	Unknown Estimate:	0.00				
R2-3 Total Estimated Hatchery Contribution							151.49			R2-3 Hatchery Proportion:	0.4633
Total Estimated Hatchery Contribution							151.49			Total Hatchery Proportion	0.4633
Release type is based on weight at release. Fingerlings (F) are <7.55 grams per fish, Advanced fingerlings (AF) are between 7.55 grams per fish and 22.62 grams per fish, Yearlings (Y) are >22.62 grams per fish.											
** Production Multiplier value is the proportion of #of IGH/FCH total release for the code to the # of fish effectively tagged											
*** Sample expansion is video total (321) divided by the number of spawning ground, trap and washback samples											

Table 6: Hatchery contribution to Shovel Creek in 2024 and 2025

Year	Total Chinook Salmon	Hatchery Origin Estimate	Percent Hatchery
2024	287	50	17%
2025	327	151	46%

COHO SALMON

From September 15, 2025, to December 15, 2025, four Coho Salmon were observed passing upstream and one observed passing downstream through the SCFCF for a total estimate of 3 Coho Salmon. The first Coho Salmon was observed on October 31, 2025, and the last Coho Salmon was observed on December 6, 2025 (Figure 10). All video observations had no marks indicating all were natural origin. All Coho Salmon observed from video footage were adults, so no grilse were estimated. No Coho Salmon carcasses were recovered in Shovel Creek in 2025.

**Figure 10: Coho Salmon passage by date through the SCFCF.**

STEELHEAD TROUT

In 2025, zero adult steelhead were observed at the SCFCF from September 15, 2025, to December 15, 2025. No steelhead carcasses were recovered in 2025. The Alaskan weir is not impermeable to juvenile fish, including “half pounders”; therefore, sub-adult or juvenile steelhead were recorded, but excluded from this analysis. All *Oncorhynchus mykiss* included in this analysis were greater than or equal to 40.64 cm (16 inches).

DISCUSSION

CHINOOK SALMON

The 2025 run of Chinook Salmon of 327 was 20 fish above the 2-year average of 307 (Figure 11). The number of two-year-olds that returned in 2025 (3) was much lower than 2024 (36). Two-year-olds returning in 2025 were from brood year 2023 and likely out-migrated in the spring of 2024, which is when reservoir drawdown for the dam removal project had begun.

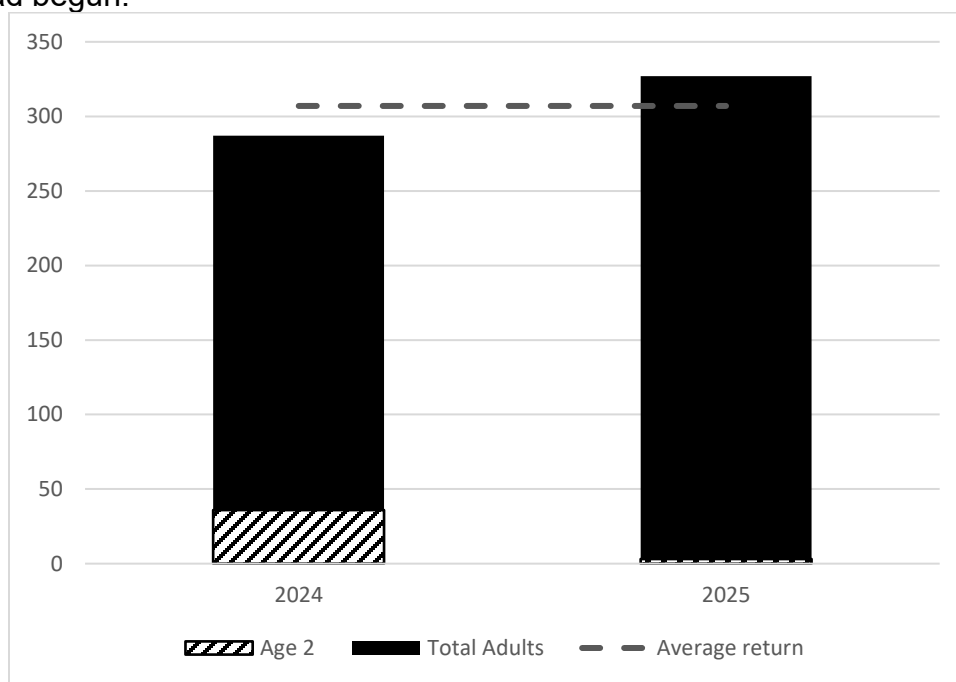


Figure 11: Shovel Creek Chinook Salmon annual estimates

In 2025 the first Chinook Salmon was observed entering Shovel Creek on October 2, 2025. The migration began to increase on October 6, 2025, and was completed by November 16, 2025 (Figure 12). In 2024, migration didn't begin to increase until October 21, 2024. The Chinook Salmon migration in Shovel Creek in 2025 was about 15 days earlier than 2024. This trend was observed in other tributaries in 2025 as well.

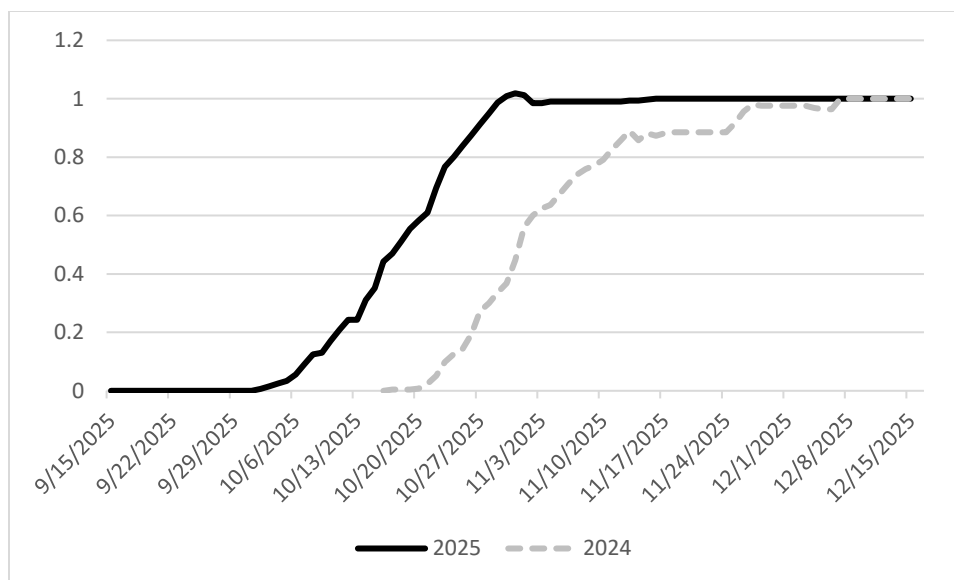


Figure 12: Shovel Creek Chinook Salmon passage proportions by date

During the 2025-2026 season Shovel Creek experienced higher unstable flows in October and November, however by December, rains had decreased and flows had begun to drop and remained relatively low for most of the spring outmigration period. The higher flows in October and November may have impacted redds, but no scour was physically observed.

No juvenile estimates were made for Shovel Creek for brood year 2024. Brood year 2025 juvenile estimates are still being calculated and will be included in future reports.

COHO SALMON

Three Coho Salmon were observed passing the SCFCF and no Coho Salmon carcasses were recovered in 2025. The SCFCF was removed December 15, 2025, so it is possible that some Coho Salmon may have entered Shovel Creek after removal of the station. The 2024 Coho Salmon estimate for Shovel Creek was 46 (Figure 13). Very few Coho Salmon were observed in most of the basin and only 26 Coho Salmon returned to Fall Creek Hatchery in 2025.

Year	Coho Salmon Grilse Estimate	Coho Salmon Adult Estimate	Total Coho Salmon Estimate
2024	1	38	39
2025	0	3	3

Figure 13: Shovel Creek annual Coho Salmon estimates

No juvenile estimates were made for Shovel Creek for brood year 2024. Brood year 2025 juvenile estimates are still being calculated and will be included in future reports.

STEELHEAD TROUT

The objectives of KRP have traditionally focused on monitoring the escapement of Chinook Salmon, and more recently Coho Salmon. In 2025, the video monitoring station was run until December 15, 2025. Steelhead escapement has proven challenging due to run timing (steelhead migration is usually underway when flow conditions make weir removal necessary) and life history, as individual steelhead are often observed to move repeatedly through the video flume in upstream and downstream directions. Zero steelhead were observed at the SCFCF in 2025. In 2024 4 steelhead were estimated to have passed the SCFCF. The SCFCF was removed on December 15, 2025, and likely missed some steelhead that may have migrated later in the winter.

ACKNOWLEDGEMENTS

The California Department of Fish and Wildlife would like to thank all field staff who helped contribute to the collection of the annual field data during the 2025 season. KRP would like to extend their gratitude to the Klamath Watershed Project for sharing their juvenile monitoring data.

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