2025 SHASTA RIVER ADULT SALMON STUDIES FINAL REPORT

Prepared by:
Treva Filsinger, Cheyanne Nelson, Domenic Giudice, and Jonathan Kang
California Department of Fish and Wildlife
Klamath River Project
1625 S. Main Street
Yreka, CA 96097
domenic.giudice@wildlife.ca.gov

2025 SHASTA RIVER ADULT SALMON STUDIES

Abstract

A total of **5,865** fall run Chinook Salmon (*Oncorhynchus tshawytscha*) were estimated to have entered the Shasta River during the 2025 spawning season. An underwater video camera operated in the flume of the Shasta River Fish Counting Facility (SRFCF) 24 hours a day, seven days a week, from August 27, 2025, to December 16, 2025. The first Chinook Salmon was observed on September 5, 2025, and the last Chinook Salmon on December 11, 2025. Klamath River Project (KRP) staff collected 453 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, collected during spawning ground surveys, and caught in the adult trap were used to describe characteristics of the run. KRP staff processed 53 carcasses as weir wash-backs in the 2025 season. Three carcasses from spawning ground surveys were processed for samples. Additionally, 246 samples were collected during the operations of the adult trap. The run was comprised of 303 grilse (5.2%), and 5,562 adults (94.8%). Grilse were determined by scale-based aging. The sex composition of the run, based on 246 trap fish sampled, was 56.9% (140) female and 43.1% (106) male. 15 adipose fin clipped (ad-clipped) fish (indicating hatchery origin) were encountered as wash-backs, an estimate of 628 (10.71%) hatchery origin fish entered the Shasta River.

A net total of **7** Coho Salmon (*Oncorhynchus kisutch*) were estimated to have entered the Shasta River prior to removal of the weir on December 16, 2025. The first Coho Salmon of the season was observed swimming upstream through the SRFCF on October 29, 2025, and the last Coho Salmon was observed swimming through the SRFCF on December 13, 2025. Based on video length estimates, zero of the Coho that passed the counting station were grilse (0%), and seven were adults (100%). Zero Coho carcasses were recovered; therefore, no hatchery origin estimates were generated.

A net total of **208** Steelhead Trout (*Oncorhynchus mykiss*) with a fork length greater than or equal to 40.64 cm (16 inches) were observed passing through the SRFCF during the 2025 season, prior to the removal of the SRFCF on December 16, 2025.

Introduction

The Klamath River Project of the California Department of Fish and Wildlife (CDFW) 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.

The Shasta River is particularly important because it is a major salmon spawning tributary. Beyond providing valuable escapement estimates to the Pacific Fishery Management Council for the effective management and allocation of fall Chinook Salmon originating from the Klamath River Basin, the Shasta River studies provide an opportunity to monitor an independent population of Coho Salmon (Williams et al. 2008) within the state and federally threatened Southern Oregon/Northern California Coast Coho range. In addition to total escapement counts, objectives include the determination of run timing, spawning distribution, length frequency distribution, sex ratio, and spawn condition for Chinook Salmon and Coho Salmon in the Shasta River. Scales and coded wire tags (CWTs) are collected to determine the age composition and hatchery contribution to each annual run.

To achieve these tasks, KRP employs several techniques which include a creel survey of sport fishing effort and harvest, recovery of fish returning to Iron Gate Hatchery (IGH) (including operations at the auxiliary fish ladder) or Fall Creek Hatchery (FCH), 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 in the Shasta River. The Shasta River Fish Counting Facility is located approximately 213 meters (700 feet) from the confluence of the Shasta and Klamath Rivers (Klamath RM 176.6, RKM 283, Figure 1 and Figure 2). Coordinates for the facility are 041º 49' 46.38" N, 122º 35' 35.38" W.

Video equipment was first installed at the SRFCF in 1998 and has been used to describe migration of salmonids into the Shasta River ever since. Although the primary responsibility of KRP is to enumerate and describe Chinook Salmon and Coho Salmon populations, data are recorded for Steelhead (*Oncorhynchus mykiss*) and other species observed at the SRFCF during its period of operation as well.

In 1997, the Southern Oregon/Northern California Coast ESU of Coho Salmon was listed as a Threatened Species by NOAA. KRP operates its SRFCF video system through December, and into January when possible; to enumerate the Coho Salmon run as well as the Chinook Salmon run. This report describes the characteristics of the Chinook Salmon, Coho Salmon and Steelhead runs that entered the Shasta River during the 2025-2026 season.

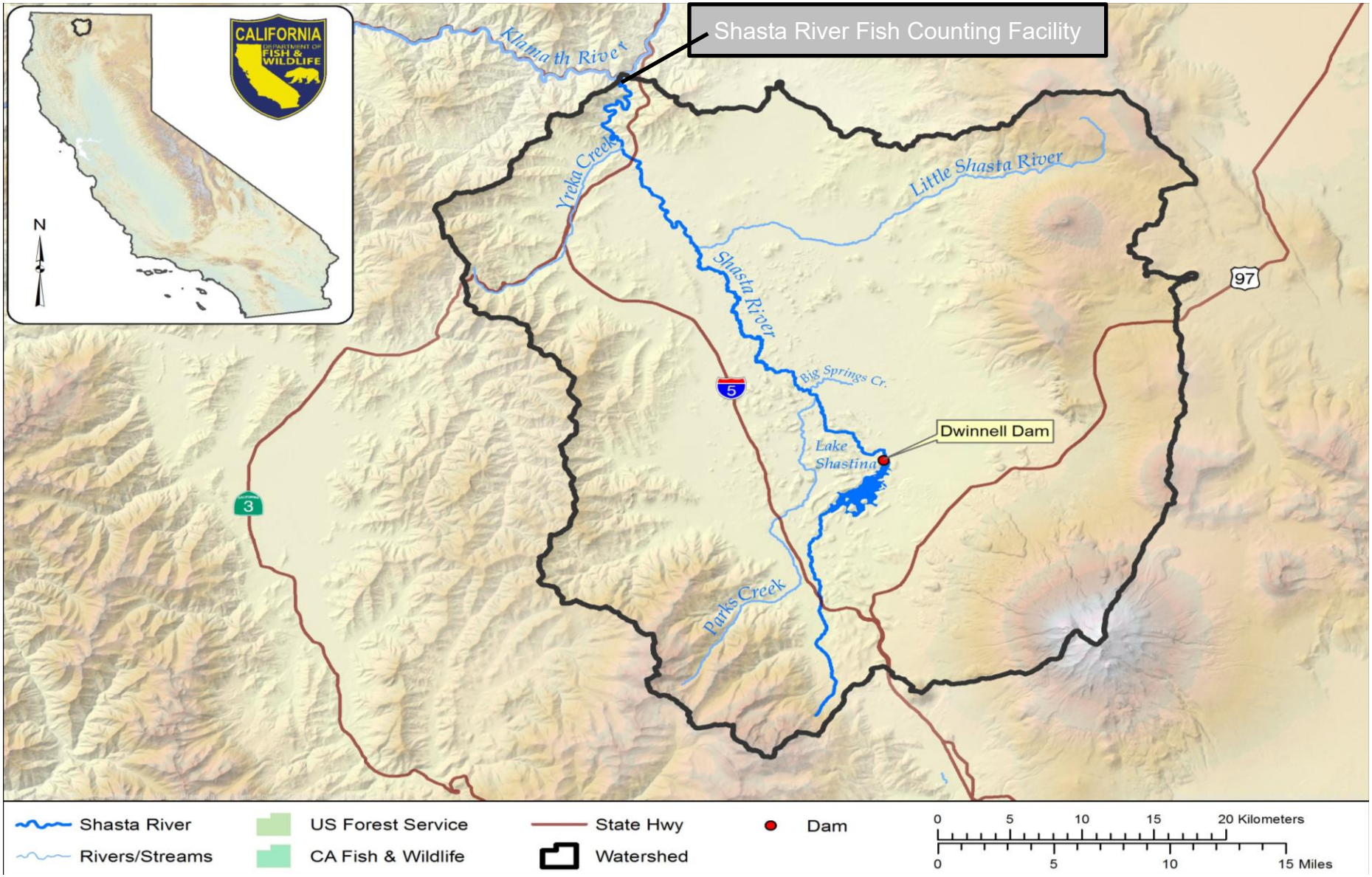

Figure 1. The Shasta River Watershed and location of the Shasta River Fish Counting Facility.

Figure 2. Google Earth Image Looking South at the Shasta and Klamath Confluence.

METHODS

Monitoring of the salmon run within the Shasta River during the 2025 season was accomplished through three primary efforts: operation of a video weir, operation of an upstream migrant trap, and collection of data from salmon carcasses that become impinged on the weir panels as they float downstream (wash-backs).

VIDEO WEIR

The SRFCF consists of a video camera, counting flume and an Alaska style weir strategically placed in a diagonal across the river channel (Figure 3). Fish migrating 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 D8VN* digital video recorder (DVR). [1]

Figure 3: Alaska-style panels of the Shasta River Fish Counting Facility (SRFCF)

The weir and video camera were installed, and recording began on August 27, 2025. KRP staff performed routine daily maintenance of the SRFCF. This included inspecting the video system to ensure that everything was operating correctly, inspecting, 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

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

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 and 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. A systematic sample of one in five Chinook Salmon carcasses were processed. Data collected on these systematically sampled 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. Heads were collected from each ad-clipped fish for CWT recovery and analysis. All carcasses were cut in half to prevent sample duplication and returned to the river downstream of the weir.

ADULT TRAP

During the 2025 season, an 8’ by 8’ trap was constructed on the upstream side of the video flume at the SRFCF to facilitate biological sampling of the fall Chinook Salmon run. Fish entered the trap by swimming upstream through the video flume through a steel fyke which led into the trap. The trap is constructed of evenly spaced bars to allow water to constantly flow into and out of the trap to keep fish in good condition. The trap was set up with two removable panels on the upstream side, and when these panels were removed, fish could easily continue to swim upstream and exit the trap. Once the panels were lowered into place, the trap was actively fishing, and fish were held in the trap. This allowed the trap to be fished for short durations (3-6 hours). The trap was typically set in the morning and checked around noon. A crew of two would process fish and empty the trap; all fish were speciated, sexed, measured, and opercle punched to prevent duplicate samples. Chinook Salmon were sampled for scales and genetic tissue. The primary purpose of the trap was to provide an unbiased scale sample collection from Chinook Salmon run.

SPAWNING GROUND SURVEYS

Spawning ground surveys were conducted by a two-person team that walked downstream through a stretch of river (usually 2-3 miles). During the surveys, crews were looking for and recording 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 Reaches.

LOCATION	REACH NUMBER	DOWNSTREAM POINT	UPSTREAM POINT	LENGTH (MILES)	LENGTH (KM)
SHASTA RIVER	1	SRFCF	Pioneer Bridge	2.97	4.78
SHASTA RIVER	2	Pioneer Bridge	Highway 263	2.47	3.98
SHASTA RIVER	3	Highway 263	Shelly Bridge (canoe reach)	0.37	0.59
SHASTA RIVER	19	Nelson Ranch	Confluence w/Big Springs Creek	1.84	2.96
SHASTA RIVER	20	Confluence w/Big Springs Creek	Confluence w/ Parks Creek	0.93	1.49
BIG SPRINGS CREEK	21	Mouth of Big Springs Creek	Upper Bridge, Big Springs Creek	0.87	1.4
SHASTA RIVER	22	Mouth of Parks Creek	Hidden Valley Ranch	2.53	4.07
PARKS CREEK	23	Mouth of Parks Creek	2nd Fence	0.99	1.59
PARKS CREEK	24	Parks Creek, Dukes	Slough Road Crossing	1.89	3.04
			Totals:	14.86	23.9

CHINOOK SALMON HATCHERY INFLUENCE

The hatchery contribution rates for Chinook Salmon have been estimated both through the recovery of carcasses and through reviewing live fish images observed at the fish counting facility. During the 2025 season hatchery contribution rates were based on observed clips on recovered carcasses for Chinook Salmon. The hatchery contribution rate of Chinook Salmon was calculated by multiplying the number of CWTs observed for each CWT group by its production multiplier value (the inverse of the proportion of each group of juveniles that were tagged). An additional sample expansion (the inverse of the number of fish handled during spawning ground surveys divided by the total estimate) was applied.

RESULTS

CHINOOK SALMON VIDEO DATA

A net total of **5,865** Chinook Salmon were estimated to have migrated through the SRFCF during the 2025 season. The total Chinook Salmon run of 5,865 was derived by subtracting the number of downstream observations (120) from the number of upstream observations (5,985). Most of the run (50.8%) was observed between September 12, 2025, and September 27, 2025. The peak day of the run was September 21, 2025, with a net passage of 510 (8.70%) Chinook Salmon. Consistent with previous years' monitoring efforts, the majority of Chinook Salmon (82%) passed upstream through the SRFCF during daylight hours between 06:00 and 17:00 hours (Figure 5).

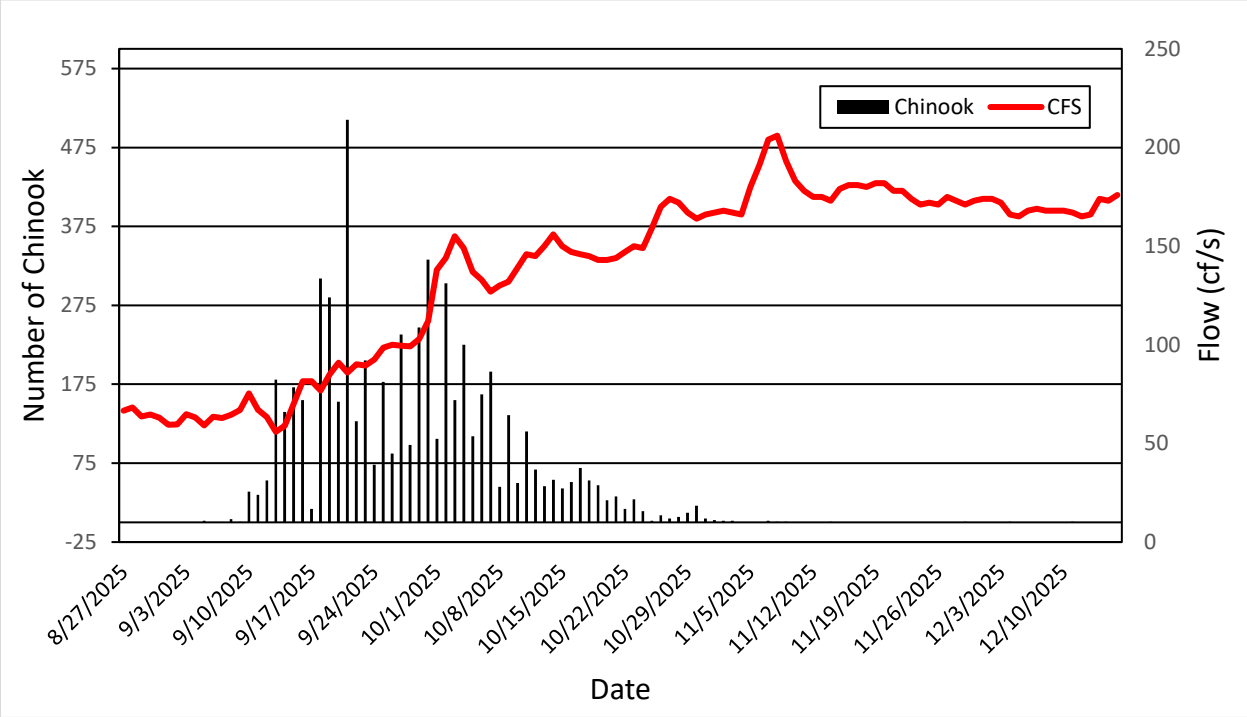

Figure 4. 2025 Shasta Chinook Salmon passage by date and average daily flows observed at USGS Gage No. 11517500.

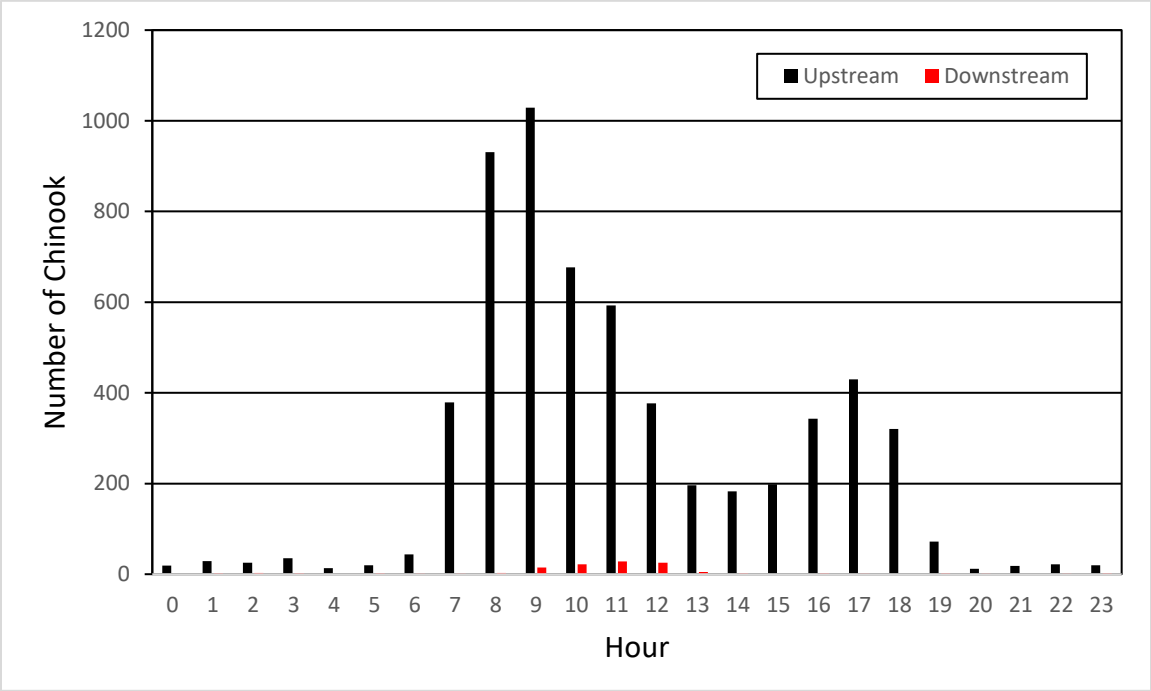

Figure 5. Summary of daily run timing of Chinook Salmon observed at the Shasta River Fish Counting Facility during the 2025 season.

CHINOOK SALMON WEIR WASH-BACK CARCASSES

A total of 204 Chinook Salmon carcasses washed back on the SRFCF weir, of which 39 were sampled as part of a systematic sample (one in five, plus all ad-clips) for biologic samples. Of the 39 carcasses sampled, 35 (89.7%) were male and 4 (10.3%) were female (Table 2). As in previous years, the wash-back samples collected at the SRFCF show a heavy bias toward males (Table 2 and Figure 6).

Table 2. Sex composition of wash-backs from the Shasta River Fish Counting Facility, 2006-2025.

Year	Total Chinook	Total Wash-Back	# Sampled	% Males	% Females
2006	2,185	457	457	94	6
2007	2,036	228	228	71	29
2008	6,362	767	767	96	4
2009	6,287	330	327	71	29
2010	1,348	118	118	83	17
2011	11,388	1,623	1,623	99.6	0.4
2012	29,544	1,040	104	81	19
2013	8,021	643	64	81	19
2014	18,357	1,450	145	73	27
2015	6,745	82	7	71	29
2016	2,889	90	15	80	20
2017	9,905	940	174	94	6
2018	20,692	406	69	72	28

2019	6,003	410	85	73	27
2020	4,168	195	36	92	8
2021	6,899	342	68	81	19
2022	4,509	319	63	82	18
2023	4,903	292	58	81	19
2024	4,982	253	49	73	27
2025	5,865	204	39	89.7	10.3
Average				81.92	18.08

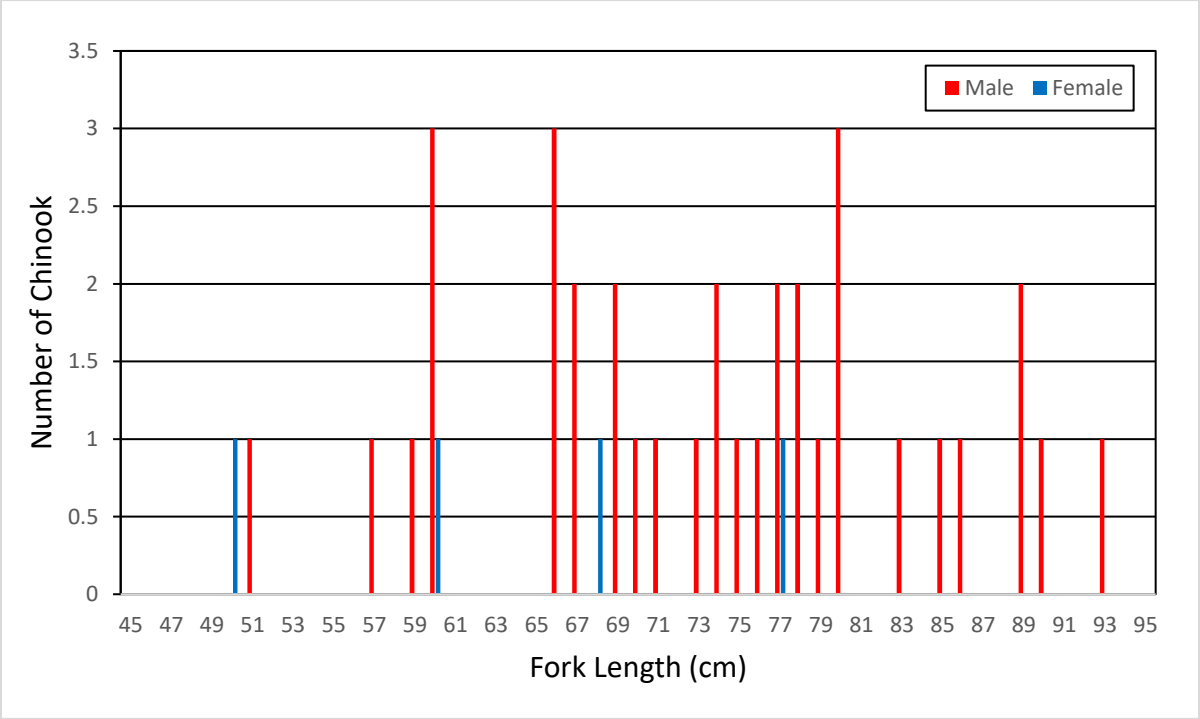

Figure 6. Length frequency distribution of Shasta River Chinook Salmon wash-backs during the 2025 season.

ADULT TRAP

The trap was installed on September 9, 2025, and was removed on October 29, 2025, to avoid potential impacts to the Coho Salmon run. On average, the trap was set at 0830 and operated to 1330 multiple times a week. The trap was fished for a seasonal total of 99.72 hours. In that time, 246 Chinook Salmon were caught and sampled. Of the 246 fish, 106 were male (43.1%) and 140 were female (56.9%). Male fork lengths ranged from 49 cm to 91 cm with an average fork length of 72 cm. Female fork lengths ranged from 50 cm to 89 cm with an average fork length of 71 cm (Figure 7).

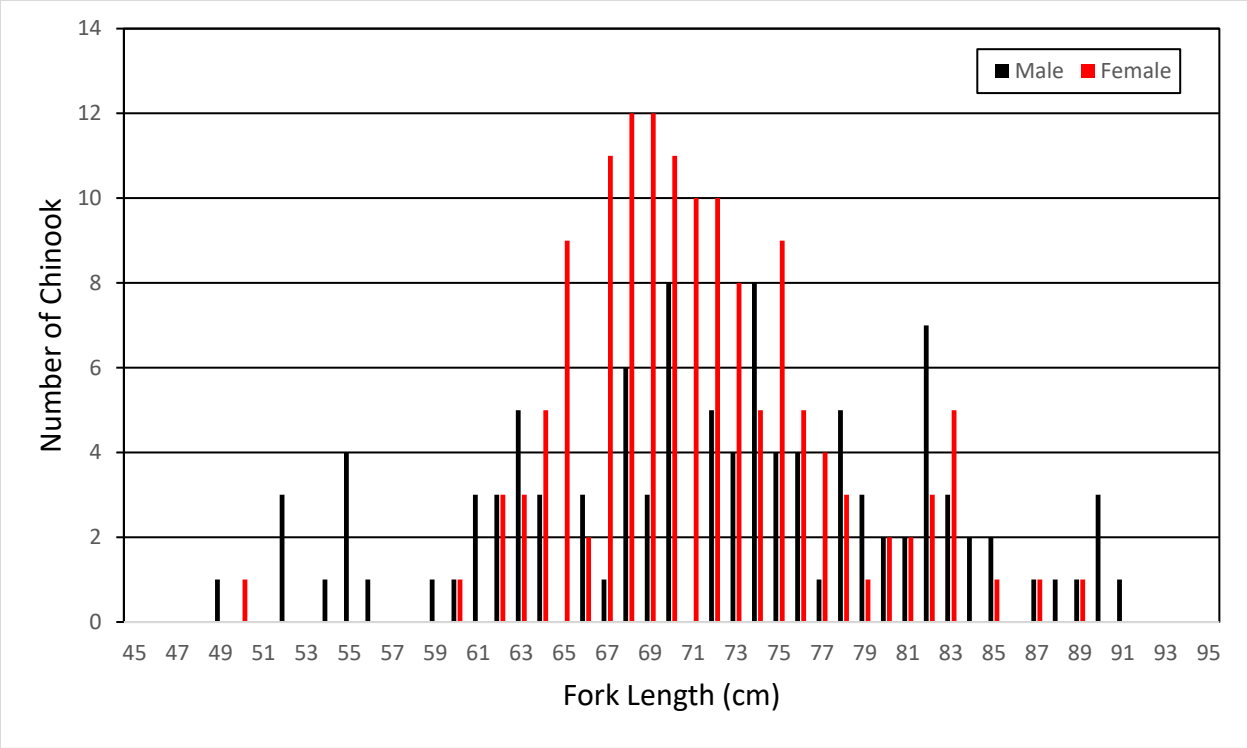

Figure 7. 2025 season Shasta River trapped Chinook Salmon fork lengths.

Spawning Ground Surveys

Spawning ground surveys were conducted throughout the spawning season. Surveys began on November 7, 2025, and were completed on January 30, 2026. Three Chinook Salmon carcasses were recovered during the spawning ground surveys. One of the carcasses recovered was a male with a fork length of 60 cm. The other two recovered carcasses were females with fork lengths of 65 cm and 67 cm. Throughout the spawning ground surveys, a total of 168 redds were observed, 91 of which were from Chinook Salmon, two from Coho Salmon, and 75 from Steelhead. 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 run timing (Figures 8, 9, and 10).

A critical factor in the efficiency and timing of the Shasta River spawning ground surveys is the unique hydrogeological framework of the upper basin, particularly within the Big Springs complex. Unlike typical surface runoff dominated tributaries in the Klamath River watershed, the Shasta River is heavily influenced by steady spring complexes. The Big Springs complex experiences highly muted peak-flow events during the fall spawning window, meaning that the physical architecture of the redds remains structurally intact for significantly longer periods. The lower levels of sediment transport prevent rapid flattening and smoothing of the riverbed topography that typically occurs in rain or snowmelt driven systems. As a result, individual redds remain distinct and identifiable to surveyors for extended durations. During the 2025 season, this long-lasting visibility allowed crews to find and count redds weeks after initial construction. Consequently, the recorded observation dates in the 2025 dataset do not accurately reflect the actual timing of redd creation (Figures, 8, 9, and 10).

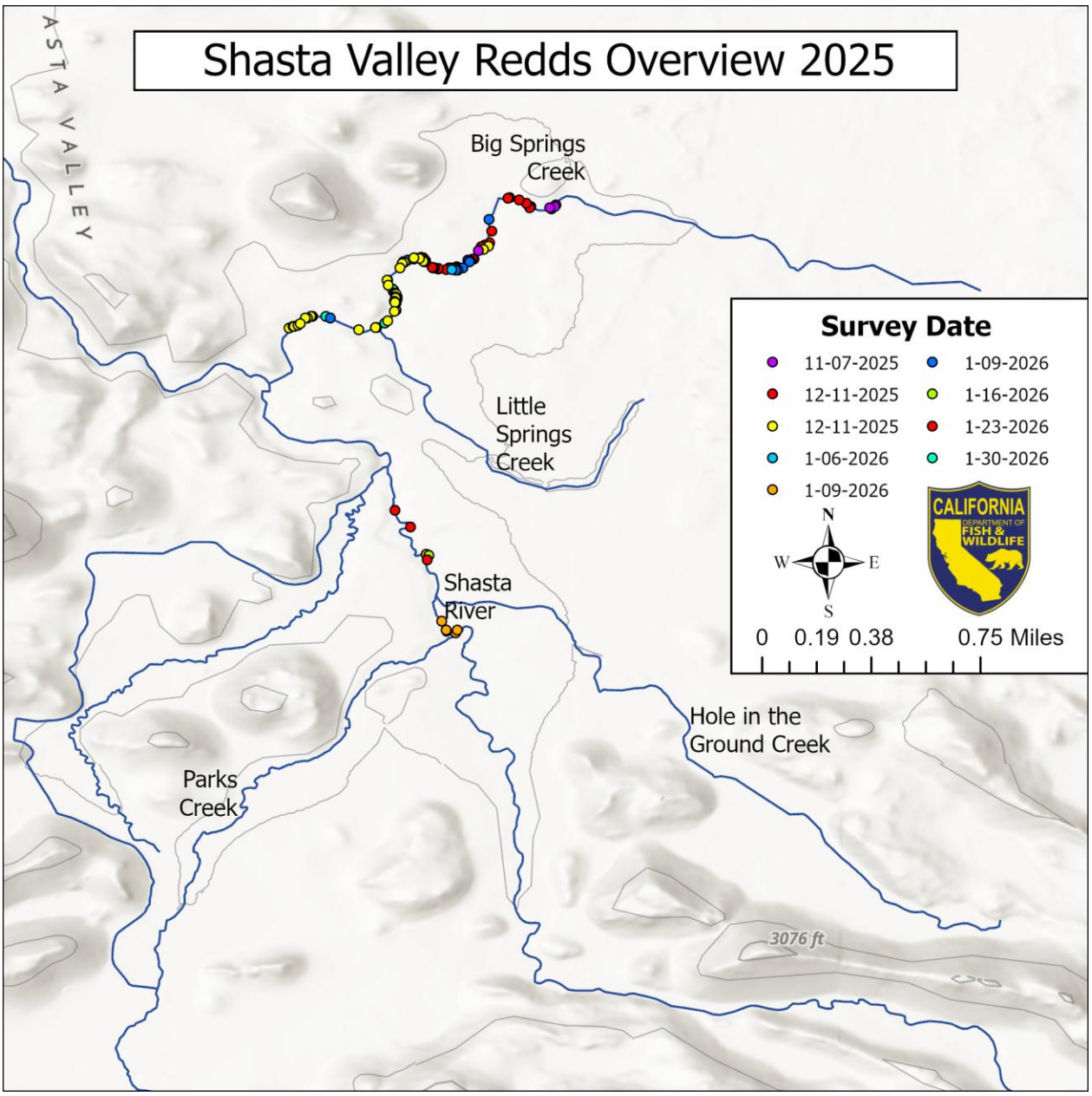

Figure 8. Map showing Chinook Salmon, Coho Salmon, and Steelhead redd locations in the Shasta River watershed.

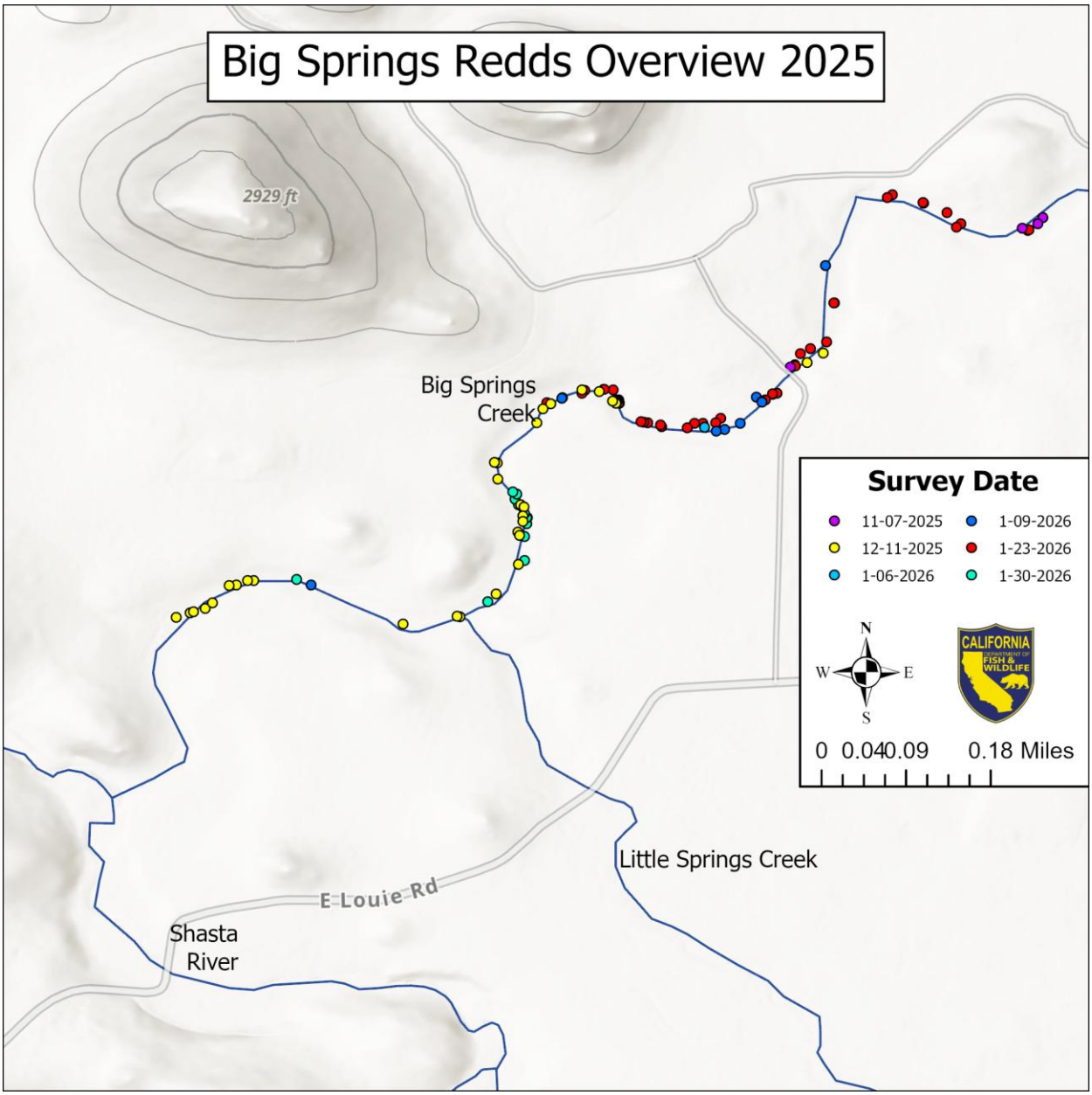

Figure 9. Map showing Chinook Salmon, Coho Salmon, and Steelhead redd locations on Big Springs Creek.

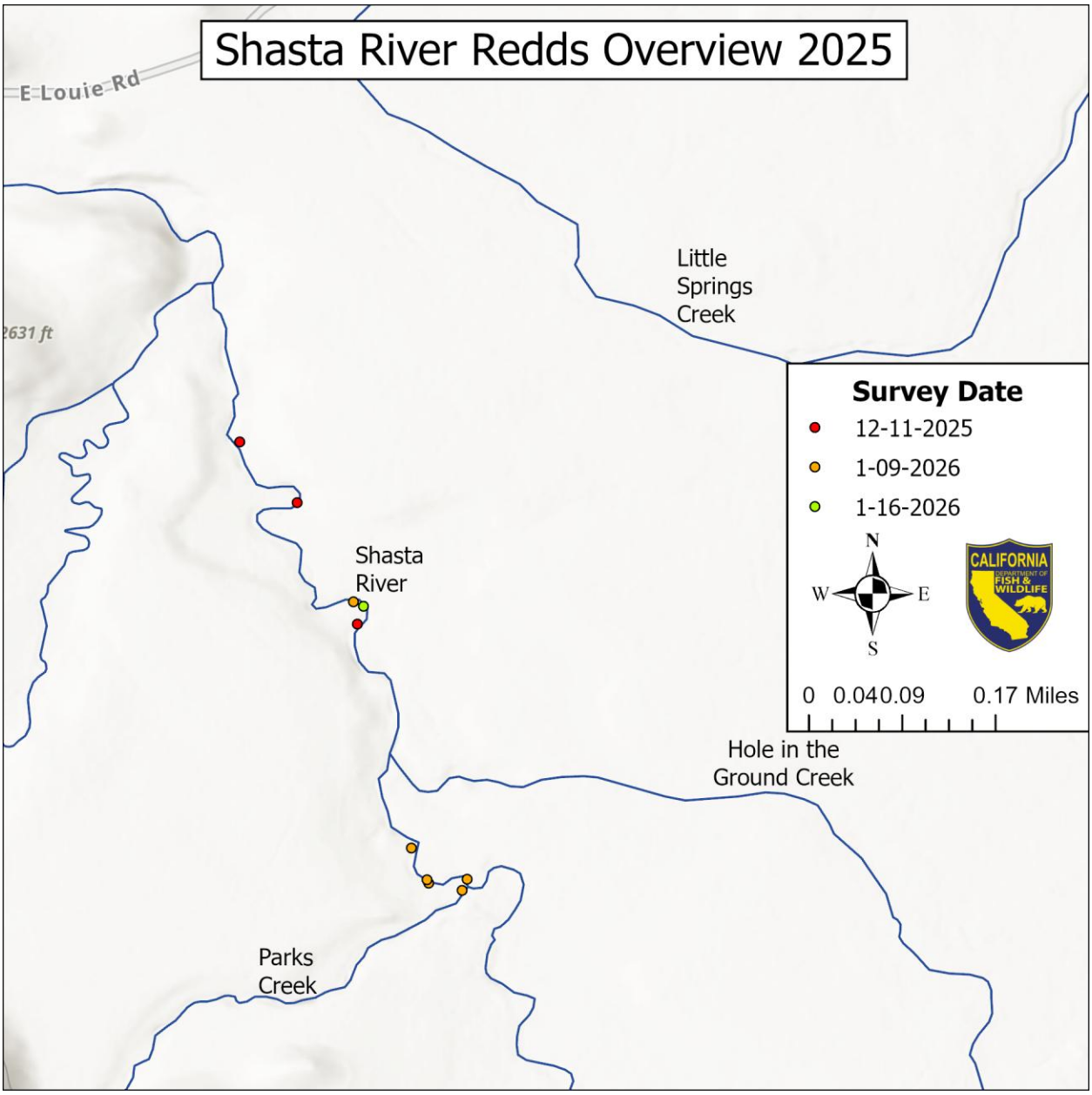

Figure 10. Map showing Chinook Salmon redd locations on the Shasta River.

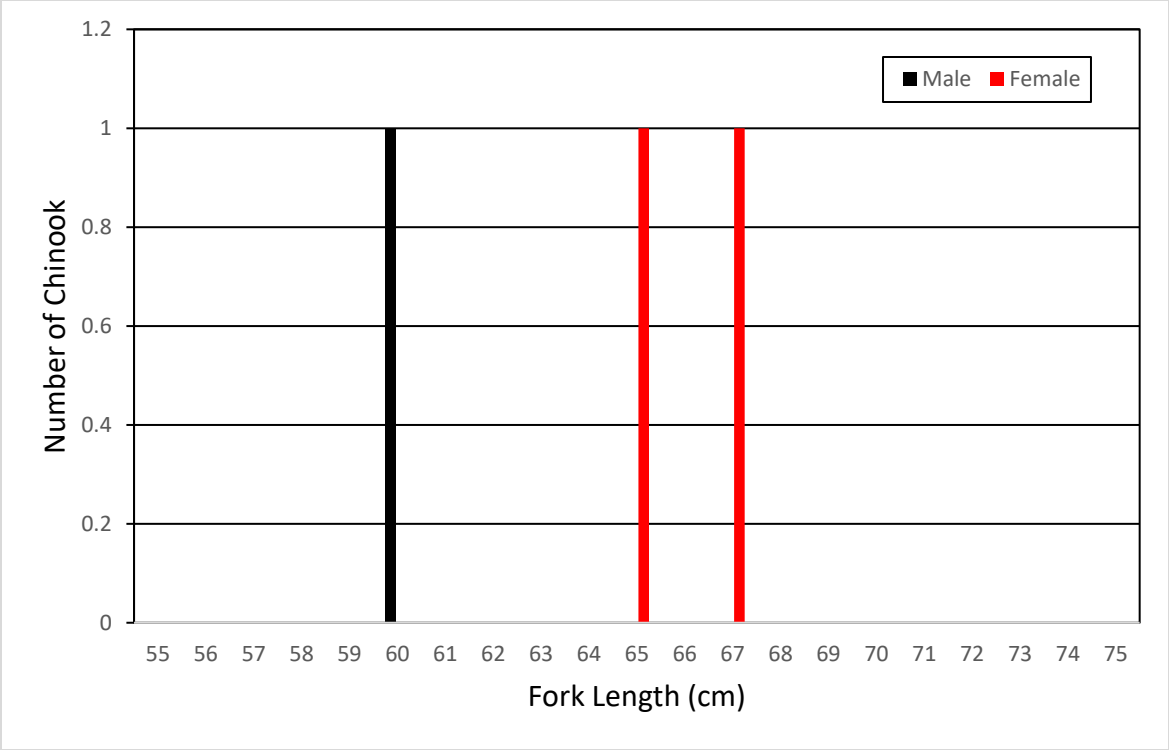

Figure 11. 2025 Shasta River Chinook Salmon spawning ground survey fork length histogram.

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 198 (3.4%) grilse and 5,667 (96.6%) adults. These estimates were made based on length frequency analysis of carcass data and trap data. Final estimates of the age composition of the 2025 run in the Shasta River 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 3). The final age estimate was 303 (5.17%) grilse, and 5,562 (94.83%) adults.

Table 3. Age composition of the Chinook Salmon run to the Shasta River, 2003-2025.

	Age 2	Age 3	Age 4	Age 5	Total Adults	Total Run
2003	155	2,798	1,325	11	4,134	4,289
2004	129	184	484	166	834	963
2005	37	1,361	579	79	2,019	2,056
2006	1,395	151	625	13	789	2,184
2007	27	1,855	146	8	2,009	2,036
2008	3,621	1,222	1,456	63	2,741	6,362
2009	151	5,587	315	243	6,145	6,296
2010	87	240	1,021	0	1,261	1,348
2011	11,175	23	190	0	213	11,388
2012	1,944	27,598	2	0	27,600	29,544
2013	1,096	3,896	3,029	0	6,925	8,021
2014	3,945	4,064	10,265	83	14,412	18,357
2015	133	5,752	658	202	6,612	6,745
2016	135	536	2,218	0	2,754	2,889
2017	6,618	782	2,022	483	3,287	9,905
2018	2,016	17,716	960	0	18,676	20,692
2019	78	5,341	585	0	5,926	6,004
2020	393	2,946	829	0	3,775	4,168
2021	927	1,676	4,273	23	5,972	6,899
2022	106	3,409	981	13	4,403	4,509
2023	156	2,181	2,415	151	4,747	4,903
2024	31	3,046	1,905	0	4,951	4,982
2025	303	3,881	1,680	1	5,562	5,865
Average	**1,507**	**4,185**	**1,651**	**67**	**5,902**	**7,409**

CHINOOK SALMON HATCHERY INFLUENCE

In 2025, a net total of 58 ad-clipped Chinook Salmon were observed passing through the SRFCF 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, 15 ad-clipped fish were recovered as wash-backs. CWTs were recovered from all 15 heads collected from the wash-backs. 14 of the tags recovered were IGH origin fish, two from brood year 2021, 11 from brood year 2022, and one from brood year 2023. One of the 15 tags recovered was from Lyons Ferry Snake River, from brood year 2021. Four additional ad-clipped Chinook were recorded in the trap; however, the wire was not extracted as they were live. The 4 CWTs were treated as unreadable tags.

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 the Shasta River divided by the number of carcasses inspected for ad-clips). Resulting in an

estimate of 628 Chinook Salmon (10.71%) of hatchery origin that returned to the Shasta River in 2025 (Table 4).

Table 4. Estimated Hatchery Contribution in the Shasta River during the 2025 season.

2025 Shasta River CWT Estimates									
CWT	Release Location	Brood Year	Age	Release Type*	Number Recovered	Production Multiplier**	Production Estimate	Sample Expansion***	Expanded estimate
62245	IGH/FCH	2023	2	F	1	1.060112402	1.06	12.95	13.73
60032	IGH	2022	3	AF	8	4.036336788	32.29	12.95	418.07
60034	IGH	2022	3	F	1	4.019925832	4.02	12.95	52.05
60035	IGH	2022	3	F	1	4.028601389	4.03	12.95	52.16
62875	IGH	2022	3	AF	1	4.059085079	4.06	12.95	52.55
62388	IGH	2021	4	AF	1	1.018643511	1.02	12.95	13.19
62079	IGH	2021	4	AF	1	1.014608829	1.01	12.95	13.14
638417	WDFW Lyons Ferry Snake River	2021	4	Y	1	1.011614654	1.01	12.95	13.10
Total Run	**5865**	**Number Recovered Subtotal**			**15**	**Expanded Estimate Subtotal**			**627.97**
Estimated Contribution of Unknown CWTs									
200000	CWT Lost				0				
300000	Head Lost				0				
400000	CWT Unreadable****				4				
Subtotal					4				
Total Estimated Hatchery Contribution					**627.97**		**Hatchery Proportion:**		**0.1071**

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 total release for the code to the # of fish effectively tagged

*** Sample expansion is video total (5,865) divided by the number of spawning ground, trap, and washback samples

**** Live ad-clipped fish from the trap that were not sampled

Table 5. Contribution of hatchery origin Chinook Salmon straying to the Shasta River, 2003-2025.

Year	Total # Chinook	Hatchery Stray Estimate	Percent Hatchery
2003	4,289	436	10.17%
2004	963	372	38.63%
2005	2,055	469	22.82%
2006	2,184	105	4.81%
2007	2,036	69	3.39%
2008	6,362	56	0.88%
2009	6,296	131	2.08%
2010	1,348	157	11.65%
2011	11,388	74	0.65%
2012	29,544	126	0.43%
2013	8,021	146	1.82%
2014	18,357	735	4.00%
2015	6,745	89	1.32%
2016	2,889	91	3.15%
2017	9,905	117	1.18%
2018	20,692	1,883	9.10%
2019	6,004	32	0.53%
2020	4,168	34	0.81%
2021	6,899	86	1.25%
2022	4,509	100	2.22%
2023	4,903	81	1.66%
2024	4,982	67	1.34%
2025	5,865	628	10.71%
AVERAGE			**5.86%**

COHO SALMON

From August 27, 2025, to December 16, 2025, a total of 7 Coho Salmon were observed passing upstream and zero observed passing downstream through the SRFCF (Figure 12). The net number of Coho Salmon estimated to have entered and remained in the Shasta River prior to removal of the weir was **7**. Migration peaked on December 9, 2025, with a net passage of two (28.57%) Coho Salmon. Length estimates from video indicate that zero grilse Coho Salmon (0%) and seven adult Coho Salmon (100%) passed the weir. Zero Coho Salmon carcasses were recovered during the 2025 season, and video footage was not clear enough to discern left maxillary clips. Additionally, zero ad-clipped Coho Salmon were observed in the video footage. Left maxillary clips on Coho Salmon indicate hatchery origin, and beginning in brood year 2023, all hatchery

origin Coho Salmon received an ad-clip. As neither indication was observed, no hatchery or natural origin estimates were calculated.

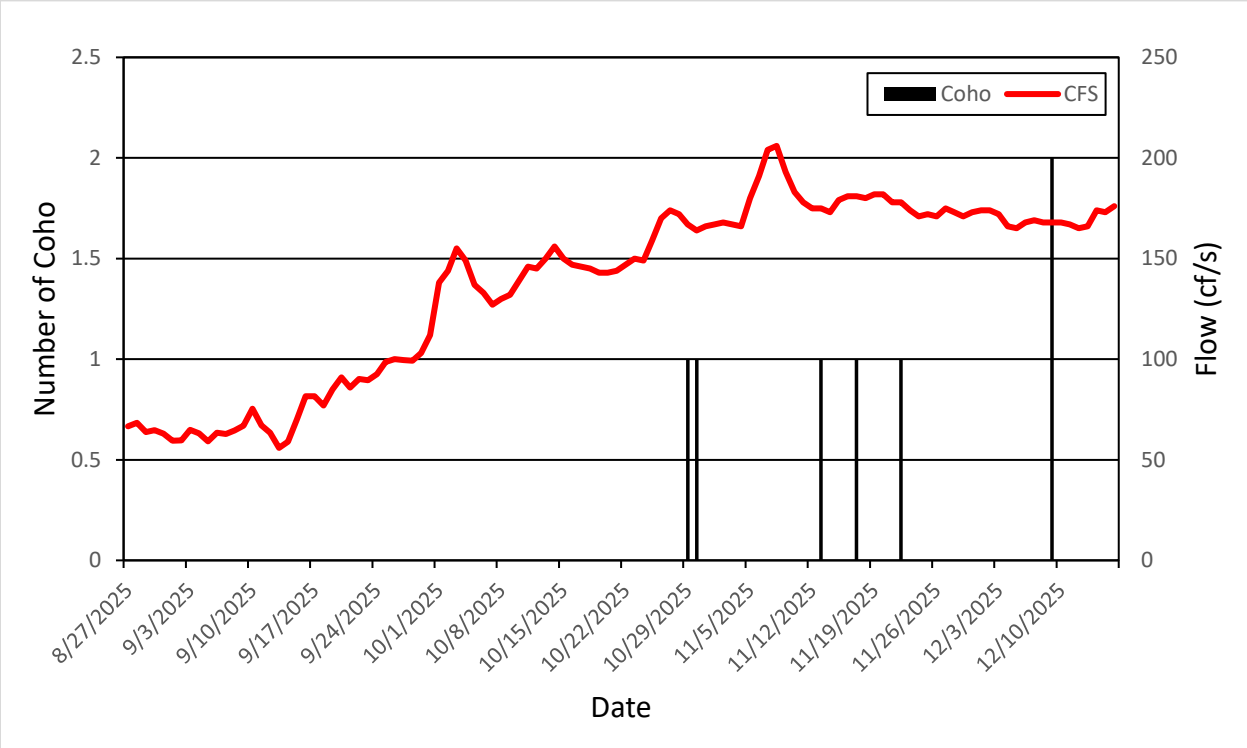

Figure 12. 2025 Shasta River Coho Salmon passage by date and average daily flows observed at USGS Gage No. 11517500.

STEELHEAD TROUT

In 2025, a net total of **208** adult Steelhead were estimated to have entered and remained in the Shasta River during the video recording season from August 27, 2025, to December 16, 2025 (Figure 13). No ad-clip observations were made, indicating zero hatchery origin Steelhead. 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).

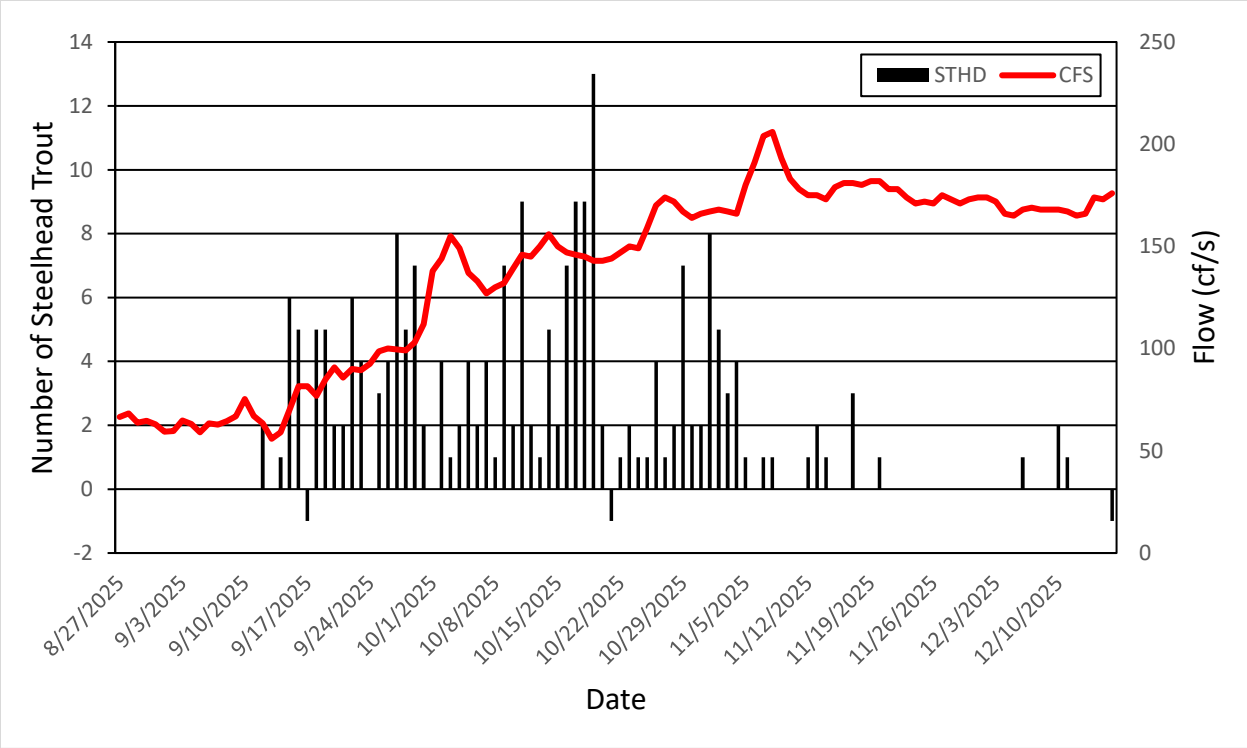

Figure 13. 2025 Shasta River Steelhead trout passage by date and average daily flows observed at USGS Gage No. 11517500.

DISCUSSION

CHINOOK SALMON

The 2025 run of Chinook Salmon of 5,865 was 656 fish below the 47-year average of 6,521 (Figure 14). At the current monitoring site, run sizes ranged from a low of 533 fish in 1990 to a high of 29,544 fish in 2012.

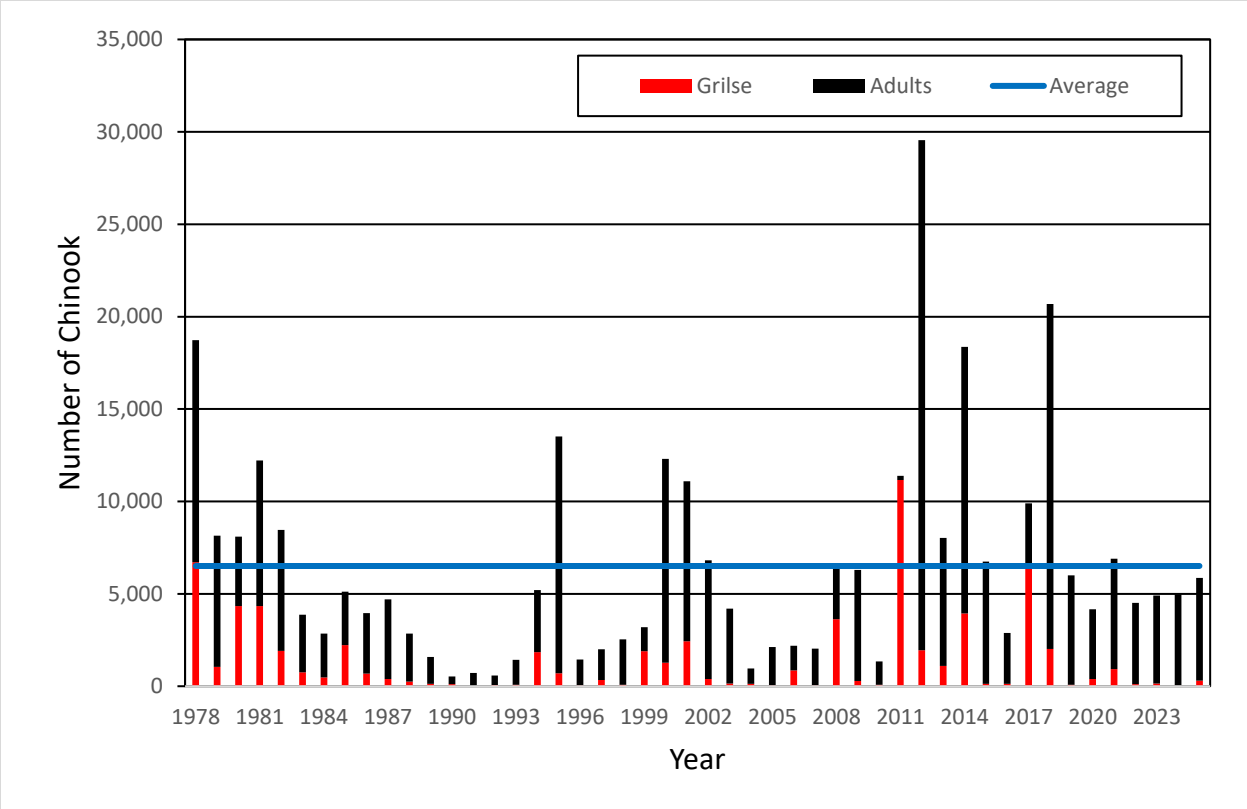

Figure 14. Shasta River annual adult and grilse Chinook Salmon populations from 1978 to 2025.

The Shasta River is an important component of the Klamath Basin Chinook Salmon run (including Trinity River) and has contributed an average of 12% of the basin-wide natural spawning escapement during the period from 1979 to 2025. However, in the past 5 years, the Shasta River contributed an average of 15% of the basin-wide natural escapement (Table 6).

Table 6. Escapement of Chinook Salmon to the Klamath Basin and Shasta River, 1979-2025.

Year	Klamath Basin	Shasta River	% Shasta
1978	74,906	18,731	25%
1979	37,398	8,151	22%
1980	48,465	8,096	17%
1981	50,364	12,220	24%
1982	50,597	8,455	17%
1983	33,310	3,872	12%
1984	21,349	2,842	13%
1985	61,628	5,124	8%
1986	142,302	3,957	3%
1987	110,489	4,697	4%
1988	91,930	2,842	3%
1989	49,377	1,577	3%
1990	16,946	533	3%

1991	12,367	726	6%
1992	17,171	586	3%
1993	25,683	1,426	6%
1994	38,578	5,203	13%
1995	179,118	13,511	8%
1996	87,500	1,450	2%
1997	50,369	2,001	4%
1998	45,343	2,542	6%
1999	28,904	3,197	11%
2000	89,122	12,296	14%
2001	85,581	11,093	13%
2002	69,502	6,818	10%
2003	89,744	4,289	5%
2004	28,516	962	3%
2005	27,931	2,055	7%
2006	45,002	2,184	5%
2007	61,741	2,036	3%
2008	48,073	6,362	13%
2009	52,499	6,296	12%
2010	49,031	1,348	3%
2011	108,612	11,388	10%
2012	133,361	29,544	22%
2013	69,986	8,021	11%
2014	112,343	18,357	16%
2015	31,596	6,745	21%
2016	15,818	2,889	18%
2017	35,036	9,905	28%
2018	61,561	20,692	34%
2019	26,412	6,004	23%
2020	31,138	4,168	13%
2021	36,564	6,899	19%
2022	26,201	4,509	17%
2023	42,303	4,903	12%
2024	29,915	4,982	17%
2025	54,373	5,865	11%
Average	57,001	6,507	12%

Historically, the Shasta River was documented as a highly productive salmon stream, with a run of over 75,000 Chinook Salmon counted at the Shasta Racks (predecessor to the SRFCF) in 1935. In most cases, the Shasta River follows the trend of the basin indicating similar survival rates; however, in the 1980's the Shasta River does not reflect that trend.

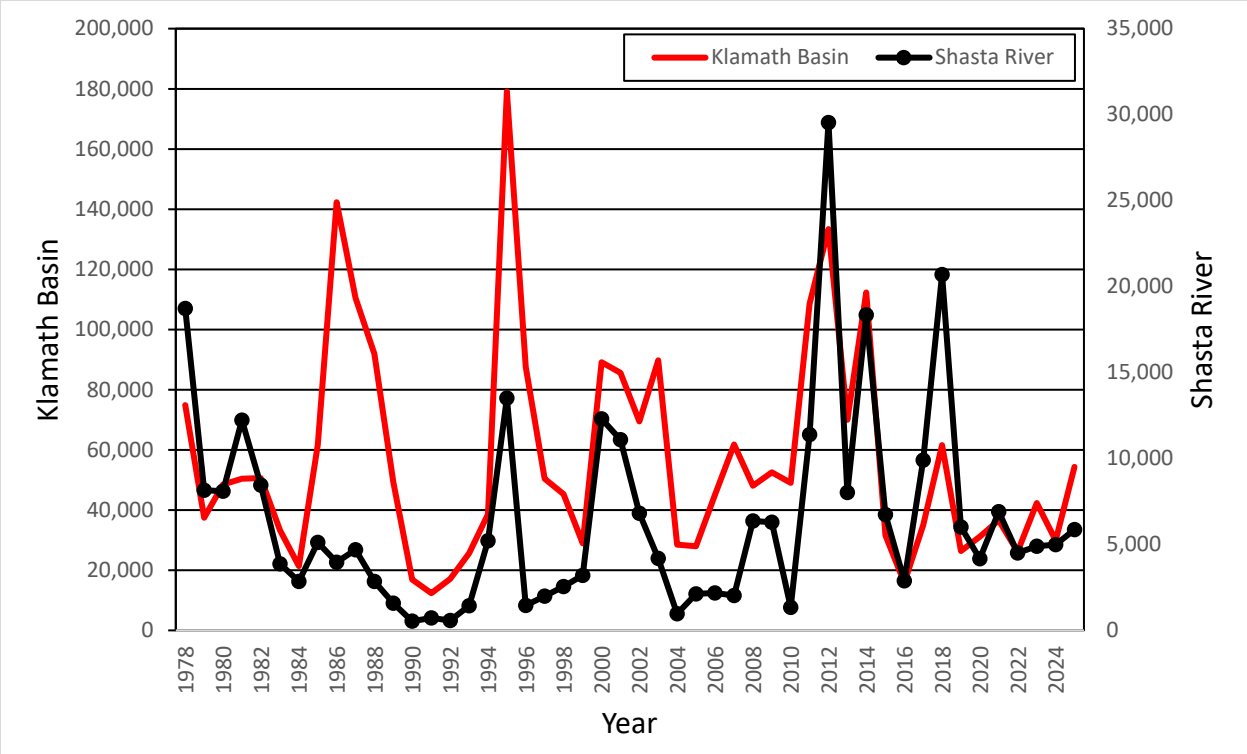

Figure 15. Chinook Salmon spawner escapement to the Klamath Basin and Shasta River from 1978-2025.

The Shasta River fall Chinook Salmon run typically enters the river in early September, earlier than runs to other upper Klamath tributaries. Fishery managers have, in recent years, been concerned with flow and temperature conditions, as it relates to fish migration, during the early weeks of the fall Chinook Salmon migration. Observations of fish migration through the SRFCF have been the basis for coordination between resource agencies and basin partners to ensure adequate flows during the critical month of September.

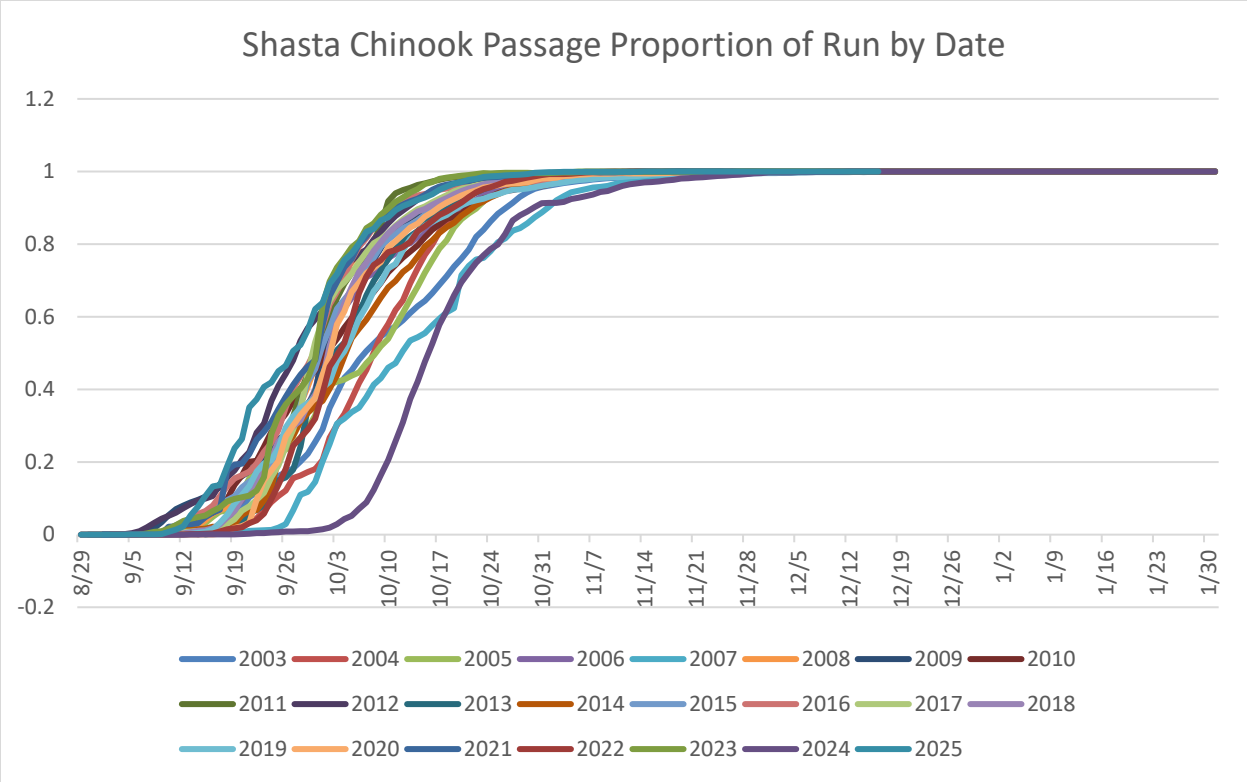

Figure 16. Shasta River Chinook Salmon passage proportions by date.

During the 2025-2026 spawning and egg incubation period (October through February), the Shasta River experienced stable flows that began to increase in November. Juvenile (brood year 2024) salmonids leaving the Klamath River tributaries, including the Shasta River in 2024-2025, may encounter high water temperatures in the main stem Klamath River and exposure to *Ceratonova shasta* and other pathogens. These pathogens are known sources of mortality in juvenile Chinook Salmon, Coho Salmon, and Steelhead (True et al, 2016). This exposure, along with ocean conditions, plays a key role in survival and subsequent adult returns.

Juvenile Chinook Salmon emigration estimates obtained during the following spring/summer of escapement (Nuñez-Guttierrez and Romero 2025) for brood years 2000 through 2022 indicate that the Shasta River's current habitat conditions continue to produce more 0+ Chinook Salmon as more adults return, indicating that the watershed continues to have an increasing ability to produce juvenile Chinook Salmon (Figure 17). Although, the rate at which juvenile Chinook Salmon that were produced from brood year 2012 was reduced when compared to previous seasons (Debrick et al., 2015). In 2012, the high number of adult returns likely exceeded available habitat. In addition, factors such as high flow events which result in streambed mobilization and sediment transport can cause significant damage to redds and emerging fry. The age and sex composition of the Chinook Salmon run may also affect 0+ Chinook Salmon production.

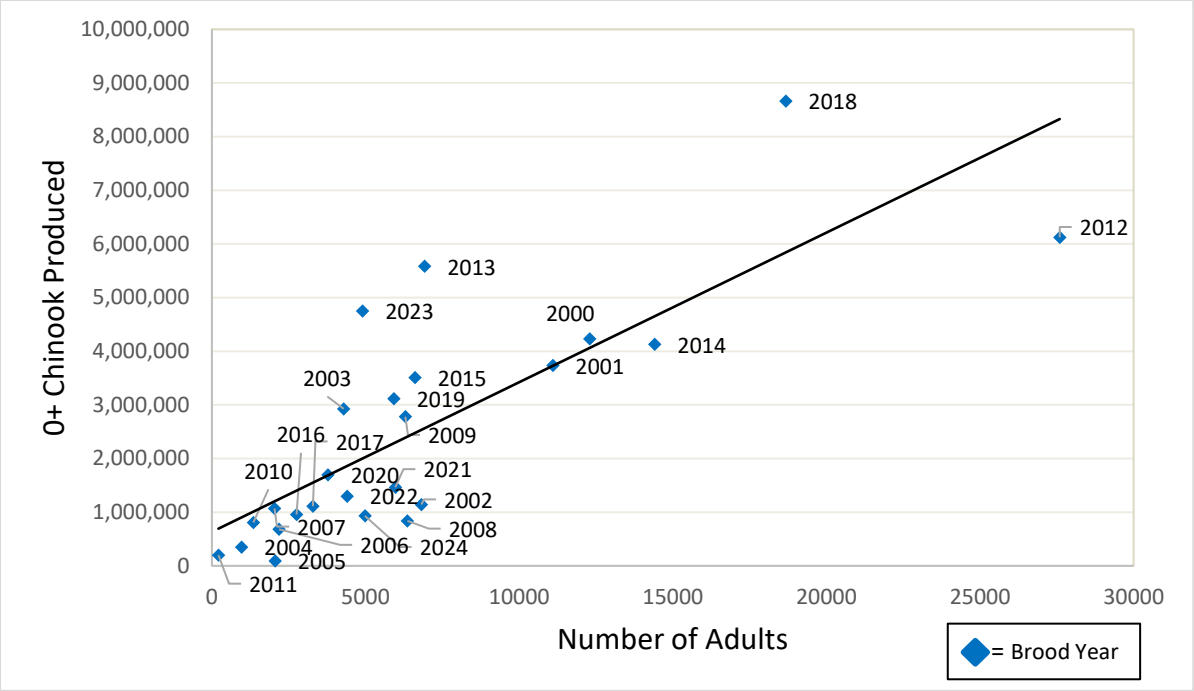

Figure 17. Number of 0+ Chinook Salmon produced per adult spawner in the Shasta River, brood year 2001-2024.

Table 7. Estimated river return age of Chinook Salmon by brood year production, 1996-2024.

Brood Year	0+ Produced (Brood Year +1)	2 (BY+2)	3	4	5	Total	% Survival	% Survival to age 2
2000	5,481,897	386	2,798	484	79	3,747	0.06835	0.0070
2001	4,358,265	155	184	579	13	931	0.02493	0.0042
2002	1,276,801	129	1,361	625	8	2,123	0.18578	0.0113
2003	3,245,136	37	151	146	63	397	0.01356	0.0013
2004	343,587	1,395	1,855	1,456	243	4,949	1.42132	0.4006
2005	90,506	27	1,222	315	0	1,564	1.76202	0.0304
2006	699,366	3,621	5,587	1,020	0	10,228	1.50136	0.5315
2007	1,098,392	151	239	190	0	580	0.05422	0.0141
2008	854,333	87	23	2	0	112	0.01335	0.0104
2009	2,835,426	11,187	27,591	3,029	83	41,890	1.50632	0.4023
2010	810,307	1,944	3,896	10,265	202	16,307	2.01629	0.2404
2011	203,074	1,096	4,064	658	0	5,818	2.90939	0.5481
2012	5,975,335	3,945	5,752	2,218	483	12,398	0.20252	0.0644
2013	5,607,862	133	536	2,022	0	2,691	0.04821	0.0024
2014	3,813,547	135	782	960	0	1,877	0.04547	0.0033
2015	3,485,286	6,618	17,713	585	0	24,916	0.70959	0.1885
2016	957,117	2,016	5,341	827	23	8,207	0.85748	0.2106
2017	1,071,498	78	2,948	4,273	13	7,312	0.65755	0.0070
2018	8,782,988	393	1,676	981	151	3,201	0.03696	0.0045
2019	3,386,515	927	3,409	2,415	0	6,751	0.21667	0.0298
2020	1,879,550	106	2,181	1,905	1	4,193	0.24747	0.0063
2021	No Estimate	156	3,046	1,680		4,882	No Estimate	No Estimate

2022	1,298,012	31	3,881			3,912		0.0024
2023	4,750,230	303				303		0.0064
2024	931,212							
Average							**0.61025**	**0.1125**

Survival of Chinook Salmon from brood year 2001 to 2020 has ranged from 0.01% to 2.86%, with an average of 0.61%. Survival to age two of Chinook Salmon from brood year 2001 to 2023 falls in the range of 0.0011% to 0.5397%, with an average of 0.1125% (Table 7).

COHO SALMON

Coho Salmon returns to the Shasta River from 1979 to 2025 are shown in Figure 18. Sampling from 1983 to 2001 cannot be directly compared to other years, as the weir was removed before November 12th during those years, and sampling does not represent the entire run of Coho Salmon. Estimates of hatchery origin adult Coho Salmon entering the Shasta River from 2007-2025 are shown in Figures 20-22.

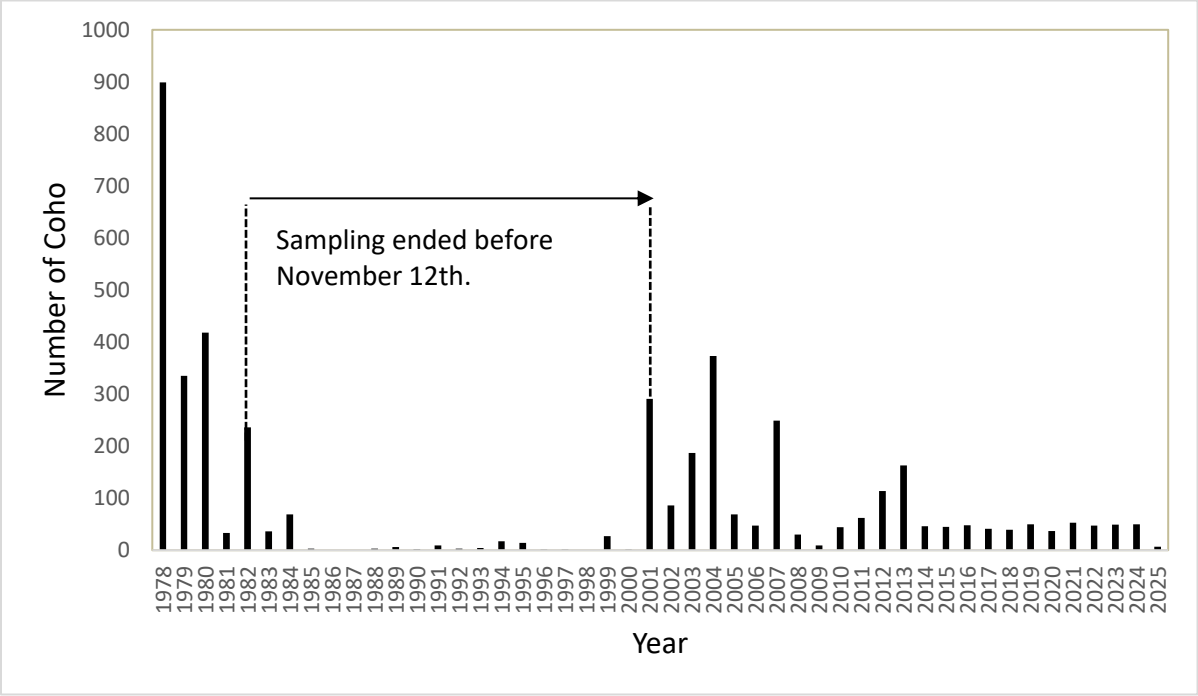

Figure 18. Shasta River Coho Salmon counts by year. In the years 1982-2001 sampling ended before November 12th and likely missed the bulk of the Coho Salmon population.

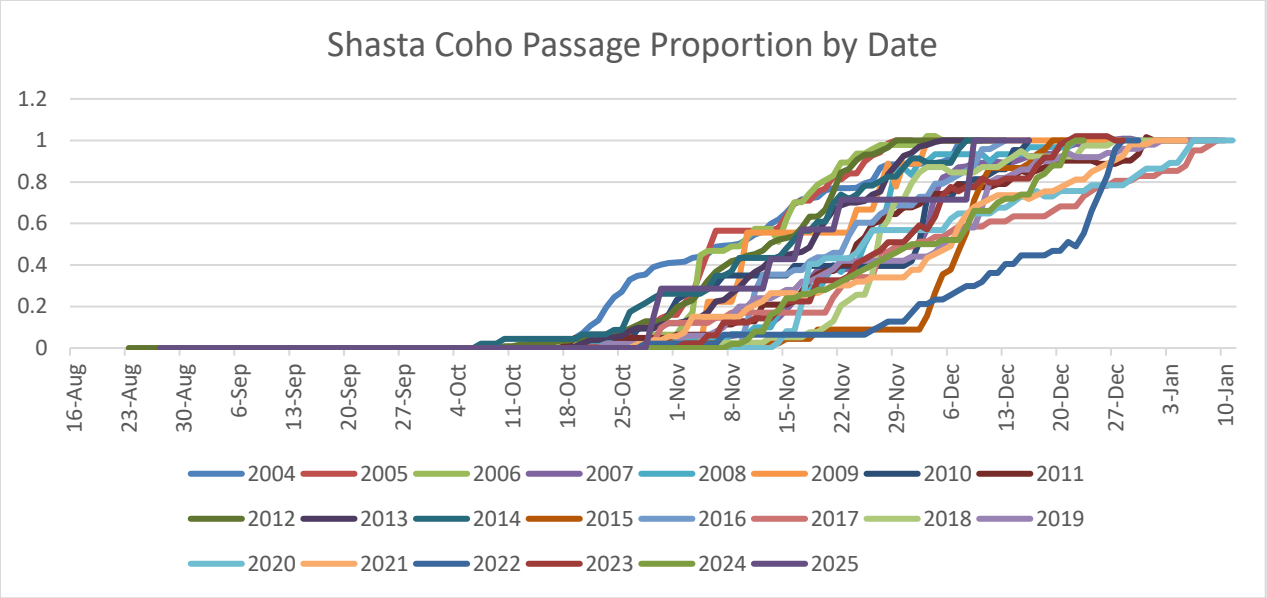

Figure 19: Shasta River Coho Salmon passage proportions by date.

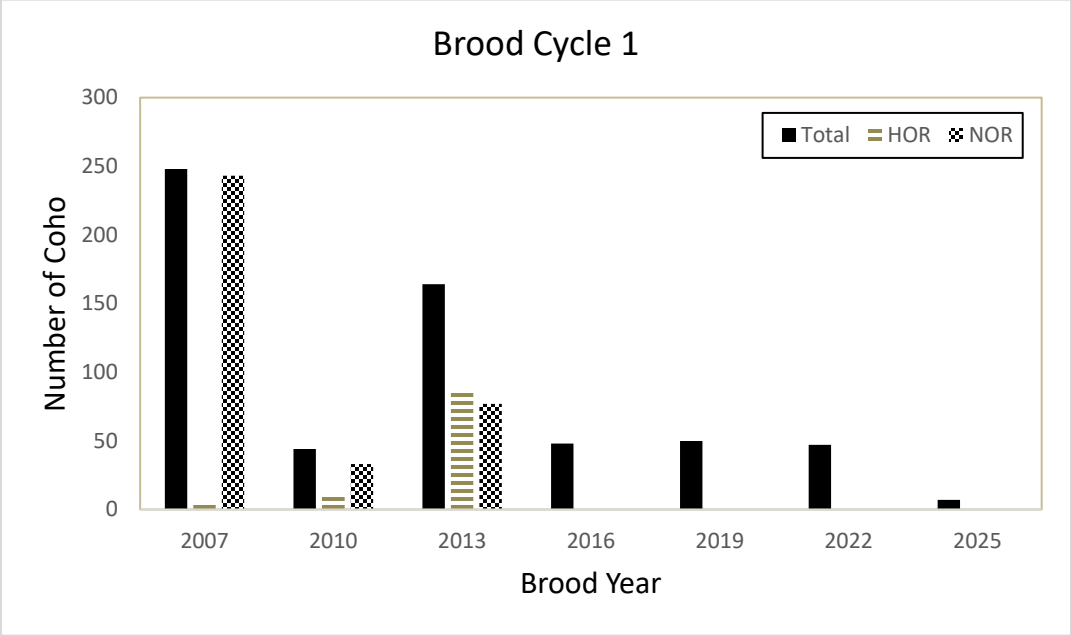

Figure 20. Brood cycle 1 comparison of natural origin (NOR) and hatchery origin (HOR) adult Coho Salmon returning to the Shasta River. Hatchery contribution not calculated for 2016, 2019, 2022, and 2025 due to no carcass recoveries.

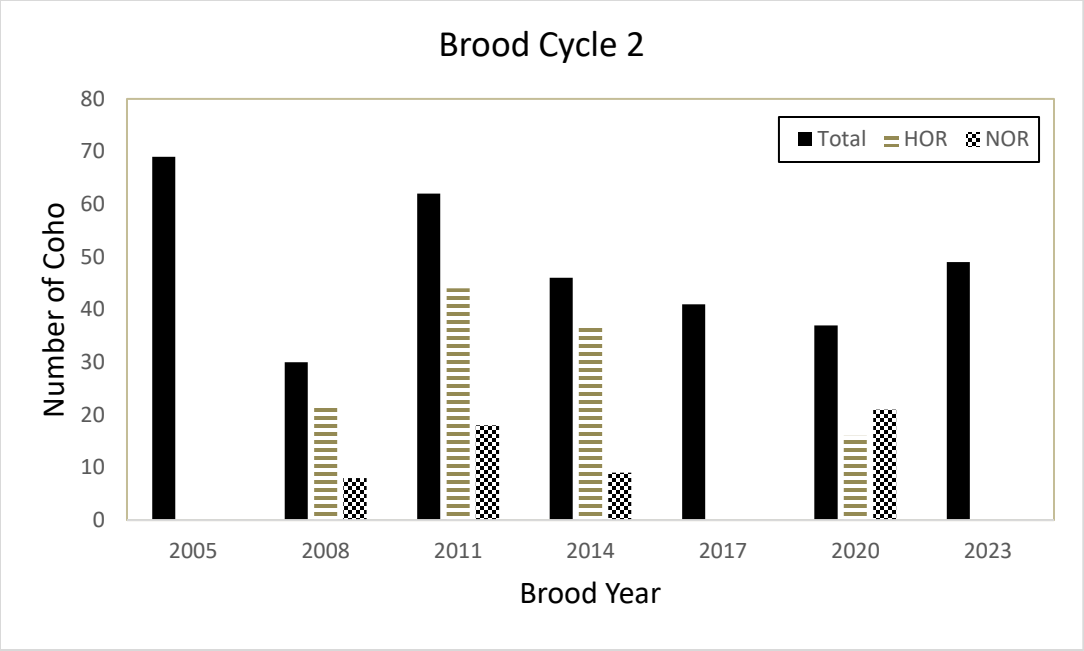

Figure 21. Brood cycle 2 comparison of natural origin (NOR) and hatchery origin (HOR) adult Coho Salmon returning to the Shasta River. Hatchery contribution was not calculated for 2005, 2017, and 2023 because no carcasses were recovered.

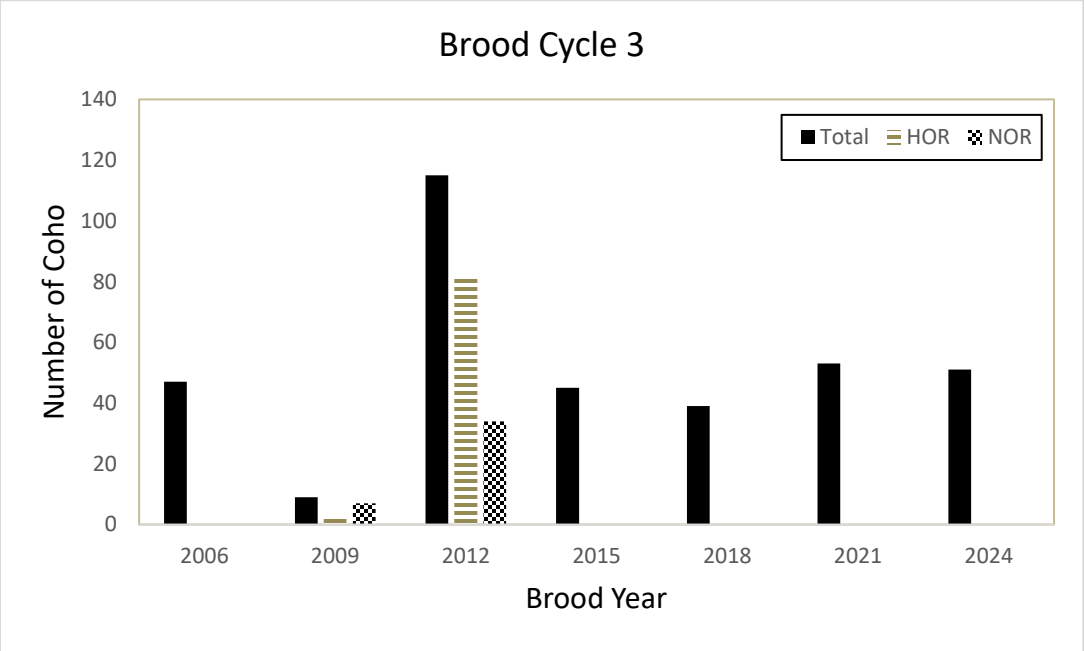

Figure 22. Brood cycle 3 comparison of natural origin (NOR) and hatchery origin (HOR) adult Coho Salmon returning to the Shasta River. Hatchery contribution not calculated for 2006, 2015, 2018, 2021, and 2024 due to unavailable data on hatchery composition.

The decline of Coho Salmon populations in the Klamath Basin, and the Shasta River in particular, has led to much discussion on the cost and benefits of different recovery strategies. The Hatchery Genetic Management Plan (HGMP) adopted for Iron Gate Hatchery, now Fall Creek Hatchery, identifies the IGH/FCH Coho Salmon program as

an integrated recovery program. This type of program is designed to aid in the recovery and conservation of a natural population, and the fish produced are intended to spawn in the wild or be genetically integrated with the targeted natural population (HGMP, 2013). The consensus among salmon geneticists involved in Shasta River Coho Salmon management is that risk of extinction (due to inbreeding and difficulty finding mates) outweighs any negative effects of IGH/FCH fish straying and spawning in the Shasta River. Research by Galbreath et al (2014) indicates that domestication effects carried by hatchery-origin Coho Salmon that spawn in natural areas are moderated within as few as two generations by selection pressures encountered in the natural environment. Improved, genetically based brood stock management practices at FCH are intended to increase the genetic diversity and fitness of FCH Coho Salmon and their progeny, so that when FCH fish stray into natural areas it will benefit the Shasta River Coho Salmon population and its recovery.

In 2025, zero Coho carcasses were recovered, and zero ad-clip observations were made, so no estimates of origin were calculated. Use of the adult trap to collect samples in future years may aid in the calculation of hatchery influence in the Shasta River. Increased straying of adult Coho Salmon due to releases from IGH, as well as hatchery juveniles entering the Shasta River during their downstream migration and possibly imprinting on Shasta River water, have been observed in recent years. Brood year 2023 Coho Salmon produced at FCH, which replaced IGH in 2023, will be marked with an ad-clip and coded wire tag.

Table 8. Estimates of hatchery strays as percentage of Coho Salmon entering the Shasta River, 2007-2025.

Year	Total # of Coho	Hatchery Stray Estimate	% Hatchery
2007	248	5	2%
2008	30	22	73%
2009	9	2	22%
2010	44	11	25%
2011	62	44	71%
2012	115	81	71%
2013	164	62	38%
2014	46	37	80%
2015	45	NA	NA
2016	48	NA	NA
2017	41	NA	NA
2018	39	NA	NA
2019	50	NA	NA
2020	37	16	43%
2021	53	NA	NA
2022	47	NA	NA
2023	49	NA	NA
2024	51	NA	NA
2025	7	NA	NA
Average	62.37	31.11	47%

Ongoing rotary trap operations at the mouth of the Shasta River (Nuñez-Guttierrez and Romero 2025) have resulted in reports documenting annual smolt point estimates,

which, along with annual adult escapement estimates, can provide a means of estimating the survival of Shasta River Coho Salmon from outmigration to adult escapement (Table 10). These relationships are complicated by the difficulty of adequately estimating the contribution of hatchery-origin spawners, estimating age structure, as well as the challenges of producing population estimates at extreme low abundance. Since 2001 (excluding brood years 2009, 2015, and 2017), Coho Salmon smolt to adult survival has ranged from 0.33% to 20.72% and has averaged 4.44% (Table 9).

Table 9. Shasta River natural origin Coho Salmon smolt and adult abundance, production, and survival.

Brood Year	Smolt Year	NOR Smolt Point Estimate	Age 2 Return Year	Age 3 Return Year	Age 2 return	Age 3 return	Age 2&3 return	Percent smolt survival
2001	2003	15,202	2003	2004		373	373	2.45%
2002	2004	2,609	2004	2005		69	69	2.64%
2003	2005	1,883	2005	2006		47	47	2.5%
2004	2006	8,968	2006	2007		244	244	2.72%
2005	2007	1,525	2007	2008		8	8	0.52%
2006	2008	335	2008	2009		7	7	2.09%
2007	2009	5,877	2009	2010		33	33	0.56%
2008	2010	157	2010	2011		17	17	10.83%
2009**	2011	64	2011	2012	1	22	23	35.94%
2010	2012	1,839	2012	2013	11	61	72	3.92%
2011	2013	612	2013	2014	1	1	2	0.33%
2012	2014	1,005	2014	2015	8	37	45	4.48%
2013	2015	7,268	2015	2016	2	46	48	0.66%
2014	2016	282	2016	2017	2	38	40	14.18%
2015**	2017	114	2017	2018	3	36	39	34.21%
2016	2018	4,319	2018	2019	3	50	53	1.23%
2017**	2019	116	2019	2020	0	36	36	31.01%
2018	2020	251	2020	2021	1	51	52	20.72%
2019	2021	715	2021	2022	2	45	47	6.57%
2020	2022	2,402	2022	2023	2	46	48	2.00%
2021	2023	1,029	2023	2024	3	46	49	4.76%
2022	2024	935	2024	2025	5	7	12	1.28%

Analyzing the comparisons of estimated adult Coho Salmon returns to yearling Coho Salmon production estimates (Nuñez-Guttierrez and Romero 2025) also produces freshwater survival estimates in the form of yearling Coho Salmon produced per adult return. The number of yearling Coho Salmon produced per returning adult has averaged 22.8 and ranged from a low of 2.5 to a high of 90 for brood years 2001-2023 (Table 10). As the number of yearlings produced per returning adult increases, it can be inferred that in-river conditions for Coho Salmon are improving. Conversely, as the number of

yearlings produced per returning adult decreases, it can be inferred that river conditions for Coho Salmon are worsening. Production is subject to variability in sex ratios of returning adults, as well as depensation effects that can occur at low population sizes. Refinements to these estimates will continue to be made in future years.

Table 10. Adult Coho Salmon estimates, yearling Coho Salmon production point estimates and ratio of yearling Coho Salmon produced per adult from 2001-2023.

Adult Brood Year	Adult Estimate	Smolt Year	Smolt Point Estimate	Smolts Produced Per Adult
2001	291	2003	15,202	52.2
2002	86	2004	2,609	30.3
2003	187	2005	1,883	10.1
2004	373	2006	8,968	24.0
2005	69	2007	1,525	22.1
2006	47	2008	335	7.1
2007	248	2009	5,877	23.7
2008	30	2010	157	5.2
2009	9	2011	64	7.1
2010	44	2012	1,839	41.8
2011	62	2013	612	9.9
2012	115	2014	1,005	8.7
2013	164	2015	7,268	44.3
2014	46	2016	282	6.1
2015	45	2017	114	2.5
2016	48	2018	4,319	90.0
2017	41	2019	116	2.8
2018	39	2020	251	6.4
2019	50	2021	715	14.3
2020	37	2022	2,402	64.9
2021	53	2023	1,029	19.4
2022	47	2024	935	19.9
2023	49	2025	559	11.4

STEELHEAD TROUT

The objectives of KRP have traditionally focused on monitoring the escapement of Chinook Salmon, and more recently Coho Salmon. In recent years, efforts have been made to extend the monitoring time frame to generate an estimate of adult Steelhead returning to the Shasta River. In 2025 the video monitoring station was run until December 16, 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. A net total of 208 Steelhead swam upstream past the Shasta video site. Returns of adult Steelhead trout to the Shasta River from 2006 to 2025 are shown in Figure 23.

Declines of Steelhead throughout California have been documented in recent decades and have been mainly attributed to habitat degradation. In the Shasta River, construction of the Dwinnell Dam in 1928 at River Mile 40 has blocked access to over 18 miles of high-quality Steelhead habitat since that time. The dam, along with other downstream diversions, has changed the Shasta River hydrograph and has contributed to an increase in summer water temperatures, limiting the availability of high-quality habitat for Steelhead (Moyle et al, 2008). As with Coho Salmon, another species with an extended freshwater period in its life history, Steelhead have been impacted by the recent, severe California multi-year drought. Ongoing land and water management projects in the upper Shasta River, targeted for the recovery of Coho Salmon, will undoubtedly benefit Steelhead as well.

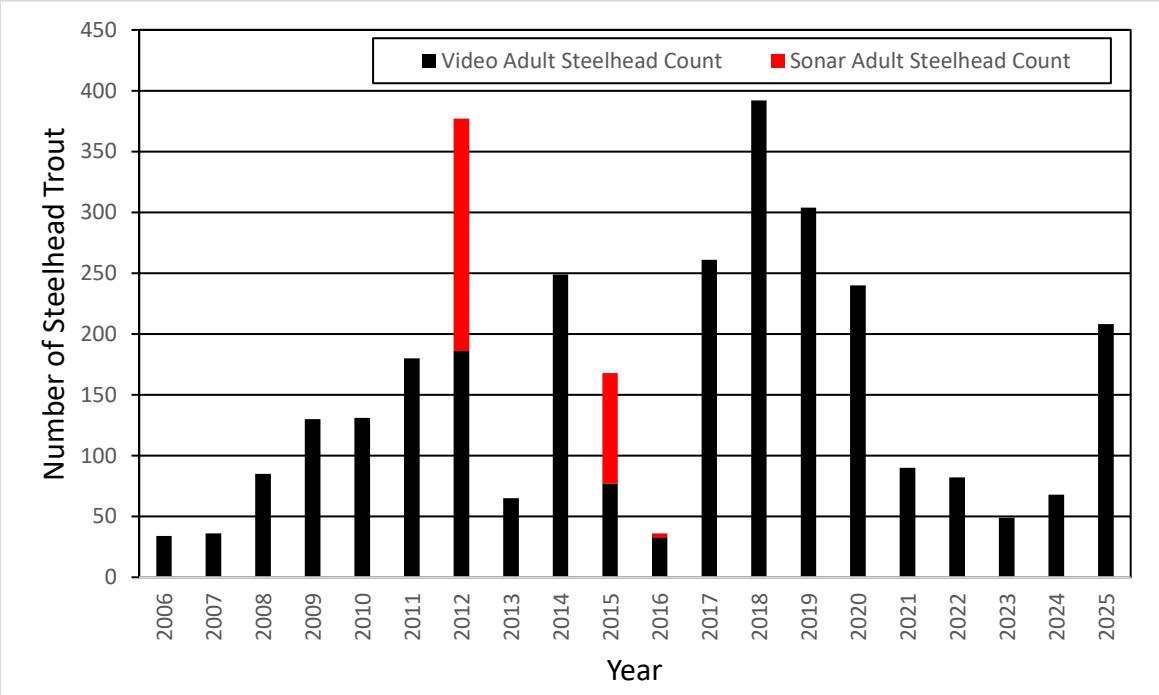

Figure 23. Adult Steelhead returning to the Shasta River, 2006-2025. These numbers are likely to represent minimum population sizes as migration may continue after weir removal.

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 staff would like to thank Shasta River landowners for their cooperation in granting access to their properties. KRP would also like to extend their gratitude to the Yreka Fisheries Program for sharing the rotary screw trapping data.

LITERATURE CITED

California Department of Fish and Wildlife, 2013. Hatchery and Genetic Management Plan for Iron Gate Hatchery Coho Salmon V 10. Prepared for National Oceanic and Atmospheric Administration, National Marine Fisheries Service.

Debrick, Amy J., Steven A. Stenhouse and William R. Chesney, 2015. Final Report, Shasta and Scott River Juvenile Salmonid Outmigrant Study. P0710307. Funded and prepared by the California Department of Fish and Wildlife, 1625 S. Main St., Yreka, CA. 96097 for the Shasta Valley Resource Conservation District.

Galbreath, P. F., M. A. Bisbee, Jr., D. W. Dompier, C. M. Kamphaus, and T. H. Newsome. 2014. Extirpation and tribal reintroduction of Coho Salmon to the interior Columbia River Basin. Fisheries 39(2):77-87

KRTAT (Klamath River Technical Advisory Team). 2026. Klamath River Fall Chinook Age-Specific Escapement, 2023 Run. Available from U.S. Fish and Wildlife Service, 1829 South Oregon Street, Yreka, CA, 96097.

Moyle, Peter, Joshua A. Israel and Sabra E. Purdy. 2008. Salmon, Steelhead and Trout in California. Center for Watershed Sciences, University of California, Davis, CA. 95616

NOAA Fisheries Northwest Science Center, 2017. Forecast of Adult Returns for Coho Salmon and Chinook Salmon. www.nwfsc.noaa.gov/research/divisions/fe/estuarine/oeip/g-forecast.cfm

Nuñez-Guttierrez, A. and R. Romero. 2026. 2025 Shasta River Juvenile Salmonid Outmigrant Study. California Department of Fish and Wildlife, Klamath Watershed Program.

Stenhouse, Steven A., Amy J. Debrick and William R. Chesney, 2016. Scott and Shasta River juvenile Chinook Salmon Out-migrant Study Multi-year Report, 2000-2015. California Department of Fish and Wildlife, Anadromous Fisheries Resource Assessment and Monitoring Program, 1625 South Main Street, Yreka, CA 96097

True, Kimberly, A. Voss, and J. Scott Foote. 2016. Myxosporean Parasite (Ceratonovashasta and Parvicapsula minibicornis) Prevalence of Infection in Klamath River Basin Juvenile Chinook Salmon, California-Nevada Fish Health Center FY 2016 Investigational Report: March-August 2016.

Williams T. et al. 2008 Framework for assessing viability of threatened Coho salmon in the southern Oregon/northern California coast evolutionarily significant unit. NOAA-TM-NMFS-SWFSC-432.