California Department of Fish and Wildlife
Klamath River Project
2025 Fall Creek Hatchery Annual Report

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ABSTRACT

A total of 1,245 fall-run Chinook Salmon, (*Oncorhynchus tshawytscha),* entered Fall Creek Hatchery (FCH) during the fall 2025 spawning season from October 13, 2025, through January 9, 2026. Klamath River Project (KRP) staff sampled every Chinook Salmon that entered FCH. Scale samples, sex, fork length (fl), and adipose fin clip status data were collected from all sampled Chinook Salmon. Male Chinook Salmon ranged in size from 36 to 96 cm fl, and female Chinook Salmon ranged from 45 to 81 cm fl. Based on scale analysis, the Klamath River Technical Team (KRTT) estimated that 13.8% (172) of the run were grilse. Females accounted for 39.4% (490) of the run while males accounted for 60.6% (755). Based on coded wire tag expansion, KRP staff estimated that 70.2% (874) of the Chinook Salmon entering FCH during the 2025 season were of hatchery origin.

In 2025, 26 Coho Salmon (*Oncorhynchus kisutch*) entered FCH during the spawning season and all 26 were held as broodstock. The recorded dates for the Coho Salmon run were from November 10, 2025, to December 22, 2025. KRP staff collected biological data (sex, fork length, presence of marks or clips, and tissue samples) on every Coho Salmon that entered the hatchery as well as scales from mortalities and Coho Salmon used in spawning. Otoliths were collected from all unmarked Coho Salmon used for spawning or recovered as mortalities. Of the trapped fish, 13 (50%) were males and 13 (50%) were females. 12 of the trapped fish had no marks and were considered natural origin, 1 had an adipose fin clip, and 13 had left maxillary clips indicating they were produced at FCH. Grilse were estimated to be less than 53 cm in fork length, and it was estimated that 1 (3.8%) of the trapped Coho Salmon were grilse, while 25 (96.2%) were adults. Of the 26 Coho Salmon trapped at FCH, all 26 were held as broodstock. Males held for broodstock ranged in size from 38 to 72 cm fl and the average fl was 65.6 cm and males represented 48% (12) of the broodstock used in spawning. Females held for broodstock ranged in size from 58 to 71 cm fl and the average fl was 63.6 cm and females represented 52% (13) of the broodstock. During the 2025 Coho Salmon spawning season mate selection was guided by the spawning matrix provided by NOAA which is designed to eliminate the spawning of closely related individuals.

INTRODUCTION

As part of the Klamath Dam Removal Project Iron Gate Hatchery (IGH) was decommissioned and all fish rearing at IGH were relocated to a new facility known as Fall Creek Hatchery (FCH) in 2024. Iron Gate Hatchery (IGH) was located adjacent to the Klamath River at river kilometer 306 (River Mile 190) just upstream of where Bogus Creek flows into the Klamath River in Siskiyou County, California. Fall Creek Hatchery was constructed on Fall Creek roughly 6 river miles up the Klamath River from IGH (Figure 1). FCH occupies a much smaller footprint than IGH and has a reduced capacity to rear Chinook Salmon relative to IGH (see table 1 for a comparison of numerical release goals for Chinook and Coho Salmon for IGH and FCH).

Klamath River Project

The California Department of Fish and Wildlife's (CDFW) Klamath River Project (KRP) conducts systematic sampling of fall-run Chinook Salmon (*Oncorhynchus tshawytscha*) annually during the spawning season at FCH. The purpose of the sampling is to characterize Chinook Salmon entering FCH in terms of timing, age and sex composition, and to recover data from all coded wire tags (CWT) recovered from the heads of adipose fin clipped (AD) Chinook Salmon. KRP staff also sample Coho Salmon (*Oncorhynchus kisutch*) that enter FCH, typically from mid-October through December. All Coho Salmon entering FCH are sampled, and spawning protocols are employed that align with the recommendations of the Hatchery and Genetic Management Plan (HGMP) for Fall Creek Gate Hatchery.

Marking Program

Tagging operations at FCH were conducted by FCH staff. All FCH produced Coho Salmon are now marked with an adipose fin clip and CWT, a deviation from IGH where all Coho were marked with a left maxillary clip (LM) before release. Approximately 25% of all fingerling Chinook Salmon and 100% of all yearling Chinook Salmon produced at FCH are adipose fin-clipped and implanted with CWTs. This allows for identification when they return to the hatchery or other locations during subsequent spawning seasons or when encountered in marine or in-river fisheries sampling. Data from CWT fish provide a reference of known-age fish which is used, along with scale samples and analysis of length frequency distribution, to determine the age composition of the run. The CWT data is also used to evaluate Chinook Salmon release strategies, survival rates, ocean distribution and harvest as well as in-river migration timing, straying, and harvest.

Table 1: Fall Creek Hatchery Production Goals

Species	Release type	IGH Release Goal	FCH Release Goal	Release Date
Chinook Salmon	Yearling	900,000	250,000	October 15th to November 20th
Chinook Salmon	Smolt	5,100,000	1,750,000	May 1st to June 15th
Chinook Salmon	Fry	0	1,250,000	Pre-March 31st
Coho Salmon	Yearling	75,000	75,000	March 15th to May 1st

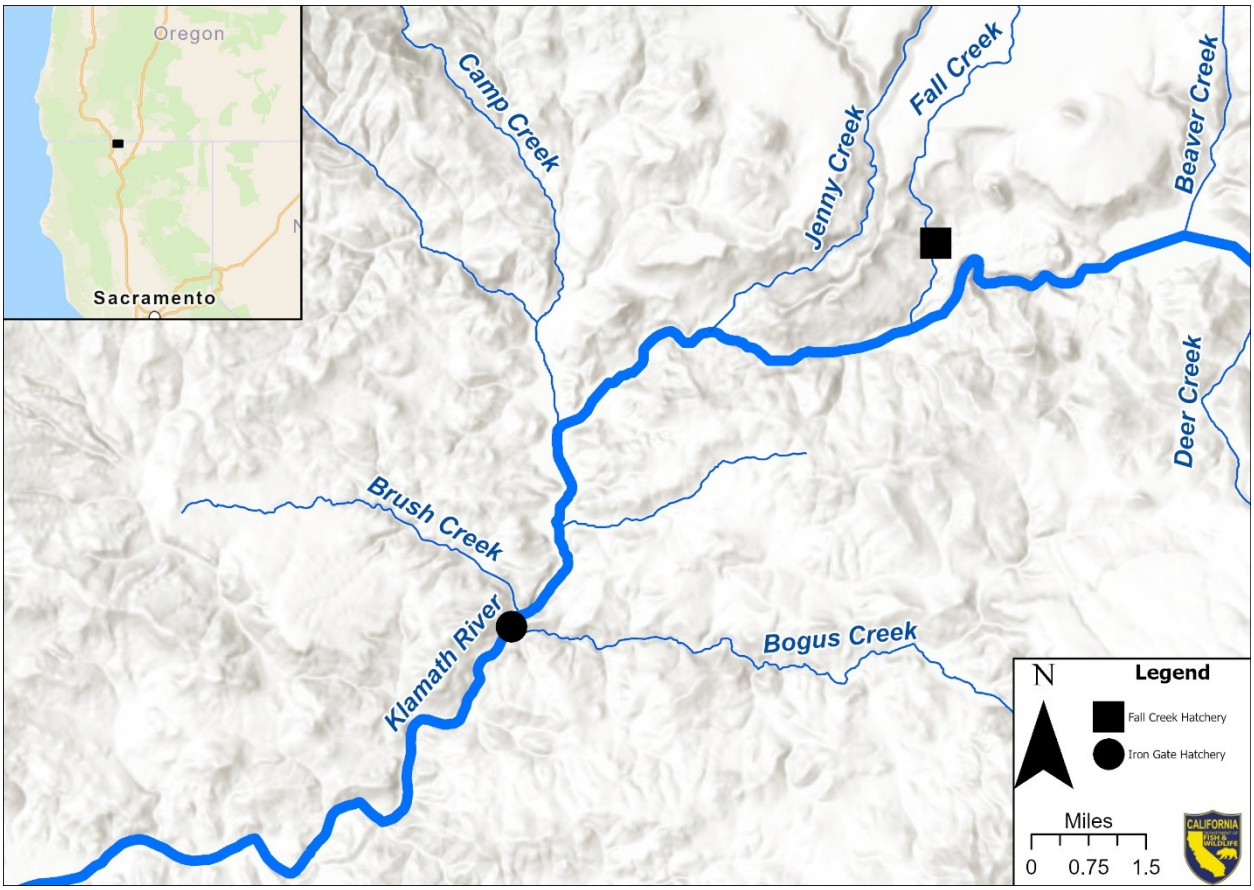

Figure 1:Iron Gate Hatchery and Fall Creek Hatchery and surrounding area, Siskiyou County, CA

MATERIALS AND METHODS

Chinook Salmon

FCH has a fish ladder on and fed by Fall Creek. This ladder leads directly to a raceway with a crowder to collect broodstock from Fall Creek. Due to the dam removal project, and similar to 2024, FCH adult returns were uncertain. Therefore, a broodstock management plan was written allowing FCH to trap fish at Bogus Creek and the IGH auxiliary ladder. These trapped fish were then transported to the FCH raceway. FCH staff operate a fish crowder which pulls fish from the raceway into the spawning building. Fish are then checked for ripeness and may either be spawned immediately or held in adjacent raceways until they've ripened.

In 2025, KRP staff sampled every Chinook Salmon spawned at FCH. Sampling included data collection on fork length, sex, scale samples, presence or absence of clips and/or marks, and spawning disposition. In preparation for a new release strategy of unmarked fry, CDFW will utilize parental based tagging (PBT) which is a genetic tissue sample collection technique allowing unmarked hatchery origin fish detectable through genetic

analysis by cataloging genetic information from the broodstock which is trackable in the offspring. FCH staff set aside every third spawning pair for the fry program and these broodstock were fin clipped. Heads were taken from all AD Chinook Salmon. All heads were transported to the KRP's Yreka laboratory for CWT extraction and reading.

Since 2015, Chinook Salmon at IGH/FCH have been spawned using a 1:1 male to female ratio. In this method, the eggs of one female Chinook Salmon and milt of one male Chinook Salmon are mixed in a pan. The eggs are water hardened prior to transport to the hatchery building. The egg lots are labeled by date, and individual pairings are not tracked when measured into Heath stack incubators.

Another methodology implemented in 2015 and continued in 2025, is the air spawning of Chinook Salmon and Coho Salmon. In this method a euthanized female fish is hung from a hook and a hypodermic needle inserted into the body ½ to 1 inch deep, usually in the hollow area below a pelvic fin. Air pressure applied at 2-3 psi forces the eggs to be expelled from the body cavity through the vent.

Grilse/adult and age composition determinations were made by the Klamath River Technical Team (KRTT 2026) using CWT information from known age fish and, length frequency analysis and scale age proportions from the systematic samples collected at the hatchery.

Coho Salmon

As Coho Salmon entered FCH during the 2025 season, hatchery personnel netted each fish and KRP staff collected biological data including: tissue sample, fork length, sex, and clip/tag information. The live Coho were then placed in a uniquely numbered 8" diameter PVC tube with ported caps and stationed in raceway racks to keep the fish alive. Tissue samples were sent via overnight mail to the NOAA lab in Santa Cruz, CA for genetic analysis and the creation of a weekly spawning matrix. The spawning matrix is designed to avoid the mating of closely related fish. Coho Salmon were not anaesthetized but kept in water throughout processing. In many years when Coho returns exceed the needs of the spawning project, excess Coho may be marked and released back to Fall Creek. In 2025, one excess Coho was released on January 9, 2026.

The Coho Salmon retained as potential broodstock were assigned a unique number, placed in individual PVC tubes, and placed in a raceway (Figure 2) with their heads oriented into the flow. Genetic results were shared by NOAA in the form of a spawning matrix. Coho Salmon that were included in the spawning matrix were checked in their tubes for spawning readiness and were either left in the tubes if not ready to spawn (or did not have suitable mates available) or brought into the spawning building from the round tanks, euthanized and spawned with fish chosen from the matrix. In 2025, Coho Salmon crosses consisted of two males to one female when possible. Half of each female's eggs are placed in labeled containers (Figure 3) and fertilized by one male for each container with the egg lots kept separate. IGH/FCH and KRP personnel tracked the use of marked vs. unmarked individuals and the use of grilse for spawning.

Figure 2: Coho brood stock in PVC tubes in a round tank.

Figure 3: Coho eggs from one female being split into two lots.

Laboratory staff developed a spawning matrix designed to avoid the spawning of closely related individuals. The weekly matrix, sent via e-mail to the KRP and FCH, displayed a series of columns with the brood stock ID number of each female Coho at the top of a

column, and beneath it, brood stock ID numbers of males in descending order of spawning suitability for that female. Male ID's highlighted in red with asterisks indicate that pair is too closely related and should not be spawned. (Table 2).

Table 2: Example of Coho spawning matrix

F_36FN	F_37F	F_39F
M_106M	M_115MN	M_106M
M_77M	M_83M**	M_113M
M_74M	M_96M**	M_79M

RESULTS

Chinook Salmon

Chinook Salmon began entering FCH on October 13, 2025. A total of 1,245 Chinook Salmon returned to FCH during the fall 2025 spawning season. Of these, KRP staff collected biological data including sex, fork length, clip information, and spawning disposition for 1,191 Chinook Salmon. The discrepancy of 54 fish between total count and total sampled is likely because the total count was made when fish were collected from the trap. Some fish were spawned and some fish were held in raceways to be spawned later. Sampling occurs after fish are killed and spawned; it's possible that 54 fish escaped from raceways or were taken by predators. Scale samples were collected from all fish. All Chinook salmon designated as broodstock to produce fry (every third pair) were tissue sampled and otoliths were collected from every 100th fish. The grilse and adult components of the 2025 run were estimated using scale age analysis (KRTAT, 2026), yielding approximately 172 grilse (13.8%) and 1,073 adults (86.2%) for a total run size of 1,245 (figure 4). Males accounted for 60.6% of the sampled fish (722) and females accounted for 39.4% (469). The last Chinook Salmon spawn date was November 24, 2025; however, one unmarked female Chinook Salmon was trapped at FCH on January 9, 2026, and was released back into Fall Creek. Sampled male Chinook Salmon ranged in size from 36 to 96 cm fl and averaged 62.9 cm (Figure 5). Sampled female Chinook Salmon ranged from 45 to 81 cm fl and averaged 63.9 cm (Figure 6).

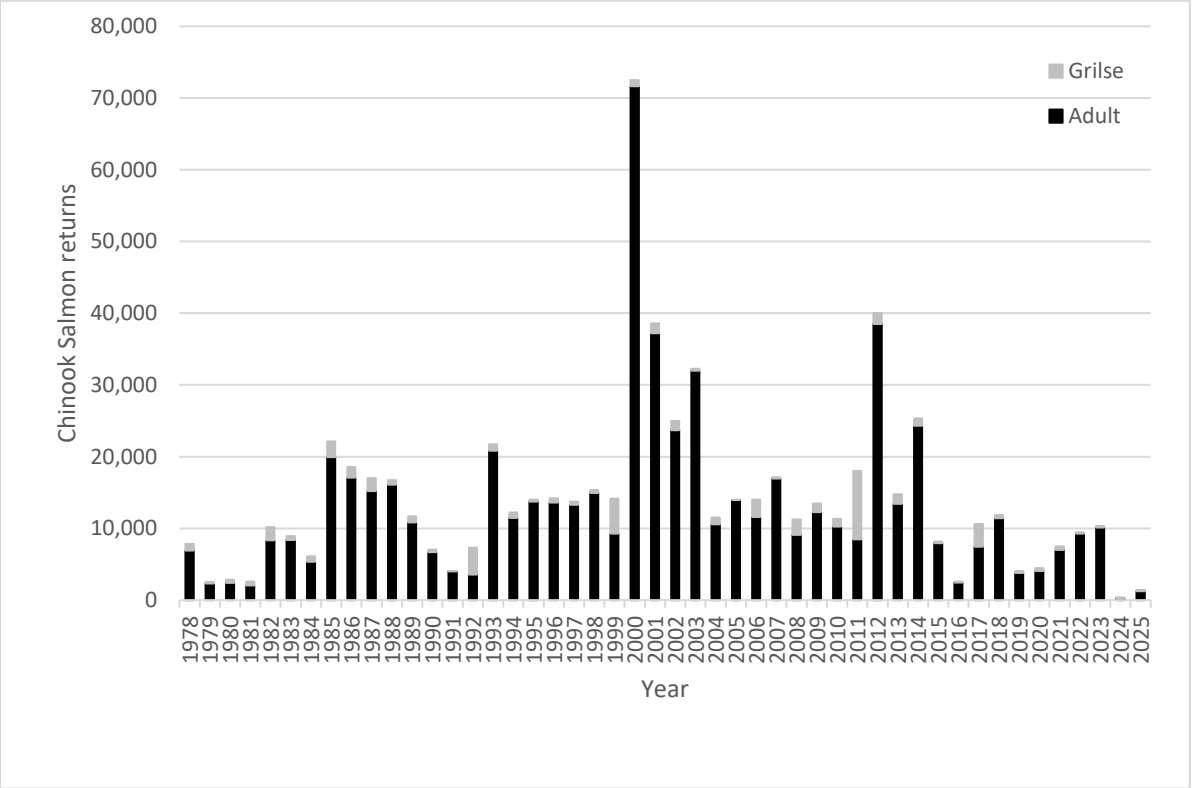

Figure 4: Annual returns of Fall Run Chinook Salmon to Iron Gate Hatchery1978-2023 and Fall Creek Hatchery 2024-2025

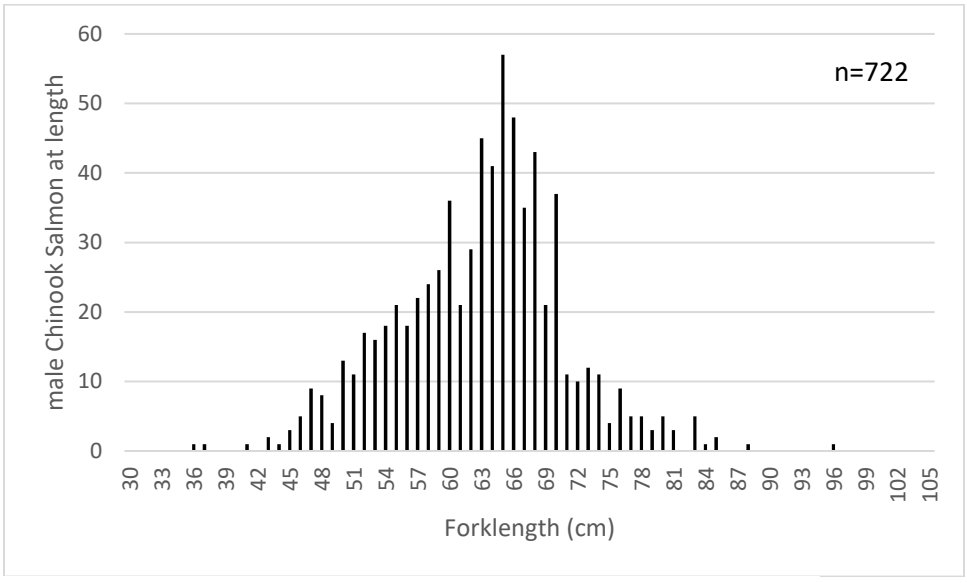

Figure 5: 2025 FCH male Chinook Salmon fork length histogram

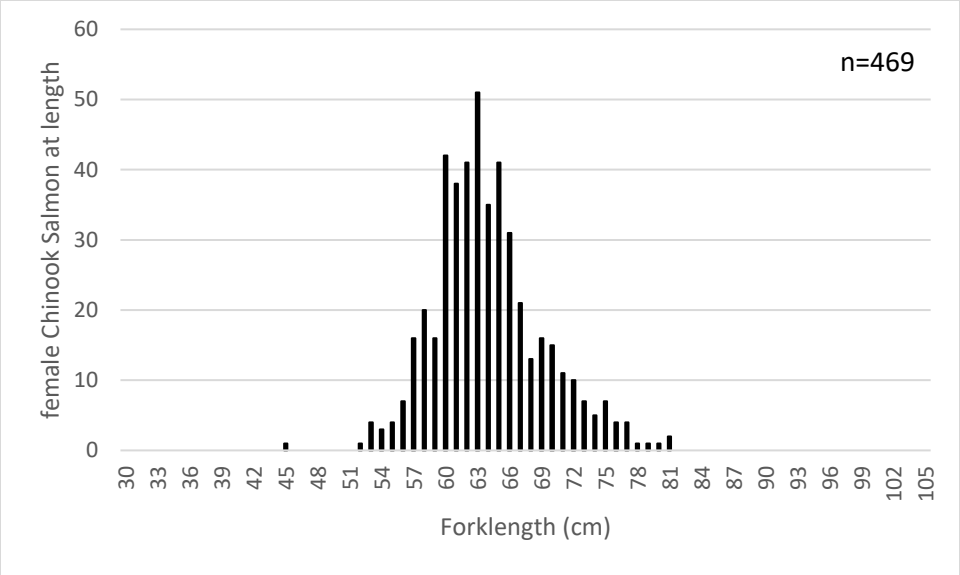

Figure 6: 2025 FCH Female Chinook Salmon fork length histogram

Heads from 268 AD Chinook Salmon were collected for CWT recovery, from which, positive reads were obtained for 246 (Table 3). The remainder were either lost prior to, or during extraction (2), did not have a tag (18), or the tags were unreadable (2). One of the tags treated as unreadable was actually read as 186846, however, subsequent research indicates this tag code has never been used anywhere in the U.S. or Canada. Genetic testing is being conducted to determine origin of that fish. In the meantime, the tag is being treated as an unreadable tag. The contribution of lost or unreadable CWTs was estimated by applying the proportions of known CWTs (246) to the 4 lost or unreadable CWTs (Table 4).

The estimated contribution of unknown CWTs was then added to the contribution of known CWTs to determine the total contribution of hatchery-origin Chinook Salmon entering FCH. Of the 246 CWTs recovered and successfully read, 245 came from IGH/FCH, and one CWT came from Trinity River Hatchery. Based on the expansion of CWTs, KRP staff estimated 70.2% of the Chinook Salmon entering IGH during the 2025 season were of hatchery origin (Table 3). Of the CWT returns (positive reads) in 2025, 15 (6%) were from yearling release groups, 179 (73%) were from advanced fingerling release groups, and 52 (21%) were from fingerling release groups (Table 3). An estimate of 836 (70.2%) Chinook Salmon were of hatchery origin during the 2025 run (Table 3). This is based on the total number of Chinook Salmon sampled (1,191), and can be expanded further to include the 54 fish lost between entering the hatchery and spawning. Based on the total return of 1,245 Chinook Salmon to FCH, it is estimated that 874 were of hatchery origin.

Table 3: 2025 FCH Chinook Salmon CWT data and estimates

Estimated Contribution of Fall Run Chinook Produced at FCH to Total Run at FCH Based on CWT's Recovered in 2025										
CWT	**Release Location**	**Brood Year**	**Age**	**Release Type**	**Number Recovered**	**Production Multiplier**	**Expanded Estimate**	**Estimate by age**	**Percent by age**	**comments**
062046	IGH	2020	5	AF	1	1.012657925	1.012657925			TRANSF TO TRH AND BACK
061582	IGH	2020	5	Y	4	1.011225921	4.044903684	5.0575616	0.61	TRANSF TO FCH AND BACK
061545	IGH	2021	4	F	4	1.000199409	4.000797637			
061546	IGH	2021	4	F	1	1.014608829	1.014608829			
062269	IGH	2021	4	F	6	1.005628984	6.033773902			
062270	IGH	2021	4	F	2	1.007862183	2.015724366			
060478	IGH	2021	4	AF	5	1.010099783	5.050498914			
060788	IGH	2021	4	AF	5	1.015745841	5.078729204			
061569	IGH	2021	4	AF	1	1.010095793	1.010095793			
062079	IGH	2021	4	AF	3	1.018124511	3.054373534			
062271	IGH	2021	4	AF	3	1.018746139	3.056238416			
062386	IGH	2021	4	AF	4	1.01926182	4.077047278			
062388	IGH	2021	4	AF	4	1.018643511	4.074574046			
061869	IGH	2021	4	Y	11	1.063491081	11.69840189	50.164864	6.10	TRANSF TO FCH AND BACK
060033	IGH	2022	3	F	3	4.115682573	12.34704772			
060034	IGH	2022	3	F	4	4.019925832	16.07970333			
060035	IGH	2022	3	F	2	4.028601389	8.057202777			
060036	IGH	2022	3	F	2	4.025807809	8.051615619			
062838	IGH	2022	3	F	1	1.018134715	1.018134715			
062977	TRH	2022	3	F	1	4.064498769	4.064498769			
060032	IGH	2022	3	AF	145	4.036336788	585.2688343			
062875	IGH	2022	3	AF	7	4.059085079	28.41359555	663.30063	80.65	
062236	IGH	2023	2	F	8	4.083744939	32.66995951			BORN AT IGH REARED AT FCH RELEASED AT IGH
062239	IGH	2023	2	F	7	4.094539607	28.66177725			BORN AT IGH REARED AT FCH RELEASED AT IGH
062240	IGH	2023	2	F	7	4.018888726	28.13222108			BORN AT IGH REARED AT FCH RELEASED AT IGH
062243	IGH	2023	2	F	3	4.109773303	12.32931991			BORN AT IGH REARED AT FCH RELEASED AT IGH
062245	IGH	2023	2	F	1	1.060112402	1.060112402			BORN AT IGH REARED AT FCH RELEASED AT IGH
062234	IGH	2023	2	AF	1	1.018951115	1.018951115	103.87234	12.63	BORN AT IGH REARED AT FCH RELEASED AT FCH
Total run:	1191		Number recovered:		246	**Expanded estimate:**			**822.3953994**	

Estimated Contribution of Unknown CWTs				
200000	CWT Lost	2		
300000	Head Lost	0		
400000	CWT Unreadable	2		
Subtotal		4	**Total estimate:**	**835.77**
Unknown Estimate:		**13.37**	**Hatchery Proportion:**	**0.7017**

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.

Table 4: 2025 FCH CWT Distribution of Unknowns (2 lost tags and 2 unreadable tags)

2025 FCH Estimated Contribution of the 4 Ad Clipped Chinook with Unknown CWT Codes Based on Proportional Distribution of Known CWTs						
CWT	**Brood Year**	**# of CWTs recovered**	**Proportion of CWTs Recovered**	**Estimated Number**	**Production Multiplier**	**Expanded Estimate**
062046	2020	1	0.004065041	0.01626016	1.01265792	0.01646598
061582	2020	4	0.016260163	0.06504065	1.01122592	0.06577079
061545	2021	4	0.016260163	0.06504065	1.00019941	0.06505362
061546	2021	1	0.004065041	0.01626016	1.01460883	0.0164977
062269	2021	6	0.024390244	0.09756098	1.00562898	0.09811014
062270	2021	2	0.008130081	0.03252033	1.00786218	0.03277601
060478	2021	5	0.020325203	0.08130081	1.01009978	0.08212193
060788	2021	5	0.020325203	0.08130081	1.01574584	0.08258096
061569	2021	1	0.004065041	0.01626016	1.01009579	0.01642432
062079	2021	3	0.012195122	0.04878049	1.01812451	0.04966461
062271	2021	3	0.012195122	0.04878049	1.01874614	0.04969493
062386	2021	4	0.016260163	0.06504065	1.01926182	0.06629345
062388	2021	4	0.016260163	0.06504065	1.01864351	0.06625324
061869	2021	11	0.044715447	0.17886179	1.06349108	0.19021792
060033	2022	3	0.012195122	0.04878049	4.11568257	0.200765
060034	2022	4	0.016260163	0.06504065	4.01992583	0.26145859
060035	2022	2	0.008130081	0.03252033	4.02860139	0.13101143
060036	2022	2	0.008130081	0.03252033	4.02580781	0.13092058
062838	2022	1	0.004065041	0.01626016	1.01813472	0.01655504
062977	2022	1	0.004065041	0.01626016	4.06449877	0.06608941
060032	2022	145	0.589430894	2.35772358	4.03633679	9.51656641
062875	2022	7	0.028455285	0.11382114	4.05908508	0.46200968
062236	2023	8	0.032520325	0.1300813	4.08374494	0.53121885
062239	2023	7	0.028455285	0.11382114	4.09453961	0.46604516
062240	2023	7	0.028455285	0.11382114	4.01888873	0.45743449
062243	2023	3	0.012195122	0.04878049	4.1097733	0.20047675
062245	2023	1	0.004065041	0.01626016	1.0601124	0.0172376
062234	2023	1	0.004065041	0.01626016	1.01895112	0.01656831
		246		4		13.3722829

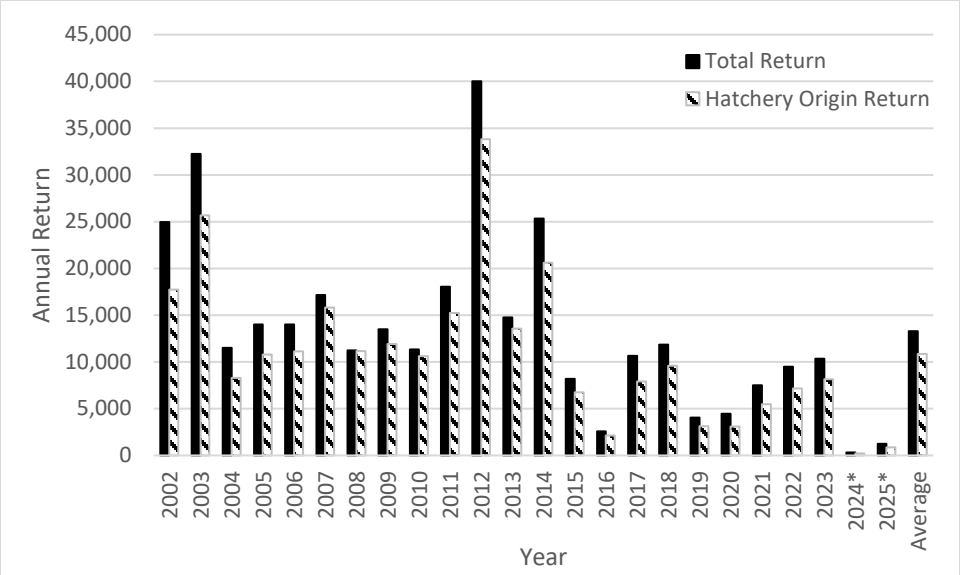

Figure 7: Iron Gate Hatchery Fall Run Chinook returns by origin 2002-2023 and Fall Creek Hatchery 2024-2025.

Ich Sampling

Due to limited staff and time, Ich sampling did not take place in 2025.

Coho Salmon

During the 2025 season, 26 Coho Salmon entered FCH with the first Coho Salmon being trapped on November 10, 2025, and the last on December 22, 2025. 13 (50%) were males and 13 (50%) were females. 12 of the trapped fish had no marks, one had an adipose fin clip and 13 had left maxillary clips indicating they were produced at IGH. Based on length frequency analyses, grilse were estimated to be less than 53 cm in fl and it was estimated that 1 (3.8%) of the trapped Coho Salmon were grilse, while the remaining 25 (96.2%) were adults. Of the 26 Coho Salmon trapped at FCH, all 26 were held as broodstock. Males held for broodstock ranged in size from 38 to 72 cm fl and the average fl was 65.6 cm. Females held for broodstock ranged in size from 58 to 71 cm fl and the average fl was 63.6 cm.

Table 5: IGH/FCH Coho Salmon mark proportions 1997-2025

Year	# Sampled	LM	RM	AD	OTHER	MARKED	UNMARKED	% MARKED
1997	2174	1970	5	28	6	2009	165	92.41
1998	669	378	0	2	0	380	289	56.80
1999	169	153	0	1	0	154	15	91.12
2000	1395	1067	4	58	4	1133	262	81.22
2001	2573	2130	138	51	8	2327	246	90.44
2002	1301	1006	25	38	7	1076	225	82.71
2003	1558	838	69	58	4	969	589	62.20
2004	1729	1203	32	69	1	1305	424	75.48
2005	1425	1282	2	1	0	1285	140	90.18
2006	301	203	2	16	0	221	80	73.42
2007	779	643	6	2	1	652	127	83.70
2008	1296	1268	2	0	1	1271	25	98.07
2009	45	29	7	0	0	36	9	80.00
2010	259	222	1	0	0	223	36	86.10
2011	586	522	0	0	1	523	63	89.25
2012	644	609	4	1	1	615	29	95.50
2013	1268	1158	2	1	2	1163	105	91.72
2014	384	346	0	5	0	351	33	91.41
2015	72	59	0	2	0	61	11	84.72
2016	86	66	0	0	0	66	20	76.74
2017	122	98	0	0	0	98	24	80.33
2018	200	170	3	0	0	173	27	86.50
2019	116	105	0	0	0	105	11	90.52
2020	242	221	0	0	0	221	21	91.32
2021	1150	1128	0	0	0	1128	22	98.09
2022	821	750	0	1	0	751	71	91.47
2023	552	477	0	0	0	477	75	86.41
2024	45	17	0	0	0	17	28	37.78
2025	26	13	0	1	0	14	12	53.85

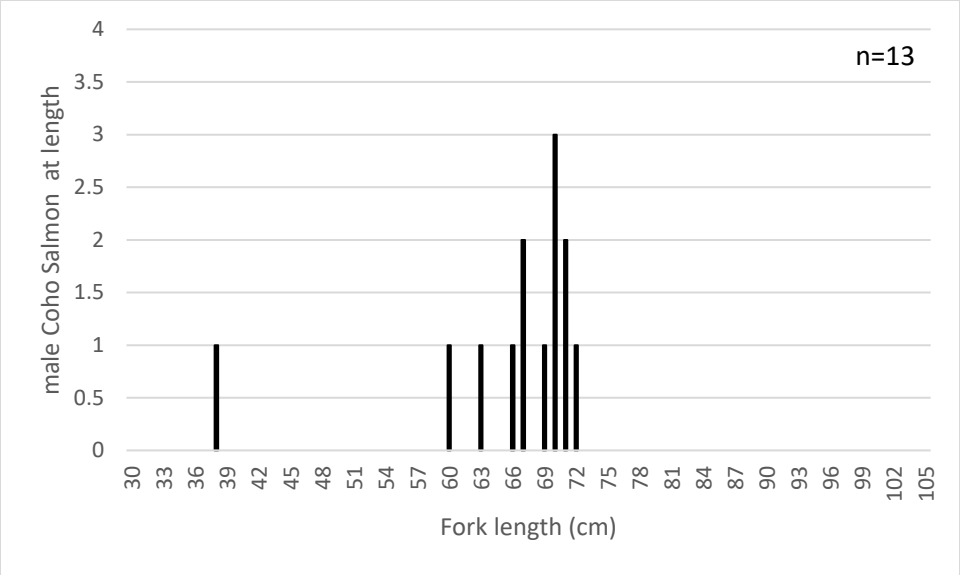

Figure 8: 2025 FCH Male Coho Salmon fork length histogram

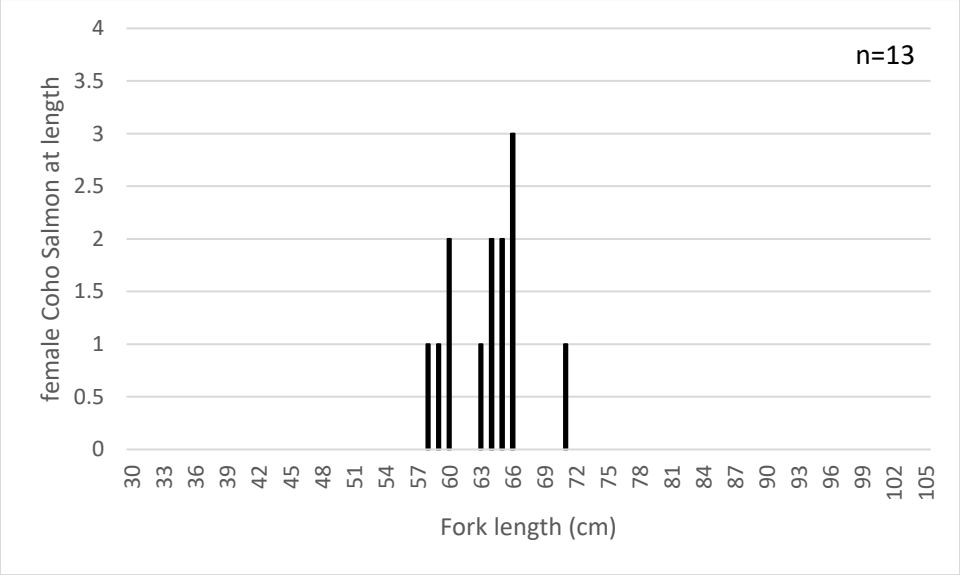

Figure 9: 2025 FCH Female Coho Salmon fork length histogram

DISCUSSION

Chinook Salmon

The 2025 run of Chinook Salmon to FCH (1,245) was the second cohort of Chinook Salmon to have access to habitat created by the Klamath Dam Removal Project and the second run of Chinook to return to the new hatchery. 2025 returns were considerably higher than the 2024 return of Chinook Salmon to FCH (317). Escapement below is plotted against IGH historic data, but to provide further context, FCH maximum production is half the number of Chinook Salmon typically released from IGH.

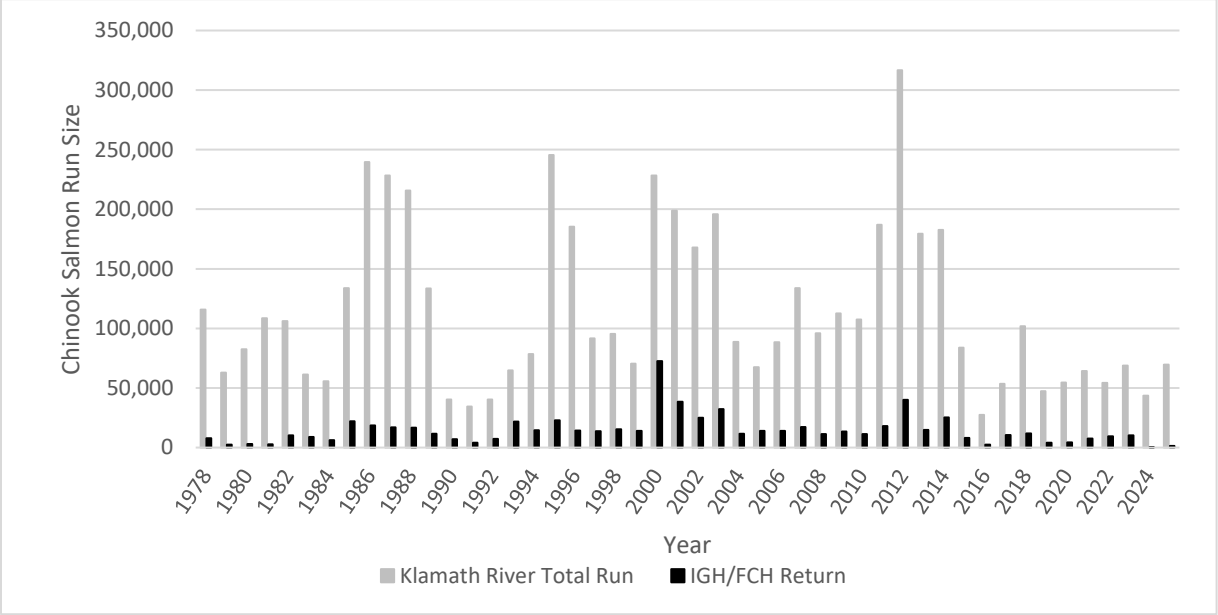

Figure 10: Klamath River and IGH/FCH Chinook Salmon Returns 1978-2025

The brood years returning to the Klamath River in 2025 were subjected to adverse river conditions during their outmigration as juveniles as well as in the marine environment, including low flows and poor water quality. Both *C. shasta and P. minibicornis* are myxozoan parasites which are known to be significant contributors to mortality in juvenile fish exposed to the parasites migrating downstream (Ray et al., 2013). Fish returning in 2025 also faced a new system as the Klamath Dam Removal Project completion impacted water quality downstream, altered the flow and temperature regimes (in absence of 4 reservoirs), and opened a large area of new habitat above the former dams. Two-year-old Chinook Salmon (brood year 2023) returning in 2025 out migrated in the Spring-Fall period of 2024, during which, dam removal activities including draw down and removal were occurring. These activities impacted water quality and water clarity, likely impacting the out migrating Chinook Salmon.

Chinook Salmon egg take in 2025 was 1,276,950, which deviated significantly from the egg take goal of 4,500,000. Production was limited by the number of returning fish. The Chinook Salmon releases from FCH may include fry, smolt, and yearling releases. Current production goals include releases of 1,250,000 Chinook Salmon fry in March, 1,750,000 smolts in May and June, and 250,000 yearlings the following October and November. Between 1990 and 2023, data on 28 brood years (excluding 2020 due to no

fingerling releases and 2021-2023 due to incomplete return data) show only seven years in which fingerlings outperformed yearlings (Table 6). In 2020 no fingerlings were released at IGH so there is no comparison of release strategies available for that year.

Table 6: IGH /FCH Smolt and Yearling Marked Releases and Recoveries Brood Years 1990-2023

	Smolt	Smolt	Smolt	Yearling	Yearling	Yearling	
Brood Year	**# CWTs Released**	**# CWTs Returned**	**% Return**	**# CWTs Released**	**# CWTs Returned**	**% Return**	**Ratio of yearling to smolt return**
1990	188595	713	0.378	95880	740	0.77180	2.041
1991	191200	96	0.050	90982	167	0.18355	3.656
1992	185464	1015	0.547	74024	269	0.36340	0.664
1993	188562	40	0.021	98099	196	0.19980	9.419
1994	194644	94	0.048	86564	453	0.52331	10.836
1995	191799	85	0.044	90172	954	1.05798	23.873
1996	196648	162	0.082	95396	581	0.60904	7.393
1999	182131	686	0.377	91220	514	0.56347	1.496
2000	187417	277	0.148	100702	707	0.70207	4.750
2001\[a]	198311	11	0.006	110167	764	0.69349	125.025
2002	210114	367	0.175	109711	295	0.26889	1.539
2003	261888	70	0.027	48592	60	0.12348	4.620
2004	205950	691	0.336	98752	215	0.21772	0.649
2005	209754	194	0.092	103157	445	0.43138	4.664
2006	309671	224	0.072	103361	230	0.22252	3.076
2007	307204	340	0.111	103876	300	0.28881	2.609
2008\[b]	986141	269	0.027	192339	197	0.10242	3.755
2009	1119054	10224	0.914	264253	581	0.21987	0.241
2010\[c]	671755	2473	0.368	261332	278	0.10638	0.289
2011	1158028	2694	0.233	286947	844	0.29413	1.264
2012	1040836	1112	0.107	263614	25	0.00948	0.089
2013	1117134	233	0.021	263836	462	0.17511	8.396
2014	965584	337	0.035	263272	969	0.36806	10.546
2015	911162	2049	0.225	241678	524	0.21682	0.964
2016	107045	440	0.411	262946	289	0.10991	0.267
2017	1063044	251	0.024	264155	628	0.23774	10.069
2018	585255	185	0.032	255529	1130	0.44222	13.990
2019	994637	528	0.053	967023	6063	0.62698	11.811
2020**/***	0	0	0.000	1988762	2185	0.10987	
2021*/**	971809	64	0.007	1462849	45	0.00308	0.467
2022*/**	1487217	13	0.001	1125443	157	0.01395	15.959
2023*/**	2138239	26	0.001	279944	1	0.00036	0.294
AVERAGE			**0.155**			**0.33086**	
						Average:	**9.18**
* Incomplete returns for BY 2021-2023							
**2020-2023 Advanced fingerlings pooled with yearlings							
***2020 No fingerlings were released							
\[a]BY 2001 smolt releases subject dry conditions and very low returns							
\[b] BY 2008 was the first to receive 25% constant fractional mark							
\[c] BY 2010 smolt release tagged at 17.16% due to disease and river conditions							

Coho Salmon

26 Coho Salmon returned to FCH in 2025 and were the second age class of Coho Salmon to return to the Klamath River after dam removal. Coho analysis in this document compares FCH and IGH data although the two hatcheries have distinct differences. The Hatchery Genetic Management Plan (HGMP 2023) was developed for FCH as part of the CDFW's application for an ESA section 10(a) (1)(A) permit for hatchery operation. The HGMP is intended to guide hatchery practices toward the conservation and recovery of listed species, specifically, the upper Klamath River Coho Salmon population unit. Recommendations include the use of the Coho Salmon spawning matrix, bird exclusion netting in the outdoor rearing raceways, and the installation of a new water filtration system in the hatchery building. The HGMP also recommends increasing the proportion of natural origin broodstock (pNOB target 20-50%) and the proportion of jacks (pJacks) included in the broodstock (Table 7).

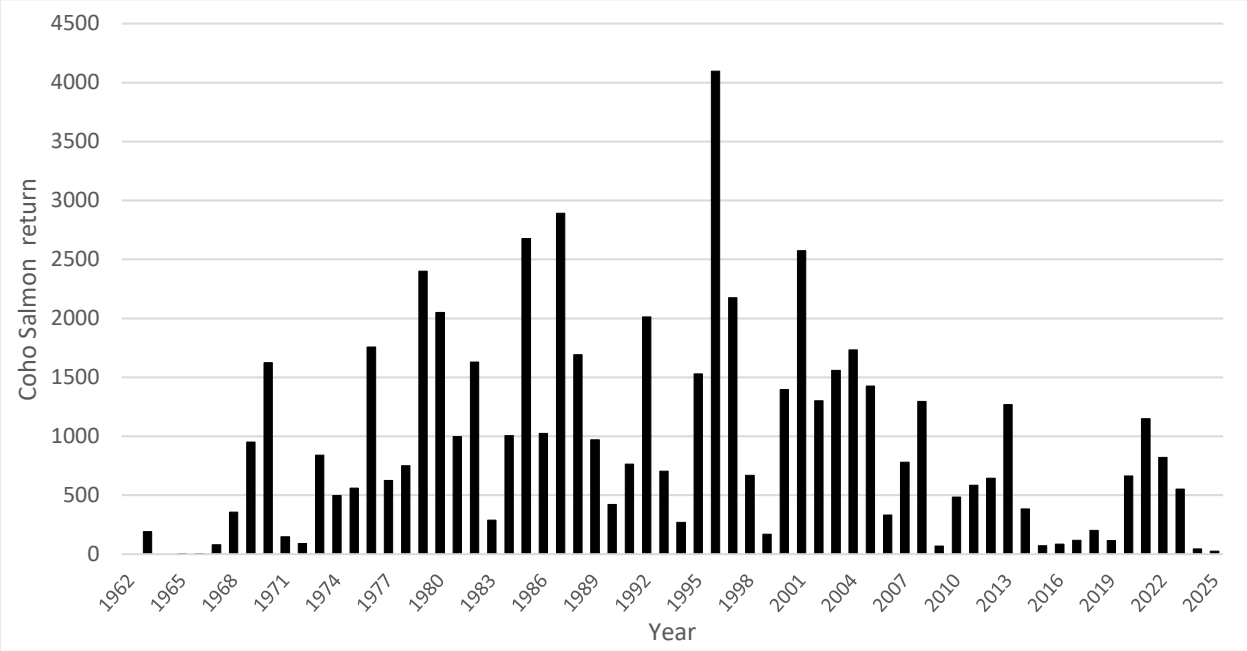

Figure 11: Coho Salmon run size at Iron Gate Hatchery 1963-2023 and Fall Creek Hatchery 2024-2025.

Unmarked Coho Salmon are presumed to be of non-hatchery origin and are incorporated into spawning as close to the wild broodstock target as possible, if the NOAA matrix shows they are suitable as brood stock. Proportions of marked and unmarked Coho Salmon that entered IGH from 1997 to 2025 are shown in Table 7.

Table 7: IGH/FCH Coho Salmon Broodstock Data 1993 -2025

Year	Adult Male	Female	Total Adults	Jacks	Total Run	Females Spawned	Natural Origin Broodstock	pNOB	pJacks	# Eggs	Fecundity	Yearlings released	Egg to Smolt Survival	Date released
1993	361	314	675	29	704	219	?	~15	~1	503,326	2,298	79,506	16%	1995
1994	100	72	172	97	269	57	?	~15	~1	141,397	2,481	74,250	53%	1996
1995	708	793	1501	29	1530	294	?	~15	~1	782,170	2,660	81,489	10%	1997
1996	1,715	1,831	3546	551	4097	200	?	~15	~1	547,255	2,736	79,607	15%	1998
1997	825	1,047	1872	302	2174	126	16	6.3	~1	304,728	2,418	75,156	25%	1999
1998	243	268	511	158	669	122	75	30.7	~1	298,357	2,446	77,147	26%	2000
1999	90	61	151	18	169	35	5	7.1	~1	86,519	2,472	46,250	53%	3/29/2001
2000	304	441	745	650	1395	95	52	27.4	~1	270,151	2,844	67,933	25%	3/27/2002
2001	972	1,494	2466	107	2573	126	22	8.7	~1	404,370	3,209	74,271	18%	3/27/2003
2002	566	627	1193	108	1301	187	68	18.2	~1	609,193	3,258	109,374	18%	3/29/2004
2003	609	708	1317	241	1558	197	172	43.7	~1	502,048	2,548	74,716	15%	4/13/2005
2004	630	865	1495	239	1734	276	10	1.8	~1	799,623	2,897	89,482	11%	4/17/2006
2005	596	799	1395	30	1425	103	10	4.9	~1	295,101	2,865	118,487	40%	4/25/2007
2006	112	151	263	69	332	85	10	5.9	~1	236,406	2,781	53,950	23%	4/9/2008
2007	300	325	625	154	779	124	10	4.0	~1	316,155	2,550	117,832	37%	4/17/2009
2008	508	770	1278	18	1296	148	9	3.0	~1	455,480	3,078	121,000	27%	4/8/2010
2009	21	25	46	24	70	20	6	30.0	40	53,435	2,672	22,236	42%	4/14/2011
2010	193	235	428	57	485	80	21	26	18	259,490	3,244	155,840	60%	3/29/2012
2011	248	204	452	134	586	57	26	23	11	151,241	2,653	39,250	26%	3/18/2013
2012	98	203	301	343	644	64	12	9	64	158,651	2,479	78,000	49%	3/17/2014
2013	552	653	1205	63	1268	80	37	23	17	224,071	2,801	89,500	40%	3/17/2015
2014*	39	95	134	250	384	62	24	31	51	121,421	1,958	27,568	23%	4/5/2016
					0	20				37,350	1,868	27,568	74%	4/5/2016
2015	13	21	34	38	72	13	9	52	40	22,240	1,711	17,232	77%	3/24/2017
2016	30	26	56	30	86	23	22	47	49	43,705	1,900	34,376	79%	3/16/2018
2017	33	60	93	29	122	39	24	31	32	74,966	1,922	57,242	76%	3/18/2019
2018	65	74	139	61	200	58	32	28	48	103,661	1,787	73,946	71%	3/14/2020
2019	46	64	110	6	116	49	13	14	11	83,756	1,709	59,259	71%	3/12/2021
2020	133	133	266	397	663	76	21	13	28	144,864	1,906	109,980	76%	3/15/2022
2021	500	590	1090	60	1150	79	16	10	6	145,065	1,836	105,647	73%	2/23/2023
2022	329	324	653	168	821	57	27	24	16	111,875	1,963	93,254	83%	4/16/2024
2023	273	261	534	18	552	59	47	47	4	127,795	2,166	79,609	62%	3/17/2025
2024	21	24	45	0	45	20	23	88	0	42,464	2,123	28,988	68%	3/16/2026
2025	12	13	25	1	26	13	15	83	6	25,067	1,928			
Avg	**351**	**424**	**775**	**140**	**887**	**98**	**29**	**24**	**27**	**256,313**	**2,432**	**73,938**	**29%**	

During the 2025 season, Coho Salmon that entered FCH during October while the Chinook Salmon spawning season was still underway were released. Additionally, any excess Coho Salmon not needed for the breeding program, or that were genetically incompatible with all other held fish, were released. Despite infrastructure challenges, early holding of Coho Salmon and more frequent spawning may be necessary during years of small Coho Salmon returns. More frequent spawning also minimizes pre-spawn (tube) mortality. Proportions of Coho Salmon retained at FCH and released into the Klamath River between 2004 and 2025 are shown in Figure 12.

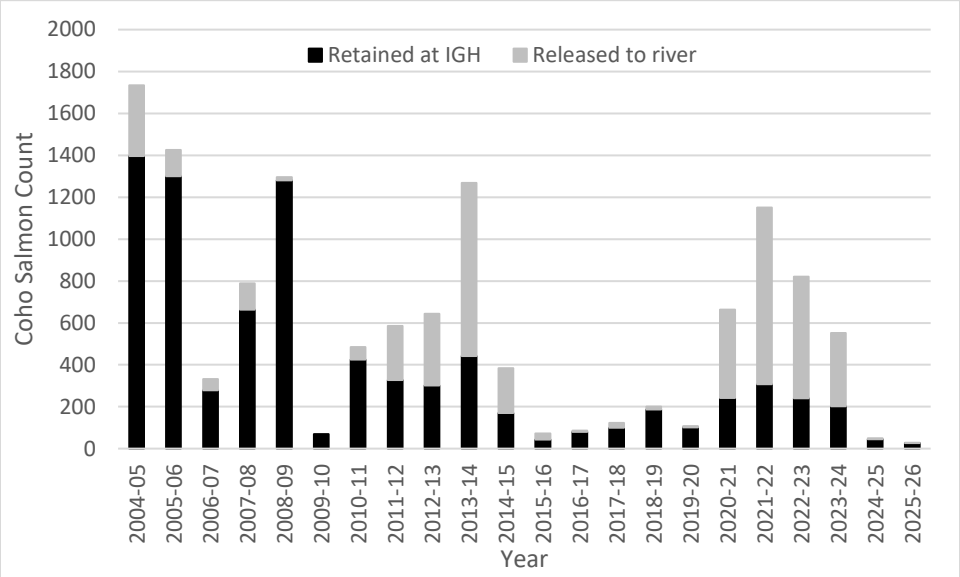

Figure 12: Coho Salmon Released and Retained for Spawning at Iron Gate Hatchery 2004-2023 and Fall Creek Hatchery 2024-2025.

The relatedness coefficient (Rxy) of pairs of Coho Salmon spawned at IGH during the 2025 season with the use of the NOAA lab spawning matrix is shown in Figure 13. Green bars represent the optimal pairings of males and females that could be achieved if the most unrelated male was spawned with its most unrelated female for each mating. In the absence of the spawning matrix and if pairs were selected purely at random, the resulting Rxy values are represented by blue bars, and the yellow bars represent actual crosses. Highly inbred pairings result in Rxy values > 0.125.

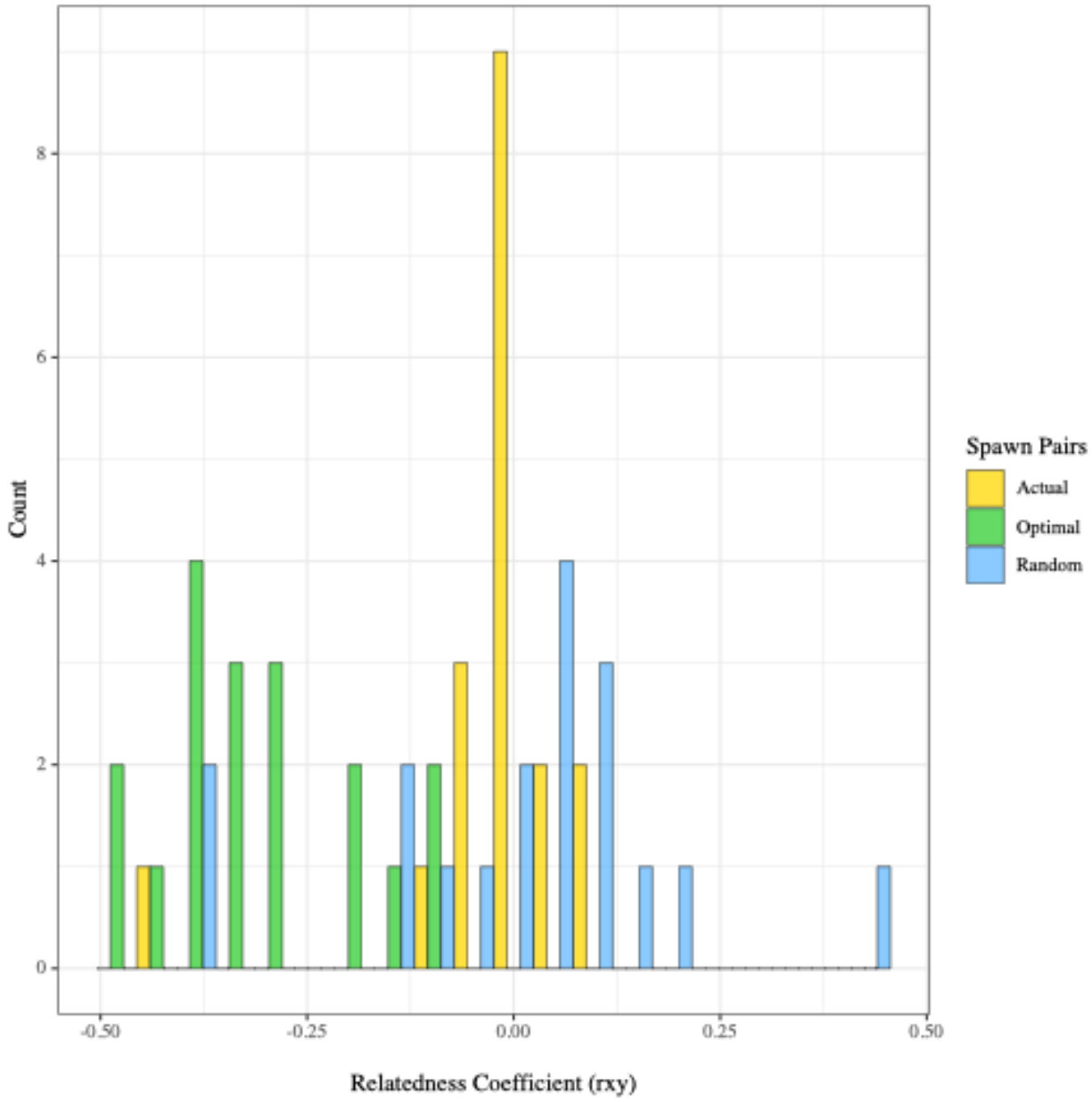

Figure 13: 2025 FCH Coho Salmon Relatedness Plot

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REFERENCES

Buttars, Braden. 2025. Constant Fractional Marking/Tagging Program for Iron Gate Hatchery Fall-run Chinook Salmon, 2025 Marking Season. Pacific States Marine Fisheries Commission: bbuttars@psmfc.org

California Department of Fish and Game, National Marine Fisheries Service Southwest Region Joint Hatchery Review Committee. 2001. Final Report on Anadromous Salmonid Fish Hatcheries in California. Review Draft June 27, 2001. 79pp.

California Department of Fish and Game, Pacific Power and Light Company. 1996. Iron Gate Hatchery Production Goals and Constraints. 3pp.

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.

California Department of Fish and Wildlife. 2023. Hatchery and Genetic Management Plan for Fall Creek Hatchery. Prepared for National Oceanic and Atmospheric Administration, National Marine Fisheries Service.

California Hatchery Scientific Review Group. 2012. California Hatchery Review: Statewide Report. 100 pp.

Garza, John Carlos, and Molecular Ecology & Genetic Analysis Team, 2012. Population Genetic Structure of Coho Salmon in the Klamath River. Southwest Fisheries Science Center.

Gilbert-Horvath, Libby. 2019. Observed relatedness coefficients of actual spawned pairs, optimally spawned pairs and randomly chosen pairs for IGH Coho during the 2018 season. NOAA Southwest Fisheries Science Center Salmonid Genetic Laboratory.

Hallett, S., R. Ray, C. Hurst, R. Holt, G. Buckles, S. Atkinson, J. Bartholomew. 2012. Density of the Waterborne Parasite *Ceratomyxa shasta* and Its Biological Effects on Salmon. *Applied and Environmental Microbiology, 78*(10), 3724-3731.

Hileman, J. and D. Giudice. 2021. Report for 2020 Monitoring of Returning Adult Chinook for *Ichythyophythirius multifiliis* (Ich) parasite in the Upper Klamath and Upper Trinity River, CDFW Klamath/Trinity Program.

KRTT (Klamath River Technical Team). 2026. Klamath River Fall Chinook Age-Specific Escapement, River Harvest, and Run Size Estimates, 2025 Run.

Pacific Fishery Management Council. 2025. *Preseason Report I: Stock Abundance Analysis and Environmental Assessment Part 1 for 2024 Ocean Salmon Fishery Regulations.* (Document prepared for the Council and its advisory entities.) Pacific Fishery Management Council, 7700 NE Ambassador Place, Suite 101, Portland, Oregon 97220-1384.

Ray, A., and J. Bartholomew. (2013). Estimation of transmission dynamics of the *Ceratomyxa shasta* actinospore to the salmonid host. *Journal of Parasitology, 140*, 907-916.

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.

Voss, A., Benson, C., & Freund, S. (2022). Myxosporean Parasite (Ceratonova shasta and Parvicapsula minibicornis) Prevalence of Infection in Klamath River Basin Juvenile Chinook Salmon, March – July 2021. U.S. Fish & Wildlife Service. California – Nevada Fish Health Center, Anderson, CA.