Tulalip Tribes Natural Resources Department Report

SKYKOMISH RIVER JUVENILE SALMON OUT-MIGRATION STUDY PROGRESS REPORT

February – June 2025

Report and Data Analysis by Heidi Stewart
Screw Trap Operations Managed by Michael Abrahamse

Tulalip Natural Resources Department
6406 Marine Dr.
Tulalip, WA 98271

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INTRODUCTION

Due to considerable declines in salmon populations, fisheries managers and stakeholders have been working collaboratively to restore salmon runs in the Snohomish watershed. In 1994, a partnership of 41 organizations formed the Snohomish Basin Salmon Recovery Forum (the Forum) to implement a watershed-scale, scientifically based adaptive management strategy to better inform salmon recovery. The Snoqualmie sub-basin is managed by a partnership of local tribes and municipalities called the Snoqualmie Watershed Forum.

In 2005, the Forum adopted the Snohomish River Basin Salmon Conservation Plan to coordinate fisheries management on a watershed scale. Central to this approach is the collection of high-quality monitoring data. To inform planning with the best available science, it is necessary to gather and analyze data on Chinook and Coho Salmon abundance, productivity, survival, escapement, spatial structure, and life-history diversity within the Snohomish system (Snohomish Basin Salmonid Recovery Technical Committee, 2005). Information on population trends and inter-annual variability is critical for guiding recovery actions, improving understanding of system productivity and capacity, and enhancing harvest-management modeling and run forecasting. Monitoring production and survival, along with physical, chemical, and biological conditions, also provides a means to evaluate habitat restoration effectiveness, recovery actions, habitat conditions, and potential ecological trajectories in the basin.

The importance of robust monitoring intensified after the National Marine Fisheries Service (NMFS) listed Puget Sound Chinook Salmon Oncorhynchus tshawytscha as threatened under the federal Endangered Species Act (ESA) in 1999. This listing included Chinook Salmon from the Snohomish River basin, encompassing sub-populations from the Skykomish and Snoqualmie Rivers. Declines in many Puget Sound Coho Salmon Oncorhynchus kisutch runs have also resulted in their designation as a species of concern under the ESA. This report focuses on Chinook and Coho Salmon because recovery efforts targeting these species will also benefit other federally listed salmonids in the watershed.

A key component of this long-term monitoring strategy has been the operation of rotary screw traps in the Skykomish and Snoqualmie rivers. For the past 24 years, these projects have sampled juvenile Chinook and Coho Salmon as they emigrate to Puget Sound. The trapping efforts aim to estimate natural production, migration patterns, and freshwater survival by directly quantifying juvenile emigration, evaluating trap efficiency, and assessing influential environmental attributes. The Tulalip Tribes' trapping project is classified as a high-priority effort by the Forum because it is essential for stock assessment, population monitoring, and run forecasting (Snohomish Basin Salmonid Recovery Technical Committee, 2005).

SKYKOMISH RIVER TRAPPING SITE

The current trap site is located 26.5 miles upriver on the Skykomish River and six miles up from the confluence with the Snoqualmie River (Figure 1). It is in the tail-out of a wide pool/run as it transitions into a riffle, confined by two gravel point bars (Figure 2). The wetted width of the Skykomish River at this point is ~325 ft. during the spring out-migration period and the channel's bank full width is ~490 ft. The channel's maximum depth at the site is ~5 ft. at summer low-flow levels and approaches ~18.5 ft. at bank full depth. The channel gradient is < 1% and the substrate is mostly gravel and cobble. When fishing, the trap is positioned in the thalweg, near the center of the river (Figure 2). Land use adjacent to the current project site is principally agricultural with relatively intact riparian vegetation. Existing riparian vegetation is primarily cottonwood and alder with some planted cedar and spruce. At the immediate trapping site, the river right is composed of a gravel bar adjacent to a cottonwood stand. The left bank is just downstream of a rip-rapped bank with planted riparian vegetation integrated into a cottonwood stand and a larger cottonwood grove downstream on the inside bend. This land has been purchased by the Tulalip Tribes for stream restoration.

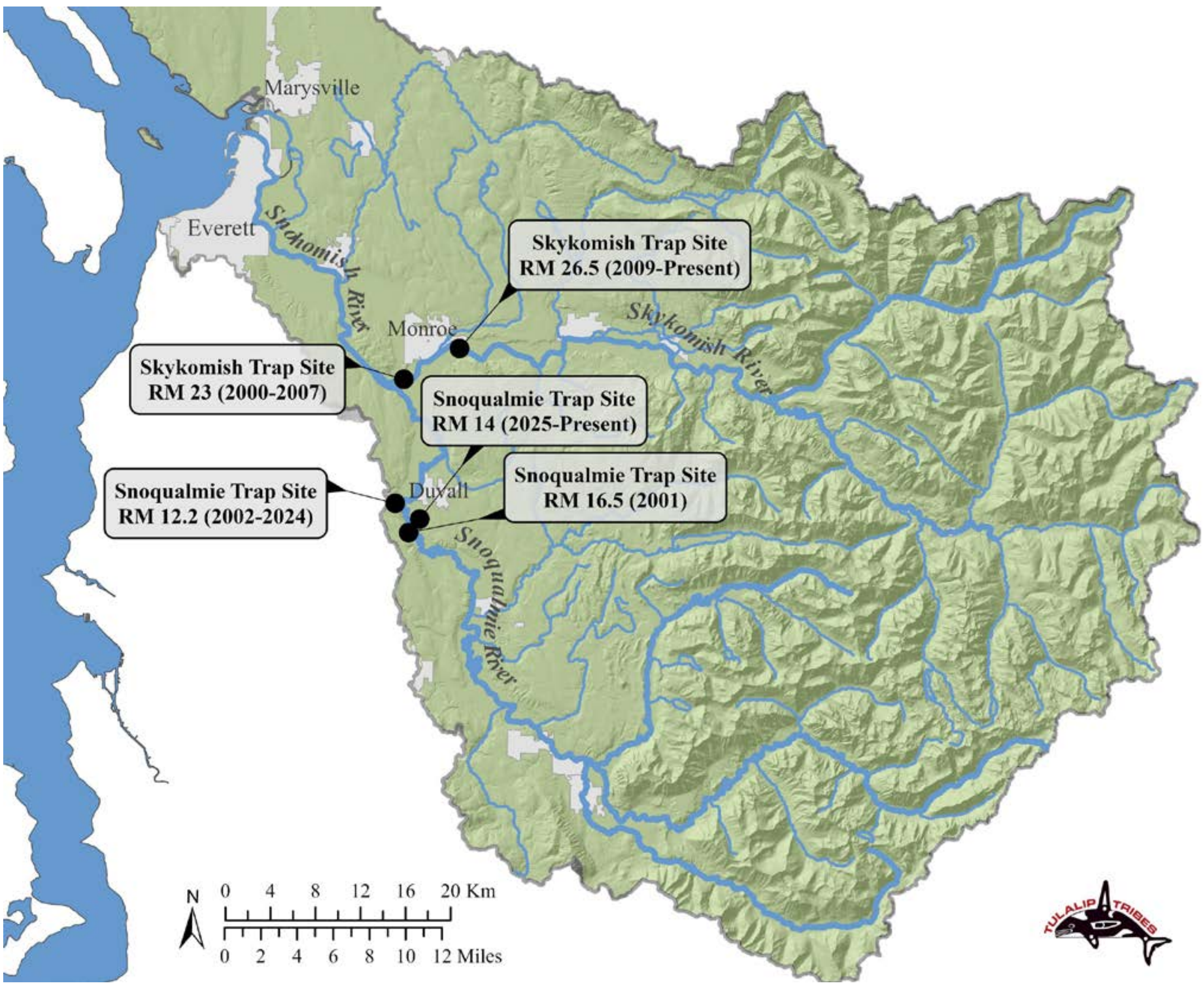


Figure 1: Map of the Snohomish watershed with the locations of the trap sites on the Skykomish and Snoqualmie Rivers.

Figure 2: Aerial photograph of the trap site at river mile 26.5 on the Skykomish River. The yellow X indicates the approximate trap fishing position.

SUMMARY OF SAMPLING OPERATIONS

The Skykomish River rotary screw trap operates during the juvenile salmon outmigration season, from February through June. Sampling is conducted on 4–5 weeknights and 3 weekdays each week, stratified by Julian week (JW) to allow more accurate year-to-year comparisons. In 2025, trapping occurred from February 11 to June 20. Overall, the trap operated for 1291 hours which is above average for the last several years (Table 1). A total of 30 observed salmonid mortalities occurred during trapping and handling, including four unmarked sub-yearling Coho Salmon and 26 Chum Salmon. There were no observed mortalities for sub-yearling or yearling Chinook. A detailed summary of the season's catch is available in Appendix A.

Catch numbers for the 2025 season were well above average for sub-yearling Chinook and above average for yearling Coho. The number of unmarked sub-yearling Chinook Salmon caught was 258% of the project average, while unmarked yearling Coho Salmon was 135% of the project average (947 hrs; Table 1). Unmarked yearling Chinook had a similar catch compared to last season with a very slight increase of 15 to 21 individuals caught throughout the season. Steelhead catch for unmarked individuals was higher than last season and increased from 21 to 69 individuals. Catch per unit effort calculations and production estimates found similarly high numbers for sub-yearling Chinook, suggesting that environmental conditions were generally supportive of early life-stage survival.

CATCH PER UNIT OF EFFORT (CPUE)

Catch data are standardized into catch per unit effort (CPUE), which represents the number of fishes caught per hour of fishing effort. CPUE can be averaged over a given period by dividing the total catch by the total fishing hours, facilitating comparisons both within and across years. Based on CPUE data, outmigration for unmarked Chinook Salmon sub-yearlings increased rapidly in mid-February and mid-March, and they gradually decreased after mid-March (Figure 3). The out-migration timing of yearling Coho Salmon is more consistent annually, typically spanning between late April through May (Kubo et al. 2013). The peak CPUE for yearling Coho Salmon in 2025 occurred within this expected timeframe.

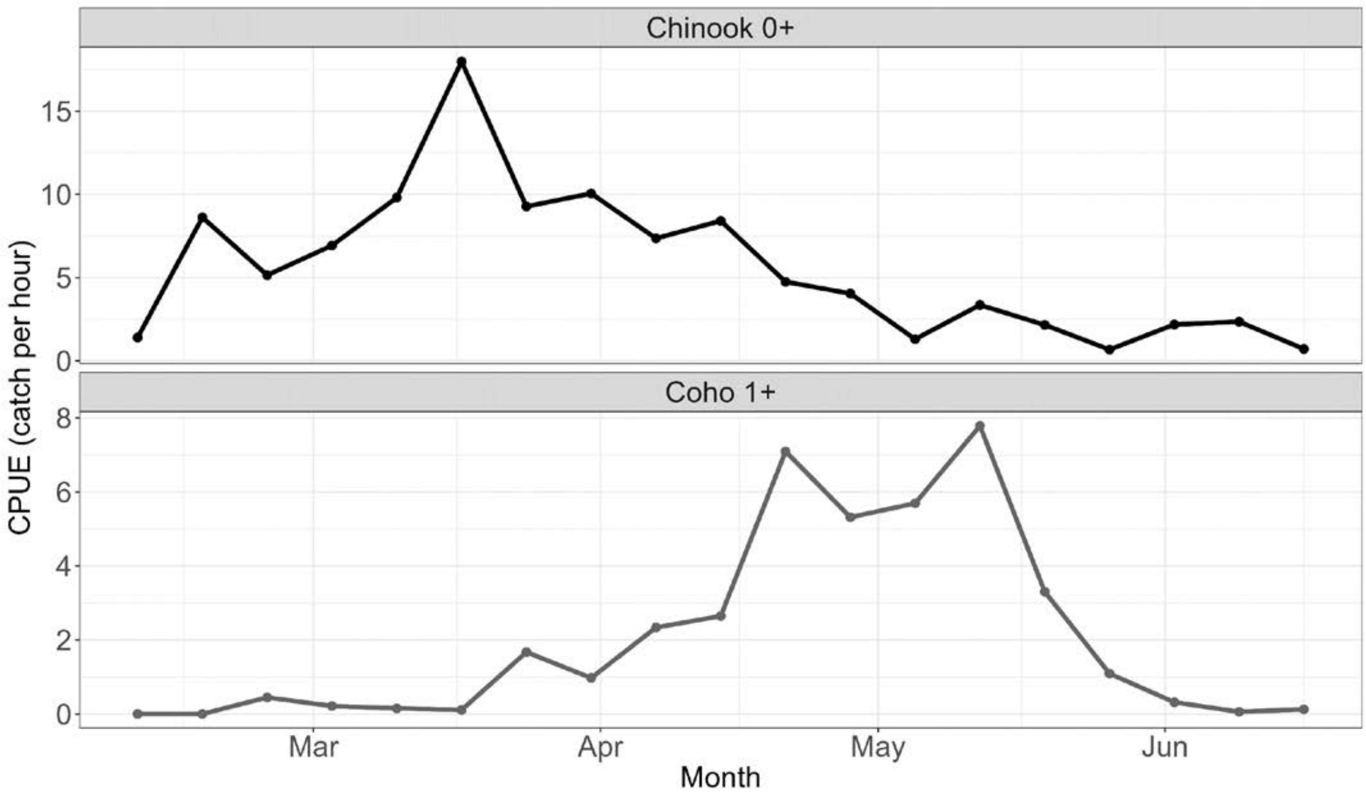


Figure 3. Natural-origin sub-yearling (0+) Chinook Salmon and yearling (1+) Coho Salmon CPUE by julian week at the Skykomish River trap, 2025.

The average annual salmonid CPUE on the Skykomish trap has varied throughout the project due to changing sampling conditions and the strength of each year's out-migrant cohort. Last year, catch rates for both sub-yearling Chinook and yearling Coho were significantly low, with CPUE well below the project average since the trap's relocation in 2009. This season, however, saw very high catch rates, with CPUE well above the project average for both species and the highest on record for Chinook. The yearling Coho catch and CPUE reached about 135% of the project average. The Chinook catch was substantially higher, at 258% of average, marking a considerable increase in outmigrants for the entire project duration (26 years).

Table 1. Annual sampling effort, catch totals, and catch CPUE (fish per hour) for unmarked sub-yearling Chinook and yearling Coho Salmon at the Skykomish River rotary screw trap 2000-2025.

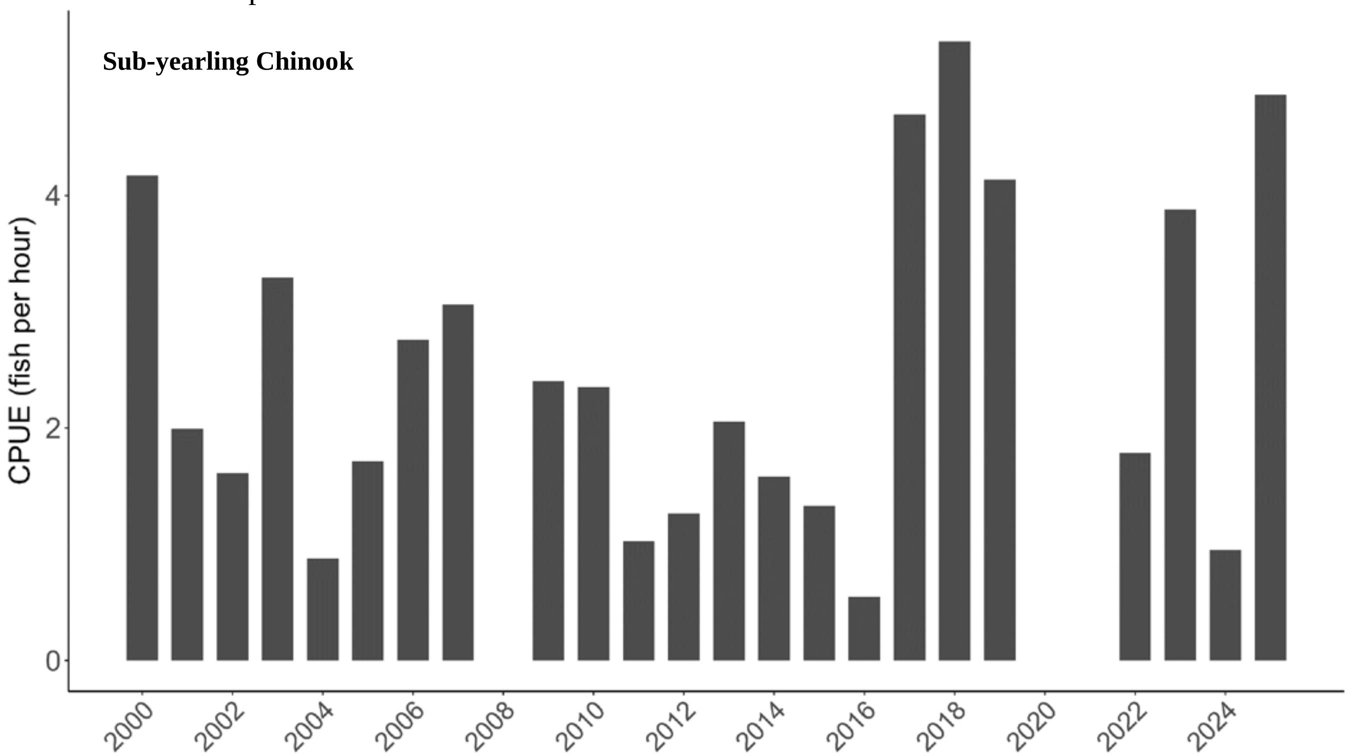
Year	Effort	Chinook 0+	Coho 1+	Chinook CPUE	Coho CPUE
2000	308	1,287	5,972	4.17	19.36

Year	Effort	Chinook 0+	Coho 1+	Chinook CPUE	Coho CPUE
2001	889	1,770	4,790	1.99	5.39
2002	672	1,082	8,779	1.61	13.07
2003	992	3,267	7,427	3.29	7.49
2004	1,071	939	10,608	0.88	9.90
2005	994	1,704	2,661	1.71	2.68
2006	1,114	3,075	6,210	2.76	5.57
2007	447	1,368	763	3.06	1.71
2008*					
2009	688	1,654	1,409	2.41	2.05
2010	974	2,288	1,245	2.35	1.28
2011	734	753	1,796	1.03	2.45
2012	1,016	1,283	2,992	1.26	2.95
2013	1,194	2,452	4,443	2.05	3.72
2014	880	1,392	2,612	1.58	2.97
2015	1,079	1,433	1,577	1.33	1.46
2016	1,032	563	2,137	0.55	2.07
2017	843	3,961	2,154	4.70	2.55
2018	836	4,453	1,583	5.33	1.89
2019	986	4,076	1,699	4.14	1.72
2020*	151	38	11		
2021*	287	1,739	181		
2022	925	1,652	2,879	1.79	3.11
2023	901	3,496	2,924	3.88	3.25
2024	826	784	1,279	0.95	1.55
2025	1,291	6,282	3,051	4.87	2.36
Average	**947**	**2,435**	**2,252**	**2.55**	**2.36**

* Values missing or estimated differently due to limited trapping seasons. Average calculated only for 2009–2019 and 2022–2025.

The CPUE for sub-yearling Chinook showed a declining trend from 2001 until 2016, reaching a project low of approximately 0.55 fish per hour (Figure 4, Table 1). From 2017 to 2019, CPUE rose significantly above prior years before returning to pre-2017 averages in 2022. In general, CPUE has been highly variable in the last few seasons (2022-2024), with a very low catch last year. This season, CPUE shows a dramatic increase back to similar rates as those observed from 2017 through 2019. Although CPUE is valuable for identifying trends, production estimates are generally more reliable for assessing overall abundance, as they account for trap efficiency and incorporate credible intervals.

In 2009, the trap was moved upstream from River Mile (RM) 23 to RM 26.5, excluding the Woods Creek drainage from sampling. Because Woods Creek supports substantial Coho Salmon production (but comparatively little Chinook spawning), this relocation reduced the drainage area contributing Coho smolts to the trap and likely explains the decline in Coho catch observed after 2009 (Figure 4). The overall decline in Coho catch rates is also influenced by decreased Coho escapement during the latter 2000s (Pacific Fishery Management Council 2019). Following the 2009 relocation, catch rates have been relatively stable in both total catch and CPUE. Although the total catch of yearling Coho this season is higher than the project average, CPUE at this sampling location is average and slightly lower than in 2022 and 2023. Overall, this year's catch is consistent with the post-relocation trend.



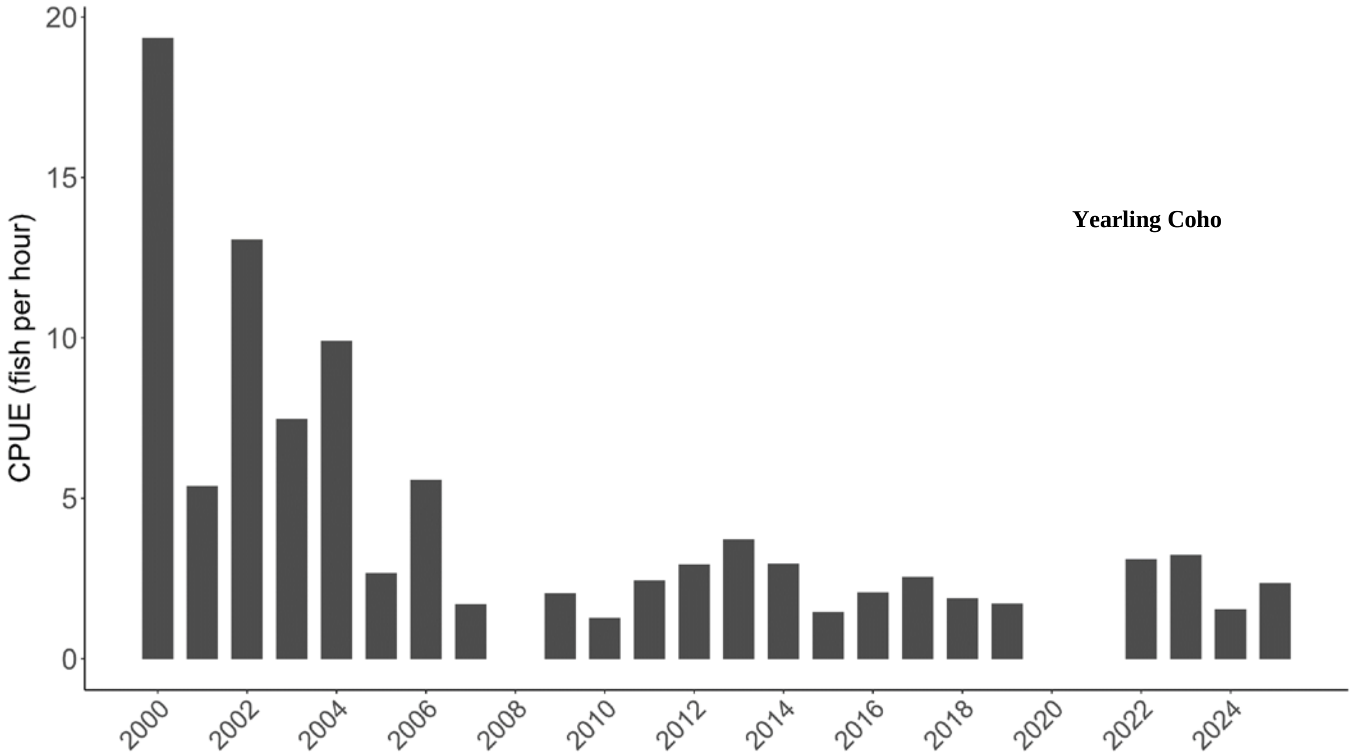


Figure 4. Natural-origin sub-yearling Chinook Salmon (top) and yearling Coho Salmon (bottom) CPUE time series at the Skykomish trap by year: 2000-2007 (River mile 23); 2009-2025 (River mile 26.5). The years 2008, 2020 and 2021 are not included due to missing or limited sampling seasons.

PRODUCTION ESTIMATES

Production in this report refers to the abundance of out-migrating salmon at the trap site. Our traps catch around one to three percent of the emigrating salmon and this proportion is known as trap efficiency. In order to estimate the total number of fishes passing the trap, we use the efficiency to expand the catch. Trap efficiency is estimated using mark-recapture efficiency trials where marked fish are released upstream of the trap weekly and those recaptured are tallied to determine what percentage of marked fish were recaptured (see details in the efficiency section of this report).

PRODUCTION ESTIMATES METHODS

In 2022, we transitioned to a Bayesian time-stratified Petersen estimator that uses a hierarchical, semi-parametric model with penalized spline (P-spline) smoothing to estimate production during sampled and unsampled strata. Posterior distributions are generated in JAGS using Markov chain Monte Carlo (MCMC) simulations. Bayesian inference approaches perform well when trap efficiencies are highly variable, when efficiency data are sparse in some strata, and when trap outages occur (Schwarz et al. 2009, Bonner and Schwarz 2011, Oldemeyer et al. 2018). These models also provide statistically robust imputations of production and efficiency during unsampled periods.

Trap efficiency values in our system are too heterogeneous for pooled Petersen estimators, and time-stratified Petersen models assume within-stratum homogeneity that is difficult to meet given river conditions and hatchery release constraints. Simple Petersen estimators also fail to incorporate efficiency variance and likely underestimate uncertainty. Comparisons among mark-recapture estimators show that Bayesian inference provides greater precision and more reliable uncertainty estimates than pooled or stratified Petersen models (Bonner and Schwarz 2011, Oldemeyer et al. 2018).

We generate production estimates using the Bayesian Time-Stratified Population Analysis System (BT-SPAS) R package (version 2021.11.02). Models use the diagonal structure with three chains and 200,000 iterations, with a 100,000-iteration burn-in and 6,000 saved iterations (thin rate = 50). We report 95% credible intervals, which reflect the probability that true production lies within the interval. Point estimates are taken as the posterior medians due to log-normal distributions with asymmetric tails. Convergence is evaluated using trace plots, autocorrelation, and Brooks-Rubin-Gelman statistics (<1.1). If needed, iterations and burn-in are increased. Model fit is assessed using deviance information criterion and residual diagnostic plots, and spline placement is adjusted using the “jump after” function when rapid changes in catch improve model fit.

Each Julian week is stratified into day and night periods, defined by sunrise and sunset times in Monroe, WA. This diurnal stratification is used because catch rates suggest differences in migration behavior and/or trap efficiency between day and night periods. Since we do not sample continuously, we must expand the trap catch to estimate the total number of fishes that would have been caught for each Julian week and diel stratum. Daytime catch is expanded into unsampled daytime strata and nighttime catch is expanded into unsampled nighttime strata. This expansion is done by dividing the catch by the proportion of the week sampled with the following formula:

$$\hat{C}_{ix} = n_{ix} / f_{ix} \qquad (1)$$

where

$\hat{C}_{ix}$ = estimated catch for diel stratum x during week i
n_{ix} = catch for diel stratum x during week i
f_{ix} = proportion of diel stratum fished during week i.

This expansion assumes that catch rates are similar during sampled and unsampled periods. In order to avoid violating this assumption, we reject some sampling events that are less than four hours if they occur during a time that could bias catch rates. For example, if a sampling event was only three hours long and occurred immediately before sunset, we would reject it because the catch rate is likely higher around sunset than the rest of the day. Occasionally, we don’t reject these short effort events when recent surveys balance out the times sampled. Also, weeks with low effort are rejected since it is less likely that catch rates remained the same throughout the entire week. It is important to separate day and night strata before making this expansion, but once the expansion is done, catch during the two diel strata are summed so that a total catch for each week can be input into the production model. With our previous model, we were able to calculate the variance in this expansion, but we currently are not able to incorporate it into our credible interval estimate. We think that with our dataset, it is more important to account for the variance in efficiency testing than the variance in this expansion since the efficiency testing is a much larger source of variance.

The coefficient of variation (CV) is calculated by dividing the posterior standard deviation by the mean. Since the posterior standard deviation is drawn from a probability density, CV in BT-SPAS is a direct measure of uncertainty in the parameter value, rather the more commonly used classical inference CV, which is a measure of the variance in estimate values if the experiment were repeated many times. This Bayesian version of CV provides a more intuitive metric for interpreting uncertainty.

Natural-Origin Sub-Yearling Chinook Salmon

Based on our data and findings from other Puget Sound trapping studies, we assume that the sub-yearling Chinook Salmon emigration begins in the first week of January (Julian week 1) and concludes by the last week of July (Julian week 30, Conrad and MacKay 2000; Seiler et al. 2002; Lisi 2019; Topping and Anderson 2021b). Although we do not sample during the very start and end of the migration period, the BT-SPAS package is capable of inferring production for these unsampled weeks. To improve MCMC convergence and ensure our estimates taper to zero at the season's boundaries, we input catch values of one for Julian weeks 1 and 30, as well as for some adjacent unsampled weeks (Carl Schwarz, personal communication).

In 2025, we estimate that approximately 917,777 natural-origin sub-yearling Chinook Salmon emigrated past our trap site on the Skykomish River. This estimate is significantly above the project average of 415,206, representing roughly 221% of the long-term average. While this estimate is slightly more conservative than the catch and higher than the CPUE estimate (258% and 190%, respectively), this model estimate is considered reasonable (Table 2). The discrepancy is likely due to the production model's use of weekly efficiencies throughout the season rather than assuming a constant CPUE. The CV (a measure of uncertainty, where lower values indicate greater reliability) for the 2025 estimate is 0.13, which is well below the project average and reflects high confidence in the model's estimates. In ecological and biological studies, a coefficient of variation (CV) below 20% generally indicates strong precision and consistent measurements, while CVs between 20–40% are common and often acceptable due to natural variability in biological systems. Values above 40% may signal high variability, sampling error, or environmental heterogeneity, and should be interpreted cautiously.

Table 2. Natural-origin sub-yearling Chinook Salmon production estimates in the Skykomish River, 2001-2025.

Migration Year	Production Estimate	2.5% Credible Interval	97.5% Credible Interval	Coefficient of Variation
2001	375,060	261,643	638,483	0.26
2002	405,924	307,717	552,788	0.15
2003	636,143	452,850	942,176	0.19
2004	248,020	165,738	363,986	0.20
2005	296,236	202,722	482,705	0.24
2006	510,128	302,321	827,053	0.25
2007	364,438	213,834	750,146	0.44
2008*				
2009	252,074	151,590	503,704	0.37
2010	560,966	350,573	1,127,872	0.39
2011	241,483	154,529	386,676	0.25
2012	155,966	121,638	250,867	0.21
2013	530,654	366,065	803,224	0.21
2014	255,308	203,401	338,638	0.13
2015	157,208	134,528	187,572	0.08

Migration Year	Production Estimate	2.5% Credible Interval	97.5% Credible Interval	Coefficient of Variation
2016	151,338	121,230	199,080	0.14
2017	996,899	724,979	1,514,165	0.20
2018	686,634	524,215	1,002,894	0.18
2019	553,375	441,194	728,195	0.13
2020*				
2021	399,128	265,730	654,917	0.24
2022	289,279	225,750	390,241	0.15
2023	432,124	356,859	565,876	0.12
2024	133,570	98,139	183,521	0.16
2025	917,777	731,549	1,196,040	0.13
Average	**415,206**	**299,078**	**634,383**	**0.21**

* 2008 – Trap repairs and site moved.

* 2020 – Covid-19 shut down.

Before 2017, production estimates showed a gradual long-term decline, reaching a project low in 2016 (Figure 5, Table 2). This was followed by a record peak in 2017, the highest estimated emigration on record, and then a downward trend with some fluctuations from 2017 to 2024, where we observed a sharp decline, resulting in our second-lowest recorded out-migration since 2001 (only lower in 2016; Table 2, Figure 5). This year has shown a sharp upward trend and return to record high abundances similar to 2017.

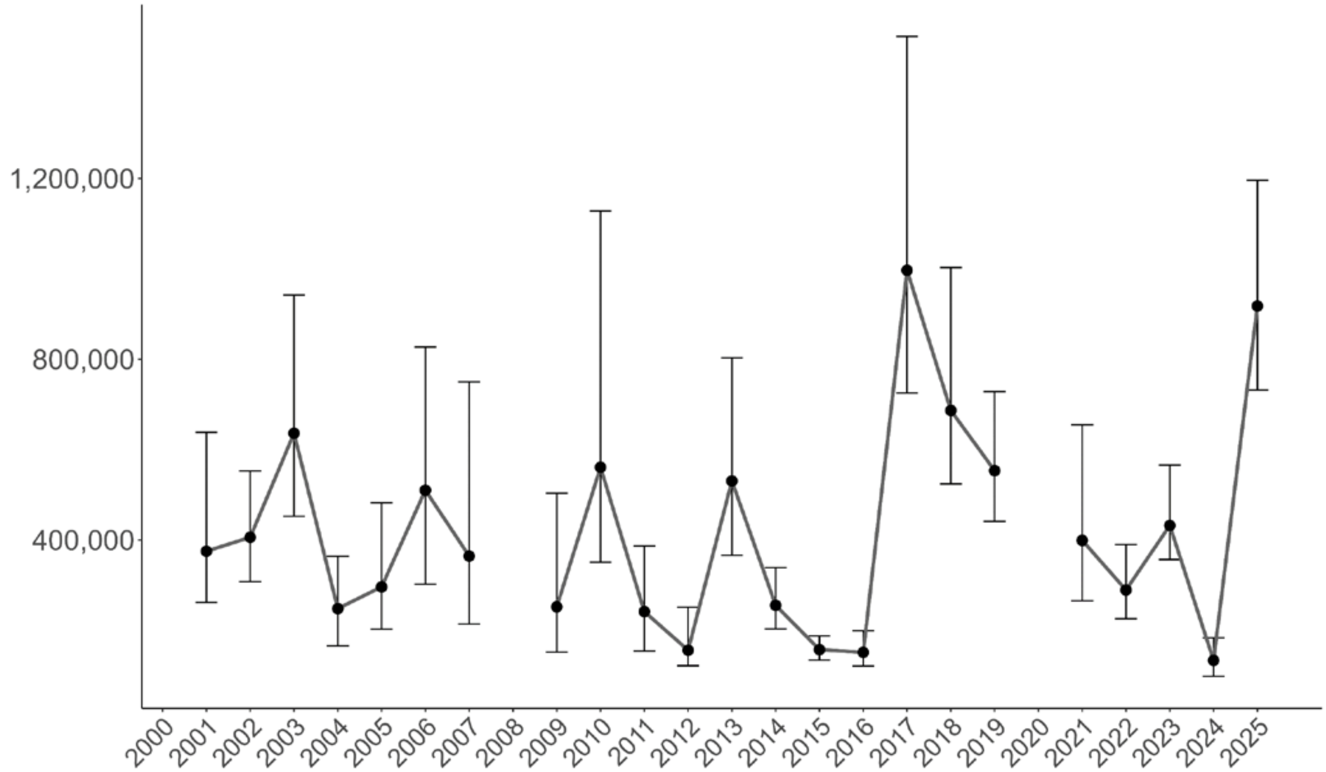


Figure 5. Natural-origin sub-yearling Chinook Salmon production estimates for the Skykomish River, 2001-2025. Error bars represent the 95% credible interval range. Data is missing for 2008 and 2020 due to missed or limited trapping seasons.

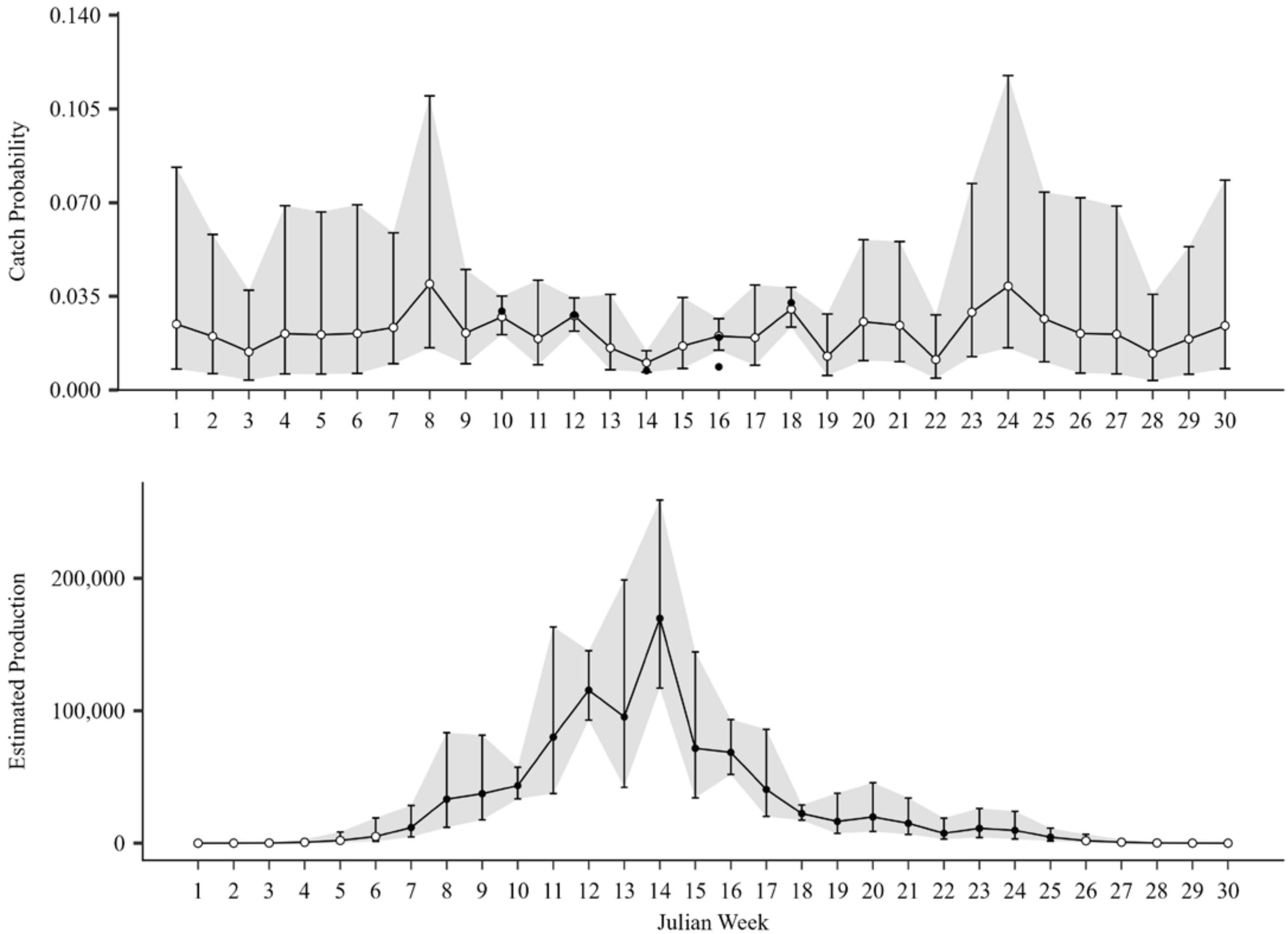


Figure 6. Natural-origin sub-yearling Chinook Salmon efficiency (i.e. catch probability, top panel) and production estimates (bottom panel) by Julian week in the Skykomish River, 2025. Shaded areas represent the credible intervals. In the catch probability plot, closed circles represent actual efficiency tests values, while open circle values represent modeled ones. In the production estimate plot, open circles represent unsampled weeks and closed circles represent sampled weeks.

Natural-Origin Yearling Coho Salmon

For yearling Coho Salmon, we assume emigration begins the second week of February (Julian week 7) and ends by the last week of June (Julian week 26), with no migration expected the week before or after. In 2025, we estimate that approximately 865,133 natural-origin yearling Coho Salmon emigrated past our trap site on the Skykomish River. This production estimate is slightly above the average and represents about 104% of the project's overall average since the trap was relocated upstream in 2009 (Table 3, Figure 7). Yearling Coho production has remained relatively stable throughout the project, with some year-to-year variability (Figure 7). The CV—a measure of uncertainty, where lower is preferable—for the 2025 estimate it is slightly above the project's average, which lessens our certainty about this estimate. The CVs for this year and last year are very similar (30% and 28%), indicating comparable relative uncertainty between seasons. However, the variability among this year's efficiency tests still contributes uncertainty to the production estimates and should be considered when interpreting the results. When comparing the model estimate with the total catch and CPUE values (135% and 100%, respectively), the model yields a lower estimate, reflecting a conservative approach to estimating production.

Table 3. Natural-origin yearling Coho Salmon production estimates in the Skykomish River, 2001-2025.

Migration Year	Production Estimate	2.5% Credible Interval	97.5% Credible Interval	Coefficient of Variation
2001	1,115,611	646,091	2,378,896	0.44
2002	1,935,526	1,298,266	2,998,647	0.22
2003	1,354,132	877,320	2,166,201	0.23
2004	2,571,352	1,468,705	4,511,959	0.29
2005	568,995	287,081	1,275,233	0.44
2006	1,361,263	816,160	2,432,828	0.31
2007	118,470	63,669	222,453	0.33
2008*				
2009	349,262	243,846	544,168	0.22
2010*	772,624			
2011	405,036	294,504	577,755	0.18
2012	573,536	402,180	821,050	0.18
2013	801,396	634,454	1,031,667	0.13
2014	1,072,216	761,702	1,664,305	0.21
2015	232,056	167,879	377,597	0.23
2016	461,968	368,178	601,446	0.13
2017	564,303			
2018	611,173	428,699	921,904	0.20
2019	332,160	271,065	417,316	0.11
2020*				
2021*				
2022	819,926	539,698	1,463,905	0.29
2023	876,537	446,146	1,696,272	0.45
2024	522,860	308,850	892,606	0.28
2025	865,133	574,913	1,630,168	0.30
Average	**831,161**	**544,970**	**1,431,319**	**0.26**

* 2008 - Trap repairs and site moved.

* 2010 - Insufficient efficiencies, used simple Petersen with five-year mean of efficiencies.

* 2020 - Covid-19 shut down.

* 2021 - Sampling stopped due to LWD jam above trap.

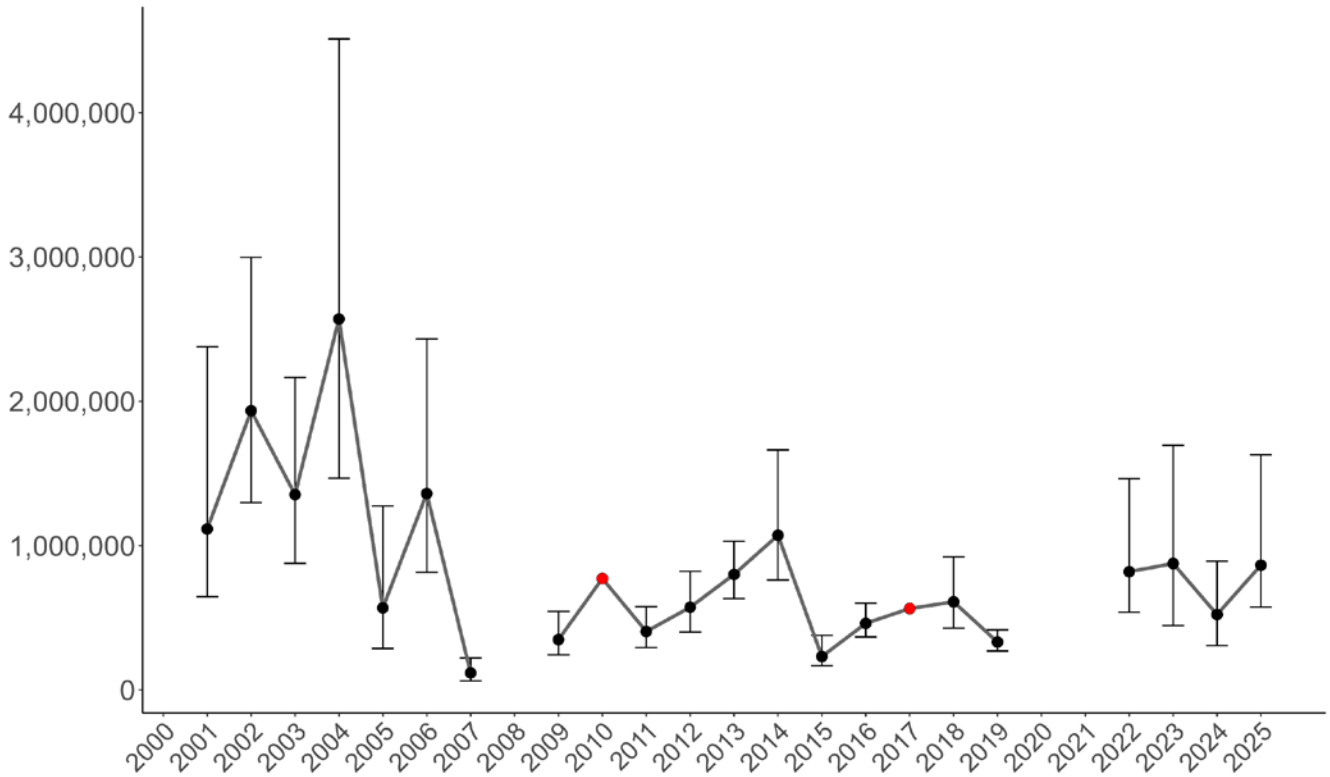


Figure 7. Natural-origin yearling Coho Salmon production estimates for the Skykomish River, 2001-2025. Red dots indicate years that used simple Petersen estimates with five-year means of efficiencies due to a lack of efficiency testing. Error bars represent the 95% credible interval range.

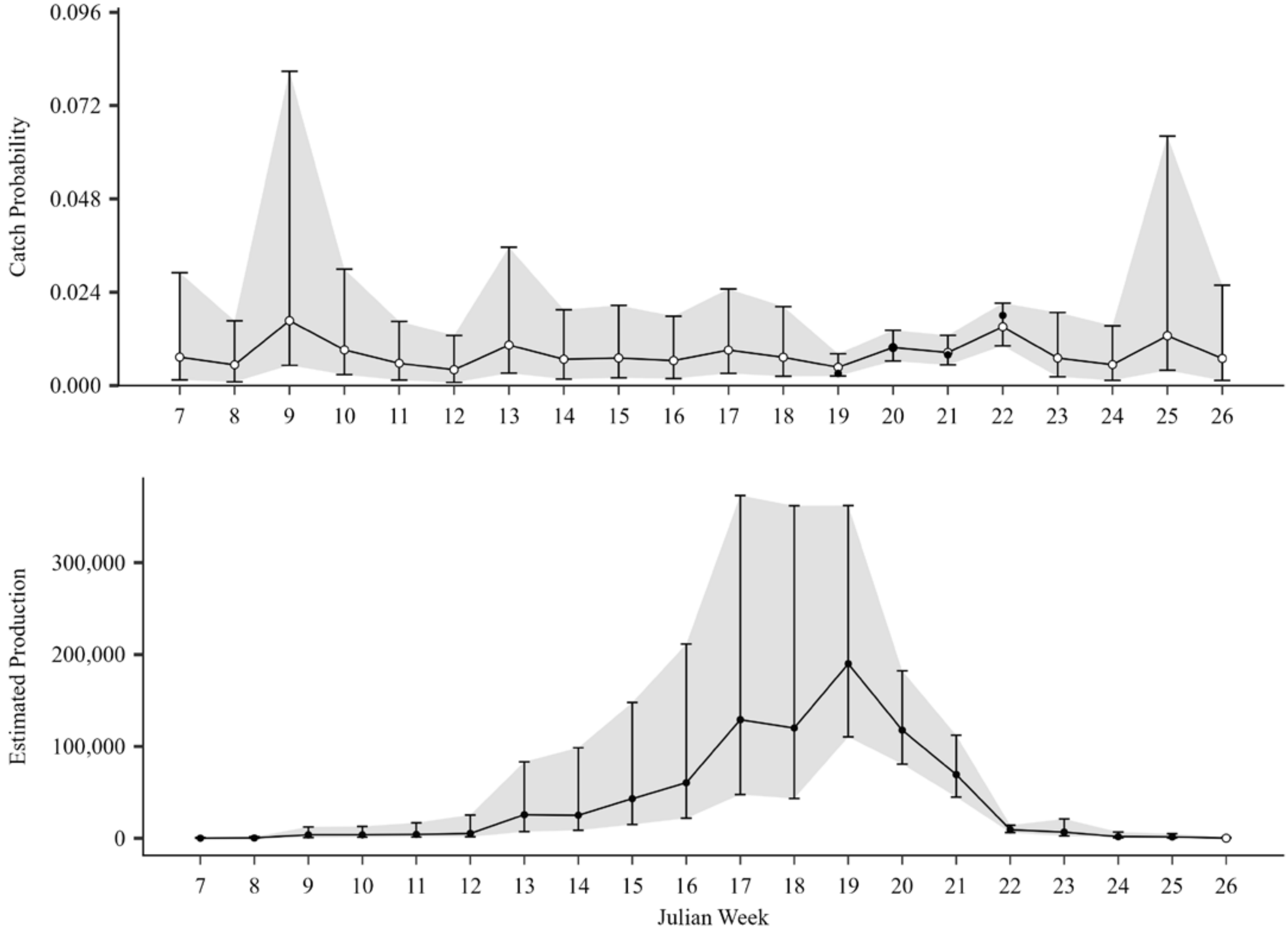


Figure 8. Natural-origin yearling Coho Salmon efficiency (i.e. catch probability, top panel) and production estimates (bottom panel) by Julian week in the Skykomish River, 2025. Shaded areas represent the credible intervals. In the catch probability plot, closed circles represent actual efficiency tests values, while open circle values were modeled. In the production estimate plot, open circles represent unsampled weeks and closed circles represent sampled weeks.

EFFICIENCY TESTING AND RESULTS

During the 2025 season, trapping equipment was inspected and monitored frequently and the trap was found to be in full operational condition with almost no escape paths detected. At the end of March, high flooding caused a log to hit the screw trap which caused some bending of components on the screw trap, no known malfunctions occurred after the log was removed but equipment will be repaired before the 2026 season. Efficiency releases were conducted weekly throughout the sampling season while hatchery Chinook and Coho Salmon were available. For each test, groups of hatchery-origin juveniles were collected from the Wallace River Hatchery, marked, and released approximately one mile upstream of the trap site. However, the Wallace River Hatchery experienced higher mortality and disease than in previous years, resulting in fish arriving in noticeably poor health. This likely affected our ability to accurately estimate trap efficiency, as mortality was elevated during releases. Due to the worsening condition of hatchery yearling Coho toward the end of the season, efficiency releases could not be conducted during the final weeks.

The trap was operating at an average efficiency rate of 2.10% for sub-yearling Chinook and 0.78% for yearling Coho during the 2025 sampling season (Table 4). Efficiency tests were rejected if the efficiency was less than 0.3% for Coho Salmon or less than 0.4% for Chinook Salmon. Tests that fall below this threshold are deemed not representative of the actual trap efficiency; only one test fell below the threshold this season. Yearling Coho typically have less efficiency than sub-yearling Chinook due to their larger size and ability to avoid the screw trap.

Table 4. Efficiency Release dates, species, and capture percentages for the Skykomish River smolt trap, 2025.

Species	Date	Released	Capture	Efficiency (%)
Chinook 0+	2025-03-11	1,764	52	2.95
Chinook 0+	2025-03-19	2,349	66	2.81
Chinook 0+	2025-04-02	2,205	16	0.73
Chinook 0+	2025-04-16	2,076	18	0.87
Chinook 0+	2025-04-22	1,833	36	1.96
Chinook 0+	2025-04-30	1,840	60	3.26
Coho 1+	2025-05-06	1,849	0	0.00
Coho 1+	2025-05-13	1,913	6	0.31
Coho 1+	2025-05-20	1,946	19	0.98
Coho 1+	2025-05-27	1,900	15	0.79
Coho 1+	2025-06-03	1,829	33	1.80
Chinook 0+	**Average**	**2,011**	**41**	**2.10**
Coho 1+	**Average**	**1,887**	**15**	**0.78**

Red = Efficiency too low (Coho <0.3; Chinook <0.4) for production modelling.

GENETIC MONITORING

Along with estimating natural production, the rotary screw trap provides an efficient way to gather genetic samples from juvenile salmonids and monitor the run timing of hatchery-origin fish. We take small fin clips from natural-origin Chinook Salmon and steelhead (*Oncorhynchus mykiss*). The steelhead samples are used to monitor the proportion of effective hatchery contribution (PEHC) in natural-origin steelhead. This research is conducted by Bethany Craig, Joseph Anderson, Ken Warheit and Todd Seamons from the Washington Department of Fish and Wildlife.

The Chinook Salmon genetic samples are used for genetic monitoring by the Tulalip Tribes' stock assessment program. These samples are genotyped to estimate relative productivity and gene flow between hatchery and natural-origin fish and to compare genetic estimates to demographic-based estimates of the proportion of hatchery-origin fish spawning naturally ($pHOS_{G,D}$) and proportion of natural influence ($PNI_{G,D}$) estimates. Additionally, Chinook from 19 spawning cohorts across the basin are genotyped to assess population structure, run timing markers, effective population size and the effective number of breeders by origin, time, and location.

DISCUSSION

This year's fishing effort totaled 1,291 hours, which was above the project average of 947 hours (Table 1). Variability in Coho Salmon efficiency tests contributed to increased uncertainty in Coho production estimates. In contrast, sub-yearling Chinook production estimates retained a high level of confidence. All trapping equipment—including the trap, boat, and associated supplies—operated as expected throughout the 2025 trapping season.

Natural-origin Chinook Salmon production has shown no clear long-term trend over the past two decades, and escapement estimates remain well below recovery goals (Snohomish County 2019). In 2025, however, we observed a return to record-high numbers similar to those seen in 2017, with a substantial increase in sub-yearling Chinook outmigrant abundance compared to recent years. Annual variability in early life-stage survival is common and the observed increase suggests a strong returning cohort and/or good conditions before and during out-migration.

We estimate that natural-origin yearling Coho Salmon production in 2025 was average to slightly above average. Although Coho did not exhibit the same sharp increase in abundance observed for sub-yearling Chinook, this year's estimates align closely with recent higher-production years (2022–2023). Increasing the frequency and reliability of yearling Coho efficiency releases in future years should help narrow credible intervals. Overall, our production estimates appear consistent with basin-wide escapement data when adjusted for brood year (Pacific Fishery Management Council 2019; Snohomish County 2019).

For the 2025 season, our primary objective was to improve consistency in release locations and increase the number of fish released during efficiency tests to reduce variability in efficiency estimates. Although release consistency improved, ongoing poor fish health at the hatchery contributed to high mortality during the releases and increased uncertainty in modeled Coho production. Moving forward, our goals include maintaining strong sub-yearling Chinook release programs and increasing the number of viable yearling Coho releases to further reduce uncertainty in production estimates.

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Prepared by:
Heidi Stewart, Field Projects Coordinator
The Tulalip Tribes Natural Resources Department, 2025

Appendix A: Summary of 2025 Skykomish River Trap Catch and Mortalities

	Chinook				Chum	Coho				Cutthroat Trout	Steelhead		Dace	Lamprey	Peamouth	Pink	Sculpin Spp.	Stickleback	Sucker Spp.	Bluegill Pumpkin Seed
	No Mark		Mark			No Mark		Mark			No Mark	Mark								
	0+	1+	0+	1+		0+	1+	0+	1+		1+	1+								
February																				
Catch	481	0	0	0	3937	4	18	0	0	0	0	0	4	16	4	6	12	0	0	0
Morts	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
March																				
Catch	2384	3	0	0	34769	73	47	0	0	0	0	0	48	23	1	264	28	2	2	0
Morts	0	0	0	0	20	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0
April																				
Catch	2061	9	0	327	13309	1522	1001	18	20	3	33	181	26	25	0	1	5	0	0	3
Morts	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
May																				
Catch	880	4	2	0	2699	848	1942	0	941	1	32	93	17	42	4	0	3	1	0	0
Morts	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
June																				
Catch	476	5	2032	0	2	262	43	11	51	0	4	10	19	42	0	0	4	1	0	0
Morts	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Total	**6282**	**21**	**2034**	**327**	**54716**	**2709**	**3051**	**29**	**1012**	**4**	**69**	**284**	**114**	**148**	**9**	**271**	**52**	**4**	**2**	**3**
Percent Morts	**0%**	**0%**	**0%**	**0%**	**0.05%**	**0.15%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0.68%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**