

FISH IN/OUT: SALMON & STEELHEAD ADULTS

Study Goals and Objectives

The 2022-2023 adult monitoring effort in the Newaukum River basin seeks to provide annual estimates of abundance, distribution, and life-history diversity of adult salmon and steelhead in addition to overall productivity of smolts-per-spawner and recruits-per-spawner. The adult salmon and steelhead monitoring in the Newaukum River basin informs restoration activities by establishing a baseline prior to the implementation of activities and monitors changes to abundance, distribution, and diversity after implementation to help determine if the activities are effective and performing as designed. The status and trends of salmon and steelhead are key indicators to ascertain if the restoration activities are both effective and adequate to maintain and recover culturally and economically significant species.

Methods / Study Design

Newaukum adult salmon and steelhead estimates were generated primarily by redd (salmon nests) counts. For spring and fall Chinook salmon we conducted census surveys, covering the entire Chinook distribution of available habitat within the basin weekly. However, the high abundance and distribution of coho salmon made a census survey impractical. Therefore, in 2022 we implemented a pilot study utilizing a Generalized Random Tessellation Stratified (GRTS) design combined with index surveys for escapement estimation. For steelhead, we were able to do a near census survey, although in a few streams or reaches, we were only able to survey once during the peak spawning period. Location of redds and counts of live and dead fish were used to determine distribution throughout the basin for each species. Biological data like fork length, sex, scales, mark status, and genetics were collected to provide insight into the biological diversity of each run.

Summary of Results

The 2022 natural origin (NOR) abundance estimate for spring Chinook was 291 which was lower than the previous two years of this study, but higher than the first year in 2019 (Table 1, Figure 1). The 2022 fall Chinook spawning escapement was estimated at 383 fish which was the lowest estimate since the inception of the intensive monitoring in the Newaukum subbasin in 2019. Coho salmon had a lower NOR abundance in 2022 than in the previous year, but higher than the first two years of the study with 3,482 spawners. However, hatchery origin (HOR) spawners exceeded NOR fish in 2022 by 28%, with 4,468 adults on the spawning grounds (Figure 2). Steelhead abundance appeared stable during run year 2023, with 891 NOR adults, which was higher than the previous year, but slightly lower than the first two years of monitoring. We estimated there were 209 HOR steelhead spawning in the study area during the 2023 run which was determined

by the March 15th cutoff date. An alternative estimate generated from hook and line sampling for mark status was unavailable in the 2023 run year because sampling was too limited.

Table 1. Abundance estimates for 2022 returns of spring Chinook, fall Chinook, coho, and 2023 returns of steelhead to the Newaukum River. Estimates were split into natural origin (NOR) and hatchery origin (HOR) based on observational (adipose fin clips) data collected for coho but based on a standard cutoff date (March 15th) for steelhead. **All numbers are preliminary.**

	HOR	NOR	Total
Spring Chinook Salmon	0	291	291
Fall Chinook Salmon	0	383	383
Coho Salmon*	4,468	3,906	8,374
Steelhead*	209	891	1,100

*Preliminary estimates not all data has been error checked.

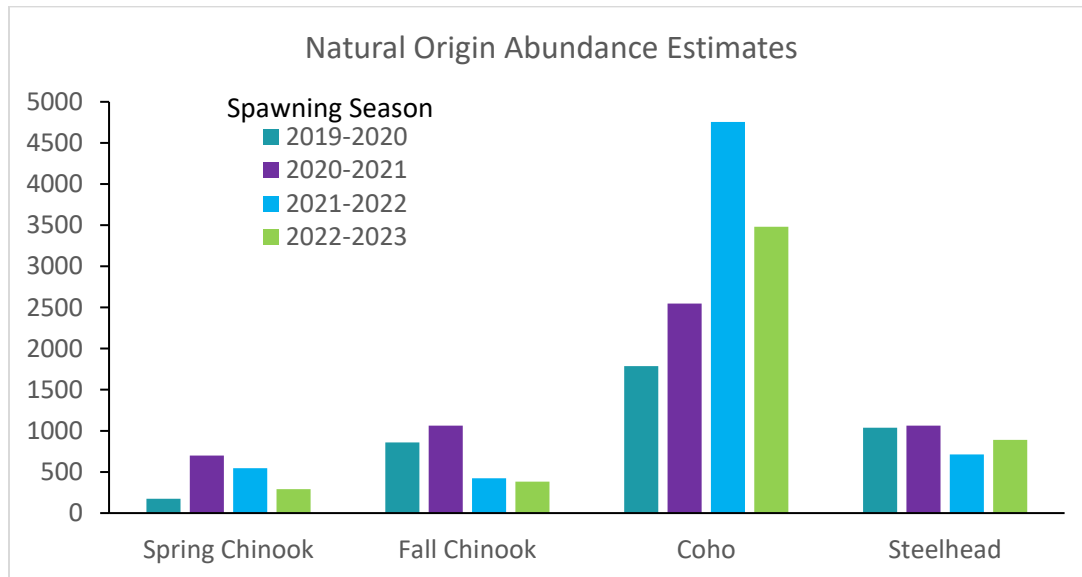


Figure 1. Abundance estimates since intensive monitoring started (2019) in the Newaukum River Basin for natural origin Chinook, coho, and steelhead.

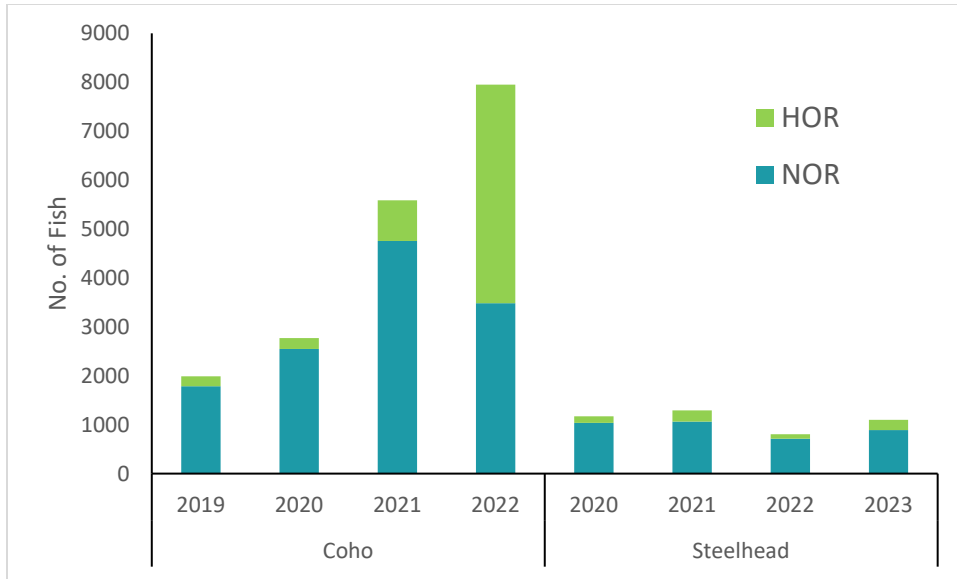


Figure 2. Comparison of natural origin (NOR) spawners to hatchery (HOR) spawners on the spawning grounds by year. No HOR Chinook have been detected in the Newaukum River basin.

Distribution of the species in 2022-2023 followed a similar pattern to the previous year’s distribution except fall Chinook, and to a lesser extent spring Chinook, which both shifted their distribution downstream (Table 2). The average percent of spring Chinook that spawned in the main stem Newaukum from 2019 through 2021 was 21%. In 2022, that proportion increased to 32%. For fall Chinook, the increase was from an average of 26% during 2019 to 2021 to 66% in 2022. More importantly, the proportion of fall Chinook spawning below the juvenile smolt trap (located at RM 5.8) increased from an average of 9% to 42%, reducing the proportion of outgoing juvenile Chinook that would have been captured in 2023 that reared upstream of the smolt trap.

Table 2. Percent of Chinook salmon that spawned in the entire main stem Newaukum River compared to below the smolt trap on the main stem.

	2019	2020	2021	2022
Spring Chinook Main Stem Newaukum	29%	16%	20%	32%
Spring Chinook Below Smolt Trap	10%	7%	8%	13%
Fall Chinook Main Stem Newaukum	27%	14%	37%	66%
Fall Chinook Below Smolt Trap	10%	4%	14%	42%

Discussion

Adult spawner abundance results from the 2022/2023 runs are preliminary and not all data has been fully checked for errors or analyzed.

The low numbers of both spring and fall Chinook salmon in 2022 emphasizes the need to prioritize restoration projects within the Newaukum River basin. We also noticed a downstream shift in Chinook spawning distribution in 2022. We observed higher densities of redds in the lower reaches than the past three years. This was likely caused by low river flows recorded in early fall when fish were making their final upstream migration. In addition, a man-made rock barrier was identified and removed in early September, just downstream of Gish Rd. bridge on the South Fork Newaukum. It is unknown how long this barrier had been in place, but it may have reduced the movement of spring Chinook upstream to the habitat utilized more heavily in prior years. Consequences of this downstream shift in distribution could have increased competition for spawning habitat, leading to superimposition of spring and fall Chinook redds.

Both steelhead trout and coho salmon abundances were similar to values observed over the past three years. However, of note during the 2022-2023 spawning season was the increase in HOR steelhead and coho, and low numbers of steelhead later in the season. The suspected increase in HOR steelhead is not reflected in the current estimate since it was based on the widely used method of assigning all redds created on or before the March 15th date as HOR steelhead and any created after the 15th as NOR steelhead. Though this method is widely used by WDFW, it has not been evaluated for the Newaukum hatchery program or any integrated hatchery program and is not believed to be as accurate as it once was when only early timed steelhead were used for the hatchery programs. Previously (2019-2021) we were able to produce a separate estimate based on hook and line sampling for mark status, but in 2023 we were unable to produce this estimate. There was an increase in the number of live HOR steelhead observed on the spawning grounds compared to previous years. However, this could have been due to low flows which allowed for easier identification of mark status. If there was an increase in HOR steelhead spawning on the spawning grounds, this may have resulted in an overestimation of the NOR fish so is worth noting and highlights the need for better methods of distinguishing among HOR and NOR steelhead.

Coho salmon did show a marked increase in HOR spawners on the spawning grounds and for the first time there was a higher abundance of HOR spawners than NOR spawners. Several years ago, the Onalaska High School aquaculture program began releasing smolts raised by the school directly into Gheer Creek instead of into Carlisle Lake. This appears to have increased the survival of HOR coho. With the limited trapping ability in Gheer Creek to remove the returning HOR coho salmon, the majority are left to spawn naturally. Increases in HOR coho salmon on the spawning grounds has the potential to increase competition for spawning habitat and could negatively affect survival of NOR juveniles. Restoration projects aimed to increase the available habitat for

both adult spawners and rearing juveniles will help minimize those impacts. Discussions about program goals and appropriate release numbers are ongoing to address the potential increased survival of HOR coho from the Carlisle Lake project.

Adaptive Management

Intensive monitoring of salmon and steelhead abundance and distribution should be paramount in aquatic habitat restoration planning in the Newaukum River Basin. Understanding habitat use by salmon and steelhead and their locations within the stream network informs restoration planning. An example of this is the low flows and reduced access to spawning habitat for Chinook in 2022. This highlights a need to restore processes that increase retention of water within the Newaukum River Basin. As the potential for increased summer temperatures intensifies with low flows, the need to protect and restore the ability of the basin to remain cool through riparian shading or other processes such as groundwater replenishment also increases. The intensive monitoring in the Newaukum basin prior to and after major restoration will allow us to evaluate the effectiveness of future planned restorations, not only in the immediate area of the restoration, but also the long-term effect on entire populations within the basin. This monitoring will also help identify areas of threat to salmon and steelhead populations and directly inform the most effective restoration projects for restoring abundances.