

Nisqually River Winter Chum Post Season and Escapement Report

2024-2025

Preseason Management

Winter Chum Stocks in the Nisqually River, Miscellaneous 13, and Chambers have shown a decreasing trend in abundance over the last 16 years, and stock timing has moved three weeks earlier over the past 32 years. Since 2009 the Nisqually Winter Chum escapement goal has been met 50% of the time, whereas Miscellaneous 13 has reached its escapement once and Chambers has failed to meet its escapement goal and has approached zero in recent years. From these concerns co-managers have continued work to monitor the commercial Area 10 and Area 11 Fall Chum directed fisheries, using “real time” genetic sampling to inform in-season management decisions to impact no more than 8% Winter Chum. During the 2021 pre-season, based on preliminary modeling work, co-managers agreed to an interim escapement goal of 25,000 Nisqually Winter Chum and agreed to use it again for the 2024-25 season. The run was forecasted for 12,160 Winter Chum returning, only 49% of the escapement goal. Due to no harvestable surplus and recent year abundances WDFW and the Nisqually Fish Commission agreed to no extreme terminal directed chum fisheries in the Nisqually River unless escapement was projected using the Yelm Creek Escapement ISU above the upper confidence interval at 35,034.

Treaty Fishery In-Season Management

Historically, Winter Chum management in the Nisqually River began in week 48, recently week 47 has been used to mark the beginning of the run due to observations during fisheries of 75% winters encountered. Out of conservation concerns, the treaty Coho fishery ended week 46; chum caught week 46 and prior are classified as fall chum strays or “others”. Distinguishing between Fall and Winter Chum salmon in the Nisqually river has largely been based on differing morphological characteristics passed down from fisherman to staff. In 2019 tissue samples were collected from 87 adult Chum along with biological data and observed morphological characteristics, results of genotyping indicate that in most cases field identification coincided with the genetic identification (95%). Prior to week 47, tribal fishermen harvested 223 Chum that were classified as Fall or “other” Chum.

The Yelm Creek in-season update tool (ISU) uses an observed peak live count from on or before Julian day 367 to predict a total Nisqually Winter Chum escapement. On December 10th 2024 an observed live count of 566 in Yelm Creek produced an escapement estimate of 48,790 (+/-3,276) well above the escapement goal of 25,000 and 35,034 fishery trigger. In the following week the Nisqually Fish Commission opened a commercial winter Chum fishery on December 15th 2024. Management decisions by the Nisqually Tribe were made to maintain a commercial fishing boundary at the mouth of Clear Creek side channel (RM 6) to protect lower mainstem spawning. Due to declining Chum catch and Chum observations on the spawning grounds, the commercial fishery was closed on January 8th, 2025. Tribal Fisherman harvested 2,055 Winter Chum during the Chum directed commercial fishery.

In order to ensure an adequate sample size for estimating Winter Chum age composition co-managers agreed to continue with a catch and release test fishery in the Nisqually mainstem to gather a minimum of 200 scale samples throughout the season. This unique sampling technique was considered after

Chinook GN Drift mortality studies in the Nisqually river produced less than a 10% short term mortality. In the 2024-2025 season 436 Chum scale samples were taken from the commercial fishery, 117 scale samples were collected during the test fishery, and an additional 100 scale samples were collected from carcasses in Yelm Creek throughout the survey season. Of the 653 scale samples collected 19 were unreadable, 12 from the commercial fishery, 4 from the test fishery and 2 from Yelm Creek carcasses. The 634 samples that were successfully read indicate that the run was composed of a nearly equal proportion of three-year-old and four-year-old fish (Table 1). When compared with mainstem samples the Yelm Creek samples were not biased towards age 3 Chum as noted in 2023-2024. The age composition from these samples did not track well with the forecasted age breakdown for the 2024-2025 season (Table 2).

Table 1: Chum age composition from 634 scales sampled during the tribal commercial fishery, test fishery and Yelm Creek carcass surveys.

Age	3	4	5
Test Fishery (N=113)	48.7%	46.2%	1.7%
Yelm Creek Carcasses (N=97)	50.0%	46.0%	1.0%
Commercial Fishery (N=424)	51.4%	44.5%	1.4%
Total (N=634)	50.7%	45.0%	1.4%

Table 2: Forecasted Chum age composition for the 2024-2025 season.

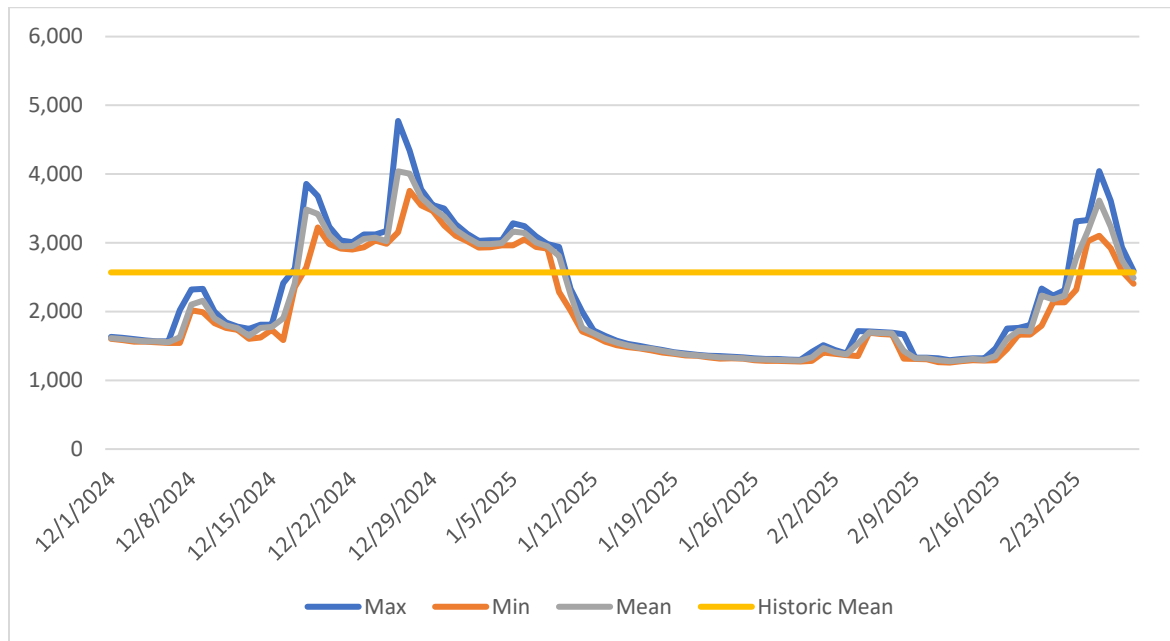
Age	3	4	5
Forecast	64.6%	35.3%	0.1%

Escapement

The Nisqually Winter Chum run extends between two Julian years and often management weeks 53 and 1 fall on the same week in different Julian years. For ease of management, we use an adjusted management week for Winter Chum where the first full seven-day management week (1 or 2) becomes 54 and so on through the conclusion of the Chum run.

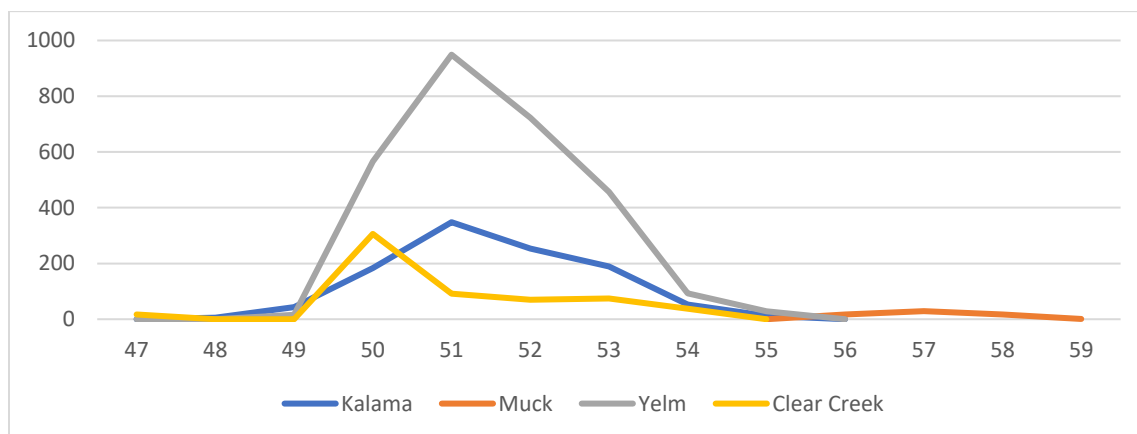
Fall weather conditions did not sufficiently recharge the aquifer and provide adequate flow in the spawning areas of Muck Creek and Exeter Springs until January 20th 2025. Other spring fed tributaries (Yelm Creek, Kalama Creek and Clear Creek) had sufficient flow for spawning in mid-November at the beginning of Winter Chum management. Overall, flows in the Nisqually River mainstem were relatively low for Winter Chum migration and spawning in comparison to the mean winter flow. Mean monthly Nisqually River flows for the 2024-2025 season were 2,490cfs in December, 1,907cfs in January and 1,873cfs in February, remaining mostly below the historic average winter flows of 2,570cfs for the entire season (Figure 1). With variable conditions and an abundance of Chum carcasses the mainstem average female per surveys were conducted using a mixture of raft and jet sled trips to ensure surveyors had enough time to provide optimal coverage throughout the season. Observed live counts in Yelm Creek, Muck Creek and the Nisqually River in late-January suggested that spawning had decreased drastically and the run was concluded to be over. There were no significant high flow events increasing risk of scour in the Nisqually River mainstem during the 2024-2025 season.

Figure 1: Nisqually River daily mean, maximum and minimum flows for December 2024 through February 2025 compared with historical mean flow. Daily means, maximums and minimums are estimated using discharges from USGS station data for McKenna and the Centralia Power canal.



Winter Chum Salmon were observed in the spawning areas of Kalama Creek, Clear Creek and Yelm Creek by late November and early December (Kalama Creek 11/26/2024, Clear Creek 12/9/2024, Yelm Creek 12/3/2024). Chum were observed in the spawning area of Muck Creek and Exeter Springs as soon as the aquifer recharged and the creek began flowing enough for passage. Peak Chum spawning appeared to be protracted in comparison to recent years and occurred between weeks 50 and 53 from mid-December through early January (Figure 2). An unusual early peak live observation in Clear Creek on week 48 was composed primarily of Fall Chum strays as a result of a large South Sound fall Chum run. The peak live count in Yelm Creek was observed on week 51, 1-2 weeks earlier than the previous 10-year average.

Figure 2: Live chum observed in four tributaries (Kalama Creek, Clear Creek, Muck Creek and Yelm Creek) for the 2024-2025 survey season.



Muck Creek (11-0018) and Exeter Springs (11-0019)

Stream flow in Muck Creek is dependent on the Muck prairie aquifer levels. In 2024 fall weather conditions did not provide sufficient precipitation to activate Muck Creek until week 55, mid-January. Weekly spawning surveys were scheduled for December through February in both Muck Creek and Exeter Springs. Permission to access the spawning ground index of Muck Creek is granted by Joint Base Lewis McChord (JBLM), thanks to the efforts made by JBLM Fish and Wildlife to assist in access and surveys providing a complete survey season.

Five surveys were completed in the Muck Creek Index and Exeter Springs after the creek recharged and began flowing. Exeter Springs is adjacent to the upper most extent of the Muck Creek mainstem index area and remained dry until week 56 one week after Muck Creek began flowing, there were no live Chum observed on four surveys in Exeter Springs. Though Muck Creek started flowing in week 55 there wasn't enough water for migration into the Muck Creek index area until week 56. Live Chum were observed on four surveys in the Muck Creek Index during the 2024-2025 survey season (Table 3, Figure 3).

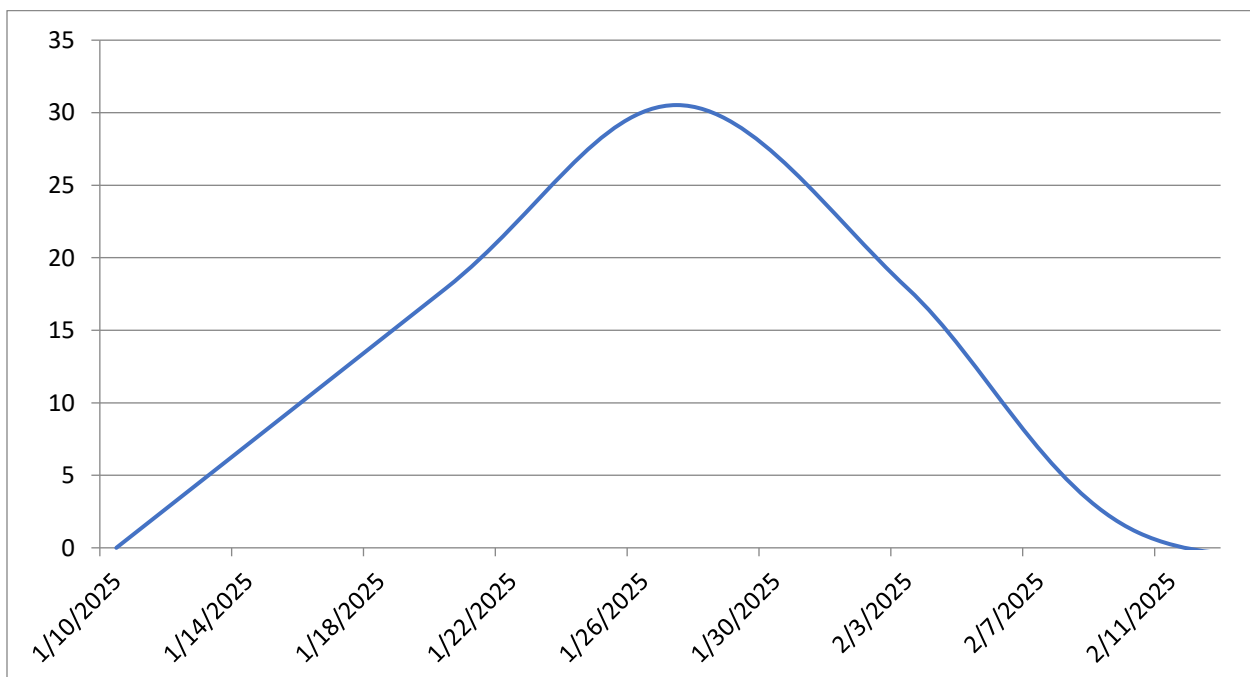
Table 3: Muck Creek Index (11-0018) 2024-2025 spawning surveys (live Chum observed).

Date	Mgmt Wk	Live Count	Estimated % seen	Adjusted % seen	AUC (Fish Days)
1/13/2025	55	0	95%	0	0
1/20/2025	56	17	95%	18	89
1/27/2025	57	29	95%	31	169
2/3/2025	58	17	95%	18	169
2/10/2025	59	1	95%	1	66
2/20/2025	60	0	95%	0	0

Total fish days = 495

Estimated number of Chum in Muck Creek Index = 495/10

Figure 3: Muck Creek Index (11-0018) area under curve spawning estimate.



Observed numbers of Chum in the Muck Creek Index are adjusted by the estimated percent observed to correct for water conditions that affect visibility of Chum (Table 3). The total fish days in AUC models are divided by an average survey life of 10 days to yield estimated escapements for surveyed sections (Tweit, B. (1989). Nisqually Chum Escapement and Run Size Estimation Methodologies (pp. 4).). Muck Creek escapement is estimated using equation 1 of the Muck Creek escapement methodology (Harrington-Tweit B., & Svoboda P. (1983). Nisqually Indian Tribe Technical Report No. 7 (pp. 16).). However, due to the late recharge and limited habitat availability during the 2024-2025 season there was no expansion used to project an escapement for the entire system, instead the AUC estimate of Chum spawning in the Muck Creek index was used.

Estimated total escapement into Muck Creek is 50 Chum.

Kalama Creek (11-0017A)

Nine spawning ground surveys were completed weekly in Kalama Creek between 11/26/2024 and 1/22/2025 (Table 4, Figure 4). Stream flow in Kalama Creek is regulated primarily by fresh water springs providing optimal visibility for counting Chum. Beaver activity was an issue in Kalama Creek this year, surveyors removed sections of a dam located near the creek mouth to create passage early in the survey season. Most of the live Chum observed in Kalama Creek were congregated around an impassable culvert adjacent to the adult hatchery pond.

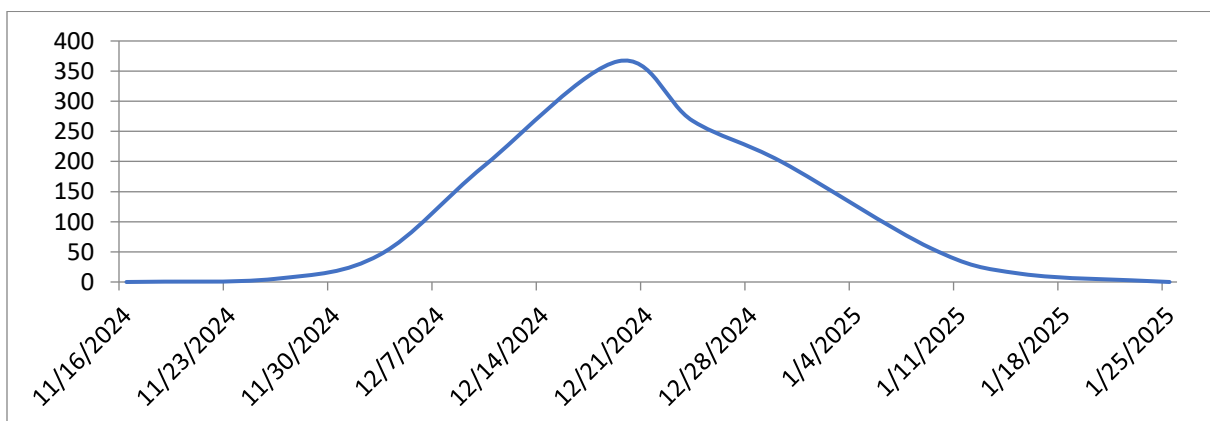
Table 4: Kalama Creek (11-0017A) 2024-2025 spawning surveys (live Chum observed).

Date	Mgmt Wk	Males	Females	Live	Estimated % seen	Adjusted % seen	AUC (Fish Days)
11/26/2024	48	0	0	5	95%	5	26
12/3/2024	49	12	3	43	95%	45	177
12/10/2024	50	32	20	183	95%	193	833
12/19/2024	51	54	48	348	95%	366	2515
12/24/2024	52	91	71	254	95%	267	1584
12/30/2024	53	230	153	189	95%	199	1399
1/9/2025	54	34	47	53	95%	56	1274
1/15/2025	55	12	36	13	95%	14	208
1/22/2025	56	0	0	0	95%	0	0

Total fish days = 8016

Estimated number of Chum in Kalama Creek = 8016/10

Figure 4: Kalama Creek (11-0017A) area under curve spawning estimate.



Estimated total escapement into Kalama Creek is 802 Chum.

Clear Creek (11-0011)

Seven spawning ground surveys were completed in Clear Creek this survey season between 11/22/2024 and 1/13/2025 (Table 5, Figure 5). Stream flow in Clear Creek is regulated primarily by fresh water springs providing optimal visibility for counting Chum. Chum observations prior to week 51 were primarily fall Chum and were excluded from the AUC model.

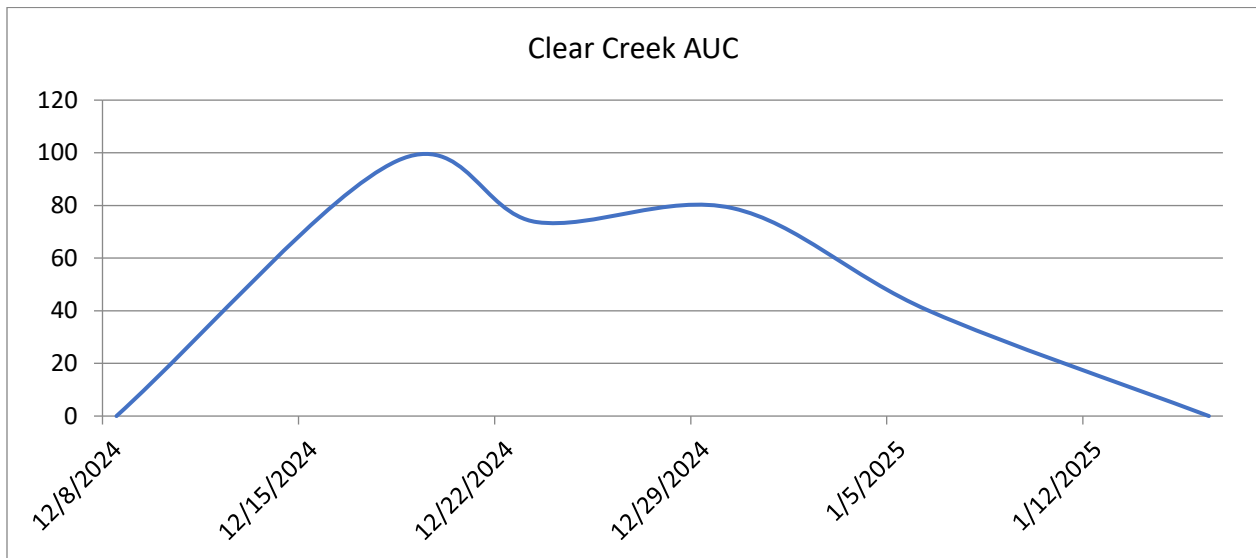
Table 5: Clear Creek (11-0011) 2024-2025 spawning surveys (live Chum observed).

Date	Mgmt Wk	Males	Females	Live	Estimated % seen	Adjusted % seen	AUC (Fish Days)
11/22/2024	47	0	1	17	95%	0	0
12/9/2024	50	20	29	306	95%	0	0
12/18/2024	51	11	4	92	95%	97	48
12/23/2024	52	113	41	70	95%	74	85
12/30/2024	53	84	65	75	95%	79	76
1/6/2025	54	23	15	38	95%	40	59
1/13/2025	55	4	7	0	95%	0	0

Total fish days = 1861

Estimated number of Chum in Kalama Creek = 1861/10

Figure 5: Clear Creek (11-0011) area under curve spawning estimate.



Estimated total escapement into Clear Creek is 186 Chum.

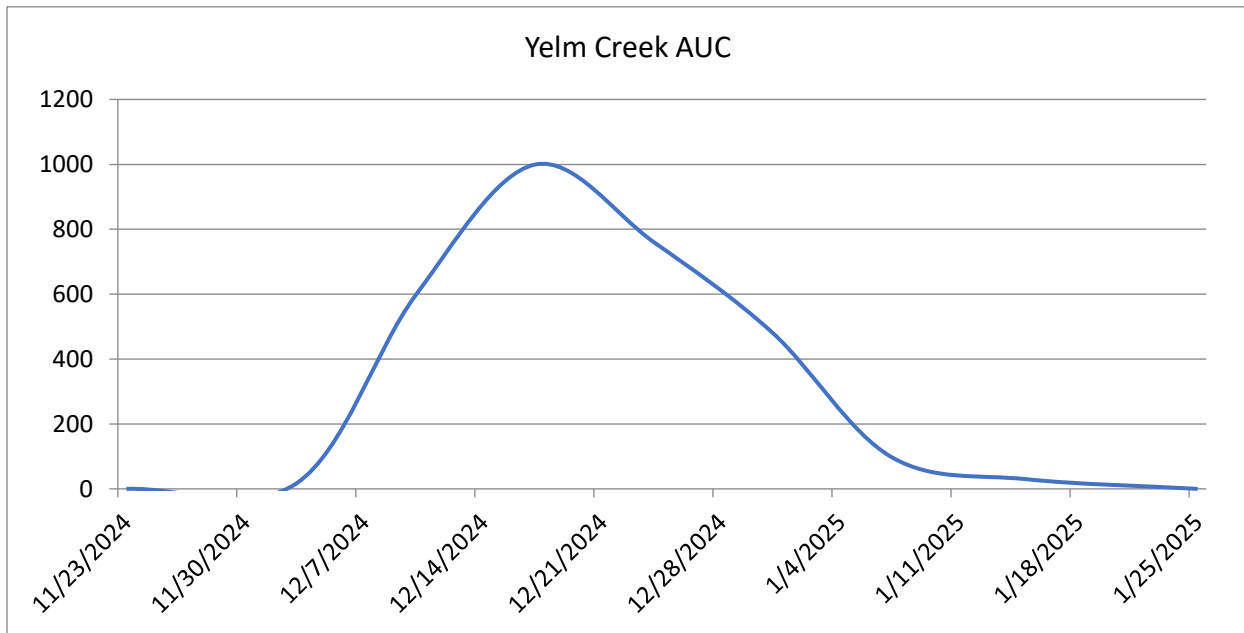
Yelm Creek (11-0043)

Eleven spawning ground surveys were completed weekly in Yelm Creek between 11/12/2024 and 1/22/2025 (Table 6, Figure 6). Stream flow in Yelm Creek remained sufficient for migration and spawning throughout the 2024-2025 season. Beaver activity in Yelm Creek was an issue this year, fish passage was created late in November and remained clear throughout the survey season. Chum observations prior to week 49 were identified as fall Chum and were excluded from the AUC model.

Table 6: Yelm Creek (11-0043) 2024-2025 spawning surveys (live Chum observed).

Date	Mgmt Wk	Males	Females	Unk	Live	Estimated % seen	Adjusted % seen	AUC (Fish Days)
11/12/2024	46	13	8	0	4	95%	0	0
11/19/2024	47	9	5	0	0	95%	0	0
11/26/2024	48	0	0	0	0	95%	0	0
12/3/2024	49	3	0	0	16	95%	17	84
12/10/2024	50	74	13	0	566	95%	596	2144
12/17/2024	51	387	157	0	949	95%	999	5582
12/24/2024	52	777	280	0	723	95%	761	6160
12/31/2024	53	0	0	2085	457	95%	481	4347
1/7/2025	2	0	0	0	93	95%	98	2026
1/15/2025	3	0	0	0	28	95%	29	509
1/22/2025	4	0	0	0	0	95%	0	0

Total fish days = 20853

Estimated number of Chum in Yelm Creek = $20853/10 = 2085.3$ **Figure 6:** Yelm Creek (11-0043) area under curve spawning estimate.**Estimated total escapement into Yelm Creek is 2085 Chum.****Nisqually Mainstem (11-0008)**

The Nisqually Index area is located between river mile 4.0 and 11.6, it includes the river mainstem and all accessible sloughs and side channels. Eight surveys were completed between 12/5/2024 and 1/21/2025 where an average of 284 female Chum carcasses were observed per survey (Table 7). Chum carcasses were encountered during every mainstem survey this spawning season. Carcasses recovered with an undetermined sex had the tails cut off and were counted as unknowns, the unknowns were then expanded using the sex ratio of the recovered carcasses with known sex from the survey completed that day. Flows in the Nisqually River mainstem remained adequate for Chum spawning in all side channels

and sloughs throughout most of the season (Figure 2). Side channels and sloughs are generally protected from scour events that often occur in winter, fortunately there were no scour events during the 2024-25 spawning and emergent season. Total adjusted number of Chum per survey is arrived at by dividing the average number of female carcasses per survey by the average proportion of females in the escapement (0.562) (Svoboda P., & Harrington-Tweit B. (1983). Nisqually Indian Tribe Technical Report No. 8 (pp. 5).). Considering the timing of live chum observations in Kalama and Yelm Creek as well as bi-modal carcass counts in the Nisqually River mainstem and Clear Creek, observations made prior to week 51 were classified primarily as fall Chum and were not used to estimate the average number of female carcasses per survey.

Table 7: Nisqually Mainstem (11-0008) 2024-2025 spawning surveys (dead and live Chum observed).

Date	Mgmt Wk	Males	Females	Unknown	exp Males	exp Females	Live
12/5/2024	49	124	96	0	124	96	5000
12/11/2024	50	220	233	12	226	239	5000
12/18/2024	51	90	66	8	95	69	4000
12/23/2024	52	201	213	5	203	216	1000
1/1/2025	53	298	377	12	303	384	1500
1/9/2025	54	319	486	6	321	490	550
1/14/2025	55	221	389	25	230	405	150
1/21/2025	56	51	130	12	54	139	5

Expanded Mainstem Average Female per Survey = 283.641

Total adjusted number of Chum per survey = $283.641/0.562 = 505$

The mainstem component of late Chum escapement is estimated using equation 3 of the 1984 Memorandum of Understanding (Svoboda P. (1984). Method for Estimating Escapement of Nisqually River Late Chum Salmon (pp. 5).). Mean monthly flows are used as an expansion factor in this equation, at higher flows Chum carcasses are more likely to be washed out of spawning areas making observations more difficult resulting in lower carcass counts. Therefore, during higher flows there is a higher expansion factor applied to the number of carcasses observed, and a lower expansion of carcasses during low flows. Mean monthly flows from December 11, 2024 one week prior to our first Winter Chum carcass recovery through January 21, 2025 were used for estimating mainstem Chum escapement for this season.

Equation 3:

$$Y = 17.71(\text{Yelm Creek}) + 0.5305 \times \frac{\text{Chum per Survey (1,000)}}{10.149 - .001063(\text{mean Dec.11-Dec.31} + \text{mean Jan.1-Jan.21 flow})}$$

$$Y = 17.71(2085) + 0.5305 \times \frac{505(1,000)}{10.149 - .001063(2853 + 2189)} \quad Y = 92,824$$

Estimated total escapement into the Nisqually River Mainstem is 92,824 Chum.

Total Nisqually late Chum escapement is estimated by the addition of Muck Creek, Kalama Creek and Clear Creek escapement estimates to the mainstem estimate which includes the Yelm Creek predictor (Svoboda P., & Harrington-Tweit B. (1983). Nisqually Indian Tribe Technical Report No. 8 (pp. 7-10).).

Muck Creek Escapement	= 50
Kalama Creek Escapement	= 802
Clear Creek Escapement	= 186
Mainstem Escapement	= 92,824
Total Chum Escapement	= 93,862

Summary of 2024-2025 Winter Chum Management and Escapement

Conservative pre-terminal and terminal commercial fisheries management, as well as the presence and ability of treaty fishers to protect their gear from marine mammals allowed more Winter Chum to return to the Nisqually spawning grounds. The Yelm Creek peak live count of 949 Winter Chum on December 17, 2024 projected an estimated escapement of 81,516 (+/-3,854) underpredicting the post season estimate of 93,862.

NIT staff reported zero pinniped observations on the spawning grounds, representing a significant decrease in marine mammal presence and predation throughout the mainstem spawning areas in comparison to recent years. The lack of pinniped observations likely coincides with the opening of the treaty commercial fishery. In recent years Seals and Sea Lions have been observed hunting and feeding on Chum in the Nisqually river beginning in mid-November and continued to be present throughout the entire season. It is unknown how much of an impact seals and sea lions may have on returning Late Nisqually Chum, their presence, location and predation activity over the last two decades is notable and may have contributed to decreasing late Chum abundances, productivity, earlier run timing shift, and possibly the predictive power of the Yelm ISU.

ASSESSOR stock-recruit modeling completed in the spring of 2023 suggests that the arrival of sea lions in 2002 along with scouring flows in the mainstem are the strongest predictors of productivity decline in the Nisqually Winter Chum stock (Howard J. (Unpublished 2023). Stock-Recruit Modeling Results for Nisqually River Winter Run Natural Origin Chum (pp. 7-11).). 2025 Participatory modeling indicates that when pinnipeds attend gauntlet areas in the Nisqually River, on average, 37% of the Winter Chum run was consumed by pinnipeds in the base model (Allyn E. (Unpublished 2025). Participatory modeling to evaluate tribal pinniped harvest in Puget Sound as a tool for salmon recovery (pp. 86-88).).

Often Muck Creek does not have sufficient flow for spawning Chum until late in December or early January. This season Muck Creek didn't begin flowing until the second week of January and didn't have enough flow to allow Chum to enter the system until January 20th, 3-4 weeks later than average peak spawn timing. Chum escapement into Muck Creek made up only .05% of the 2024-2025 total estimated escapement well below the 10-year average of 29%. The stability of Muck Creek with its high-quality spawning habitat can likely play a significant role in the survival of a brood. Unfortunately flows in Muck

Creek didn't allow for fish passage until very late in the spawning season creating sub-optimal spawning conditions for Nisqually Winter Chum.

Mainstem flows remained mostly adequate for the utilization of all sloughs and side channels and there were no high flow scouring events during the 2024-2025 season. Observations of structurally in-tact Chum redds during spring mainstem steelhead surveys paired with Chum fry observations in sloughs and side channels indicate that river conditions were favorable for the survival of the 2024-25 brood.

The total escapement of late Chum into the Nisqually River is estimated to be 93,862 fish for the 2024-2025 season, almost four times the interim escapement goal of 25,000.