

**Washington Department of Fish and Wildlife
Puget Sound Treaty Indian Tribes**

Puget Sound Chinook Comprehensive Harvest Management Plan

Annual Report
The 2016-2017 Fishing Season

September 2017

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Executive Summary

This annual report on the Puget Sound Chinook Comprehensive Harvest Management Plan summarizes harvest information about commercial salmon fisheries occurring between May 1, 2016 and April 30, 2017, and Chinook spawning escapement in 2016. It also includes harvest information relevant to the 2015-2016 non-treaty sport fishing season and a review of the coded wire tag sampling rates in fisheries during calendar year (January-December) 2015.

Commercial Chinook catch in Puget Sound pre-terminal fisheries was similar to the pre-season projection for the Strait of Juan de Fuca net fishery and substantially lower than projected in the Strait of Juan de Fuca troll fishery and San Juan Islands net fisheries. Commercial catches in terminal in some areas were above expectations, primarily in fisheries targeting higher than anticipated terminal hatchery runs (i.e. Bernie Kai-Kai, Gorst Creek, and Hoodsport Hatcheries).

Marine and freshwater landed recreational Chinook catch in the 2014-2015 season was estimated at 42,057 and was lower than the pre-season projection of 57,698. Creel survey-based estimates of catch in 2015-2016 mark-selective recreational fisheries in Areas 5, 9, 10, and 11 are included in this report. Total encounter estimates for the 2015-16 marine area selective fisheries are presented and compared to pre-season projections for these areas.

Escapement for Nisqually River, Skokomish River, Mid-Hood Canal, and Hoko River Chinook stocks were lower than projected by preseason modeling. However, other remaining stock escapements were higher than preseason projections.

Coded-wire tag sampling rates for calendar year 2015 commercial fisheries exceeded 20% in all areas. Sampling rates for marine recreational fisheries achieved the 10% objectives.

1 Introduction

The Puget Sound Chinook Harvest Management Plan mandates annual reporting of the performance of Chinook harvest management relative to the standards and guidelines of the plan (PSIT and WDFW 2010). This report partially fulfills that requirement and that of the Terms and Conditions in the 2016 Harvest Biological Opinion (F/WCR-2016-4914) by assessing the performance and effectiveness of treaty and non-treaty commercial fishery management actions adopted for the most recent management year, May 2016 through April 2017. Included in this report are:

- Management objectives for the 2016-2017 management year (May 1, 2016 through April 30, 2017)
- Projected and actual commercial landed catch in Puget Sound and descriptions of fisheries for the 2016-2017 management year

- Projected and actual landed catch for 2016 Puget Sound recreational fisheries where creel surveys were conducted and for all 2015 Puget Sound recreational sport fisheries
- Estimates of total encounters for mark-selective fisheries and non-landed mortality for commercial fisheries with Chinook non-retention where data are available
- Projected and actual spawning escapement for all Puget Sound Chinook populations in 2016 with details on estimation methods and surveys.
- Summaries of biological sampling of spawning escapement, and estimates of contributions of hatchery- and natural-origin spawners where available
- Coded-wire tag sampling rates for commercial and recreational fisheries in calendar year 2015 (January to December, 2015).

1.1 Management Objectives

General management objectives for Puget Sound Chinook populations, including Exploitation Rate Ceilings (ERCs), Critical Exploitation Rate Ceilings (CERC's), Upper Management Thresholds (UMTs), and Low Abundance Thresholds (LATs) were implemented in 2016 (Table 1-1). The final pre-season FRAM model run (2016) highlighted the rates that were used as the ceilings for each Management Unit (MU) in 2016, and the projected exploitation rates and escapements for each unit (Table 1-2).

Pre-season fishery planning for 2016-2017 fisheries projected that natural spawning escapement would fall below the Low Abundance Thresholds (LAT) for the Nooksack early, Stillaguamish, Snohomish, and Mid-Hood Canal MUs, so CERC's were implemented for those units. Escapement projections for other MUs exceeded their LAT's.

Table 1-1. 2016 Puget Sound Chinook Harvest Management Objectives.

Management Unit	ER Ceiling	Critical ER Ceiling	Upper Management Threshold	Low Abundance Threshold
Nooksack		7.0% SUS	4,000	
North Fork		(9% allowed 1 of 5 years)	2,000	1,000
South Fork			2,000	1,000
Skagit summer / fall	50%	15% SUS	14,500	4,800
Upper Skagit summer				2,200
Sauk summer				400
Lower Skagit fall				900
Skagit spring	38%	18% SUS	2,000	576
Upper Sauk				130
Cascade				170
Suiattle				170
Stillaguamish	25%	15% SUS	900	700
North Fork summer			600	500
South Fork & MS fall			300	200
Snohomish	21%	15% SUS	4,600	2,800
Skykomish			3,600	1,745
Snoqualmie			1,000	521
Lake Washington	20% SUS	10% PTSUS		
Cedar River			1,680	200
Green	15% PTSUS	12% PTSUS	5,800	1,800
White River spring	20%	15% SUS	1,000	200
Puyallup fall	50%	12% PTSUS		500
South Prairie Creek			500	
Nisqually	50%	50% Reduction of SUS ER		700
Skokomish	50%	12% PTSUS	3,650 aggregate; 1,650 natural	1,300 aggregate; 800 natural
Mid-Hood Canal	15% PTSUS	12% PTSUS	750	400
Dungeness	10% SUS	6% SUS	925	500
Elwha	10% SUS	6% SUS	2,900	1,000
Western SJDF	10% SUS	6% SUS	850	500

Table 1-2. Management guidelines implemented and projected exploitation rates and escapements for Puget Sound Chinook Management Units from 2016 – 2017 pre-season planning (FRAM 2916).

Management Unit	ERC or CERC implemented	Projected ER	Projected Escapement	UMT	LAT
Nooksack	7% SUS	6.7% SUS	329	4,000	2,000
Skagit summer fall	50%	43%	13,812	14,500	4,800
Skagit spring	38%	32%	1,786	2,000	576
Stillaguamish	15% SUS	9%	247	900	700
Snohomish	15% SUS	10% SUS	2,763	4,600	2,800
L. Washington (Cedar)	20% SUS	19% SUS	1,264	1,680	200
Green	15% PT SUS	10% PTSUS	3,882	5,800	1,800
White	20%	20%	1,487	1,000	200
Puyallup	50%	50%	971	500 South Prairie	500
Nisqually	50%	50%	1,289		700
Skokomish ¹	50%	47.8%	1,404	3,650 aggregate, 1,650 natural	1,300 aggregate, 800 natural
Mid Hood Canal	12% PT SUS	11% PT SUS	333	750	400
Dungeness	6% SUS	5% SUS	326	925	500
Elwha	10% SUS	5% SUS	2,773	2,900	1,000
Western SJDF	10% SUS	3% SUS	2,345	850	500

¹Skokomish UMT and LAT aggregate is the combined total returns to spawning grounds and George Adams Hatchery. The UMT and LAT natural abundance is the total return to spawning grounds regardless of origin (hatchery and natural origin).

2 Commercial Harvest

This chapter provides post-season estimates of Chinook catch for Puget Sound commercial fisheries, catch from tribal ceremonial and subsistence (C&S) fisheries, and test or research fisheries. Catch is projected pre-season through modeling of the fishery regime, which is developed and agreed upon in the Pacific Fisheries Management Council (PFMC) and North of Cape Falcon (NOF) forums, using the Fishery Regulation Assessment Model (FRAM). The 2016–17 List of Agreed Fisheries (Appendix A) describes all salmon fisheries for all areas of Puget Sound and ocean fisheries off the Washington coast. The final pre-season projections of catch under this regime were made in FRAM run number 2916.

Commercial, ceremonial and subsistence, and test fishery catch is accounted for on fish tickets, i.e., receipts from transactions between fishers and buyers. Fish ticket data are stored in a database maintained jointly by WDFW and the Puget Sound Tribes. In some fisheries, particularly non-treaty purse seine fisheries, estimates of non-landed mortality are also available, for comparison to pre-season expectations (Table 2-8 and Table 2-9). WDFW conducts on-the-water observations of by-catch in commercial fisheries, concentrating on areas and gears where Chinook retention is not allowed.

Non-treaty troll, treaty troll, and recreational catches in Washington coastal fisheries north of Cape Falcon were less than their expected quotas (Table 2-1). Comparisons of projected and actual Puget Sound catch are provided for two pre-terminal areas (Strait of Juan de Fuca and San Juan Islands), and six regional terminal fisheries (Nooksack/Samish, Skagit, Stillaguamish/Snohomish, South Puget Sound, Hood Canal, and Strait of Juan de Fuca). General information is presented for the 2016–17 fisheries,

including in-season management actions that deviated from the pre-season plan, and explanations for differences in projected and actual catch.

Table 2-1. Projected and actual Chinook catch in waters of the Washington coast and Puget Sound fisheries in 2016.

Fishery	Projected	Actual
Washington ocean non-treaty troll	35,000	17,344
Washington ocean recreational	35,000	16,907
Washington ocean treaty troll	40,000	22,832
Puget Sound pre-terminal net & troll total		
Strait of Juan de Fuca troll	5,610	1,607
Strait of Juan de Fuca net	365	341
San Juan Islands net ^a	6,385	21
Nooksack-Samish terminal net	19,783	11,099
Skagit terminal net	2,820	2,576
Stillaguamish-Snohomish net	979	6,315
South Puget Sound terminal net	14,418	17,266
Hood Canal terminal net	30,534	38,989
Strait Tributaries terminal net	5	3

^a includes non-retention mortality in NT purse seine fishery.

2.1 Strait of Juan de Fuca and San Juan Islands

Treaty net fisheries in the Strait of Juan de Fuca and the San Juan Islands caught 341 and six Chinook, respectively. Catch in the Strait of Juan de Fuca occurred primarily during the Chinook directed fishery during the summer.

Non-treaty fisheries targeting Fraser sockeye in Areas 7 and 7A did not occur in 2016 due to low returning abundances and no available international TAC (total allowable catch), which resulted in 0 landed Chinook. Because purse seines are required to release all Chinook, release mortality estimates are calculated using available data from on-water by-catch monitoring. Post-season analysis estimated 15 chinook mortalities in the chum fishery.

The Treaty troll fishery in the Strait of Juan de Fuca, exclusive of catch in Area 4B when it was managed under PFMC quotas, caught 1,607 Chinook.

2.2 Nooksack/Samish Terminal Area

Treaty Spring Chinook Ceremonial and Subsistence Fishery

The Lummi Nation conducted fishing with tangle-net gear on 22 days from April 4 to June 15, 2016. Total landed catch was 111 hatchery origin Chinook with an additional 34 natural-origin Chinook released. Genetic results indicated that all of the 35 NORs were assigned North Fork origin. Applying the expected release mortality rate of 40% to the NOR encounters results in 15

estimated mortalities. The encounter rate of NORs was lower than the pre-season projection of 39 fish.

In 2016, the Nooksack Tribe conducted a limited traditional Ceremonial fishery May 6th with a single Chinook caught by that fisher. A permit only, subsistence fishery was opened on May 11th, May 15th, and May 26th with 40 Chinook caught. A total of 41 Chinook were caught in the combined traditional C&S fisheries and all were sampled. Of the 41 chinook, 34 were Kendall hatchery origin and seven were NORs. Of the seven NORs, DNA was successfully read on five: three were assigned to the North/Middle Fork population and two to the South Fork population. Expansion of the two unknown NORs, results in an additional fish to each of the North/Middle Fork and South Fork populations for a total breakdown of four North/Middle Fork NORs and three South Fork NORs caught in the Nooksack Tribe C&S fishery.

In total, the Tribes 2016 total NOR mortality is estimated to be 22 NORs.

Table 2-2. Expected and observed Chinook catches in the Nooksack/Samish terminal area, 2016.

Area	Management Period	Projected	Actual
7B, 7C, 7D, Treaty net ¹	Chinook, coho, chum	10,792	8,112
7B, 7C Non-treaty net	Chinook, coho, chum	7,550	1,705
Nooksack River Treaty net	Early Chinook, May-Jun	411	187
	Fall Chinook, Aug-Oct	1,030	1,095

¹ Includes 7A on reservation catch.

Fall Chinook, Coho, and Chum Fisheries

The tribal fall Chinook fishery in Bellingham Bay (Area 7B), and Lummi Bay (7D) operated as planned from August 1st through September 2nd and in Samish Bay (7C) from August 1st through September 16th, with a catch of 5,700 Chinook. The coho fishery operated as planned from September 4th through October 22nd, with an incidental harvest of 2,412 Chinook. No Chinook were harvested incidentally during the chum fishery, which took place from October 25th to December 9th. The total fall Chinook catch of 8,112 for Areas 7B, 7C and 7D was lower than the preseason projection of 10,792 (Table 2-2).

The non-treaty fishery in Area 7B and 7C landed 1,705 Chinook from July through September, lower than the pre-season projection of 7,515.

Fisheries for fall Chinook, coho, and chum in the Nooksack River occurred as planned in weeks 32 – 36, 37 - 43, and 44 - 50, respectively. The total Chinook catch was 1,095, exceeding the projected catch of 1,030 fish; 486 were caught during the Chinook period and 609 during the coho fishery. No Chinook were harvested during the chum period.

2.3 Skagit Bay/Skagit River Terminal Areas

Skagit Terminal Area Treaty Fisheries – 2016

Spring Chinook Fisheries: Treaty commercial fisheries in the Skagit terminal area directed at hatchery spring Chinook were conducted in 2016 as scheduled preseason. Incidental catch of spring Chinook also occurred during week 27 and 28 of the directed sockeye fishery, as Skagit River sub-areas 78D-2, 78D-3, 78D-4 were still in the spring management period during some or all of that time. A total of 127 wild spring Chinook and

438 hatchery spring Chinook were caught in these fisheries, compared to 150 wild and 745 hatchery spring Chinook expected pre-season based on Chinook FRAM 2916. An additional 2 wild spring Chinook and 13 hatchery spring Chinook were harvested for ceremonial purposes.

Summer/Fall Chinook Fisheries: No treaty commercial fisheries directed at summer/fall Chinook were scheduled in the Skagit terminal area for 2016. However, as anticipated, incidental catch of summer/fall Chinook occurred in the sockeye, and coho fisheries. The sockeye and coho fisheries were adjusted from the preseason schedule as noted in Table 2-3 due to in-season management needs, response to greater than expected coho abundance and chinook encounters, as well as intertribal sharing agreements. The Upper Skagit Tribes switched to Chinook non-retention during the second week of their coho fishery because of greater than expected Chinook encounters. An estimated 52.4% release mortality rate was applied to estimated total encounters during the non-retention period. Total summer/fall Chinook mortality in these fisheries was 1,172 fish, compared to the pre-season expectation of 991 based on Chinook FRAM 2916. An additional 195 summer/fall Chinook were harvested for ceremonial purposes, which was less than the pre-season modeled value of 625.

Terminal Area Test Fisheries: A suite of Skagit terminal area test fisheries targeting Chinook, sockeye, coho, and chum were conducted by the Skagit tribes in 2016. Some weeks of these fisheries were adjusted or cancelled, as noted in Table 2-3, in response to weather, flow concerns, or staffing issues. A total of 46 wild spring Chinook, 23 hatchery spring Chinook, and 560 summer/fall Chinook were caught in these fisheries. The pre-season expectation of mortalities in the test fisheries was 48 wild spring Chinook, 33 hatchery spring Chinook, and 474 summer/fall Chinook.

Summary: Overall, a total of 175 wild spring Chinook, 474 hatchery spring Chinook, and 1,972 summer/fall Chinook were killed in treaty commercial, C&S, and test fisheries. The preseason expectation based on FRAM Chin2916 was 212 wild springs, 519 hatchery springs, and 2,090 summer/falls. The *preliminary* post-season estimate of 2,604 wild spring terminal run size was above the FRAM forecast of 1,983. The *preliminary* post-season estimate of 2,823 hatchery spring terminal run size was more than the FRAM forecast of 2,503. The *preliminary* post-season estimate of 18,769 summer/fall terminal run size was greater than the FRAM forecast of 15,886.

Table 2-3. Skagit terminal area projected and actual Chinook catches for treaty fisheries in 2016. Weekly projections were made by plugging the FRAM Chin2916 run sizes into the Skagit weekly harvest rate model, so totals may differ slightly from FRAM.

Fishery	Preseason Projected			Post-season Observed/Estimated			Difference	
	Schedule	Encounters	Mortality	Schedule	Encounters	Mortality	Encounters	Mortality
Test:								
Chinook	1 site, wks 19-35	191	191	No week 21, 25, or 27-29	98	98	-93	-93
Sockeye	2 sites: Area 3 wks 23-30, Blakes wks 24-29	89	89	Area 3 Same, No Blakes weeks 27-29	53	53	-36	-36
Coho	3 sites: Blakes wks 38-42, Area 3 wks 35-44, Spudhouse wks 34-42	274	274	Blakes same, No Area 3 wks 41-44, No Spudhouse wk 41 added wk 44	465	465	191	191
Chum	3 sites, wks 44-45	0	0	Blakes same, No wk 45 Bay/Jetty	1	1	1	1
Steelhead	1 site, wks 5-18	0	0	Same	12	12	12	12
Area 8/78C Spring Chinook Fishery Swinomish and Sauk-Suiattle Tribes:								
Week 19	2 days	77	77	Same	19	19	-58	-58
Week 20	2 days	103	103	Same	71	71	-32	-32
Week 21	2 days	74	74	Same	63	63	-11	-11
Area 78C/78D Spring Chinook Fishery Upper Skagit Tribe:								
Week 20	0.583 day	112	112	Same	264	264	152	152
Week 21	0.667 day	126	126	0.333 day	93	93	-33	-33
Week 22	0.667 day	132	132	None	0	0	-132	-132
Area 8/78C/78D Chinook C&S Fishery Swinomish, Sauk-Suiattle, Upper Skagit Tribes:								
Sum/Fall-Spring Chin.	As needed	650	650	As needed	210	210	-440	-440
Areas 8/78C Sockeye Fishery Swinomish and Sauk-Suiattle Tribes:								
Week 26	3 days	40	40	3 days	34	34	-6	-6
Week 27	5 days	50	50	5 days	68	68	18	18
Week 28	5 days	105	105	4.67 days	97	97	-8	-8
Week 29	5 days	365	365	7 days	178	178	-187	-187
Week 30	None	0	0	1.83 days	40	40	40	40
Area 78D/78O Sockeye Fishery Swinomish Tribe:								
Week 28	1 day	4	4	None	0	0	-4	-4
Week 29	1 day	4	4	None	0	0	-4	-4

		Preseason Projected		Post-season Observed/Estimated			Difference	
Areas 78C/78D/78O Sockeye Fishery Upper Skagit Tribe (wks 27-30 Chinook non-retention):								
Week 27	0.75 days	7	7	0.667 days	81	81	74	74
Week 28	0.75 days	39	39	0.625 days	94	94	55	55
Week 29	0.75 days	57	57	1.667 days	107	107	50	50
Week 30	0.75 days	137	137	None	0	0	-137	-137
Week 31	0.5 days	184	184	None	0	0	-184	-184
Areas 8/78C Coho Fishery Swinomish and Sauk-Suiattle Tribes:								
Week 40	None	0	0	3.67 days, based on ISU	37	37	37	37
Week 41	None	0	0	2.33 days, based on ISU	2	2	2	2
Areas 78C/78D Coho Fishery Upper Skagit Tribe: (wks 40-43 Chinook non-retention)								
Week 41	None	0	0	2.167 days, based on ISU	417	417	417	417
Week 42	None	0	0	2.25 days, based on ISU	138	72	138	72
Areas 8/78C Chum Fishery Swinomish and Sauk-Suiattle Tribes:								
Week 46	None	0	0	None	0	0	0	0
Total Skagit Terminal Area:		2,820	2,820		2,642	2,576	-178	-244

2.4 Stillaguamish/Snohomish Terminal Area

The tribal net fishery in Area 8A was closed during the 2016/2017 fishing season, however 43 Chinook were taken for C&S purposes, less than the 100 set aside pre-season (Table 2-4). Non-treaty commercial fishing in Area 8A was also closed during the 2016/2017 fishing season.

Tribal Chinook catch in Area 8D occurred from May through early-September, with most of the catch occurring during mid-July. Total 8D catch was 6,272, including 1,728 for ceremonial or subsistence purposes (Table 2-4). Chinook catch was greater than projected in area 8D, however this terminal fishery primarily harvests hatchery fish.

The Stillaguamish Tribes harvested no Chinook for ceremonial and subsistence purposes from the Stillaguamish River in 2016 (Table 2-4).

Table 2-4. Projected (FRAM 2016) and actual Chinook net fishery harvest in the Stillaguamish - Snohomish terminal area in 2016.

Area		Projected	Actual
8A Commercial	Treaty	1	0
	Treaty C&S	Up to 100	43
	Ntrty	0	0
8A Test		0	0
8D Commercial	Treaty	846	4,544
	Treaty C&S		1,728
	Ntrty	0	0
Stillaguamish R. Net	Treaty C&S	32	0

2.5 South Puget Sound Terminal Areas

Table 2-5. Projected and actual Chinook catch in 2016 South Puget Sound net fisheries.

Area	Management Period	Projected	Actual
Area 9/10/11	Coho (A10 - Test)	21	0
	Chum (A9 - Test)	583	73
	A9 (Trty. C&S + chum)	668	15
	Trty coho/chum (A10/11)	12	10
	NT chum (A10/11)	600	85 ^a
Area 10E	Treaty Chinook/coho/chum	2,839	5,733
Area 10A	Chinook (test)	377	394
	Coho/chum	15	3
Duwamish River	Coho/chum	465	94
	Coho (Test/C&S)	0	249
L Washington/Ship Canal	Sockeye/coho/ C&S	578	238
	Test/Research	0	3
Lake Sammamish	Chinook	0	0
Puyallup River	Spring/Fall C&S	455	184
	Chinook	951	564
White River	Spring C&S	-- ^b	190
Areas 13, 13D-K	Chinook/Coho/Chum	2,634	2,750
Area 13A	Chinook/Coho/Chum	446	2,380
Areas 13C/Chambers	Chinook	305	0
Nisqually River	Chinook/coho	3,469	4,301

^a NT fisheries were non-retention for Chinook and values are reported as release mortalities.

^b White River C&S Projected harvest is incorporated in the Puyallup River Spring/Fall C&S catch of 455 fish.

Marine Areas 9, 10 & 11

The coho test fishery in area 10 was not implemented in 2016. The chum test fishery in Apple Cove Point (Area 9) incidentally caught a total of 73 Chinook (Table 2-5), well below the estimated 583.

The non-treaty chum-directed fishery in Area 10 and 11 incidentally harvested no Chinook, and 85 estimated release mortalities. The treaty chum fishery harvested 10 Chinook. Fisheries directed at Chinook and coho in Area 10E harvested 5,733 Chinook (Table 2-5). No Chinook were harvested during the chum fishery in area 10E.

Fifteen Chinook were harvested in Area 9 for C&S purposes, while no Chinook were harvested during the chum fishery.

Lake Washington

There were no Chinook directed fisheries in Lake Washington, the Ship Canal, or North Lake Washington. Sockeye returns to Lake Washington were insufficient to allow any directed fisheries. The Suquamish and Muckleshoot tribe conducted C&S fisheries in the Lake Ship Canal targeting sockeye, with a total by-catch of 15 Chinook. In addition to the Sockeye C&S

fishery the Muckleshoot Tribe conducted a C&S fishery on Chinook in the ship canal (fish ladder) where 146 chinook were caught. The Suquamish Tribe did not conduct any C&S fisheries on Chinook. Incidental Chinook catch during the coho fishery in Lake Union, and the upper and lower Ship Canal harvested 73 Chinook, which was less than expected. The Muckleshoot Tribe conducted a coho directed commercial fishery in North Lake Washington with a total by-catch of 7 Chinook. There were no coho directed fisheries in Lake Sammamish.

Elliott Bay/Duwamish River

The Muckleshoot Tribe conducted a C&S fishery which caught 394 chinook. The Chinook test fishery in Area 10A did not occur in 2016. There were no Chinook-directed commercial fisheries in 10A or the Duwamish River. In 10A, there were three Chinook caught in late September/October during the coho directed fishery. In the Duwamish River, 94 Chinook were caught incidentally during the coho directed fisheries and 249 during Test and C&S fisheries, which is well below the pre-season projected catch of 465.

Puyallup River and White Rivers

Ceremonial and subsistence fisheries in the Puyallup River caught 184 Chinook salmon during management weeks 21 – 26. Based on fisheries sampling data, approximately 12 of those fish are assumed to be fall-run based on ad-clip marks. The Muckleshoot Tribe had an additional C&S fishery in the White River starting in week 21 which caught 190 Chinook of which one was ad-clipped from a sample of 123 fish (~65% sampling rate). The pre-season projected C&S catch was 455.

Fall Chinook catch was 564 during the 6-hour Chinook fishery. Except for the estimated 12 fall Chinook assumed captured during the spring Chinook C&S fishery, no directed fall Chinook C&S fisheries occurred (Table 2-5).

Marine area 13 & sub areas (Deep South Sound)

The Chinook fishery in Carr Inlet (13A) caught 2,380 Chinook (Table 2-5), in August and early September (weeks 32 – 36). Pre-season projected catch was 446. This fishery targets Minter Creek Hatchery Chinook returns where no natural origin fish are returning to spawn.

The Chinook fishery at Chambers Bay (13C) occurred in weeks 31 – 36, and zero Chinook were harvested (Table 2-5). The pre-season catch projection was 305.

Chinook directed fisheries in 13D and Budd Inlet (13F) occurred from late-July through September (weeks 29 – 37); total catch was 2,726. Chinook caught incidentally during the coho fishery in (Week 38-45) 13D totaled 24. Zero Chinook were caught during the Fox Island (Area 13) coho fishery. The total pre-season catch projection for both areas was 2,634.

Nisqually River

The treaty commercial fishery in the Nisqually River harvested an estimated 4,301 Chinook, excluding jacks, but including fish for Ceremonial and Subsistence purposes, with a pre-season projected commercial catch, excluding jacks, of 3,469 (Table 2-5). Based on preliminary terminal runsize to the Nisqually River, the estimated terminal net harvest rate is 21 percent, which is lower than the expected pre-season harvest rate of 24 percent.

2.6 Hood Canal

Treaty Chinook directed fishing in 12C occurred as planned from July 24 thru August 24 (weeks 31 – 36) with a catch of 5,034. During the coho fisheries, seven Chinook were landed in early-

October in 12C, while two Chinook were landed in 12, and three in 12B. Catch was 50% lower than pre-season expectations due to the lower than predicted run size.

Chinook harvest in the Hoodsport Hatchery Zone (12H) was 18,529 and occurred as planned from July 12 through September 15. Catch exceeded the preseason expectation of 15,458.

Chinook harvest in the Skokomish River occurred as planned from July 31 through August 22 landing 10,314 fish. Chinook harvest also occurred in Purdy Creek (tributary of Skokomish River that feeds the George Adams Hatchery) to access Chinook returning to George Adams Hatchery each Saturday from July 10 through August 6 landing 3,470 fish.

In Port Gamble (Area 9A), 178 Chinook were harvested, primarily in mid-August to mid-September during coho fisheries.

Non-treaty commercial fisheries in the Hoodsport Zone (12H) harvested 4,898 Chinook salmon (Table 2-6). There were no Chinook landed in other non-treaty fisheries in Hood Canal in 2016, and 24 estimated mortalities based on observer data (Tables 2-6 and 2-9).

Table 2-6. Pre-season projected and observed catch of Chinook in Hood Canal terminal area net fisheries in 2016.

Area	Target Species	Projected	Actual
(12, 12B-12D, 9A) (T)	Chin, coho, chum	6,157	5,224
(12-12C, 9A) (NT)	chum, coho	36	24 ^a
12A Net (T)	Coho	72	0
12H Net (T)	Chinook, chum	15,458	18,529
12H Net (NT)	Chinook, chum	5,000	4,898
Skokomish River (82G) (T)	Chin, coho, chum	3,811	10,314
(82J) (T)	<i>Chinook</i>		3,470
Total		30,534	38,989 ^b

^a NT fisheries were non-retention for Chinook and values are reported as release mortalities.

^b Total does not include catch from area 82J.

2.7 Strait of Juan de Fuca

Due to the continued depressed status of Chinook populations, terminal fisheries in the Dungeness River and Elwha River were closed or provided very limited fishing opportunity. Chinook retention in the Dungeness Bay (6D) coho fishery was limited and three Chinook were retained during this fishery. Zero Chinook were harvested for ceremonial purposes in the Elwha River (Table 2-7).

Table 2-7. Projected and actual catches of Chinook in Strait of Juan de Fuca terminal net fisheries in 2016.

Terminal Area	Projected	Actual
Area 6D & Dungeness River Treaty	0	3
Area 6D Non-Treaty	1	0 ^a
Elwha River Treaty (C&S)	4	0
Hoko River Treaty	0	0

^a NT fisheries were non-retention for Chinook and values are reported as release mortalities.

2.8 Non-Treaty Commercial Monitoring and Total Mortality

Because non-treaty vessels are required to release non-target species in many fisheries, WDFW conducts on-water monitoring to provide data on encounters of non-target species. Summaries of observer data for 2016 are presented in Table 2-8. Expanded estimates of total mortality, where available, were presented above in the summaries for individual fisheries, and are summarized and compared to pre-season expectations below in Table 2-9.

Table 2-8. Commercial fishery observation data for 2016 Puget Sound non-treaty salmon net fisheries.

Area	Gear type	# sets observed	Chinook	Coho	Sockeye	Pink	Chum	Steelhead
7A	PS	26	1	63	0	0	823	0
7	PS	31	1	154	0	0	1,493	0
10	PS	32	10	27	0	0	1,860	0
11	PS	27	2	34	0	0	1,866	0
12	PS	23	0	59	0	0	3,720	0
12B	PS	27	11	56	0	0	6,016	0
7A	GN	4	0	3	0	0	59	0
7	GN	2	0	0	0	0	4	0
12	GN	5	0	4	0	0	804	0
12B	GN	3	0	0	0	0	241	0

Table 2-9. Total pre-season projected and post-season estimated Chinook mortality (landed + released) in Puget Sound non-treaty commercial salmon fisheries in 2016.

Area	Total Mortality	
	Projected	Actual
6D	1	N/A (0 landed)
7/7A	1,526	15
8	N/A	Closed
8A	N/A	Closed
10/11	600	85
12/12B	32	24
12H	5,000	4,898
9A/12A	7	N/A (0 landed)

3 Recreational Harvest

This chapter summarizes expected recreational catch in Puget Sound marine waters and freshwater tributaries for the 2016-2017 management year, and presents catch estimates available from creel studies for that period. Due to the cycle of recovery and analysis of Catch Record Cards (CRCs) used by recreational anglers, complete catch estimates for all areas are not yet available. Since complete catch estimates were not available for all areas in the annual report covering the previous management cycle, projected and actual recreational catches for the 2015-2016 management year are also included here.

3.1 2015-2016 Recreational Catch

Total Recreational Chinook harvest in 2015-2016, estimated from preliminary Catch Record Card (CRC) data and creel estimates where available, was 32,938, compared to a preseason projection of 46,687. The CRC estimates are preliminary and subject to revision. Projected and actual catches for individual fisheries are shown in Table 3-1. Updated estimates of total mortality in mark-selective fisheries, for those fisheries where estimates are available, are presented in final reports available at <http://wdfw.wa.gov/publications/search.php?Cat=Fishing/Shellfishing>.

Table 3-1. Projected (FRAM 2115) and actual (preliminary, where available) Chinook catches in Puget Sound recreational fisheries during the 2015-2016 season.

Area/Fishery	Projected	Actual
Area 5-6		
Area 5 Summer MSF	6,465	4,802
Area 5 Winter MSF	346	105*
Area 6 Summer MSF	4,311	3,816
Area 6 Winter MSF	1,434	444
Other		
Strait Tributaries		
Area 7		
Non MSF	2,709	6,034
MSF (December-April)	6,152	2,669
Nooksack/Samish FW	6,829	0
Area 8-1 & 8-2		
MSF	761	1,022
Skagit River		
Spring MSF	335	61
Area 8D SAF	178	327
Stillaguamish River	0	0
Snohomish River		
Skyokomish MSF	0	0
Area 9		
Summer MSF	2,483	2,331
Winter MSF	977	1,989
Area 10		
Summer MSF	0	0
Winter MSF	191	143
Area 11		
Summer MSF	3,105	1,502
Winter MSF	368	0
Area 10E SAF	87	164
Lake Sammamish	0	0
Area 10A SAF	0	0
Green River	0	0
Puyallup River		
Carbon R MSF	323	267
Puyallup R MSF	1,574	821
Area 13		
Summer MSF	1,134	1,027
Winter MSF	82	2
Chambers Cr	72	0
Nisqually	2,063	1,768
Deschutes	42	0
Area 12		
Summer MSF	699	297
Winter MSF	480	411
Skokomish River	3,487	2,936

*Estimate through 3/31/2016

3.2 2016-2017 Recreational Catch

Projected Chinook catches for 2016-2017 recreational fisheries are listed in Table 3-2. The recreational fishing regime included mark selective fisheries (MSF) for portions of the year in Marine Areas 5 through 13 and in a number of rivers. WDFW conducted intensive sampling and monitoring of MSFs in Marine Areas 5, 9, 10 and 11, which provided the estimates in Table 3-2. Brief summaries of Chinook catch and encounters resulting from these sampling programs are included below. The analysis of 2016 summer fisheries is still in draft. When complete, this analysis will be made available on the WDFW website:

<http://wdfw.wa.gov/publications/search.php?Cat=Fishing / Shellfishing>.

For fisheries without intensive sampling and/or creel data available, catch will be estimated using CRC data and data from baseline dockside sampling of marine fisheries. Baseline sampling provides data on catch per unit effort (CPUE), species composition, as well as CWT and biological sampling data. For freshwater fisheries, catch estimates are made using CRC data, unless creel studies were conducted and harvest estimates are available. For marine fisheries, species-specific catch estimates are made using CRC estimates of total catch, combined with species composition data obtained from the baseline sampling program. These estimates will be included in the 2017 annual report.

Table 3-2. Projected (FRAM 2916) and actual (preliminary, where available) Chinook catches in Puget Sound recreational fisheries during the 2016-2017 season.

Area/Fishery	Projected	Actual
Area 5-6		
Area 5 Summer MSF	6,166	3,345
Area 5 Winter MSF	222	
Area 6 Summer MSF	3,408	
Area 6 Winter MSF	1,314	2,252*
Other		
Strait Tributaries		
Area 7		
Summer (July MSF)	1,299	1,335
Winter MSF	4,018	4,024*
Nooksack/Samish FW	7,201	
Area 8-1 & 8-2		
MSF	825	421*
Skagit River		
Spring MSF	307	
Area 8D SAF	151	
Stillaguamish River	0	
Snohomish River		
Skyokomish MSF	562	
Area 9		
Summer MSF	3,056	2,981
Winter MSF	1,052	2,818*
Area 10		
Summer MSF	1,395	1,085
Winter MSF	173	
Area 11		
Summer MSF	1,506	1,480
Winter MSF	99	
Area 10E SAF	82	
Lake Sammamish	0	
Area 10A SAF	0	
Green River	0	
Puyallup River		
Carbon R MSF	139	
Puyallup R MSF	0	
Area 13		
Summer MSF	366	
Winter MSF	43	
Chambers Cr	73	
Nisqually	308	
Deschutes	4	
Area 12		
Summer MSF	765	
Winter MSF	501	
Skokomish River	0	

*Preliminary MSF catch estimate.

3.2.1 Marine Area 5 Summer MSF

2016 was the 14th year of summer mark-selective Chinook fishing in Marine Area 5. The 2016 fishery was opened for a set season, from July 1 through August 15.

WDFW conducted comprehensive fishery monitoring activities during the Area 5 MSF. Sampling activities included dockside creel sampling and intensive efforts to distribute and collect voluntary trip reports (VTRs) from the angling public. An enhanced Voluntary Trip Report (VTR) program was used to obtain estimates of Chinook encounter rates by size class (legal or sub-legal) and mark status (ad-marked or unmarked), similar to the approach used successfully during summer 2009. Detailed descriptions of the sampling program and results are available in WDFW (2016).

For Area 5, WDFW estimates that 3,345 Chinook were landed, compared to preseason projections of 6,166 (Table 3-3).

Table 3-3. Comparison of modeled (FRAM 2916) and estimated total Chinook encounters for the 2016 Area 5 summer Chinook MSF.

Data Source	Group	Total Encounters	Legal	Sublegal	Landed Only
FRAM Encounters	UM	11,480	6,619	4,861	66
	AD	16,306	7,011	9,295	6,100
	Total	27,786	13,630	14,156	6,166
	% Marked	59	51	66	99
Estimated (Creel) Encounters	UM	7,372	1,250	6,122	2
	AD	18,711	3,578	15,132	3,343
	Total	26,083	4,829	21,254	3,345
	% Marked	72	74	71	100

3.2.2 Marine Area 7 Summer MSF

2016 was the first year of summer mark-selective Chinook fishing in Marine Area 7. The 2016 fishery was open from July 1 through July 31, 2016.

WDFW conducted comprehensive fishery monitoring activities during the Area 7 MSF. Sampling activities included intensive dockside creel sampling, on-the-water effort surveys, test fishing and collection of voluntary trip reports (VTRs) from the angling public. Detailed descriptions of the sampling program and results are available in WDFW (2016).

For Area 7, WDFW estimates that 1,335 Chinook were landed, compared to preseason projections of 1,299 (Table 3-4).

Table 3-4. Comparison of modeled (FRAM 2916) and estimated total Chinook encounters for the 2016 Area 7 summer Chinook MSF.

Data Source	Group	Total Encounters	Legal	Sublegal	Landed Only
FRAM Encounters	UM	1,250	885	365	71
	AD	2,756	1,411	1,345	1,228
	Total	4,006	2,296	1,710	1,299
	% Marked	69	61	79	95
Estimated (Creel) Encounters	UM	2,122	1,485	637	0
	AD	2,971	1,485	1,485	1,335
	Total	5,092	2,971	2,122	1,335
	% Marked	58	50	70	100

3.2.3 Marine Area 9 Summer MSF

In 2016, a recreational MSF occurred for the ninth consecutive summer in Marine Area 9. This fishery was open from July 16 through August 4. As in previous years, WDFW's Puget Sound Sampling Unit (PSSU) implemented an intensive monitoring program in Area 9 during the summer season to collect the data needed to provide in-season catch estimates and to estimate key parameters characterizing the fishery and its impacts on unmarked salmon. Detailed descriptions of the sampling program and results are available in WDFW (2016).

An estimated 2,981 Chinook were landed in Area 9, compared to preseason projections of 3,056 (Table 3-).

Table 3-5. Comparison of modeled (FRAM 2916) and estimated Chinook encounters for the 2016 Area 9 summer Chinook MSF.

Data Source	Group	Total Encounters	Legal	Sublegal	Landed Only
FRAM Encounters	UM	1,340	780	560	16
	AD	5,682	3,495	2,187	3,040
	Total	7,022	4,275	2,747	3,056
	% Marked	81	82	80	99
Estimated (Creel) Encounters	UM	2,818	705	2,114	9
	AD	9,629	3,288	6,341	2,972
	Total	12,448	3,993	8,455	2,981
	% Marked	77	82	75	100

3.2.4 Marine Area 10 Summer MSF

In 2016, a summer recreational MSF was implemented in Area 10 for the ninth consecutive year, running from July 16 through August 15, 2016, and was preceded by a catch and release fishery June 24, through July 15, 2016. WDFW's Puget Sound Sampling Unit (PSSU) implemented an intensive monitoring program in Area 10 throughout the season in order to collect the data needed to estimate key parameters characterizing the fishery and its impacts on unmarked

salmon. An estimated total of 1,085 Chinook were landed during this fishery, compared to the pre-season projection of 1,395 (Table 3-6). Unmarked legal and sublegal encounters were greater than pre-season projections.

Table 3-6. Comparison of modeled (FRAM 2916) and estimated Chinook encounters for the 2016 Area 10 summer Chinook MSF

Data Source	Group	Total Encounters	Legal	Sublegal	Landed Only
FRAM Encounters	UM	1,363	699	664	21
	AD	3,357	1,579	1,778	1,374
	Total	4,720	2,278	2,442	1,395
	% Marked	71	69	73	98
Estimated (Creel) Encounters	UM	1,694	1,186	508	0
	AD	2,371	1,186	1,186	1,085
	Total	4,065	2,371	1,694	1,085
	% Marked	58	50	70	100

3.2.5 Marine Area 11 Summer MSF

In 2016, a summer recreational MSF was implemented in Area 11 for the ninth consecutive year, running from June 24 through August 19. WDFW's Puget Sound Sampling Unit (PSSU) implemented an intensive monitoring program in Area 11 to collect the data needed to provide in-season catch estimates and to estimate key parameters characterizing the fishery and its impacts on unmarked salmon. An estimated total of 1,480 Chinook were landed during this fishery, compared to the pre-season projection of 1,247 (Table 3-7.). Unmarked legal and sublegal encounters were greater than pre-season projections.

Table 3-7. Comparison of modeled (FRAM 2916) and estimated Chinook encounters for the 2016 Area 11 summer Chinook MSF.

Data Source	Group	Total Encounters	Legal	Sublegal	Landed Only
FRAM Encounters	UM	634	294	340	12
	AD	2,264	1,423	841	1,238
	Total	2,898	1,717	1,181	1,247
	% Marked	78	83	71	99
Estimated (Creel) Encounters	UM	744	446	298	4
	AD	3,050	1,652	1,399	1,477
	Total	3,794	2,098	1,696	1,480
	% Marked	80	79	82	100

4 Spawning escapement

This section compares natural Chinook escapement estimates for 2016 with pre-season escapement projections, and management thresholds.

In general, FRAM projects natural escapement of unmarked Chinook. For some MUs where hatchery-origin adults contribute to natural spawning, the FRAM projections of escapement include natural-origin recruits (NOR) and hatchery-origin recruits (HOR) that spawn naturally. This includes projections for the Skagit, Cedar, Green, Puyallup, Skokomish, Mid-Hood Canal, Dungeness, and Elwha. For the White MU, the projection includes fish of natural origin and fish originating from the acclimation pond program. Natural-origin adults that are used for hatchery broodstock may be included in the projections of natural escapement.

FRAM projects natural-origin escapement for the Nooksack, Skagit spring, Stillaguamish, and Snohomish populations, so hatchery-origin fish must be subtracted from total escapement, and the number of natural-origin fish used for broodstock added, to obtain an estimate comparable to the FRAM projections.

Escapements for available spring-run Chinook management units were all above projected estimates.

For summer/fall populations, escapement was greater than projected for most management units. However, Lake Washington-Cedar River, Nisqually River, Skokomish River, Mid-Hood Canal, Elwha River, and Hoko River escapements were below forecasted abundance.

Table 4-1. Preseason projections and estimates of Puget Sound Chinook natural spawning escapement in 2016.

Management Unit		NOR	HOR	Total	Projected (FRAM 2916)
Nooksack	NF			N/A	90 ¹
	SF			N/A	238 ¹
Skagit spring	Suiattle			648	486 ¹
	Cascade			295	330 ¹
	Sauk			1,502	970 ¹
	Total spring			2,445	1,786 ¹
Skagit summer/fall	Sauk summer			1,044	549 ¹
	Upper Skagit summer			15,423	10,576 ¹
	Lower Skagit fall			2,921	2,287 ¹
	Total summer/fall			19,338	13,812 ²
Stillaguamish	NF	516	227	743	185 ¹
	SF	79	39	118	63 ¹
	Total	595	266	1,002 ³	248 ¹
Snohomish	Skykomish	2,363	1,422	3,785	2,007 ¹
	Snoqualmie	1,013	355	1,368	756 ¹
	Total	3,376	1,777	5,153	2,763 ¹
Lake Washington	Cedar	627	418	1,045	1,264
	Sammamish	168	1,079	1,247	N/A: Sammamish not in FRAM
Green		2,566	7,497	10,063	3,882
Puyallup		694	1,963	2,657	971
White		775	2,851	3,626 ⁴	1,487 ⁴
Nisqually		611	468 ⁵	1,079 ⁶	1,289
Skokomish		237	1,105	1,342	1,404
Mid Hood Canal	Dosewallips	2	6	8	
	Duckabush	3	12	15	
	Hamma Hamma	56	212	268	
	Total	60	231	291	333
Dungeness		135	273	523 ⁷	326
Elwha				2,628 ⁸	2,773
Hoko				1,324	2,345

1. Natural-origin only.

2. Skagit Su/Fa projection total includes NOR and HOR escapement to the spawning grounds.

3. Includes additional 65 HORs and 76 NORs collected for broodstock from the North Fork which are part of the FRAM Projection.

4. Includes only adult NORs and adult vent-clipped acclimation pond fish trucked and released upstream of Mud Mountain,

5. Includes 340 HORs from Clear Creek Hatcher trucked and released upstream.

6. Change-in-ratio (CIR) estimate will be revised with actual sport-catch data when available.

7. Includes 115 fish (30 NORs and 77 HORs) removed from the river for use as broodstock.

8. Estimate does not include jacks.

4.1 Nooksack River Early Chinook

Nooksack River 2016 Chinook escapement estimates are not available at this time, pending additional data and genetic laboratory analyses. The following is a summary of the North Fork and Middle Fork Nooksack surveys and carcasses for the 2016 season.

The co-managers (Washington Department of Fish and Wildlife and the Lummi Tribe) surveyed the North Fork and Middle Fork sub-basins for North Fork/Middle Fork early-timed Chinook. Surveys in the North Fork sub-basin began during the first week of July and continued through the end of October. A total of 160 carcasses were enumerated in Kendall Creek (downstream of the hatchery rack) and Kendall Slough. An additional 194 Chinook carcasses were observed in the remainder of the North Fork sub-basin. Additionally, 1,690 adult Chinook and 116 jacks recruited to Kendall Hatchery. In the Middle Fork, surveys were conducted from late July through early October and resulted in 126 carcasses being recovered.

Surveys on the South Fork Nooksack were conducted by the three co-managers (Washington Department of Fish and Wildlife, Lummi Tribe and Nooksack Tribe) between mid-August and the end of October. South Fork data are currently unavailable.

A total of 1,661 Chinook recruited to Skookum Creek Hatchery in 2016.

4.2 Skagit River

Background

Six recognized Chinook populations spawn in the tributaries and mainstems of the Skagit River watershed. The Sauk River, Suiattle River, Baker River, and the Cascade River are major tributaries to the Skagit River, but there are also numerous smaller, anadromous fish bearing tributaries flowing both into the major tributaries and also into the Skagit River directly. Five hydroelectric projects are in the basin; two on the Baker River at river miles (RM) 1.6 and 9.3, and three on the Skagit River at RM 96.6, 100.9, and 105.1.

Escapements were calculated using various methodologies dependent on population and based on either total new redd counts, total visible redd counts, linear regression predictions, or a combination of methods. During spawning ground surveys, Chinook carcasses were sampled for fork length, sex, scales, and presence or absence of a hatchery mark. We also electronically sampled Chinook carcasses for coded wire tags (CWT) and collected CWT present snouts.

Surveys were performed on foot, by pontoon, jet boat, or by helicopter. Calculation of escapements for Skagit summer and Skagit fall Chinook, Sauk River spring (one 0.9 mile mainstem index), and Sauk River summer Chinook spawning escapement estimates have relied heavily on aerial redd surveys of extensive mainstem sections. However, due to poor water viewing conditions in 2016 aerial based total visible redd counts were unable to be performed for the period around peak spawning of the mainstem Skagit summer Chinook population, and for any Skagit fall Chinook mainstem indexes. Escapement estimates for Skagit fall Chinook relied entirely on linear regression predictions for the Skagit summer and fall Chinook.

Additional personnel from the Skagit Fisheries Enhancement Group (SFEG), Skagit River System Cooperative (SRSC, the management body for the Sauk-Suiattle and Swinomish Indian tribes), the Upper Skagit Indian Tribe (USIT), Seattle City Light, and Puget Sound

Energy, also performed work and contributed data necessary to complete the escapement estimates and predictions for the Skagit River Basin Chinook salmon runs.

Methods and Results

Suiattle River Spring Chinook

Suiattle River spring Chinook spawn in the clear, large tributaries draining into the turbid mainstem of the Suiattle River. Some redds are found at tributary confluences with the mainstem and within the tributary's clear water lens in the mainstem created by unmixed tributary and mainstem water. Redds found within the tributary lenses are included in the tributary counts. Historically, limited spawning activity has been documented in the glacially influenced, high turbidity mainstem with the exception of spawning in the tributary clear water lenses. The only recorded exception to date was in 2011, when an unusual combination of environmental variables reduced turbidity in the mainstem and resulted in conditions the Chinook apparently deemed suitable for spawning.

Suiattle spring Chinook spawning Surveys were conducted from 3 August 2016 through 22 September 2016 by WDFW surveyors. Tributary indexes were surveyed for new redds every seven days to attempt to ensure redds were enumerated before redd visibility life had expired. The indexes included all known spawning habitat for each tributary. Tributary spawning surveys were conducted on foot. Encountered Chinook carcasses were sampled for scales, measured for fork length, and checked for presence of coded wire tags. Redds were marked with survey flagging to prevent double counting during subsequent surveys. The total redd count was multiplied by 2.5 fish per redd to estimate escapement.

The logjam that had been a passage barrier on Buck Creek in previous years (approximately river mile 1.2) remained in 2016 and appeared about the same size as observed in 2015. The pool habitat behind the jam had further filled with cobble and smaller substrate and was forcing the creek through a couple interstitial spaces on the left bank side of the jam. The Buck Creek logjam was a total fish passage barrier and was also preventing spawning substrates from moving downstream. A new wood and rock barrier had also formed in the lower half of the Lime Creek index. It too was a total passage barrier.

A total of 102 Suiattle spring Chinook carcasses were observed in 2016 and 99 were collected and sampled. There were 96 wild unmarked and no CWT Suiattle spring Chinook, one carcass that was unknown adipose clip and no CWT, one fish that was adipose present but was missing part of its head (unknown CWT) and one fish that was unknown adipose clip and unknown CWT but was scale sampled. The season total redd count was 259 redds (Table 4-2).

Table 4-2. Suiattle River spring Chinook 2016 spawning ground survey redd counts.

Stream	WRIA	Survey method	Reach (RM)	Location ¹	Redds
Big Creek	3.0723	Foot	0.0-0.6	7.8	3
Tenas Creek	3.0761	Foot	0.0-0.5	9.6	2
Straight Creek	3.0797	Foot	0.0-0.1	15.1	1
Buck Creek	3.0813	Foot	0.0-1.7	18.1	23
Circle Creek	3.0892	Foot	0.0-0.2	18.4	0
Lime Creek	3.0897	Foot	0.0-0.5	20.8	3
Downey Creek	3.0919	Foot	0.0-2.1	24.4	174
Sulfur Creek	3.0973	Foot	0.0-0.9	26.3	36
Milk Creek	3.1022	Foot	0.0-0.1	28.6	17
Total redds					259

¹Location refers to river mile location of tributary mouth on a mainstem, or lower river mile terminus of a mainstem index.

The preliminary 2016 Suiattle River Spring Chinook escapement estimate was 648 fish (rounded). All data and estimates of escapement were preliminary at the time of reporting and remain subject to further review and agreement by the Skagit comanagers before finalization.

Upper Cascade River Spring Chinook

Cascade River spring Chinook spawn in the mainstem Cascade River and accessible tributaries from river mile 8.1 (just upstream of a high gradient canyon) up to and including the forks at RM 18.6. Spawning has also been documented in the North and South Fork Cascade Rivers, from the mouth of each fork upstream at varying distances (less than one river mile) dependent upon stream flow and available spawning habitat.

Cascade spring Chinook surveys occurred from 2 August 2016 through 22 September 2016. The surveys included all known spawning habitat. Mainstem surveys were conducted by foot or pontoon boat by WDFW and USIT personnel. The survey protocol was to survey each index every seven days. In previous years the protocol had been to survey every 10 to 14 days, but the interval was advanced in 2016 in an effort to recover more carcasses and enumerate more redds before redd life had expired. All new redds were marked with survey flagging to ensure they were only counted once. The total redd count was multiplied by 2.5 fish per redd to estimate escapement. All recoverable carcasses were sampled for scales, measured for fork length, and electronically checked for coded wire tags.

With the weekly survey interval 14 upper Cascade spring Chinook carcasses were observed in 2016. By comparison only three were observed in 2015 but escapement was also lower. Of the located carcasses, one was not able to be collected and 13 were collected and sampled. All sampled carcasses were wild adipose present (unmarked) and no coded wire tag (no beep). The weekly survey interval may have enabled surveyors to more frequently get to carcasses before the scavengers do. A total of 118 redds were located and marked in 2016 (Table 4-3).

The 2016 upper Cascade River spring Chinook spawning escapement estimate was 295 fish. All data and estimates of escapement were preliminary at the time of reporting and remain subject to further review and agreement by the Skagit comanagers before finalization.

Table 4-3. 2015 Cascade River spring Chinook redd counts.

Stream	WRIA	Survey method	Reach (RM)	Location ¹	Redds
Cascade River	3.1411	Foot	8.1-9.0	8.1	10
Marble Creek	3.1451	Foot	0.0-0.3	8.6	1
Cascade River	3.1411	Foot/Raft	9.0-12.4	9.0	41
Cascade River	3.1411	Foot	12.4-15.8	12.4	38
Cascade River	3.1411	Foot	15.8-18.6	15.8	27
Kindy Creek	3.1528	Foot	0.0-0.5	16.2	1
North Fork Cascade River	3.1605	Foot	0.0-0.1	18.6	0
South Fork Cascade River	3.1411	Foot	0.0-0.5	18.6	0
Total redds:					118

¹Location refers to river mile location of tributary mouth on mainstem, or lower river mile terminus of a mainstem index.

Upper Sauk River Spring Chinook

Upper Sauk River spring Chinook spawn in the mainstem Sauk River and in the North and South Fork Sauk Rivers. Mainstem spawning has been documented between RM 31.0 to the forks at RM 31.9. A high gradient section of the Sauk River beginning 0.9 river miles downstream of the White Chuck River acts as an assumed barrier to Sauk summer Chinook and serves as the lowest point of spawning of upper Sauk River spring Chinook. Spawning in the North Fork Sauk occurs from the mouth to an impassable falls 1.6 RM upstream. Spawning in the South Fork Sauk has been documented from the forks upstream to approximately river mile 5.0, upstream of the area known as Monte Cristo Lake. However most years a formidable cascades section at approximately river mile 2.9 is an apparent barrier to spring Chinook passage during most flow conditions.

Sauk River spring Chinook spawning areas were surveyed from 18 August 2016 through 12 October 2016. Surveys were conducted by foot or pontoon boat on indexes upstream of the White Chuck River every seven days. The survey goal for the index below the White Chuck River was every two weeks by helicopter due to the section being too treacherous to raft or walk. Recovered carcasses were sampled for scales, fork length, and presence of coded wire tags. Redds located during foot or pontoon boat surveys were counted and marked with survey flagging.

A total of 196 Sauk spring Chinook carcasses were observed in 2016 and 164 of the carcasses were able to be recovered and sampled. Of the sampled carcasses 163 were wild unmarked and untagged fish, and one fish was adipose clipped only.

There were 577 redds located upstream of the White Chuck River by ground based surveys and 24 redds observed downstream of the White Chuck River in the section surveyed by helicopter (Table 4-4). Total redds from ground based counts and the flown section were summed and multiplied by 2.5 fish per redd to estimate escapement. The 2016 upper Sauk River spring Chinook escapement estimate was 1,502 fish (Table 4-1). All data and estimates of escapement were preliminary at the time of reporting and remained subject to further review and agreement by the Skagit comanagers before finalization.

Table 4-4. Upper Sauk River spring Chinook redd counts from 2016 spawning ground surveys.

Stream	WRIA	Survey method	Reach (RM)	Location ¹	Redds
Sauk River	3.0673	Flight	31.0-31.9	31.0	24
Sauk River	3.0673	Foot/Float	31.9-34.5	31.9	142
Sauk River	3.0673	Foot/Float	34.5-37.8	34.5	267
Falls Creek	3.1182	Foot	0.0-0.2	34.9	3
Sauk River	3.0673	Foot/Float	37.8-39.7	37.8	30
South Fork Sauk River	3.1204	Foot	0.0-2.9	0.0	74
South Fork Sauk River	3.1204	Foot	4.4-5.0	4.4	0
North Fork Sauk River	3.0673	Foot	39.7-40.1	39.7	30
North Fork Sauk River	3.0673	Foot	40.1-41.3	40.1	31
Total redds (rounded):					601

¹Location refers to river mile location of tributary mouth on mainstem, or lower river mile terminus of a mainstem index.

Skagit Summer Chinook

Skagit River summer Chinook spawn in the mainstem of the Skagit River from the mouth of the Sauk River at RM 67.2 to the Seattle City Light Powerhouse at Newhalem at RM 94.3. Spawning also occurs in tributary streams with suitable flow and spawning habitat. Tributaries were surveyed by foot or pontoon boat at an interval of every seven days to ensure all redds were enumerated before redd life expired. Tributary surveys covered most of the known spawning area with the exception of some limited spawning known to occur above the tributary index areas in years of high abundance, and in some other tributaries which have infrequent spawning activity. Time constraints due to limited personnel resources prevented us from surveying all known spawning habitat. The mainstem of the Skagit River was surveyed by helicopter.

Carcass recovery and sampling occurred incidentally during tributary surveys, and actively during mainstem carcass recovery surveys conducted on jet boats. Mainstem carcass surveys of approximately 22.3 river miles were attempted weekly. Recovered carcasses were sampled for scales, measured for fork length, and checked for presence of tags and marks. Not all carcasses encountered could be sampled; carcasses were often observed in deep pools beyond the reach of gaff hooks, or were badly decomposed and disintegrated upon disturbance. All new redds located during tributary surveys were counted and marked with survey flagging. The protocol for mainstem aerial redd surveys was to count all visible redds including redds that were recognizable from previous flight surveys.

Skagit summer Chinook tributary spawning surveys occurred regularly from 9 September 2016 through 08 November 2016 (Table 4-5). A total of 693 Skagit summer Chinook carcasses were observed in 2016 and 683 carcasses were recovered and sampled. There were 637 carcasses that were unmarked and untagged wild Skagit summer Chinook, 13 carcasses were adipose clipped only (no CWT), 22 carcasses were adipose clipped and coded wire tagged, 1 carcass was coded wire tagged only (adipose present), 5 carcasses were unmarked (adipose present) but did not have a head to scan for CWT (unknown CWT), 4 carcasses had decomposed or scavenged adipose fins so were unknown adipose clip, but did not have coded wire tags (no beep), and 1 carcass was highly decomposed and was unknown adipose clip and unknown coded wire tag (unknown adipose clip, unknown CWT).

Table 4-5. Skagit summer Chinook redd counts from 2016 spawning ground surveys.

Stream	WRIA	Survey method	Reach (RM)	Location ¹	Redds
Goodell Creek	3.1867	Foot	0.0-1.3	92.9	13
Falls Creek ³	3.1780	Foot	0.0-0.4	4.0	1
Bacon Creek	3.1774	Foot	0.0-4.2	82.9	60
Diobsud Creek	3.1750	Foot	0.0-1.3	80.7	44
Cascade River	3.1411	Foot/Float	0.0-4.2	78.1	132
Marblemount Slough	03.1408	Foot	0.0-1.5	77.6	1 ³
Illabot Creek	3.1346	Foot	0.0-2.6	71.6	109 ⁴
Total redds:					360

¹Location refers to river mile location of tributary mouth on mainstem, or lower river mile terminus of a mainstem index.

²Falls Creek WRIA 03.1780 is a tributary of Bacon Creek. The mouth is located at river mile 4.0 of Bacon Creek on the right bank.

³Marblemount Slough had abnormally high flows in 2016 and a summer Chinook redd was found during work by SFEG.

⁴Thirteen redds were found in Illabot Slough in 2016. Illabot Slough had higher than average stream flow in 2016.

We observed 360 summer Chinook redds in the tributaries (Table 4-5). Stream flow and weather conditions during Skagit summer Chinook spawning were challenging for

counting mainstem redds in 2016. Of four flights attempted the first two flights were timely and high quality, then flight surveys were interrupted for almost a month due to river conditions. One flight was attempted during the interruption but the counts were not used because water clarity was too poor to see most of the spawning habitat. The final flight was conducted on 24-Oct well after the normal peak of spawning. It was noted during the flight that high flows had flattened or scoured redds and redistributed gravel throughout the indexes. With no peak count, a lengthy gap around the peak, and the observed redd scour, estimating mainstem redds using the standard area under the curve (AUC) method was not possible for 2016. Instead, a regression of Sauk summer Chinook total escapement to Skagit summer Chinook escapement was used to develop a linear regression for estimating 2016 Skagit summer Chinook escapement. The 2016 expected escapement of Skagit summer Chinook is 15,423 fish (Table 4-1). All data and estimates of escapement are preliminary at the time of reporting and remain subject to further review and agreement by the Skagit comanagers before finalization.

Lower Sauk River Summer Chinook

Lower Sauk River summer Chinook spawn from the mouth of the Sauk River to approximately RM 31.0 (0.9 RM downstream of the White Chuck River). The only documented tributary spawning occurs in Dan Creek (WRIA 3.1079) but due to frequent low flows during spawning, summer Chinook use of Dan Creek has been intermittent. Any carcasses located in Dan Creek were sampled for scales, measured for fork length, and checked for presence of tags and marks. The lower Sauk River is too wide, braided, and spawning too sparsely distributed to be effectively surveyed by foot or pontoon boat, so mainstem Sauk River summer Chinook spawning was surveyed by helicopter.

The Sauk Suiattle Indian Tribe (SSIT) and WDFW conducted carcass collection surveys for Sauk summer Chinook carcasses in the mainstem of the Sauk River in 2016. A total of 39 carcasses were located and sampled. There were 35 carcasses that were unmarked and no beep (no CWT) wild fish. Two recovered carcasses were adipose clipped and coded wire tagged (adipose clipped and beeped), and one carcass was unmarked but was missing portions of the head due to scavenging or decomposition so the CWT status was unknown.

Dan Creek had passable stream flows in 2016. Surveys of Dan Creek began 3 October and continued through 9 November. In 2016 five Sauk summer Chinook redds were observed within the Dan Creek index (Table 4-6).

Two flights were successfully completed on the Lower Sauk River summer Chinook mainstem reaches but four were attempted. Mainstem Sauk summer Chinook spawners are notoriously difficult to monitor due to turbidity inputs from the Suiattle River. Suiattle inputs did not result in any partial surveys of the Sauk summers population in 2016 but poor weather and flows in general restricted us to just the two successful flights. The AUC methodology has always relied on an estimated zero date for pre and post spawning and on getting at least three flights with the middle flight as close to expected peak spawning as possible. While we did not get the three flights we hoped for this year, our second flight was timed around when the peak count would have been expected so at least gave us a possible peak to work with. By calculating the AUC without a third flight we acknowledge we are unsure if the back half of the curve represented reality so it is possible spawning dropped off sooner. However, the hanger for our flight services was along the Sauk River and upstream of most of the Sauk summer spawning areas. To perform surveys on the Skagit River the helicopter always had to fly over the Sauk River, and sometimes flew downstream a bit to evaluate conditions. Because attempted flights for surveying Skagit fall Chinook occurred later than the assumed end date used for Sauk summer Chinook spawning portions of the Sauk summer section were observed after the assumed peak there was no reason to conclude spawning occurred later than the zero date used in 2016.

Table 4-6. Lower Sauk River summer Chinook redd counts from 2016.

Stream	WRIA	Survey method	Reach (RM)	Location ¹	Redds by method		
					Foot surveys	AUC	Linear regression
					Actual	Estimated	Predicted
Sauk River	3.0673	Flight	0.0-13.2	0.0		81	N/A
Sauk River	3.0673	Flight	13.2-21.1	13.2		282	
Dan Creek	3.1079	Foot	0.0-0.8	16.8	5		
Sauk River	3.0673	Flight	21.1-31.0	21.1		49	
Grand total redds from all methods (rounded):						417	

¹Location refers to river mile location of tributary mouth on mainstem, or lower river mile terminus of a mainstem index.

The 2016 escapement estimate of lower Sauk River summer Chinook was 1,044 fish (rounded). All data and estimates of escapement were preliminary at the time of reporting and remained subject to further review and agreement by the Skagit comanagers before finalization.

Lower Skagit River Fall Chinook

Skagit fall Chinook spawn in the mainstem Skagit River from the vicinity of RM 24.5 to the mouth of the Sauk River (RM 67.2). They have also been documented spawning in a variable number of large and small tributary streams depending on flow conditions. Tributary surveys were conducted by foot every seven to fourteen days. Encountered carcasses were sampled for scales, measured for fork length, and checked for coded wire tags. Tributary redds were counted and marked with flagging to prevent repeated counting.

As with the past 3 years, we were unable to conduct a usable series of aerial surveys on the mainstem Skagit River fall Chinook spawning zone in 2016 due to poor weather and water visibility. The 2016 fall Chinook escapement was predicted by regression based on the relationship between estimated escapements of Skagit summer and Skagit fall Chinook from 2004-2012, 2015. River conditions in the mainstem Skagit have been poor for fall Chinook flight surveys the past several seasons and escapements have had to be predicted by regression since 2013. The regression used for the 2016 estimate did not consider tributary redds observed in 2016. Instead, the regression was formulated entirely on total escapements of Skagit summers and falls from 2004-2012, 2015 (i.e. the summed totals of AUC estimates from the mainstems and tributary redd counts and multiplied by 2.5 fish per red). Using the regression, the 2016 Skagit summer Chinook estimate was used to predict the 2016 Skagit fall estimate. The Chinook populations employed in this regression were selected on the basis of "best population relationships" and the selection was biased. Considering that this estimate/prediction is based solely on regression, it would be prudent to use it with discretion and caution. It is also recommended that this escapement be re-examined should new and/or better methods become available.

Due to unsatisfactory water conditions we were only able to collect a minimal amount of data from the index sections of Skagit River tributaries in known fall Chinook spawning areas from 15 September 2016 through 21 November 2016 (Table 4-7). A total of 3 Skagit fall Chinook carcasses were observed in 2016 and 2 were sampled. Of the 2 carcasses sampled, 1 was an unmarked wild Chinook and one was an adipose clipped only, hatchery origin fish. The season total redd count was 31 redds (Table 4-7).

The 2016 Skagit fall Chinook escapement prediction of 2,921 fish (Table 4-1), is preliminary, and is awaiting co-manager review and agreement which had not yet occurred at the time of publication.

Table 4-7. Lower Skagit River fall Chinook redd counts from 2016 spawning ground surveys. Redd counts were provided from Grandy Creek and part of Finney Creek by the Upper Skagit Tribe. The Skagit Fisheries Enhancement group surveyed Hansen Creek and Alder Creek.

Stream	WRIA	Survey method	Reach (RM)	Redds
Skagit River	3.0176	Flight	24.5-56.5	Did not survey (DNS)
Skagit River	3.0176	Flight	56.5-67.2	DNS
Hansen Creek	3.0265	Foot	3.0-4.3	0
Day Creek	3.0299	Foot	0.0-2.2	1
Jones Creek	3.0332	Foot	0.0-1.3	2
Grandy Creek	3.0337	Foot	0.0-1.1	9
Alder Creek	3.0359	Foot	0.0-1.6	0
O'Toole Creek	3.0365	Foot	0.0-0.2	0
Pressentin Creek	3.0385	Foot	0.0-0.4	4
Finney Creek	3.0392	Foot	0.0-6.0	10
Jackman Creek	3.0626	Foot	0.0-0.7	5
EF Nookachamps	3.0230	Foot	3.5-5.1	DNS
Total redds:				31

4.3 Stillaguamish River

The Stillaguamish River basin has two populations of Chinook distinguished by genetic characteristics: summers and falls. These two populations overlap in spawn timing and distribution with both populations spawning in both forks of the Stillaguamish River. The summer stock is a composite of natural and hatchery-origin supplemental production with the majority of spawning occurring in the North Fork Stillaguamish and its major tributaries, including Boulder River and Deer, Grant, French, and Squire Creeks. The fall stock is a composite of natural and hatchery-origin supplemental production with the majority of spawning primarily in the mainstem and South Fork Stillaguamish Rivers, in Pilchuck, Jim, and Canyon Creeks, and in the North Fork Stillaguamish River. Escapement is currently estimated for North Fork and South Fork Stillaguamish Rivers rather than summer and fall populations of Chinook.

Escapement estimates for Stillaguamish Chinook were calculated by multiplying the cumulative redd count by 2.5. Since 2008, Chinook redds found in the North and South Forks have been individually counted during periodic foot or raft surveys using the marked redd census method. Previous to 2008, redd counts in the North and South Forks were estimated using area under the curve methodology based on aerial surveys of North and South Fork mainstem reaches as well as ground-based surveys of tributary streams. Aerial surveys continue to provide redd count data for the Lower Mainstem and upper South Fork. Since 2008, the Stillaguamish Tribe Department of Natural Resources has provided ground coverage of the North Fork Stillaguamish River from its mouth to river mile (RM) 30.0. WDFW staff surveyed the remaining known Chinook spawning areas in the Stillaguamish basin.

Surveys were conducted from mid-August to mid-November to encompass the spawn timing of both stocks. All known spawning habitat was surveyed either by foot or raft on a seven to fourteen day cycle, or by helicopter every fourteen to twenty-one days. All ground-counted redds were flagged, enumerated and recorded with a GPS waypoint. Helicopter surveys counted total visible redds during each flight and total redds were estimated using area-under-the-curve methods. Carcasses encountered were sampled for scales, DNA, CWT, and adipose fin mark status.

North Fork Stillaguamish summer and fall Chinook

North Fork Stillaguamish Chinook spawning surveys covered the entire known distribution. Surveyed areas were the North Fork from RM 0.0 to 34.4 and North Fork tributaries including Squire, Segelson, French, Brooks, and Grant creeks, and Boulder River. Escapement was estimated using expansion of cumulative redd counts (2.5 fish per redd) from raft and foot surveys. Survey conditions for counting Chinook in the North Fork Stillaguamish were generally good throughout the spawning period. The first redd was detected August 19th in the lower South Fork, and last one was detected November 21st in Grant Creek. A total of 296 Chinook redds were counted on the North Fork of the Stillaguamish in 2016 (Table 4-8). The escapement estimate was 743 fish (516 NOR, 227 HOR) (Table 4-8 and Table 4-10). An additional 141 fish (76 NOR, 65 HOR) were taken for hatchery brood stock and were not included in the escapement estimate. Total NOR North Fork Stillaguamish River escapement (natural spawning + broodstock collection) was 592 Chinook.

Table 4-8. North Fork Stillaguamish summer and fall Chinook redd counts in 2016.

Stream	WRIA	Method	Reach (RM)	Redds	Escapement
North Fork	5.0135	Foot/Float	0.0-14.3	41	103
North Fork	5.0135	Foot/Float	14.3-30.0	182	455
North Fork	5.0135	Foot/Float	30.0-34.4	32	80
Grant Creek	5.0156	Foot	0.0-0.4	11	28
Deer Creek	5.0173	Foot	0.0-6.0	3	8
Brooks Creek	5.0215	Foot	0.0-0.1	0	0
Boulder River	5.0229	Foot	0.0-2.9	7	18
French Creek	5.0246	Foot	0.0-3.0	3	8
Squire Creek	5.026	Foot	0.0-4.0	17	43
Brown Creek	5.0265	Foot	0.0-1.0	0	0
Total Redds				296	
Escapement Estimate					743

South Fork and Mainstem Stillaguamish summer and fall Chinook

South Fork and Mainstem Stillaguamish summer and fall Chinook escapement in 2015 was estimated using expansion of cumulative redd counts (2.5 fish per redd) from aerial, foot, and raft surveys. Areas surveyed were the Mainstem between Sylvana and the confluence at Arlington (river miles 6.0 to 17.8), the South Fork from the confluence to Granite Falls (river miles 17.8 to 34.7), and Canyon, Jim, Siberia, and Pilchuck Creeks. River mile 34.7 to 55.1 include Granite Falls and Robe Canyon and are neither surveyable nor good Chinook spawning habitat.

The mainstem aerial index reach, from the juvenile trap (RM 6.0) to the forks (RM 17.8) was flown three times, September 11, 24, and October 8. Rain generated flow pulses in late October and November reduced visibility and precluded further survey efforts.

A total of 47 Chinook redds were found in the Mainstem Stillaguamish and South Fork Stillaguamish River in 2016 (Table 4-9). The escapement estimate was 118 adult fish (79 NOR and 39 HOR; Table 4-10).

Table 4-9. South Fork and Mainstem Stillaguamish summer and fall Chinook redd counts in 2016.

Stream Reach	WRIA	Method	Reach (RM)	Redds	Escapement
Mainstem	5.0001	Flight	6.0-17.8	7	18
South Fork	5.0001	Foot/Float	17.8-34.7	16	40
South Fork (upper)	5.0001	Foot	34.7-65.0	0	0
Pilchuck Creek	5.0062	Foot/Float	0.0-6.2	5	13
Jim Creek	5.0322	Foot/Float	0.0-4.1	7	18
Siberia Creek	5.0324	Foot	0.0-0.4	0	0
Canyon Creek	5.0359	Foot	0.0-0.5	0	0
Total Redds				47	
Escapement Estimate					118

Carcass sampling and escapement composition

WDFW and Stillaguamish Tribe Natural Resources staff conducted spawning ground survey work and carcass sampling in the North and South Forks of the Stillaguamish River and their tributaries. Tribal staff focused their Chinook carcass recovery efforts in the North Fork between the mouth and Swede Heaven Bridge (RM 0.0 to 30.0) and WDFW staff focused on the remaining spawning grounds. In total, 78 complete carcasses (status of both adipose fin and CWT was determined) were sampled in the Stillaguamish River; 73 in the North Fork reaches and five in the South Fork reaches. An additional 2 sampled carcasses were categorized as “unknown” because either the adipose status or the CWT status was undetermined. The sampling rates of Chinook carcasses, not including those with unknown mark dispositions, were 9.8% for North Fork reaches, and 4.2% for South Fork reaches. These rates were calculated by dividing the number of carcasses sampled by the escapement estimate for each population.

Escapement of Chinook by origin (hatchery or natural) was determined by applying ratios of hatchery marked carcasses and unmarked carcasses to the escapement estimate by reach groupings. Grouping reaches into subsets of the populations allows the calculation of hatchery origin recruits (HOR) and natural origin recruits (NOR) for escapement reaches where sample sizes were small or no carcasses were sampled.

Table 4-10. Stillaguamish Chinook carcass sampling and escapement composition in 2015.

	Escapement	No. Hatchery	No. Natural	% Hatchery	% Natural	No. Sample	% sampled
North Fork Stillaguamish							
NF Confluence to Deer Creek ¹	103	17	86	16.7%	83.3%	6	5.8%
NF above Deer Creek	535	191	344	35.7%	64.3%	56	10.5%
NF Tributaries	105	19	86	18.2%	81.8%	11	10.5%
NF Totals	743	227	516	30.6%	69.4%	73	9.8%
South Fork Stillaguamish ²	118	39	79	33.3%	66.7%	5	4.2%
Stillaguamish Totals	861	267	594	31.0%	69.0%	78	9.1%

Key for Grouped Stratum and Populations:

NF Confluence to Deer Creek: North Fork Stillaguamish from RM0.0 to RM14.3

NF above Deer Creek - Deer Cr.: North Fork Stillaguamish from RM14.3 to RM34.4

NF Tributaries: Grant, Brooks, French Segelson, Squire, and Ashton creeks, and Boulder River

All "SF" reaches: Mainstem RM 0-17.8, South Fork Stillaguamish RM 17.8-70.0 and, Pilchuck, Jim, Siberia, and Canyon (RM 0.0-0.3) creeks.

¹Due to low sample size, rates from the NF above Deer Cr. Reach were used for HOR/NOR breakout in this reach.

²Due to low sample size, the average of rates from the previous two years were used for HOR/NOR breakouts.

4.4 Snohomish River

There are two populations of Chinook in the Snohomish River basin: Skykomish summer/fall Chinook and Snoqualmie fall Chinook. The Skykomish stock spawns in the mainstem of the Skykomish River and its tributaries, including the Wallace and Sultan Rivers, Bridal Veil Creek, the South Fork Skykomish River (between RM 49.6 and RM 51.1 and above Sunset Falls) and the North Fork Skykomish River (occasionally above Bear Falls at RM 13.1). The Snoqualmie stock spawns in the Snoqualmie River and its tributaries, including the Tolt and Raging Rivers, and Tokul Creek.

Escapement estimates of naturally spawning Chinook salmon returning to the Snohomish watershed are calculated from cumulative redd counts made from physical surveys of their spawning grounds, and from counts of adult fish passed at Sunset Falls. Additionally, redd estimates for unsurveyed reaches on Raging River, North Fork Tolt River and Cherry Creek were expanded based on redds per mile of adjacent surveyed reaches. Survey methods included ground based walking, float, and jet sled surveys, as well as aerial surveys conducted from a helicopter. Ground counted redds were monitored using marked-redd-census methodology. Ground surveys were done at a frequency of seven to ten days so as to not miss new redds. Redds in ground-surveyed reaches were enumerated, marked with a GPS waypoint, and flagged to prevent re-counting on subsequent surveys. Aerial surveys were conducted on the Snohomish, Skykomish and North Fork Skykomish Rivers at target intervals of two weeks. Aerial surveys provided total visible redd counts per survey flight and were plotted against survey date for the area-under-curve (AUC) method yielding total redd days. Total redd days were then divided by the assumed standard 21-day redd life to yield the estimated cumulative redds from aerial surveyed reaches. The cumulative redd count was then expanded by 2.5 (fish per redd) to estimate escapement. Additionally, a count of Chinook passed above the trap at Sunset Falls on the South Fork of the Skykomish was made. Carcasses encountered were sampled for scales, DNA, CWT, adipose fin mark status, and otoliths.

Skykomish summer/fall Chinook

Spawning ground surveys were conducted throughout the known spawning distribution of Skykomish summer/fall Chinook. Survey reaches were the mainstem Snohomish and Skykomish Rivers, Pilchuck, Sultan, and Wallace Rivers, Woods, Elwell, Bridal Veil, Olney, and Proctor Creeks, and in the North and South forks of the Skykomish River.

Survey conditions were good for most of the spawning season. High flows mid-October made survey conditions difficult. Survey intervals were kept to seven to ten days except for when rain-fed flow pulses in mid-October and November caused survey delays. Two aerial surveys were flown on the Mainstem Snohomish, Skykomish and North and South Fork Skykomish Rivers on September 29 and October 12.

A total of 1,354 Chinook redds were found in the Skykomish River and its tributaries, and Pilchuck River in 2016 (Table 4-11). The spawning escapement estimate (including Sunset Falls trap counts) was 3,785 adult fish (2,363 NOR, 1,422 HOR; Table 4-13). An additional 8,321 adult hatchery origin fish (including 348 jacks) recruited to Wallace Hatchery and were

not included in this escapement estimate. Total NOR Skykomish escapement (natural spawning + broodstock collection) was 2,363 Chinook.

Table 4-11. Skykomish summer/fall Chinook redd counts and escapement, 2016.

Stream Reach	WRIA	Method	Reach (RM)	Redds	Escapement
Snoh-Sky (Mainstems)	7.0012	Float/Flight	20.5-51.5	595	1,488
NF Skykomish	7.0982	Foot/Flight	0.0-13.5	79	198
SF Sky (Sunset Falls)	7.0012	Trap/Haul	51.5-up	n/a	310
Pilchuck River	7.0125	Foot/Float	2.0-26.5	39	98
Woods Creek	7.0826	Foot/Float	0.0-3.5	4	10
Elwell Creek	7.0865	Foot	0.0-1.0	0	0
Sultan River	7.0881	Foot/Float	0.0-9.7	275	687
Wallace River (lower)	7.094	Foot/Float	0.0-4.4	126	315
Wallace River(upper)	7.094	Foot/Float	4.4-7.3	218	545
Olney Creek	7.0946	Foot	0.0-0.6	0	0
Proctor Creek	7.097	Foot	0.0-0.4	5	13
Bridal Veil Creek	7.1248	Foot	0.0-0.4	13	121
Total Redds				1,354	
				Escapement	3,785

Snoqualmie summer/fall Chinook

The escapement estimates for Snoqualmie summer/fall Chinook were made using cumulative redd counts from boat, foot, and aerial surveys of known spawning habitat. Surveyed reaches were the Snoqualmie River and its tributaries, including the Tolt and Raging Rivers and Cherry and Tokul Creeks. Chinook redds were observed from early September to mid-November.

Survey conditions were good for monitoring chinook spawning until mid-October when Fall rainstorms significantly increased stream flows, delaying or preventing some surveys

In 2016, 1,368 Chinook are estimated to have escaped to the Snoqualmie Basin, based on a total count of 519.5 redds (Table 4-12). Based on carcass sampling results, the escapement estimate is composed of 1,013 NORs and 355 HORs (Table 4-13).

Table 4-12. Snoqualmie fall Chinook redd counts and escapement by reach, 2015.

Stream Reach	WRIA	Method	Reach (RM)	Redds	Escapement
Snoqualmie River (Lower)	7.0219	Float	20.5-24.9	77	193
Snoqualmie River (Upper)	7.0219	Float	32.9-39.6	111	278
Cherry Creek	7.0240	Foot	1.8-3.5	2	5
Tolt River (Lower)	7.0291	Foot/Float	0.0-6.0	61	153
Tolt River (Upper)	7.0291	Foot/Float	6.0-8.9	23	58
NF Tolt River	7.0291	Foot	8.9-11.3	19	48
SF Tolt River	7.0302	Foot	0.0-2.3	10	25
Raging River	7.0384	Foot	0.0-4.6	91	228
Raging River (Upper)	7.0384	Foot	4.6-13.2	82.5	206
Tokul Creek (Lower)	7.044	Foot	0.0-0.3	43	174
Tokul Creek (Upper)	7.044	Foot	0.3-0.6	0	0
Total Redds				519.5	
Escapement Estimate					1,368

Sampling and HOR:NOR summary

Field staff sampled 698 complete Chinook carcasses (status of CWT, otolith mark, and adipose fin mark are known) within the Snohomish basin. Additionally, adipose fin and CWT status was determined for 112 live Chinook passed at Sunset Falls. In total, the Chinook carcass sampling rate on the spawning grounds and at Sunset Falls was 15.7% (Table 4-13). This was calculated by dividing the number of carcasses and live fish sampled by the escapement estimate.

Escapement of Chinook by origin (hatchery or natural) was determined by applying ratios of hatchery marked carcasses and unmarked carcasses (and live fish sampled at Sunset Falls) to the escapement estimate by reach groupings (Table 4-13). Grouping reaches into subsets of the populations allows the calculation of hatchery origin recruits (HOR) and natural origin recruits (NOR) for escapement reaches where sample sizes were small or no carcasses were sampled.

Table 4-13. Snohomish Chinook carcass sampling and escapement composition in 2016.

Stratum	Escapement	No. Hatchery	No. Natural	% Hatchery	% Natural	Number Sampled	Percent Sampled
Skykomish	1,511	345	1,166	22.8%	77.2%	114	7.5%
Bridal Veil	319	148	171	46.4%	53.6%	153	48.0%
SF Sky *	310	25	285	8.0%	92.0%	112	36.1%
Pilchuck River ¹	98	10	88	10.3%	89.7%	1	1.0%
Sultan River	687	70	617	10.3%	89.7%	39	5.7%
Wallace River	860	824	36	95.8%	4.2%	48	5.6%
Skykomish Population	3,785	1,422	2,363	37.6%	62.4%	467	12.3%
Snoqualmie	1,194	246	948	20.6%	79.4%	175	14.7%
Tokul	174	109	65	62.7%	37.3%	169	97.1%
Snoqualmie Population	1,368	355	1,013	25.9%	74.1%	344	25.1%
Snohomish Total	5,153	1,777	3,376	34.5%	65.5%	811	15.7%

*Sunset Falls sample: A sub-sample of Chinook passed upstream were sampled for cwt wire and adipose mark.

¹ Due to low carcass samples on Pilchuck River, HOR/NOR ratio for Sultan River was applied instead.

Key for Grouped Stratum and Populations:

Skykomish Population:

Bridal Veil: Bridal Veil Creek, NF Skykomish River, SF Sky (Sunset Falls)

Sultan: Sultan River

Skykomish: Snoh-Sky (Mainstems), Elwell Creek, Olney Creek, Woods Creek, Proctor Creek

Pilchuck: Pilchuck River

Wallace: Wallace River (Upper and Lower)

Snoqualmie Population:

Snoqualmie: Snoqualmie River (Lower and Upper), Raging River, Tolt River (Lower and Upper), SF

Tokul: Tokul Creek (Lower), Tokul Creek (Upper)

4.5 Cedar River

Prior to 1999, live counts and Area Under the Curve (AUC) methods were used to estimate Chinook spawning abundance in the Cedar River. Since 1999, Chinook redds have been enumerated and mapped in the Cedar River via floating surveys, and escapement estimated by expanding the redd count by 2.5. Cedar River redd surveys are considered to be a complete census of the mainstem river, where every Chinook redd in the Cedar system is counted. Redd surveys are conducted between RM 4.2 and RM 21.8 (Landsburg Dam) 2-3 times per week for the duration of the Chinook spawning period. The portion of the river upstream from the Landsburg Dam to the Cedar Falls powerhouse (RM 34.5), and the lower 4.2 miles of the Cedar mainstem are each surveyed once per week. Due to the overlap with sockeye spawning timing, Chinook redds are only included in the count if a female Chinook is present and actively attending to a redd.

In 2016, a total of 418 Chinook redds were observed in the Cedar River during the spawning season (including the surveyed area upstream from Landsburg Dam and including all small tributaries). Of the 418 Chinook redds, 410 were observed in the Cedar River mainstem (381 below Landsburg Dam and 29 above), and 8 were observed in small tributaries to the Cedar River (seven in Taylor Creek and one in Rock Creek). Expansion by 2.5 fish per redd resulted

in the estimated escapement of 1,045 Chinook (Table 4-1). A total of 405 adult Cedar River Chinook were sampled for adipose fin clips in 2016. This sample indicated that 60% of the Cedar River Chinook were natural origin fish (unclipped) and 40% were hatchery origin (clipped) fish.

4.6 Sammamish River/North Lake Washington Tributaries

The Sammamish Chinook population is composed of naturally spawning Chinook in the Big Bear/Cottage Lake Creek watershed and in the Issaquah Creek watershed downstream of Issaquah Hatchery. Chinook natural escapement to the Sammamish River/ North Lake Washington tributaries in 2016 was estimated at 1,247 fish (Table 4-1).

Big Bear/Cottage Lake Creeks

Escapement estimation to Big Bear Creek and Cottage Lake Creek involves weekly surveys of all known Chinook spawning areas to enumerate live Chinook. Total spawning escapement is estimated using the AUC method, where live fish counts and a 10-day stream life estimate are used to calculate escapement.

The Bear Creek/Cottage Creek index area was surveyed weekly during the 2016 spawning season. The escapement estimate was 354 fish. Of these, 138 fish were counted in the Bear Creek mainstem, and 216 fish were counted in the Upper and Lower Cottage Creek Indexes. A total of 71 Chinook were sampled for adipose fin clips in 2016. This sample indicated that 19% of all Chinook in the Bear/Cottage system were natural origin fish (unclipped) and 81% were hatchery origin fish.

Issaquah Creek System

Issaquah Creek is surveyed weekly from the Issaquah Hatchery (located at river mile 3.0), downstream to its confluence with Lake Sammamish to count Chinook carcasses. All Chinook carcasses are assumed to have spawned, and the cumulative carcass count is used as the escapement estimate for this reach of Issaquah Creek. East Fork Issaquah Creek is also surveyed weekly from its confluence with the Issaquah Creek mainstem, upstream to the High Point Trail crossing at approximately RM 3.0. Similar to the Issaquah Creek mainstem, the cumulative carcass count is used as the escapement estimate for the East Fork.

The Issaquah Creek system was surveyed weekly during the 2016 spawning season, and total escapement was estimated at 893. This estimate includes 831 fish in the mainstem below the hatchery, and 62 fish from the East Fork. A total of 336 adult Chinook from the Issaquah Creek system were sampled for adipose fin clips in 2016. This sample indicated that 9% of all Chinook in the Issaquah Creek system were natural origin fish (unclipped) and 91% were hatchery origin fish.

Chinook escapement to Issaquah Hatchery in 2016 was 2,613 (2,596 adults and 17 jacks); of which 177 (176 adults and 1 jack) were intentionally released upstream to spawn in upper Issaquah Creek. 2016 was the second year with no Chinook returns to the University of Washington hatchery; the program has been discontinued.

4.7 Green River

Beginning in 2009, Muckleshoot (MIT) and WDFW Biologists agreed to attempt weekly counts of new Chinook redds in all survey-able reaches of the Green River and Newaukum Creek during Chinook spawning ground surveys, reasoning that so few redds were being dug, it was

possible to count all redds in all reaches. This estimation methodology uses season total redd counts, without adjustment, in four of the six sections of the mainstem Green River. At the conclusion of the spawning season, the observed number of redds in these sections of the river is known, and the variance is zero. There may be observational error in these sections or spawning outside these sections. However these factors operate in all sampling programs and are not included in any variance estimates.

New Chinook redds were counted weekly over three days in the mainstem river between River Mile (RM) 25.4 to 48.5 (Lower River, Middle River, and Lower Gorge) and 59.2 to 61.0 (Headworks). Using two, one-man pontoon boats or two, two-man boats, crews worked in tandem to count redds left and right of the center of the river. Foot surveys of Chinook naturally spawning in Newaukum Creek were conducted weekly by WDFW crews from the creek mouth to river mile 3.9. Redds in the Metzler Side Channel (MSC) were counted opportunistically when adequate water filled the side channel, in a similar manner. Only those redds that could reasonably be presumed to be Chinook redds were counted, based on the presence of a female observed digging or guarding the redd, or when redd size and substrate size were unambiguous.

A rigorous surveying schedule began on September 7 and continued through November 4. Surveys were suspended during the week of October 16 when high flows prohibited safe conduct of surveys. Redd counts from Metzler Side Channel were conducted on September 26, October 11, and November 4. These counts were added to the weekly counts for the Middle River. The weekly number of redds counted in each section, was summed, without adjustment, to produce the season total redd count by section.

On October 5 and 19, a count of visible redds in each reach was made by helicopter in all 6 sections, encompassing the entire "spawnable area" of the mainstem river between RM 25.4 and approximately RM 60.4. Pending amenable weather conditions, flights were timed to coincide with the historical peak of natural Chinook spawning activity which typically occurs the first or second week in October. Flight scheduling was limited by availability of the helicopter and weather and river conditions.

Escapement was calculated for the sections of the river not surveyed by boat: "Gorge", RM 48.5 to 56.2; and "Hwy 167 to Transfer Shack", RM 25.4 to 26.7, the lowermost reach in the Lower River. The season total redd count from the section just below the Gorge; Lower Gorge section: RM 44.3 to 48.5, was divided by the number of redds in the Lower Gorge section counted on the flight, resulting in the "Ground to Air Ratio" (G/A). The G/A was then applied to the number of redds observed in the Gorge on the day of the flight. For the Hwy 167 to Transfer Shack reach, the sum of redds observed during the two aerial surveys was used to estimate a season total of 11 redds.

Season total redd counts from boat and foot surveys of the mainstem Green River and Newaukum Creek and calculated values from the aerial sections of the Green River, were multiplied by 2.5 fish per redd to estimate total Chinook spawning naturally in the Green River basin. This multiplier is intended to account for the number of males and females and is derived from the sex ratio of 1.5 males for every female.

Post season analysis of the season totals indicates that peak spawning activity varied by section, but was generally highest during the first two weeks of October in both the mainstem and Newaukum Creek (Table 4-14 and Table 4-15). By the end of surveys the week of October 9, 95% of redds (3,377 of 3,567) observed during boat and foot spawning ground surveys were complete.

Table 4-14. Chinook redd counts from foot and boat surveys of the Green River in 2016.

Section	Week									Total
	4-Sep	11-Sep	18-Sep	25-Sep	2-Oct	9-Oct	16-Oct	23-Oct	30-Oct	
Headworks	-	33	182	455	453	215	-	72	10	1,420
Lower Gorge	-	0	11	93	82	63	-	0	1	250
Middle River	1	2	52	294	447	459	-	89	8	1,352
Lower River ¹	-	8	25	-	161	-	-	-	0	194
Newaukum Creek	0	0	60	100	125	56	-	10	0	351
Total	1	43	330	942	1,268	793	-	171	19	3,567

¹Aerial surveys on October 5 and 19 were used to estimate 11 redds in the Hwy 167 to transfer shack reach.

Table 4-15. Aerial survey counts of Chinook redds in the Green River, 2016.

Section	Week ¹									Total
	4-Sep	11-Sep	18-Sep	25-Sep	2-Oct	9-Oct	16-Oct	23-Oct	30-Oct	
Headworks	-	-	-	-	526	-	177	-	-	703
Gorge	-	-	-	-	353	-	81	-	-	434
Lower Gorge	-	-	-	-	209	-	61	-	-	270
Middle River	-	-	-	-	682	-	227	-	-	909
Lower River	-	-	-	-	185	-	25	-	-	210
Hwy 167-Transfer Shack	-	-	-	-	11	-	0	-	-	11
Total	-	-	-	-	1,966	-	571	-	-	2,537

¹Aerial counts can include redds still visible from prior weeks and thus exceed boat counts for the same week.

The season total redds from the Middle River was 1,264 redds plus 88 from MSC, 250 from the Lower Gorge, 1,420 from the Headworks, and 194 in the Lower River plus 11 in the Hwy 167-Transfer Shack reach. The G/A ratio for the Lower Gorge was 1.20 (250/209) resulting in a calculated 422 redds for the "Gorge". A total of 3,674 redds were counted or calculated in the mainstem Green River, including MSC, by census. In Newaukum Creek, the season total redds for the section "400th to Whitney Hill Bridge" was 223 and for the section "Whitney Hill Bridge" to mouth" was 128, totaling 351 redds in Newaukum Creek.

Applying the constant 2.5 fish/redd (1.5 males:1.0 female), an estimate of 10,063 naturally spawning Chinook was generated for the Green River Basin (Table 4-1).

During the season, 1,140 adults and 163 jacks that returned to the Soos Creek and Keta Creek hatcheries were tagged by the Muckleshoot Indian Tribe, hauled upstream, and released in the mainstem. Although duration of survival and spawning success of these fish may be variable, any redds created by these fish would have been counted during surveys, meaning that they are included in the natural spawning escapement estimate.

River flows during the 2016 Chinook spawning season were moderate through the peak of spawning in mid-October after which flows increased substantially (Table 4-16). This resulted in surveys being suspended during the week of October 16 followed by reduced visibility in the final two weeks of the survey season.

Table 4-16. Average weekly discharge (cfs) at three locations on the Green River (Palmer USGS Gage 12106700, Auburn USGS Gage 12113000, and Newaukum Creek USGS Gage 12108500) in 2016. Weekly discharges are 7-day averages of mean daily discharge beginning with the day listed.

USGS Gauge	Week								
	4-Sep	11-Sep	18-Sep	25-Sep	2-Oct	9-Oct	16-Oct	23-Oct	30-Oct
Palmer	230	213	291	349	435	905	1,694	1,365	1,128
Auburn	366	342	433	480	563	1,124	2,147	1,839	1,600
Newaukum Creek	5	5	7	5	6	28	49	49	66

Carcass sampling

Naturally spawning Chinook carcasses (clipped and unclipped) were sampled opportunistically during spawning ground surveys in the mainstem and Newaukum Creek. Biological data were collected from these carcasses, and a “Percent Egg Retention” variable was determined. The “Percent Egg Retention” variable was determined by inspection of the gonads of all female carcasses. The proportion of eggs estimated to have been retained was noted for carcasses where eggs remained in the body cavity. A carcass noted as having 25% egg retention was estimated to have expelled 75% of her total eggs. Additionally, tagged fish from re-released hatchery returns were noted for all sampled carcasses.

A total of 1,056 carcasses were sampled for standard biological data by Green River crews in 2016; 722 (62 DIT+ 12 CWT&AD + 490 AD + 158 thermal marked with adipose fin and no CWT) or 68.4% were of hatchery origin as indicated by the presence of an adipose fin, CWT tag, or hatchery thermal mark (Table 4-17).

Table 4-17. Summary of Chinook biological sampling in the Green River, 2016.

Section	Biological Samples	Adipose Clipped	Thermal Marks	MIT Tags ¹	Acoustic MIT Tags ²	CWT ³ & Ad-Clipped	DIT ³
Headworks	482	196	101	1	4	2	38
Lower Gorge	103	42	18	15	2	1	3
Middle River	221	126	10	35	1	4	9
Lower River	12	11	0	15	0	2	1
Metzler Side Channel	0	0	0	0	0	0	0
SubTotal: River	818	375	129	66	7	9	51
Newaukum: 400th to Whitney Hill Br	147	64	19	8	1	1	8
Newaukum: Whitney Hill Br to Mouth	91	51	10	14	1	2	3
SubTotal: Newaukum	238	115	29	22	2	3	11
Grand Total:	1,056	490	158	88	9	12	62

¹“MIT tags”; the number of sampled fish with MIT tags, or those otherwise identified as hatchery re-release.

²Acoustic MIT Tags: the number of carcasses retrieved with MIT acoustic tags (MIT supplemental study)

³CWT: Coded wire tag present (unconfirmed) DIT = (Double Index Tag) Adipose fin present, coded wire tag present.

Table 4-18. Coded wire tag sampling, thermal mark analysis of otoliths¹, and origin of natural Chinook spawners² in the Green River, 2016.

	Sampled						NM with no Thermal Mark		AD or NM with Thermal Mark		NM not analyzed for Thermal Mark	
	Number	NOS	HOS	Not Analyzed ³	CWT	No CWT	DIT	No CWT	CWT	No CWT	CWT	No CWT
Green River	818	140	557	121	61	757	3	140	10	496	48	121
Newaukum Creek	238	39	155	44	14	224	0	39	3	141	11	44
Green River Basin Total	1,056	179	712	165	75	981	3	179	13	637	59	165

¹Since 2014, Chinook released from the Palmer Hatchery have been thermal marked but not adipose fin clipped. In 2016, otoliths were collected from all NM carcasses, however only scale age 3 fish with no CWT were analyzed for presence of a thermal mark.

²NOS= Natural origin spawner; HOS= Hatchery origin spawner; NM = Adipose fin present; AD = Adipose fin clipped; CWT = Coded wire tag present (unconfirmed); DIT = Double Index Tag; Adipose fin present, coded wire tag present; TM = Thermal Marked.

³Not analyzed = adipose fin present with no CWT but not analyzed for thermal mark. Includes 1 carcass (Green River) for which adipose fin presence was unknown.

4.8 White River

By definition, the escapement estimate for White River Spring Chinook is derived from trap counts at the Army Corps of Engineers' Buckley Diversion Dam fish trap (Buckley Trap) and hatchery returns to the White River Hatchery (WRH). The WRH and Buckley Trap are on opposite sides of a diversion dam on the White River. Off-site propagation of White River Spring Chinook also occurs at the Minter Creek/Hupp Springs Hatchery, and returns to that facility are recorded separately. Under ideal conditions, the Buckley Trap allows sampling and enumeration of all fish transported to the upper White River watershed. During odd years when pink salmon return and during years of relatively high coho returns (2003-2012), sampling at the Buckley trap is limited, particularly during the latter part of the Chinook run. As a consequence, the proportions of hatchery and natural-origin spring and fall Chinook transported above the dam are uncertain. Records of trap and haul operations conducted in the absence of state or tribal fisheries managers are a subject of ongoing concern. In 2016, complete sampling occurred through September 7th, but 644 Chinook (410 adults and 234 jacks) of unknown origin were transported upstream after this date.

The number of adult fish sampled at the WRH and at the Buckley Trap prior to the termination of sampling was 8,720. Of these, 3,401 were natural-origin (NOR) and acclimation pond (AP) recruits. NORs are assumed to be primarily spring Chinook although based on DNA analysis, fall run Chinook and potential hybrids have been passed. NORs made up 16% and APs made up 54% of the sampled Chinook. At the Buckley Trap, the ratios of coded wire tagged to non-coded wire tagged fish, as well as vent clipped to non-vent clipped fish among sampled adults and jacks, were applied to un-sampled adults and jacks passed upstream after September 7th. In addition, 94 of the adult NORs were collected at, or taken to, the White River Hatchery for use as broodstock.

Table 4-19. Estimated number NOR and Acclimation Pond Chinook salmon hauled upstream of Mud Mountain Dam in 2016. Results are a combination of returns sampled White River Hatchery and sampled and un-sampled fish at Buckley Trap.

Origin	Adults	Jacks	Totals
Wild (NOR)	775	274	1,049
Acclimation Pond	2,851	2,213	5,064
Totals	3,626	2,487	6,113

There are two hatchery programs for White River spring Chinook: the Minter Creek/Hupp Springs program and the White River Hatchery. The Minter Creek/Hupp Springs program was initiated in the mid-1970's in response to steep declines in population abundance. The spring Chinook program was subsequently expanded following completion of the Muckleshoot Tribe's White River Hatchery in 1989. In 2016, escapement to the Minter Creek/Hupp Springs hatchery was 793 adults. None of these fish nor their gametes were taken to the White River Hatchery. Escapement to the White River Hatchery in 2016 was 1,797 adults and 2,882 jacks. These fish were either collected at the Buckley fish trap on the south side of the diversion dam, or volunteered to the WRH trap on the north side of the diversion dam.

4.9 Puyallup River

The Puyallup Tribal Fisheries (PTF) and WDFW staff used a redd count based methodology to estimate Chinook escapement in the Puyallup River basin during even years. The escapement estimate includes fall-timed Chinook spawning in the lower White River downstream of the Buckley diversion dam trap. These fish have been enumerated by PTF biologists through spawning ground surveys since 2002, but were not accounted for in escapement estimates prior to 2009.

South Prairie Creek

Survey coverage of the South Prairie system was very good in 2016. The cumulative redd count of 227 in South Prairie Creek, expanded by 2.5, yielded an escapement estimate of 568 spawners. In Wilkeson Creek, the cumulative redd count of 4, expanded by 2.5, yielded an escapement estimate of 10 spawners. The South Prairie Creek (SPC) sub-basin total spawning escapement estimate for 2016 is 578. Based on mark-sampling of carcasses observed, about 60% of these fish were marked, so the escapement was made up of 234 NORs and 344 HORs.

Carbon River

Because conditions in the Carbon River seldom allow accurate Chinook escapement surveys, estimates are based on the relationship between SPC and Carbon River escapement in 1999, when there was an accurate redd count for the Carbon River. Carbon River reaches with complete data tracked the SPC spawn timing remarkably well. Therefore, reaches with incomplete data were expanded using the SPC spawn timing curve with a high degree of confidence. The 2016 SPC escapement, including Wilkeson Creek, utilized in the Carbon River escapement expansion is an adjusted area under the curve (AUC) escapement estimate accounting for the average even-year (1994-2016) ratio of redd-based escapement and live fish AUC estimate exclusively in SPC multiplied by the 2016 AUC live fish estimate for SPC sub-basin.

Survey conditions were not suitable on the Carbon River during the 2016 spawning period. Consistent with the last ten years, the 2016/1999 SPC AUC escapement ratio ($695 / 1422 = 0.4888$) was applied to the 1999 Carbon River escapement (250) to estimate the 2016 value. This method estimated 122 Chinook spawning in the Carbon during 2016 ($250 * 0.4888 = 122$). Based on mark sampling ratios observed in South Prairie Creek, the escapement was made up of 49 NORs and 73 HORs.

Puyallup River Tributaries

Aggregate escapement to Puyallup River tributaries in 2016 was estimated at 385 (Table 4-20). Based on mark sampling in these tributaries, excluding Clark's Creek, 50 of these fish are NORs and 335 HORs.

Table 4-20. Chinook escapement estimates for Puyallup River tributaries, 2016.

Tributary	Escapement
Fennel Creek (WRIA 10.0406)	315
Canyon Falls Creek (10.0410)	33
Kapowsin Creek (10.0600)	10
Clear Creek (10.0022)	28
Clarks Creek (10.0027)	0
Tributary total	385

Mainstem Puyallup River

Chinook spawning escapement to the mainstem Puyallup River was estimated to be 846. This escapement comprised 109 NOR and 737 HOR Chinook, based on mark sampling ratios observed in mainstem tributaries.

As with the Carbon River, surveys of Puyallup River were not possible in 2016. WDFW and PTF staff believe that mainstem spawning escapement is closely related to the tributaries (Fennel, Canyon Falls, Clear, Kapowsin, and Clarks creeks). Therefore, the 2016/1999 Puyallup tributary AUC ratio ($490 / 113 = 4.3377$) was applied to the estimated 1999 Puyallup mainstem escapement (195) to estimate 2016 escapement of 846 Chinook ($195 * 4.3377 = 846$). The same even-year (1994-2016) average AUC adjustment used for the Carbon River was applied to the Puyallup tributary AUC live-fish estimate to develop the 2016 Puyallup tributary AUC estimate for this analysis.

Lower White River

The fall component of Chinook spawning in the lower White River and its tributaries, downstream of the Buckley trap, are included in the 2016 Puyallup River basin fall Chinook escapement estimate. Spawning ground surveys indicate that, in some years, a sizeable number of Chinook spawn in these areas.

Spring and fall Chinook spawn in the White River. The fall component in the lower White River and tributaries was identified by mark sampling during spawning ground surveys and the genetic analysis conducted by Ford et al. (2004). Carcass sampling during spawning ground surveys provides a ratio of hatchery-origin fall Chinook (i.e. fish with a clipped adipose fin), to unmarked fish. Based on previous genetic analysis of samples collected in Boise Creek (Ford et al 2004), 60% of the unmarked fish are assumed to be fall Chinook.

Fall Chinook spawning escapement into the lower mainstem White River and its tributaries in 2016 was estimated to be 726 fish. This escapement is made up of 252 NORs and 474 HORs based on mark sampling ratios observed during spawning ground surveys.

Total Puyallup Escapement

The estimated total number of naturally spawning fall Chinook in the Puyallup basin in 2016 was 2,657. Based on carcass sampling, we estimated that 694 were NORs, and 1,963 were HORs. The estimate of NORs assumes the proportions of hatchery and natural origin spawners is the same in Puyallup River tributaries, the Puyallup River mainstem, South Prairie Creek, and the Carbon River.

4.10 Nisqually River

Escapement to the Nisqually River in 2016 was estimated using a change in ratio methodology (Seber 1982). This method uses (1) the proportion of marked fish entering the river (as estimated by sampling tribal gillnet catch), (2) the total removals below the video counting slot in the Yelm Diversion dam and proportion of those removals marked, and (3) the proportion of marked fish passing above the Yelm Diversion Dam video counting slot to estimate the total return to the river.

Escapement to the Nisqually River was estimated to be 1,079 Chinook salmon (468 HOR, 611 NOR) (Table 4-1). This total includes 340 HOR's which originally returned to Clear Creek Hatchery and were trucked and released upstream to spawn naturally.

4.11 Hood Canal

Natural Chinook escapement to the Skokomish River and Mid-Hood Canal rivers in 2016 were 1,432 and 291, respectively (Table 4-21).

Mid-Hood Canal

The Mid-Hood Canal population is comprised of Chinook produced in the Dosewallips, Duckabush, and Hamma Hamma watersheds.

In the Dosewallips and Duckabush rivers, the lower reaches surveyed are spawning and transit areas. Upper reaches of the Dosewallips and Duckabush rivers have also been regularly surveyed since 1998, but few adults have been observed. Current escapement estimates are derived from combinations of live Chinook adult counts and Chinook redd expansions, depending on flow conditions and fish distributions.

In the Hamma Hamma River, most of the Chinook spawning area is currently being surveyed. A cooperative supplementation program was initiated in 1995 to rebuild Chinook abundance. Prior to 1998, escapement had been estimated from counts of cumulative new redds and/or from live Chinook using the area-under-the curve (AUC) method. However, since returns increased as the result of supplementation, the AUC method has been employed as the primary method of escapement estimation.

Summer chum salmon and pink salmon (in odd years) spawn at the same time as Chinook in the lower reaches of these three streams. Consequently, it can be difficult to distinguish Chinook redds from summer chum or pink redds unless Chinook are actively spawning and observed on redds. Pink salmon spawn predominately downstream of RM 6.7 on the Dosewallips, downstream of RM 2.6 on the Duckabush and throughout the reaches surveyed on the Hamma Hamma. Summer chum salmon spawn predominately downstream of RM 3.6 on the Dosewallips, downstream of RM 2.6 on the Duckabush and throughout the reaches surveyed on the Hamma Hamma. It has been possible to count Chinook redds in the upper Dosewallips and Duckabush River reaches (especially in years without pink salmon).

The WDFW conducted spawner surveys on the Dosewallips, Duckabush, and Hamma Hamma rivers every 7 to 10 days from late August or early September through October. The escapement estimate to all three systems combined was 291 adults: 8, 15, and 268 Chinook in Dosewallips, Duckabush, and Hamma Hamma rivers, respectively (Table 4-21). During 2016, it is possible that some Chinook redds were not identifiable on the Dosewallips and Duckabush rivers in areas with summer chum spawning. However, based on the number of Chinook redds and adults observed during surveys and carcasses recovered during intensive weekly surveys,

few Chinook were present and the escapement estimates for Dosewallips and Duckabush rivers are considered accurate.

The Dosewallips River was surveyed from RM 0 to RM 2.3, RM 3.6 to RM 6.7, and RM 7 to RM 11; Rockybrook Creek, a tributary, was surveyed from RM 0 to RM 0.3. No Chinook redds were observed and the escapement estimate based on AUC with 3 live fish observations in the Dosewallips River during 2016. The Duckabush River was surveyed from RM 0 to RM 2.6, RM 4.8 to RM 6. Although no Chinook redd was conclusively identified, an AUC estimate of 15 individual live adults was made based on observations made in September and October. The Hamma Hamma River was surveyed from RM 0.3 to RM 1.8; John Creek, a tributary, was also accessible to Chinook and was surveyed from RM 0 to RM 1.6. The estimated total escapement to the Hamma Hamma is 268 which is the AUC estimate of natural spawners in the mainstem. Flows were low in John Creek late into the season that the fish counted there had been previously accounted for in several Hamma Hamma mainstem surveys. No Chinook were collected for broodstock. The FRAM pre-season escapement projection was 333 for the Mid-Hood Canal (FRAM 2916) while the estimated escapement is 291 Chinook. Escapements to the Dosewallips River and Duckabush River were low as anticipated.

Skokomish River

Chinook spawning takes place in the mainstem Skokomish River up to the confluence with the South and North Forks at RM 9, in the South Fork (primarily up to RM 5.5), and in the North Fork from RM 9 to 15.7 (where Little Falls blocks further access). Natural escapement estimates have historically been based on counts of Chinook redds in the principal spawning habitat in the mainstem Skokomish (RM 2.2 to 9.0), North Fork (R.M. 9.0 to 15.6), and South Fork (R.M. 0 to 2.2). Since 2008, surveys have been conducted from RM 0 to RM 5.5 in the South Fork, and included in the total escapement estimate. In addition, escapement estimates are made for Vance Creek and Hunter Creek. However, dramatically increasing numbers of summer chum spawning in the mainstem Skokomish since 2014 have caused the co-managers to re-evaluate the redd-based spawning methodology, and ultimately shift to a modified Area under the Curve (AUC) methodology applied elsewhere in Hood Canal. This change was necessary because summer chum spawning has become so prolific that Chinook redds have become more concentrated in preferred habitat leading to superimposition and difficulties in detection.

Live and dead adults, along with visible redds, were counted in Skokomish River index areas during foot and raft surveys (e.g., see Smith and Castle 1994). Surveys are conducted every seven to ten days from late August through October. Weekly instantaneous live fish counts for the entire mainstem, South Fork and North Fork were used to calculate fish days, which were then divided by a stream life value of 15 days to estimate total Chinook escapement. In addition, foot surveys are made in Hunter and Vance creeks. Escapements to these tributaries are estimated based on redd counts and/or live Chinook observed.

In recent years, low flows at the mouth of the South Fork have prevented Chinook from accessing the lower South Fork early in the season. In 2016, however, Chinook had limited access the South Fork Skokomish after a brief period of increased flow in early September.

The total estimated spawner escapement to the Skokomish River is 1,342 (Table 4-21). This total includes 886 in the mainstem Skokomish, 448 Chinook in the North Fork, and 8 Chinook in the lower (RM 0 to RM 5.5) South Fork Skokomish. The pre-season escapement prediction was 1,404 (FRAM 2916).

Table 4-21. Summary of Chinook escapement to Hood Canal streams during 2016.

Area	Stream	Escapement	Comments
82 G/J	Skokomish R.	886	AUC based on live fish (MS+NF), the apportioned using redd-based esc for NF and SF, due to large summer chum return in MS
	N.F. Skokomish R.	448	
	S.F. Skokomish R.	8	
Total		1,342	
12A	Little Quilcene R.	0	No Chinook observed
	Big Quilcene R.	1	One dead Chinook observed
Total		1	
12B	Dosewallips R.	8	AUC based on live fish
	Duckabush R.	15	AUC based on live fish
	Hamma Hamma R. a/	268	AUC Hamma
Total		291	
12C	Dewatto R.	90	AUC
	Lilliwaup Cr.	0	AUC
Total		90	
12D	Tahuya R.	27	AUC
	Union R.	50	Trap
Total		77	
Hood Canal total		1,801	

a/ Hamma natural escapement = 268, broodstock = 0, John Ck = 61 (John Creek fish previously counted in Hamma AUC due to late access)

Mark Sampling

Mass marking has been implemented for releases from George Adams Hatchery, Hoodspout Hatchery, and Endicott Ponds. Double index tag groups have been released from George Adams Hatchery since 1998. The proportion of all Hood Canal hatchery Chinook that were either tagged and/or marked has incrementally increased since brood year 2003. In addition, all of the Chinook released from the Hamma Hamma supplementation program were tagged and/or marked. Coded-wire tag (CWT), age, and sex composition data have been routinely collected from Chinook returning to George Adams Hatchery since 1988.

There has been more intensive sampling of Chinook on the spawning grounds since 1998. During 2016, the Skokomish, Dosewallips, Duckabush, and Hamma Hamma rivers were targeted for enhanced mark and CWT sampling and WDFW also sampled Chinook carcasses for marks and CWTs on the Dewatto and Lilliwaup rivers.

Of the 206 Chinook sampled in Hood Canal rivers during 2016, 96 Chinook were adipose-clipped and, of these, three had CWTs. Twenty-seven unmarked Chinook were coded-wire tagged. We sampled 7.6% of the Chinook spawning escapement in the Skokomish River, 17.5% of the Mid-Hood Canal Chinook escapement (in the Hamma Hamma, Duckabush, and Dosewallips rivers), with an overall sampling rate of 11.4% in all Hood Canal rivers combined (

Table 4-22).

Jacks are not included in Chinook spawning escapement estimates in Hood Canal, but few jacks were sampled during 2016.

The proportion of hatchery fish in the spawning escapement is estimated based on age composition in the escapement, carcass sampling rate, and the proportion of hatchery production releases that were marked and/or tagged from BY 2011 (age 5), BY 2012 (age 4), and BY 2013 (age 3). Estimates of hatchery contribution to natural the spawning escapement are also made based on the total number of CWT tags, marks recovered (adipose-clips and otolith), and corrected for clip error rates for the returning brood years.

In the Skokomish River system, 81 of 102 (79%) Chinook sampled were adipose-marked (

Table 4-22). Spawning escapement in the Skokomish River was comprised of about 82% hatchery-origin Chinook and 18% natural-origin Chinook, with a similar contribution of NOR returns to the North Fork where they accounted for 17% (

Table 4-22).

Hatchery releases into the Hamma Hamma River for the purposes of supplementation are 100% CWT and otolith marked, with the exception of BY 2013, when all broodstock were collected directly from the Hamma Hamma River. The 2013 BY was 100% tagged but not otolith marked since the purpose of otolith marking has been primarily to assess differences in the survival of Hamma Hamma origin supplementation fish versus George Adams origin supplementation fish. All Chinook carcasses were sampled for CWT and otoliths during 2016. Origin for the 2013 BY were determined by CWT, while origin for all other brood years were determined by otolith mark. The CWT rate was then adjusted for tag loss based on a seven-year average of otolith marks without tags from Mid-Hood Canal.

In the Hamma Hamma River, 27 of 52 (52%) Chinook sampled had a CWT. However, otolith marks and corrections for tag loss produced final estimates for spawning escapement composition comprised of 79% supplementation-origin Chinook, and 21% natural-origin Chinook, and zero percent hatchery-origin strays in the Hamma Hamma River, based on combined CWT and otolith analysis. One Chinook carcass was sampled in the Duckabush and none were sampled in the Dosewallips River in 2016. The one carcass sampled in the Duckabush was a CWT supplementation fish from the Hamma Hamma program yielding a raw estimate of 100% supplementation-origin fish. However, sample size was insufficient to use stream specific data, therefore the Hamma Hamma rates were applied to all Mid-Hood Canal returns. No true hatchery strays were sampled in Mid-Hood Canal based on ad-clips or CWT tag codes..

Table 4-22. Chinook salmon spawner escapement origin based on carcasses sampled for marks and coded-wire tags (CWTs) in Hood Canal rivers, 2016.

Management Unit	Escapement	Chinook Sampled		Tagged ^{1/}			Untagged ^{1/}			Unknown Tagged ^{2/}			Totals			Escapement	
		No.	%	AD	NM	Unk	AD	NM	Unk	AD	NM	Unk	CWT's Recovered	Ad-clips observed	Rate	HOR	NOR
Skokomish																	
Mainstem River	886	93	10.5	3	2	1	70	16	0	0	1	0	5	73	0.82	724	162
North Fk. River	448	6	1.3	0	0	0	5	1	0	0	0	0	0	5	0.83	373	75
South Fk. River	8	3	37.5	0	0	0	3	0	0	0	0	0	0	3	1.00	8	0
Skokomish River Total	1,342	102	7.6	3	2	1	78	17	0	0	1	0	5	81	0.82	1,105	237
12A																	
Big Quilcene R.	1	1	0.0	0	0	0	1	0	0	0	0	0	0	1	NA		
Little Quilcene R.	0	0	0.0	0	0	0	0	0	0	0	0	0	0	0	NA		
12B																	
Hamma Hamma R. ^{3/}	268	52	19.4	0	27	0	0	17	0	0	8	0	27	0	0.79	212	56
Duckabush R.	15	1	6.7	0	1	0	0	0	0	0	0	0	1	0	1.00	12	3
Dosewallips R.	8	0	0.0	0	0	0	0	0	0	0	0	0	0	0	NA	6	2
Mid-Hood Canal Total	291	53	18.2	0	28	0	0	17	0	0	8	0	28	0	0.79	231	60
12C																	
Dewattor R.	90	2	2.2	0	0	0	2	0	0	0	0	0	0	2	1.00	90	0
Lilliwaup R.	0	0	0.0	0	0	0	0	0	0	0	0	0	0	0	0.00	0	0
12D																	
Tahuya R.	27	1	3.7	0	0	0	1	0	0	0	0	0	0	1	1.00	27	0
Union R.	50	50	100.0	0	0	0	0	0	0	12	0	0	0	12	0.24	12	38
Hood Canal Total	1,800	206	11.4	3	27	1	81	41	0	0	2	0	30	96	0.80	1,442	358

^{1/} AD = Adipose fin-clipped; NM = No Mark; Unk = Unknown

^{2/} Visual detection only life fish at the trap

^{3/} Supplementation Origin Fish calculated from otolith recoveries

4.12 Dungeness

Since 1986, surveys by foot have been conducted throughout the spawning season from RM 0.0 to 18.7 in the mainstem Dungeness, and from RM 0 to 5.1 in the Gray Wolf mainstem, to generate a cumulative redd count for the season. The total redd count is multiplied by 2.5 to estimate the total number of adults. In 2016, 163 Chinook redds were counted in the Dungeness River and no redds were counted in the Gray Wolf (Table 4-23). The estimated number of natural spawners in the river was 408 adults. There were an additional 115 adults either trapped or netted from the river for the hatchery broodstock program including five pond mortalities. The total estimated return to the river was 523, which includes eight hatchery jacks (Table 4-1).

The decreases in escapement of Dungeness spring Chinook relative to recent years and relative to forecast are partially due to the termination of the captive brood program after the 2002 brood, and resulting decrease in numbers of hatchery juveniles released. Because the forecasts for Strait of Juan de Fuca Chinook are based solely on average recent returns, they did not account for this reduction in production.

Table 4-23. The distribution of Chinook redds in the Dungeness Rivers system, 2016.

Dungeness River	Lower River mile	Upper River mile	Total miles	Redds
Mouth to Woodcock Bridge	0.5	3.3	2.8	27
Woodcock Bridge to HWY 101	3.3	6.4	3.1	47
Hwy 101 to May Rd.	6.4	9.2	2.8	47
May Rd. to Canyon Creek	9.2	10.8	1.6	7
Canyon Creek to Clink bridge	10.8	13.8	3.0	19
Clink Bridge to Forks Campground	13.8	15.8	2.0	7
Forks Campground to East Crossing	15.8	17.5	1.7	7
East Crossing to Gold Creek	17.5	18.7	1.2	2
Total			18.2	163
Redd Density (Redds/mi)				9.0
Greywolf River				
Mouth to RM 1.0 Bridge	0.0	1.0	1.0	0
RM 1.0 Bridge to 2 Mile Camp	1.0	2.5	1.5	0
02 Mile Camp to Cliff Camp	2.5	4.0	1.5	0
Cliff Camp to Slab Camp	4.0	5.1	1.1	0
Slab Camp to 1.0 mile upstream	5.1	6.1	1.0	0
Total			6.1	0
Redd Density (Redds/mi)				0.0
Grand total redds				163
Grand total spawners				408
Broodstock Removed				115
Total Return (Adults)				523

Hatchery Release Strategies

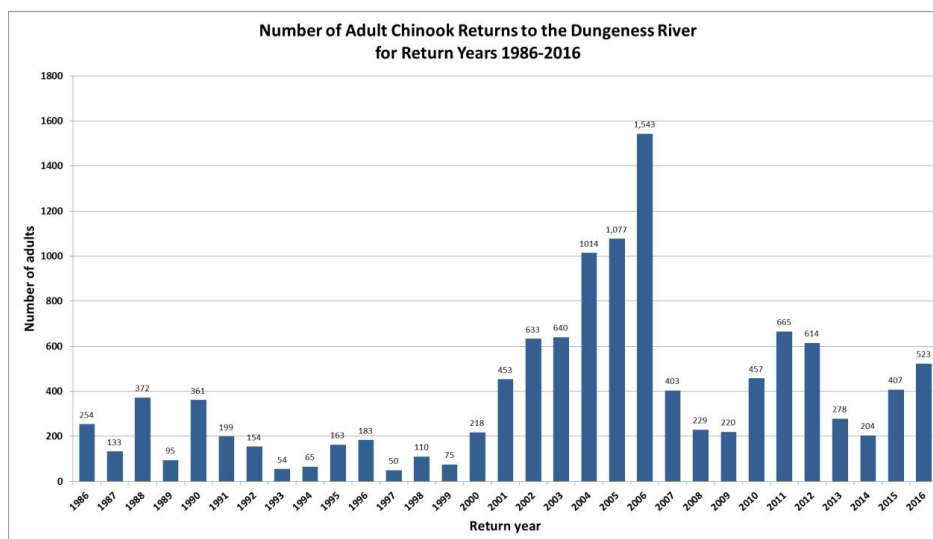
Most hatchery Chinook salmon are released into the Dungeness and Gray Wolf Rivers in June as spring accelerated zeros (Table 4-24). Two release groups of yearlings, BY2010 and BY2011, were released from Hurd Creek. The spring accelerated zero and yearling release groups were 100% tagged but not adipose clipped. The purpose of not clipping and tagging 100% of the hatchery releases was to avoid adult fish being harvested in the mark selective fisheries and still be positively identified as hatchery. None of the release groups in the Dungeness Basin are otolith marked since all fish were tagged.

Table 4-24. Releases of hatchery Chinook in the Dungeness River Basin for brood years 2010-2013.

Brood year	Age at return	Tag code	Release site	Life stage at release	No. released	Type of mark/tagged applied
2013	2	210488	Upper Dungeness Acclimation Pond	Spring accelerated zeros	52,949	CWT only
2013	2	211062	Dungeness Hatchery	Spring accelerated zeros	55,888	CWT only
2013	2	211063	Gray Wolf Acclimation Pond	Spring accelerated zeros	52,865	CWT only
2012	3	211022	Upper Dungeness Acclimation Pond	Spring accelerated zeros	48,898	CWT only
2012	3	211023	Gray Wolf Acclimation Pond	Spring accelerated zeros	48,693	CWT only
2012	3	210489	Dungeness Hatchery	Spring accelerated zeros	51,340	CWT only
2011	4	210968	Gray Wolf Acclimation Pond	Spring accelerated zeros	56,080	CWT only
2011	4	210969	Dungeness Hatchery	Spring accelerated zeros	54,104	CWT only
2011	4	210970	Upper Dungeness Acclimation Pond	Spring accelerated zeros	53,786	CWT only
2011	4	210971	Hurd Creek Hatchery	Yearling	51,984	CWT only
2010	5	210894	Gray Wolf Acclimation Pond	Spring accelerated zeros	48,817	CWT only
2010	5	210895	Hurd Creek Hatchery	Yearling	39,931	CWT only
2010	5	210896	Dungeness Hatchery	Spring accelerated zeros	27,387	CWT only

Since 1986, the Dungeness River Chinook total returns have ranged from 50 in 1997 to 1,543 in 2006 (Figure 4-1).

Figure 4-1. Estimated number of Chinook returns from 1986 to 2016 in the Dungeness.



CWT Recoveries

Each carcass observed on the spawning ground and those collected and used for broodstock were sampled. Information, such as, fork length, post orbital hypural (POH) length, gender, mark status (adipose fin present or absent), scales, otoliths, DNA, gill condition, and tag presence were collected. If a CWT had been detected, the snout was removed and a label was attached for identification.

A total of 149 carcasses (n=115 broodstock collection; n=34 spawning ground) were sampled from broodstock collections and natural spawners in the river. Of the total number of carcasses sampled, 98 of 149 (65.8%) were tagged (Table 4-25). Nine Age-2 Chinook carcasses with

CWT were collected during the season. Age 2 Chinook were not used for escapement expansion estimates.

Table 4-25. The number of CWT recoveries from Dungeness River Chinook salmon collected from broodstock collections and on spawning ground surveys (SGS) in the Dungeness and Gray Wolf rivers in 2016.

Recovery type	Carcass sample size	# carcasses with CWT	Prop. Snouts detected with CWT	No. carcasses with no tag detected	Prop. no tag detected
Broodstock collection and mortalities	115	80	0.6957	35	0.3043
Spawning Ground Survey (SGS)	34	18	0.5294	16	0.4706
Total sample size	149	98	0.6577	51	0.3423

Of the 98 CWT tagged fish, 9 (9.18%) were age 2, 27 (27.6%) age 3, 46 (46.9%) age 4, and 16 (16.3%) were age 5. One of the age 4 fish sampled was from a program outside the basin (Morse Creek Hatchery). The Morse Creek Hatchery Chinook releases are of Elwha stock origin (Table 4-26 and Table 4-27).

Table 4-26. The number of CWT recoveries from Dungeness River Chinook salmon collected from broodstock collections and on spawning ground surveys (SGS) in the Dungeness and Gray Wolf rivers in 2016.

BY	Age	Tag code	Tags recovered		Total number of tags recovered
			Broodstock samples	SGS samples	
2014	2	211064	3	1	4
2014	2	211065	4	0	4
2014	2	211147	1	0	1
	Age 2	Total	8	1	9
2013	3	210488	9	2	11
2013	3	211062	6	3	9
2013	3	211063	5	1	6
2013	3	636449	1	0	1
	Age 3	Total	21	6	27
2012	4	210489	13	5	18
2012	4	211022	11	1	12
2012	4	211023	13	2	15
2012	4	636296 ^{1/}	0	1	1
	Age 4	Total	37	9	46
2011	5	210968	3	1	4
2011	5	210969	5	1	6
2011	5	210970	2	0	2
2011	5	210971	4	0	4
	Age 5	Total	14	2	16
		Total CWT	80	18	98
		Sample size	115	34	149

^{1/} Morse Creek release

Table 4-27. Number of coded wire tags recovered from Chinook in the Dungeness River by release group, release site, and rearing hatchery during RY 2016.

Brood year	Total age	Tag code	Total no. tags recovered	Prop.	Release date	Release site	Rearing hatchery	FW age
2011	Age 5	210968	4	0.0408	June, 2012	Gray Wolf River	Gray Wolf accl. pond	Zero
2011	Age 5	210969	6	0.0612	June, 2012	Dungeness River	Dungeness Hatchery	Zero
2011	Age 5	210970	2	0.0204	June, 2012	Dungeness River	Upper Dungeness accl. pond	Zero
2011	Age 5	210971	4	0.0408	April, 2013	Hurd Creek	Hurd Cr. Hatchery	Yearl.
Total	Age 5		16	0.1633				
2012	Age 4	210489	18	0.1837	June, 2013	Dungeness River	Dungeness Hatchery	Zero
2012	Age 4	211022	12	0.1224	June, 2013	Dungeness River	Upper Dungeness accl. pond	Zero
2012	Age 4	211023	15	0.1531	June, 2013	Gray Wolf River	Gray Wolf accl. pond	Zero
2012	Age 4	636296	1	0.0102	April, 2014	Morse Creek	Morse Creek Hatchery	Yearl.
Total	Age 4		46	0.4694				
2013	Age 3	210488	11	0.1122	June, 2014	Dungeness River	Upper Dungeness accl. pond	Zero
2013	Age 3	211062	9	0.0918	June, 2014	Dungeness River	Dungeness Hatchery	Zero
2013	Age 3	211063	6	0.0612	June, 2014	Gray Wolf River	Gray Wolf accl. pond	Zero
2013	Age 3	636449	1	0.0102	June, 2014	Dungeness River	Dungeness Hatchery	Zero
Total	Age 3		27	0.2755				
2014	Age 2	211064	4	0.0408	June, 2015	Dungeness River	Upper Dungeness accl. pond	Zero
2014	Age 2	211065	4	0.0408	June, 2015	Gray Wolf River	Gray Wolf accl. pond	Zero
2014	Age 2	211147	1	0.0102	June, 2015	Hurd Creek	Hurd Cr. Hatchery	Zero
Total	Age 2		9	0.0918				
All ages			98	1.0000				

Based on the CWT results and scale samples analyzed, the preliminary HOR/NOR composition for Return Year (RY) 2016 was 66.9% HOR and 33.1% NOR. The ages of the NOR Chinook for RY2016 consisted of 11.0% age-3, 73.1% age-4, 15.9% age-5, and 0.0% age-6. The ages of the HOR Chinook for RY2016 consisted of 29.4% age-3, 52.3% age-4, 18.3% age-5, and

0.0% age-6. The ages of all Chinook for RY2016 combined was 23.5% age-3, 59.0% age-4, 17.5% age-5, and 0.0% age-6 (Table 4-28).

Table 4-28. Total number and percentages of Age 3, Age 4, and Age 5 HOR and NOR Chinook returns in 2016. Does not include nine age 2 HOR in broodstock collection.

	NOR	Percentage	HOR	Percentage	Total	Percentage
Age-3	18	11.0%	103	29.4%	121	23.5%
Age-4	120	73.1%	183	52.3%	303	59.0%
Age-5	26	15.9%	64	18.3%	90	17.5%
Age-6	0	0.0%	0	0.0%	0	0.0%
Total	164	100.0%	350	100.0%	514	100.0%

Smolt releases in the Dungeness basin have been around 200,000 to 250,000 annually. Sub-yearlings were released in the upper Dungeness River near RM 15.8 and from the Graywolf Acclimation Pond located at RM 1.0. Yearling and sub-yearling smolts have been released from the Dungeness Hatchery at RM 10.5. Hatchery smolt-to-adult return rates were estimated by dividing the number of hatchery adult returns identified with coded wire tags by the number of tagged hatchery smolts released by brood year (Table 4-29).

Table 4-29. Number of tagged Chinook sub-yearlings and yearlings released by year, size, and date. Estimate of smolt-to-adult returns of hatchery released Chinook in the Dungeness Basin based on observed and expanded tag recoveries by tag group.

Brood year	Release year	Tag code	Age at release	Number released	Size at release (fish per pound)	Date of release	Release location	Observed recoveries	Expanded recoveries	Age 2 Obs Recoveries	SAR
2003	2005	210560	Yearling	47,860	8.9	4/6/2005 - 4/7/2005	Dungeness Hatchery	10	24		0.0005015
2004	2006	210561	Yearling	37,000	8.3	4/5/2006	Dungeness Hatchery	1	2		0.0000541
2004	2006	210562	Yearling	48,931	7.5		Hurd Creek	9	63		0.0012875
2005	2006	210640	Subyearling	54,500	48	6/21/2006	Gray Wolf Acclimation Pond	9	19		0.0003486
2005	2006	210641	Subyearling	54,500	65	6/3/2006	Gray Wolf Acclimation Pond	22	45		0.0008257
2005	2007	210639	Yearling	54,364	7.4 - 8.1	4/3/2007	Hurd Creek	13	27		0.0004967
2005	2007	210642	Yearling	63,500	6.9	4/2/2007	Dungeness Hatchery	3	7		0.0001102
2006	2007	210716	Subyearling	51,000	70	5/20/2007	Gray Wolf Acclimation Pond	36	95	2	0.0019020
2006	2007	210717	Subyearling	51,540	48	6/13/2007 - 6/19/2007	Gray Wolf Acclimation Pond	11	29		0.0005627
2006	2008	210718	Yearling	58,400	6.9	4/1/2008	Hurd Creek	17	55		0.0009418
2006	2008	210719	Yearling	58,536	7.7	4/1/2008 - 4/30/2008	Dungeness Hatchery	5	20		0.0003417
2006	2008	210725	Yearling	10,264	7.6	4/1/2008 - 4/30/2008	Dungeness Hatchery	1	4		0.0003897
2007	2008	210774	Subyearling	46,376	68	5/21/2008 - 5/27/2008	Gray Wolf Acclimation Pond	49	154	2	0.0033638
2007	2008	210775	Subyearling	45,655	34	6/25/2008	Gray Wolf Acclimation Pond	73	211	10	0.0048407
2007	2009	210776	Yearling	49,764	5.8 - 6.4	4/3/2009	Hurd Creek	20	65		0.0013062
2007	2009	634669	Yearling	30,607	7.5	4/3/2009 & 4/11/2009	Dungeness Hatchery	1	3		0.0000980
2008	2009	210846	Subyearling	48,393	78	5/16/2009	Gray Wolf Acclimation Pond	87	254	18	0.0056206
2008	2009	210847	Subyearling	48,869	44	6/22/2009	Gray Wolf Acclimation Pond	43	131	8	0.0028443
2008	2010	210848	Yearling	48,702	6.7 - 7.4	4/7/2010	Hurd Creek	12	50		0.0010267
2008	2010	210849	Yearling	48,447	6.2	4/4/2010 - 4/7/2010	Dungeness Hatchery	25	74	4	0.0016100
2009	2010	210563	Subyearling	49,594	52	6/4/2010 - 6/5/2010	Gray Wolf Acclimation Pond	52	140		0.0028229
2009	2010	210773	Subyearling	49,694	59	6/2/2010 - 6/3/2010	Dungeness Hatchery	46	111		0.0022337
2009	2010	210893	Yearling	42,636	9.0 - 9.5	4/4/2011 - 4/21/2011	Dungeness Hatchery	3	6		0.0001407
2010	2011	210894	Subyearling	48,817	52	6/4/2011 & 6/20/2011	Gray Wolf Acclimation Pond	29	63		0.0012905
2010	2011	210986	Subyearling	27,387	54	6/14/2011 &	Dungeness Hatchery	11	22		0.0008033
2010	2012	210895	Yearling	39,931	8.5	5/15/2012	Hurd Creek	6	12		0.0003005
2011	2012	210968	Subyearling	56,080	55.5	6/11/2012 &	Gray Wolf Acclimation Pond	6	13		0.0002318
2011	2012	210969	Subyearling	54,104	42.5	6/15/2012 &	Dungeness Hatchery	8	17		0.0003142
2011	2012	210970	Subyearling	53,786	53 - 55	6/10/2012	Upper Dungeness Acclimation Pond	16	35		0.0006507
2011	2013	210971	Yearling	51,984	7.4	4/4/2013	Hurd Creek	4	9		0.0001731

Juvenile Salmonid Outmigrant Monitoring

The WDFW smolt trapping on the Dungeness River is conducted to estimate the natural origin sub-yearling Chinook production, as well as that of other anadromous salmonids. These data are reported to NMFS Protected Resources Division per File # 19804 (CITE), and are displayed here for information only.

A floating five-foot diameter screw trap has been used in the Dungeness River by the Washington Department of Fish and Wildlife to capture outmigrating juvenile salmonids since the 2005.

This trap is operated continuously between February to late July or mid-August. High water events, debris, and mechanical failures may shut down trapping operations temporarily. Although the hatchery released Chinook are unmarked, they are 100% coded wire tagged (CWT). Hatchery produced juvenile Chinook migrants can be distinguished from natural juveniles caught in the screw trap due to the detection of a CWT. Trapping and fish sampling methods are described in the report by Topping et al. (2008).

The number of naturally produced sub-yearling Chinook in the Dungeness River ranged from a low of 3,870 in 2015 to a high of 164,815 in 2013. An average of 54,507 sub-yearlings have been naturally produced in the Dungeness River. The two lowest years for Chinook sub-yearling production occurred during the last two brood years with 3,870 in 2015 and 5,556 in 2016 (Table 4-30).

Table 4-30. Catch and estimated production of juvenile salmonids migrating from the Dungeness River, 2005-2016.

Begin	End	Subyearling	Subyearling	Natural 0+	Natural 0+	Natural 0+	Natural 1+
		Chinook	Chinook	Coho	Pink	Chum	Steelhead
		Natural Prod.	Hatchery Prod.	Prod.	Prod.	Prod.	Prod.
3/8/2005	8/5/2005	81,865		57,095			9,192
2/2/2006	8/17/2006	136,724		43,888	696,642	194,721	6,125
2/21/2007	8/19/2007	110,021	65,016	22,134		381,781	11,445
2/13/2008	8/12/2008	11,612	74,038	21,293	472,334	98,483	10,344
2/19/2009	8/12/2009	20,443	11,374	30,780	43,161	630,358	10,101
2/8/2010	7/28/2010	10,604	36,547	38,210	197,963	41,326	17,486
2/9/2011	8/31/2011	10,250	63,608	26,280	33,209	202,658	19,600
2/14/2012	8/28/2012	71,810	72,868	31,794	3,687,547	38,968	5,521
2/6/2013	8/8/2013	164,815	74,038	52,336	11,043	338,568	7,812
1/16/2014	8/13/2014	26,513	86,954	35,839	29,547,068	92,275	13,167
2/4/2015	7/28/2015	3,870	101,696	6,040		155,645	5,972
2/3/2016	7/25/2016	5,556	73,279	20,493	89,802	23,927	4,354
Average production all years		54,507	65,902	32,182		275,337	10,093
Data source DRAFT: Pete Topping, WDFW							

1/ Natural origin Chinook production estimates are extrapolated to and starting date of 1/15 and an ending date of 8/31

2/ Production estimates for Chinook, chum and pink are generated using maiden captured fish that are marked after capture and released above the trap. Individual efficiency tests are pooled using a G-test to inform efficiency strata that are applied to the estimated maiden catch for each efficiency strata.

3/ Production estimates for coho and steelhead are generated by utilizing a two trap design, coho and steelhead captured in a weir trap on Matriotti Creek located upstream of the screw trap are marked, released, and recaptured downstream in the screw trap. (Pete Topping, WDFW).

NOR smolt-to-adult return rates (SAR) were estimated by dividing the number of NOR adults produced from natural spawners by the number of natural origin smolts. NOR return rates, based on age-2 to age-5 returns, ranged from 0.000763 to 0.011599 (Table 4-31). Hatchery SAR were calculated for each of the different release sites and size groups (Graywolf Acclimation Pond sub-yearlings, Upper Dungeness sub-yearlings, Dungeness Hatchery sub-yearlings and yearlings, and Hurd Creek Hatchery yearlings; (Table 4-32).

Table 4-31. NOR smolt to adult return rates for Dungeness River Chinook.

Brood year	Total natural spawners	Smolt trap year	Juvenile Chinook abundance	Age-2	Age-3	Age-4	Age-5	Age-6	Total	Smolt to Adult Rate (SAR)
2004	953	2005	81,865	0	75	98	17	0	190	0.002321
2005	955	2006	136,724	0	38	96	12	0	146	0.001068
2006	1,405	2007	110,021	0	4	57	23	0	84	0.000763
2007	305	2008	11,621	0	25	44	19	0	88	0.007578
2008	140	2009	20,443	0	37	175	16	0	228	0.011153
2009	128	2010	10,604	0	56	57	10	0	123	0.011599
2010	345	2011	10,250	0	2	21	11	0	34	0.003317
2011	535	2012	71,810	0	13	74	28	TBD	115	0.001608
2012	508	2013	164,815	0	14	130	TBD	TBD	144	0.000874
2013	168	2014	26,513	0	16	TBD	TBD	TBD	TBD	TBD
2014	108	2015	3,870	4	TBD	TBD	TBD	TBD	TBD	TBD
2015	265	2016	5,556	TBD	TBD	TBD	TBD	TBD	TBD	TBD

Table 4-32. Dungeness Chinook salmon natural and hatchery smolt to adult return rates.

Ocean entry year	Natural SAR	Gray Wolf sub-yearling	Upper Dungeness sub-yearling	Dungeness sub-yearling	Dungeness yearling	Hurd yearling
2005	0.0023209				0.0005015	
2006	0.0010678	0.0005872			0.0000541	0.0012875
2007	0.0007635	0.0012288			0.0001102	0.0004967
2008	0.0075784	0.0040964			0.0003488	0.0009418
2009	0.0111530	0.0042257			0.0000980	0.0013062
2010	0.0115994	0.0028229			0.0022337	0.0009222
2011	0.0033171	0.0012905			0.0008033	
2012	0.0016077	0.0002318	0.0006507		0.0003142	0.0003005
2013	0.0008741					0.0001731

DRAFT January 10 2017: Randy Cooper, Pete Topping, and Joe Anderson, Washington Department of Fish and Wildlife.

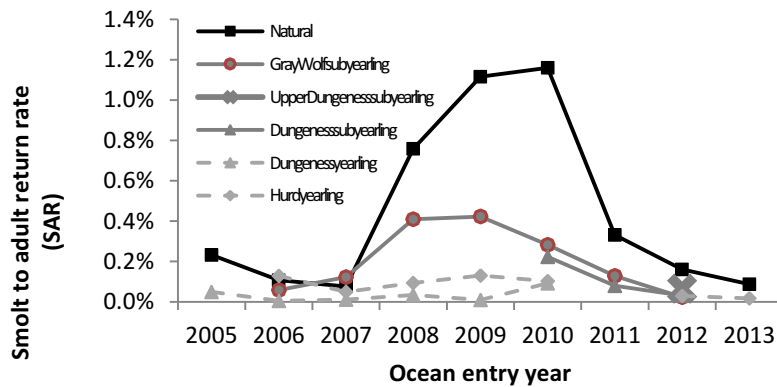


Figure 4-2. Smolt to adult return rate of natural origin (black) and hatchery produced (gray) Chinook salmon in the Dungeness River. Natural survivals are from the river mouth (smolt trap location) to adult return, whereas hatchery survivals are from release to adult return. In comparison to the natural survival, hatchery estimates therefore include the additional mortality suffered in the river prior to ocean entry. Estimates are total return to the river, and do not account for fishing mortality. DRAFT January 10 2017: Randy Cooper, Pete Topping, and Joe Anderson WDFW.

From 2006 to 2016, the total Dungeness River Chinook NOR plus HOR returns ranged from 204 to 1,543 (Table 4-33). The number of NOR Chinook returns ranged from 43 to 339 and the number of HOR returns ranged from 90 to 1,204. The eleven year average was 29.3% NOR and 70.7% HOR.

Table 4-33. Total number of NOR and HOR natural spawners and broodstock in the Dungeness River for return years 2006-2016.

Return year	Natural spawners NOR	Natural spawners HOR	Natural spawners NOR+HOR	Broodstock collection NOR	Broodstock collection HOR	Broodstock collection NOR+HOR	Natural spawners + Broodstock NOR	Natural spawners + Broodstock HOR	Total returns NOR+HOR
2006	293	1,112	1,405	46	92	138	339	1,204	1,543
2007	146	159	305	47	51	98	193	210	403
2008	86	54	140	53	36	89	139	90	229
2009	71	57	128	42	50	92	113	107	220
2010	76	269	345	18	94	112	94	363	457
2011	83	452	535	21	109	130	104	561	665
2012	212	296	508	38	68	106	250	364	614
2013	46	122	168	31	79	110	77	201	278
2014	21	87	108	22	74	96	43	161	204
2015	65	200	265	37	105	142	102	305	407
2016	135	273	408	30	77	115	165	350	523

1/ Natural spawners: Chinook that spawned naturally in the river. Natural spawner estimate based on redd surveys.

2/ Broodstock collection: Chinook that were collected in the river or returned to the hatchery and used for broodstock. Total includes pre-spawn mortalities.

3/ NORs and HORs determined by CWT detection, otolith marks, scales, or visible marks (adipose clips) from broodstock and river carcasses sampled.

Natural origin production (natural origin recruits per total natural spawner) was measured for brood years 2004 to 2010 and ranged from 0.0598 to 1.6286 averaging 0.4841 for the 7 year period (Table 4-34).

Table 4-34. Productivity Metrics for Dungeness Chinook salmon.

Brood year	HOR natural spawners	NOR natural spawners	HOR+NOR natural spawners	Age-3 Natural Recruits	Age-4 Natural Recruits	Age-5 Natural Recruits	Age-6 Natural Recruits	Total Natural Recruits	Recruits per spawner
2004			953	75	98	17	0	190	0.1994
2005			955	38	96	12	0	146	0.1529
2006			1,405	4	57	23	0	84	0.0598
2007	159	146	305	25	44	19	0	88	0.2885
2008	54	86	140	37	175	16	0	228	1.6286
2009	57	71	128	56	57	10	0	123	0.9609
2010	269	76	345	2	21	11	0	34	0.0986
2011	452	83	535	13	74	26		113	
2012	296	212	508	14	120			134	
2013	122	46	168	18				18	
2014	87	21	108						

4.13 Elwha River

The Elwha Dam removal project began in September 2011 and was completed by March 2012. The natural river flow was restored through the former Lake Aldwell. Prior to September 2012, Chinook spawning in the Elwha River was limited to the 4.8 miles below the dam with most natural spawning concentrated between RM 2.8 and 4.4. In August 2014, the Glines Canyon Dam was removed. Before dam removal, Chinook surveys were conducted by raft and foot surveys. SONAR technology is being used in the Elwha River as a method to improve enumeration of Chinook passage during the entire run from June through September. This technology will improve Chinook escapement estimates due to the difficulty of observing redds and fish in turbid water conditions caused by the removal of the two dams. Denton et al. (2017) used a DIDSON LR (long range) multi-beam sonar system to enumerate Chinook salmon in the Elwha River in 2016. For RY 2016, their best total return estimate for Chinook salmon was 2,628 fish with a calculated 95% CI 2,543 – 2,715.

Peak Spawning Ground Surveys and Redd Distribution

In September 2016, the National Park Service (NPS), Lower Elwha Klallam Tribe (LEKT), National Marine Fisheries Service (NMFS), and Washington Department of Fish and Wildlife (WDFW) staff conducted redd surveys in reaches between the Glines Powerhouse and the river mouth (McHenry et al. 2017). Two Elwha tributaries, Little River and Indian Creek, were also included with these surveys. A total of 614 Chinook salmon redds and 646 adults (544 live/102 dead) were observed downstream of the former Glines Powerhouse site (

Table 4-35).

Table 4-35. 2016 Elwha River Chinook salmon spawners from Upper Watershed Dam to the mouth. (McHenry et al. 2017).

Survey Reach	RKM midpoint	Redds	Redds/km	Live Chinook	Dead Chinook	Jacks
Upper Elwha						
Upper Watershed	43.8	1	0.0	0	0	0
Press/Geyser Valley	28.8	10	1.6	4	0	0
Former Mills reservoir	23.4	47	10.4	29	0	2
Upper Elwha Subtotal		58	1.5	33	6	2
Middle Elwha						
Glines Powerhouse	20.6	36	32.7	36	0	5
Altaire Bridge	19.5	19	19.0	15	0	0
Griff Creek	18.5	27	4.0	0	0	0
Rabbit Hole	17.3	30	20.0	24	0	0
Fisherman's Corner	16.1	78	97.5	31	0	0
ONP Boundary	14.7	42	21.0	29	28	0
McDonald Bridge	12.9	15	9.4			
Little river	12.2	1	0.5	0	0	0
Indian Creek	12.1	28	14.7	24	14	0
Aldwell South	11.0	48	20.9	14	12	1
Aldwell North	8.8	86	45.3	13	20	0
Middle Elwha Subtotal		410	24.1	186	74	6
Lower Elwha						
Dam outflow	7.3	16	13.3	17	8	0
HWY 112 Bridge	6.1	74	38.9			0
County Bridge	3.8	23	11.5			0
East Channel	1.4	30	10.7	6	3	0
Hunt Road Channel	2.0	3	1.9	2	0	0
Lower Elwha Subtotal		146	15.4	25	22	0
		614		544	102	8

In addition to SONAR enumeration and peak spawning ground surveys, adult Chinook were collected by various methods for broodstock purposes in the lower river. WDFW hatchery staff collected salmon for broodstock by net, seine, gaff, and trap methods. A total of 613 Chinook were removed from the river and used as broodstock for the hatchery program (Table 4-36). The terminal run size to the river was based on the SONAR estimate of 2,628 Chinook (Table 4-36). The total number of Chinook that spawned naturally in the Elwha River and its tributaries was estimated at 2,015 (Table 4-36). This number was calculated by subtracting the number of Chinook that were collected for broodstock from the SONAR estimate (Table 4-36).

Table 4-36. Chinook broodstock collection and total return to the Elwha River in 2016.

Method of capture	No. of males	No. of females	No. of jacks	Non-viable females	Total w/ jacks
Number of Chinook gaffed /netted spawned on site	43	60	0	83	186
Number of Chinook netted in river and taken to hatchery	135	177	2	0	314
Number of Chinook transported from LEKT Hatchery to WDFW Elwha Channel	19	11	1	0	31
Number of Chinook return to WDFW Channel Trap (Volunteers)	63	14	5	0	82
Totals	260	262	8	83	613
Estimated number of natural spawners in the river = (SONAR-broodstock collection)					2,015
Estimated total non-jack returns-SONAR					2,628

CWT and Otolith Mark Recoveries

The following information for Elwha River Chinook carcass sampling in 2015 is taken from the summary report by Weinheimer et. al. 2017.

We surveyed the mainstem Elwha and tributaries from the former Glines Dam Powerhouse site at river km 21.4 to the confluence of the river with the Strait of Juan de Fuca. Surveys were conducted by foot and inflatable raft. The Elwha River was broken up into 6 sections. Each reach was scheduled to be surveyed every 7 to 10 days. Based on redd survey numbers from previous spawning seasons, we felt this sampling structure would allow us to sample most of the available carcasses in each reach throughout the season.

Evaluating hatchery mark rates

The primary hatchery marking strategy for brood years of Elwha Chinook salmon expected to return in 2016 was a thermal otolith mark (Table 2). Avoidance of the adipose clip was intended to reduce vulnerability to mark selective fisheries. Most hatchery Chinook salmon are released into the Elwha River as sub-yearlings, but there is also a smaller yearling release group. All of the yearling releases from brood years 2011, 2013 and 2014, and a portion of the sub-yearling releases in brood years 2012 and 2013, received a CWT mark in addition to the thermal otolith mark (Table 4-37).

In some years, equipment malfunctions limited the capacity to induce thermal otolith marks. Thermal otolith marks require sequentially altering water temperature during embryonic development in a prescribed protocol over the course of approximately 1-3 weeks, and specialized chillers are required to accomplish this task. Any hatchery juveniles that were not otolith marked due to chiller malfunctions were selectively placed into the yearling program receiving the CWT mark (Table 4-37, brood year 2012).

Chinook salmon carcasses were sampled weekly at the WDFW Elwha Rearing Channel (hereafter WDFW Hatchery) throughout the spawning season. Chinook salmon broodstock spawned at the WDFW hatchery originated from a variety of sources. The primary collection method was by gill net from the Elwha River. Chinook salmon broodstock also included volunteers to the WDFW hatchery trap and volunteers to the LEKT hatchery trap that were subsequently transported to the WDFW adult holding pond. WDFW used PIT tags, inserted upon capture and transfer to the adult holding pond, to identify the original collection method of Chinook salmon spawned at the hatchery. Some broodstock were collected from the river and spawned on site rather than at the hatchery but these were not sampled in our study.

Table 4-37. Releases of hatchery Chinook in the Elwha River Basin, brood years 2011-2014.

Brood Year	Type	OT	OT + CWT	CWT	AD + CWT + OT	Total
2011	Sub-yearling	1,524,769	0	0	0	1,524,769
	Yearling	0	196,575	0	0	196,575
2012	Sub-yearling	907,387	0	0	251,892	1,159,279
	Yearling	0	0	201,074	0	201,074
2013	Sub-yearling	2,388,947	0	0	251,024	2,639,971
	Yearling	0	177,269	0	0	177,269
2014	Sub-yearling	2,429,097	0	0	250,295	2,679,392
	Yearling	0	158,799	0	0	158,799

Carcass Recoveries

We sampled a total of 554 Chinook carcasses throughout the sampling season (Table 4-38). A total of 264 samples (48%) originated from the Elwha River and tributaries. Of the fish sampled outside the hatchery, 88.3% were sampled above the former Elwha Dam site. Thirty four Chinook carcasses were collected between the Glines Powerhouse and ONP boundary and it

could not be determined whether they were collected in reach 5 or 6. The highest number of samples collected in one week from the river occurred during the week of Sept 19-23, and over three quarters (86%) of the samples we collected from the river were recovered during the month of September (Table 4-39). The number of carcasses found dropped significantly after October 7. Sex data was recorded for each carcass. POH length was recorded for 545 (98.4%) carcasses and fork length for 505 (91.2%) carcasses. Otolith samples were taken from 542 (97.8%) carcasses, readable scale samples from 449 (81.0%) and DNA fin clips from 341 (61.6%). A total of 6 carcasses were sampled in Indian Creek (6) and Little River (0).

Table 4-38. Total number of Chinook carcasses sampled by survey reach in the Elwha River Watershed 2016.

Reach	Number of Carcasses Sampled	Percent of Total
Reach 1 – Former Elwha Dam Site to river mouth	31	5.60%
Reach 2 - Gooseneck to former Elwha Dam Site	5	0.90%
Reach 3 - Highway 101 Bridge to Gooseneck	6	1.08%
Reach 4 – ONP Boundary to Highway 101 Bridge	45	8.12%
Reach 5 – Fisherman’s Corner to Highway 101 Bridge	75	13.54%
Reach 5 and 6 - Powerhouse to ONP Boundary	34	6.14%
Reach 7 – Glines Powerhouse to Altaire	31	5.60%
Reach 8 – Rica to Glines	29	5.23%
Reach 9 – Grand Canyon to Goblins Gate	2	0.36%
Indian Creek	6	1.08%
Little River	0	0.00%
WDFW Hatchery	290	52.35%
Total	554	100%

Table 4-39. Number of Chinook carcasses sampled by week for individual reaches during the 2016 season. Zero indicates a survey was completed but no carcasses were sampled. A dash indicates no survey was conducted that week. No surveys were conducted during the weeks October 17-21 and 24-28 due to lack of carcasses.

Week	Reach									Indian Creek	Little River	Hatchery
	1	2	3	4	5	5,6	6	7	8			
Aug 29-Sept 2	0	0	0	0	-	-	-	-	-	-	-	20
Sept 5-Sept 9	13	-	-	0	-	2	-	-	-	-	-	46
Sept 12-Sept 16	9	1	4	7	7	13	-	-	-	-	-	59
Sept 19-Sept 23	5	-	-	21	28	19	-	11	-	-	-	52
Sept 26- Sept 30	4	4	2	16	22	-	19	14	2	5	-	48
Oct 3-Oct 7	0	-	-	0	18	-	12	4	-	1	-	65
Oct 10-Oct 14	-	-	-	1	0	-	-	-	-	-	-	-
Oct 17- Oct 21	-	-	-	-	-	-	-	-	-	-	-	-
Oct 24- Oct 28	-	-	-	-	-	-	-	-	-	-	-	-
Totals	31	5	6	45	75	34	31	29	2	6	0	290

Broodstock collection method

Most of the fish sampled at WDFW Hatchery were net-collected fish rather than volunteers to either the WDFW or LEKT Hatchery (

Table 4-41). We sampled over two thirds of all the LEKT and gill net fish that came to the hatchery in 2016 and just over 62% of all volunteer fish to the WDFW Hatchery (

Table 4-41). We sampled slightly more than 16% of the Chinook salmon gaffed for hatchery broodstock this season.

Table 4-40. Adult collection method summary for Elwha Chinook salmon carcass sampling 2016.

Sample Location	Collection Method	Number of Carcasses Sampled	Percent of Total Carcasses Sampled
Mainstem and Tributaries	Natural Spawners	234	42.24%
	Gaffed	30	5.42%
WDFW Hatchery	Gill Net (N)	215	38.81%
	Lower Elwha Klallam (LEKT)	24	4.33%
	Volunteers (V)	51	9.21%

Table 4-41. Elwha Chinook salmon broodstock collection summary. Numbers include non-viable females and pond mortalities.

Broodstock collection method	Total Collected	Percent sampled
Gill net	314	68.47%
LEKT Hatchery volunteers	31	77.42%
WDFW Hatchery volunteers	82	62.20%
Gaffed	186	16.13%
Total	613	52.20%

Hatchery mark rates

We collected 542 otolith samples from Chinook salmon over the course of the season. Four hundred and eighty two (88.9%) of the samples had an otolith mark present. Of the remaining 60 samples, 34 had no otolith mark but did have a CWT present, two fish were ad marked but did not carry an otolith mark or CWT and one fish could not be determined whether it had any external hatchery marks but had a CWT. In addition, an otolith from an undetermined species at the time of collection was identified in the lab as a chum salmon. Thus, 23 fish (4.2%) had no internal (Otolith or CWT) or external hatchery marks (Table 4-42).

Overall, the proportion of hatchery-origin Chinook salmon was 95.8%. We observed relatively little differences in the mark rates of the different survey reaches and hatchery broodstock sources (Table 4-42). Only two reaches, reach 7 and Indian Creek, had a mark rate < 90% (Table 4-42).

Table 4-42. Hatchery mark rates of Chinook salmon sampled from the Elwha River 2016 based on thermal otolith, adipose and CWT marks.

	Location	Otolith Mark		All Hatchery Marks	
		N	Percent Marked	N	Percent Marked
Hatchery	Net	212	89.62%	212	96.23%
	LEKT	22	81.82%	24	100.00%
	Volunteer	50	84.00%	50	100.00%
Carcass Survey	Reach 1	28	92.86%	28	96.43%
	Reach 2	5	100.00%	5	100.00%
	Reach 3	5	100.00%	6	100.00%
	Reach 4	44	93.18%	45	93.33%
	Reach 5	75	89.33%	75	97.33%
	Reach 5 and 6	34	85.29%	34	100.00%
	Reach 6	31	93.55%	31	93.55%
	Reach 7	29	82.76%	29	82.76%
	Reach 8	2	100.00%	2	100.00%
	Little River	0	0.00%	0	0.00%
	Indian Creek	5	60.00%	5	60.00%
	Total	542	88.93%	546	95.79%

CWT Data

We collected CWTs from 137 fish in the Elwha River watershed during fall 2016. Forty eight of those snouts (33.8%) were found in the river in reaches 3 through 6. We did not find any CWTs below the Gooseneck or above the former Glines dam. The majority of the CWTs originated from releases into the Elwha River, but some were derived from releases into the neighboring Morse Creek (N = 3) or Dungeness (N= 2) watersheds (Table 4-43). Fish that were released from the Elwha were mostly from the yearling program (66.4%), except for 44 tags from the 2012 brood year when a portion of the sub-yearling releases were coded-wire tagged (Table 4-43).

Table 4-43. Chinook Coded Wire Tag (CWT) data for snouts recovered during spawn year 2016.

	Sampling Location	# of Snouts	Brood Year	Release Location
River	Elwha Dam to Mouth	1	2013	Elwha River
	101 Bridge to Gooseneck	1	2012	Elwha River
	ONP Boundary to 101 Bridge	6	2012	Elwha River
		3	2013	Elwha River
	Altair to ONP Boundary	1	2011	Elwha River
		1	2012	Dungeness River
		16	2012	Elwha River
		1	2012	Morse Creek
		2	2013	Elwha River
		1	2013	Morse Creek
	Glines to ONP Boundary	2	2011	Elwha River
		10	2012	Elwha River
		1	2013	Elwha River
Hatchery	Net	2	2010	Elwha River
		1	2011	Dungeness River
		2	2011	Elwha River
		30	2012	Elwha River
		1	2012	Morse Creek
		10	2013	Elwha River
	LEKT	1	2013	Morse Creek
		4	2012	Elwha River
	Volunteer	14	2013	Elwha River
		8	2012	Elwha River
		18	2013	Elwha River
	Total	137		

Scale Data

Of the 547 scale samples collected, 449 (82.1%) were successfully aged in the laboratory. Age-4 was the dominate age class in each sampling reach and the netted fish at the hatchery, as over 61% of the entire collection was composed of age-4 Chinook salmon (Table 4-44). The highest percentage of age-5 Chinook salmon were collected from reach 3 which is just upstream of the former Elwha Dam site (Table 4-44). Only one age-6 fish was sampled at the WDFW Hatchery and was collected by netting. Sixty three (14.2%) were identified as fish that migrated to the ocean as age-2 (stream type Chinook, Table 4-45). All of these stream-type Chinook were hatchery origin. No scale samples were collected from Little River.

Table 4-44. Chinook carcass age data from scale samples by reach for the Elwha River 2016.

Sample Location	Collection Method	Number of Samples	Total age				
			2	3	4	5	6
WDFW Hatchery	Net	176	1.70%	8.52%	63.64%	25.57%	0.57%
	LEKT	22	9.09%	45.45%	45.45%	0.00%	0.00%
	Volunteer	48	37.50%	12.50%	45.83%	4.17%	0.00%
Reach 1		28*	3.57%	7.14%	50.00%	39.29%	0.00%
Reach 2		4	0.00%	0.00%	75.00%	25.00%	0.00%
Reach 3		2	0.00%	0.00%	50.00%	50.00%	0.00%
Reach 4		35	5.71%	5.71%	60.00%	28.57%	0.00%
Reach 5		62	1.61%	4.84%	74.19%	19.35%	0.00%
Reach 5,6	Carcass Sample	23	0.00%	0.00%	65.22%	34.78%	0.00%
Reach 6		21	0.00%	9.52%	71.43%	19.05%	0.00%
Reach 7		24	0.00%	8.33%	58.33%	33.33%	0.00%
Reach 8		0	0.00%	0.00%	0.00%	0.00%	0.00%
Indian Creek		4	0.00%	0.00%	100.00%	0.00%	0.00%
Little Creek		0	0.00%	0.00%	0.00%	0.00%	0.00%
All Samples		449	6.00%	9.33%	61.56%	22.67%	0.22%

*Includes 26 Gaffed fish

Table 4-45. Age at return of hatchery and unmarked sub-yearling and yearling releases 2016.

Origin	Age at Outmigration	N	Total Age				
			2	3	4	5	6
Unmarked	Sub-yearling	17	0	2	10	5	0
Unmarked	Yearling	0	NA	NA	NA	NA	NA
WDFW Hatchery	Sub-yearling	361	26	30	219	85	1
WDFW Hatchery	Yearling	63	0	9	42	12	0

4.14 Hoko

WDFW and Makah Fisheries Management staff conducted foot surveys to count live and dead Chinook and Chinook redds in the mainstem between river miles 3.4 to 21.7 and tributaries, which represents all Chinook spawning area in the Hoko basin. There are ten mainstem and 13 tributary reaches, which include the Little Hoko River, a tributary to the lower mainstem, and Browne's, Herman, North Fork Herman, Ellis, Bear, and Cub creeks, which are tributaries to the upper mainstem. WDFW conducted surveys from RM 3.4 to 10.1 during the 2016 return year (Table 4-46). Makah Fisheries Management (MFM) surveyed the mainstem Hoko upstream of RM 10.1 to RM 21.7, Hoko tributaries, and the Sekiu River (Table 4-47). Towards the end of the spawning season, survey conditions in the mainstem river were poor on the October 29th survey due to high water.

Washington Department of Fish and Wildlife (WDFW) conducted one complete survey in the mainstem of the Hoko River from RM 3.4 to RM 10.2 during the 2016 return year. WDFW attempted to survey the lower mainstem after October 12 but was unsuccessful due to high flows and poor water visibility during the season. No redds or fish were observed by MFM in the mainstem upstream of RM 13.0.

Table 4-46. Chinook redd surveys in mainstem Hoko River from RM 3.4- RM 10.1 by WDFW in 2016.

Date	Survey reach	Carcasses			New redds	River conditions
		Live	Dead	Total		
10/12/16	3.4 - 4.4	0	0	0	0	Good
10/12/16	4.4 - 5.6	7	0	7	6	Good
10/12/16	5.6 - 7.5	32	0	32	29	Good
10/12/16	7.5 - 8.4	20	1	21	22	Good
10/12/16	8.4 – 8.7	6	0	6	2	Good
10/12/16	9.8 - 10.1	60	0	60	28	Good
10/23/16	3.4 – 10.1					High flows-no survey 693 cfs
10/30/16	3.4 – 10.1					High flows-no survey 557 cfs
11/6/16	3.4 – 10.1					High flows-no survey 965 cfs
11/13/16	3.4 – 10.1					High flows-no survey 709 cfs
Total		125	1	126	87	

Table 4-47. Summary of Hoko and Sekiu Chinook surveys by Makah Fisheries Management staff in 2016.

Date	Stream Name	Trib To	WRIA	RM Lower	RM Upper	Stream Flow	Live Chinook	Dead Chinook	New Redds
10/21	Bear	Hoko	19.0196	0.00	1.33	Low Moderate	0	0	0
10/10	Brown's	Hoko	19.0170	0.00	0.97	Low Moderate	66	0	18
10/19	Brown's	Hoko	19.0170	0.00	0.97	Moderate	225	15	68
11/7	Brown's	Hoko	19.0170	0.00	0.97	Moderate	4	1	0
10/21	Cub	Hoko	19.0197	0.00	0.57		0	0	0
10/10	Herman	Hoko	19.0183	0.00	2.00	Low Moderate	5	0	0
10/31	Ellis	Hoko	19.0192	0.00	0.45	Moderate	0	0	0
10/10	Hoko	Strait	19.0148	13.00	15.30	Moderate	0	0	0
10/21	Hoko	Strait	19.0148	15.30	18.40	Low	0	0	0
10/8	Hoko	Strait	19.0148	18.40	20.40	Low	0	0	0
10/27	Hoko	Strait	19.0148	20.40	21.30	Low	0	0	0
10/24	Little Hoko	Hoko	19.0149	0.00	3.50	Moderate	41	0	2
11/7	Little Hoko	Hoko	19.0149	0.00	3.50	Low Moderate	20	0	9
10/25	Rights	Hoko	19.0174	0.00	0.30	Moderate	12	3	4
9/30	Sekiu	Straits	19.0203	2.32	5.03	Low	0	0	0

Redd counts are multiplied by 2.5 adults per redd to estimate natural escapement. We estimated the number of redds in sections that were not surveyed by applying the nearest redds per mile value. A total of 188 redds were observed by Makah and WDFW fisheries staff during their surveys. An additional 74 redds were added for sections not surveyed using the redds per mile expansion value. The total number of redds was estimated at 621 for a total adult estimate of 1,552.

Due to the high flows during the season, an expansion equation was applied to the number of redds enumerated prior to October 13 in order to interpolate what may have been constructed subsequent to that date. This method was used due to high flow conditions that often prohibit surveying in late October through November. This expansion was applied only to the lower mainstem (RM 1.5 to 10.2). The expansion used the four-year mean ratio of spawning before October 13. The expanded redd count was added to the total number of redds counted in the upper mainstem and tributaries plus broodstock collected to estimate the total escapement. Once the total expanded number of redds was determined, redds were converted to fish at an expansion factor of 2.5 fish/redd.

- a) The total number of redds observed up to and including October 12, 2016 from RM 3.4 to RM 10.1 was 87 redds.
- b) 4 year average of redds constructed in lower Hoko River before October 13 (years 1998, 2010, 2011, 2013) = 0.3054 or 0.6946 after October 12. (1998 = 0.1802; 2010 = 0.2038; 2011 = 0.4298; 2013 = 0.4076)
- c) Expanded redd count = (87 redds on Oct 12) / (1-0.6946) =286 redds or 713 adults (286 redds x 2.5 adults/redd)
- d) 101 redds observed in tributaries = 252 adults (101 redds x 2.5 adults/redd)
- e) Estimated total number of spawners in the river based on surveys and expansion = 965.
- f) 685 Chinook returned to the Makah Hoko Falls Hatchery (230 adults and 10 jacks broodstock spawned, 432 adults and 5 jacks returned to the river, one non-viable female and 7 mortalities).

For the 2016 Hoko Chinook broodstock season, 189 females, 480 males, and 16 jacks returned to the Hoko Falls Hatchery pond facility. Of the 685 total that returned to the pond, 6 males and 1 jack were mortalities and 114 females plus 1 non-viable female (NVF), 116 males

and 10 jacks were spawned. The remaining 74 females, 358 males, and 5 jacks were returned to the river to spawn (Table 4-48).

Table 4-48. Number of female, male, and jack Chinook that returned to the Hoko Falls Hatchery in 2016 that were spawned, released back to the river to spawn naturally, culled, surplused, and died before spawning.

Source	Method	Broodstock Females	Broodstock Males	Broodstock jacks	Total Adults	Grand Total
Hoko Falls Hatchery	Broodstock spawned	114 + 1 NVF ¹	116	10	231	241
Hoko Falls Hatchery	Returned to the river	74	358	5	432	437
Hoko Falls Hatchery	Culled	0	0	0	0	0
Hoko Falls Hatchery	Surplused	0	0	0	0	0
Hoko Falls Hatchery	Mortalities	0	6	1	6	7
Total		189	480	16	669	685

¹ NVF= Non-viable female. Included in all totals.

Table 4-49. Dates of Hoko Hatchery female and male Chinook salmon broodstock released back into Hoko River between October 12 and October 26, 2016 and allowed to spawn.

Date released back to river	No. of females released	No. of males released	Total broodstock released
10/10/16	4	50	54
10/11/16	36	249	285
10/12/16	0	0	0
10/13/16	0	0	0
10/14/16	0	1	1
10/17/16	2	0	2
10/18/16	13	12	25
10/21/16	8	18 plus 4 jacks	26 plus 4 jacks
10/22/16	5	9 plus 1 jack	14 plus 1 jack
10/24/16	1	5	6
10/25/16	2	9	11
10/26/16	3	5	8
Totals	74	358 plus 5 jacks	432 plus 5 jacks

Data source: Joe Hinton, Hoko Falls Hatchery, Makah Tribe

The number of hatchery origin and natural origin Chinook that returned to the Hoko Falls Hatchery Hatchery for the broodstock program were 673 and 26, respectively (

Table 4-50). Of the estimated 625 natural in-river spawners, 604 were hatchery origin spawners (HOR) and 21 were natural origin spawners (NOR) (

Table 4-50). The total numbers and percentages, by age, of total spawners, including jacks were 129 age 2 (9.7%), 419 age 3 (31.7%), 552 age 4 (41.7%), 224 age 5 (16.9%), and no age 6 or age 7. The returns to the river spawners plus broodstock collected consisted of 1,277 (96.5%) hatchery origin and 47 (3.5%) natural origin for a total return of 1,324 fish which includes 129 jacks (

Table 4-50).

Table 4-50. Age and origin of broodstock and natural Chinook spawners in the Hoko River in 2016.

Brood	Age	Returns to River by Origin			Returns to Hatchery by Origin			Total Spawners by Origin			HOR Proportion
		HOS	NOS	Total	HOS	NOS	Total	HOS	NOS	Total	
2014	2	61	0	61	68	0	68	129	0	129	1.00
2013	3	192	6	198	214	7	63	406	13	419	0.97
2012	4	256	5	261	285	7	292	541	11	552	0.98
2011	5	95	10	106	106	12	118	201	23	224	0.90
2010	6	0	0	0	0	0	0	0	0	0	
2009	7	0	0	0	0	0	0	0	0	0	
Total		604	21	625	673	26	699	1,277	47	1,324	0.96

Data source: Hap Leon, Makah Fisheries Management

To avoid the possibility of double-counting redds in the river from the hatchery broodstock released back to the river, the number of females and males from the hatchery were documented by release date. A portion of the redds counted during spawning ground surveys was assumed to have been made by females released by the hatchery.

<u>Hatchery spawner estimates</u>	
674	Adult return to the hatchery
25	Jack return to the hatchery
699	Total return to the hatchery
<u>Hatchery Returns Released</u>	
437	All hatchery returns to the river
97	Hatchery returns to river after 10/17
<u>River spawner estimates</u>	
0	Sekiu River spawner estimate
965	Hoko spawner estimate from WDFW & Makah-surveyed areas
-437	minus all hatchery returns to river (to reduce double-counting)
97	plus hatchery returns to river after 10/17 (added back in)
5	jacks which were returned to the river to spawn
625	Total in-river spawning adults, of whatever origin, excluding jacks
<u>Total spawner estimates</u>	
699	Return to hatchery, including jacks
625	Spawners that spawned in the river or a tributary
1,324	Total spawners

Table 4-51. Age and origin of broodstock and natural Chinook spawners in the Hoko River in 2015.

Brood	Age	In-River spawners by Origin			Hatchery Broodstock by Origin			Total Spawners by Origin		
		HOS	NOS	Total	HOS	NOS	Total	HOS	NOS	Total
2013	2	115	27	142	12	6	18	127	33	160
2012	3	190	185	374	36	27	63	226	211	437
2011	4	760	1,018	1,778	150	218	368	910	1,235	2,145
2010	5	106	15	122	8	5	13	115	20	135
2009	6	0	0	0	0	0	0	0	0	0
2008	7	0	0	0	0	0	0	0	0	0
Total		1,171	1,245	2,415	207	255	462	1,377	1,500	2,877

5 Coded-wire Tag Sampling

Commercial and recreational catch is sampled to recover coded-wire tagged Chinook and coho. General objectives are to sample 20% of commercial catch in each area and week, and 10% of marine recreational catch in each area and month. Sampling rates for calendar year (January-December) 2015 are summarized below, and were based on catches reported by local biologists, and sample sizes queried from the RMIS database. Sampling rates of commercial fisheries in 2015 generally exceeded the 20% sampling objective (Table 5-1). Marine area recreational fisheries were sampled at rates between 10% and 36% for the year (Table 5-2). Note that these data were updated just prior to completion of this report, and will be validated and corrected as needed prior to submission to update the RMIS (Regional Mark Information System) database.

Table 5-1. Chinook coded-wire tag sampling rates for commercial fisheries in 2015 (calendar year).

Catch Area/River	Catch	# Sampled	Sample Rate
7-7A	4,981	3,180	64%
7B-7C-7D-Nooksack River	25	7	28%
Skagit River/Bay	1,510	1,302	69%
8A	48	20	42%
8D	2,353	606	26%
Stillaguamish River	0	0	--
10	11	11	100%
10E	3,683	1,428	39%
10F	29	19	66%
10A	248	244	98%
Duwamish River	382	334	87%
Puyallup/White rivers	1,859	1,039	56%
Nisqually River	4,408	2,884	65%
13A	120	49	41%
13C	362	120	33%
13D-F	3,404	1,795	53%
9	528	409	77%
9A-12-12A-12B	13	5	38%
12C	4,572	1,081	24%
12H	13,056	4,116	32%
Skokomish River	6,302	2,161	34%
Purdy Creek	4,470	1,770	40%
Strait of JDF 4B-5-6C (Net)	847	281	33%
Strait of JDF 4B-5-6C (Troll) ^a	13,624	4,447	33%

^a Includes 4B Summer Troll catch for 2015.

Table 5-2. Chinook coded-wire tag sampling rates for marine recreational fisheries in 2015.

Catch Area	Catch	# Sampled	Sample Rate
Marine Sport Area 5	8,268	1,447	17.5%
Marine Sport Area 6	6,363	1,974	31.0%
Marine Sport Area 7	8,615	1,523	17.7%
Marine Sport Area 8.1	191	31	16.2%
Marine Sport Area 8.2	731	218	29.8%
Marine Sport Area 9	5,504	996	18.1%
Marine Sport Area 10	428	75	17.5%
Marine Sport Area 11	2,682	516	19.2%
Marine Sport Area 13	1,049	131	12.5%
Marine Sport Area 12	460	58	12.6%

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Appendix 1. 2015-2016 List of Agreed Fisheries

Part I. Treaty/Non-Treaty OCEAN Fisheries (FRAM #2916 (Chinook) & #1637 (Coho))

Treaty Troll Quota	40,000 Chinook; No Coho
Non-treaty TAC	70,000 Chinook and 18,900 Coho.
NT Troll TAC	35,000 Chinook and the equivalent Coho mortality of the commercial portion of the overall non-Indian TAC consisting of non-retention Coho mortality in the commercial fishery north of Cape Falcon
Recreational TAC	35,000 Chinook and the equivalent Coho mortality of the recreational portion of the overall non-Indian TAC consisting of 18,900 retained marked Coho in the Columbia river subarea plus non-retention Coho mortality in the recreational fisheries in the Neah Bay, La Push, and Westport subareas.

1.1 Treaty Troll: Areas 2, 3, 4 & 4B

5/1-6/30	Chinook directed fishery with sub quota of 20,000 Chinook. May 1 through June 30 or attainment of 20,000 Chinook sub quota, whichever comes first. All salmon except Coho. If the Chinook quota for the May-June fishery is not fully utilized, the excess fish may be transferred into the later all-salmon season on an impact-neutral basis for limiting stocks into the later all-salmon season. If the Chinook quota is exceeded, the excess will be deducted from the later all-salmon season.
7/1-8/31	All salmon species except Coho, with sub quota of 20,000 Chinook plus any portion of uncaught Chinook rolled over from the May 1 st through June 30 th time period on an impact neutral basis. Chum release 8/1-8/31.

1.2 Non-Treaty Troll: U.S./Canada border to Cape Falcon

<p>5/1- thru earliest of 6/30 or pre- season Chinook sub-quota of 14,000 (no more than 4,600 of which may be caught in the area between the U.S./Canada border and the Queets River and no more than 4,600 of which</p>	<p>All salmon except Coho with 14,000 Chinook quota; no more than 4,600 of which may be caught in the area between the U.S./Canada border and the Queets River and no more than 15,000 of which may be caught in the area between Leadbetter Pt. and Cape Falcon; Open periods are: May 1-3, May 6-10, May 13-17, May 20-24, May 27-31, June 3-5, June 10-16, and June 24-30. A landing possession limit of 40 Chinook per vessel per open period is in effect. An in-season conference call will occur when it is projected that 10,500 Chinook have been landed overall or 3,450 have been landed in the area between the U.S./Canada border and the Queets River or 3,450 have been landed in the area between Leadbetter Pt and Cape Falcon to consider modifying the open period and adding landing and possession limits. Mandatory Yelloweye Rockfish Conservation Area,</p>
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<p>may be caught in the area between Leadbetter Pt. and Cape Falcon)</p>	<p>Columbia and Cape Flattery Control Zones closed. Trip limits, gear restrictions, and guidelines may be implemented or adjusted in-season. Vessels must land their fish within 24 hours of any closure of this fishery; under state law, vessels must report their catch on a state fish receiving ticket. Vessels in possession of salmon north of the Queets River may not cross the Queets River line without first notifying WDFW with area fished, total Chinook and halibut catch aboard, and destination. Vessels in possession of salmon south of the Queets River may not cross the Queets River line without first notifying WDFW with area fished, total Chinook and halibut catch aboard, and destination. Vessels fishing, or in possession of salmon while fishing north of Leadbetter Point must land and deliver their fish within the area and north of Leadbetter Point. Vessels fishing, or in possession of salmon while fishing south of Leadbetter Point must land and deliver their fish within the area and south of Leadbetter Point, except that Oregon permitted vessels may also land their fish in Garibaldi.</p>
<p>7/8 thru earliest of 8/23 or pre- season Chinook sub-quota of 21,000 (no more than 8,300 of which may be taken in the area between the U.S./Canada border and the Queets River).</p>	<p>All salmon except Coho with 21,000 Chinook quota, no more than 8,300 of which may be caught in the area between the U.S./Canada border and the Queets River. Open periods are: July 8-14, July 22-28, August 1-7, and August 15-23. A landing possession limit of 50 Chinook per vessel per open period is in effect. . No Chum retention north of Cape Alava, Washington beginning August 1 (all retained Coho must have a healed adipose fin clip). An in-season conference call will occur when it is projected that 15,750 Chinook have been landed overall or 6,225 have been landed in the area between the U.S./Canada border and the Queets River to consider modifying the open period and adding landing and possession limits. Mandatory Yelloweye Rockfish Conservation Area, Cape Flattery and Columbia Control Zones closed. Grays Harbor Control Zone closed beginning August 8. Trip limits, gear restrictions, and guidelines may be implemented or adjusted in-season. Vessels must land their fish within 24 hours of any closure of this fishery. Under state law, vessels must report their catch on a state fish receiving ticket. Vessels in possession of salmon north of the Queets River may not cross the Queets River line without first notifying WDFW with area fished, total Chinook and halibut catch aboard, and destination. Vessels in possession of salmon south of the Queets River may not cross the Queets River line without first notifying WDFW with area fished, total Chinook and halibut catch aboard, and destination. Vessels fishing, or in possession of salmon while fishing north of Leadbetter Point must land and deliver their fish within the area and north of Leadbetter Point. Vessels fishing, or in possession of salmon while fishing south of Leadbetter Point must land and deliver their fish within the area and south of Leadbetter Point, except that Oregon permitted vessels may also land their fish in Garibaldi.</p>

1.3 Non-Treaty Recreational

Area 1: Leadbetter Point to Cape Falcon (Oregon)

7/1-8/31 (18,900 Mark Selective Fishery Coho sub quota)	Open 7 days per week; 2 fish per day, only one of which may be a Chinook; retained Coho must have a healed adipose fin clip; Chinook minimum size limit 24 inches and Coho minimum size 16"; Chinook guideline: 10,200; closed in Columbia Control Zone. In-season management may be used to sustain season length and keep harvest within the overall Chinook recreational TAC for north of Cape Falcon.
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Buoy 10

6/16-7/31	Open 7 days/week; 6 fish per day, up to 2 may be adults; Chinook minimum size 12 inches and retained Chinook must have a healed adipose fin clip. Release all salmon other than hatchery Chinook and Sockeye. Barbless hooks only.
8/1-9/5	Open 7 days/week; 2 fish per day, only 1 may be a Chinook. Chinook minimum size 24", Coho minimum size 16", Release all salmon other than Chinook and hatchery Coho. Sunday-Monday release wild Chinook, retained hatchery Chinook and Coho must have a healed adipose fin clip. Barbless hooks only.
9/6-9/30	Open 7 days/week; 2 fish per day (minimum size 12 inches), Coho must have a healed adipose fin clip. Release all salmon other than hatchery Coho. Barbless hooks only.
10/1-12/31	Open 7 days/week; 6 fish per day, up to 2 adults (minimum size 12 inches); Release all salmon other than Chinook and hatchery Coho, retained Coho must have a healed adipose fin clip;
1/1-3/31	Open 7 days/week, Daily limit 6, Up to 2 adults, (minimum size 12"), Hatchery Chinook only.
North Jetty	Open 7 days per week when Area 1 or Buoy 10 area is open. When Buoy 10 area and Area 1 are open concurrently, the daily limit and minimum size restrictions follow the most liberal regulations of those areas. Barbless hooks only.

Area 2: Queets River to Leadbetter Point

7/1-8/21 (16,600 Chinook guideline)	Open 7 days per week; 1 fish per day; Coho retention not allowed; Chinook minimum size limit 24 inches and Coho minimum size 16 inches; Chinook guideline: 16,600. In-season management may be used to sustain season length and keep harvest within the overall Chinook recreational TAC for north of Cape Falcon.
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Area 2-1 (east of a line from Leadbetter Point to Cape Shoalwater): Willapa Bay

7/1-7/31	Open concurrent with Area 2, when Area 2 is open for salmon. Area 2 rules apply.
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8/1-1/31 pole endorsement.	6 fish limit, 4 adults, 12" min size limit. Release wild Chinook. 2
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Area 2-2 (east of line between tips of exposed jetties): Grays Harbor

West of Buoy 13 line 7/1-8/21	Open concurrent with Area 2, when Area 2 is open for salmon. Area 2 rules apply.
East of Buoy 13 line, when open	All salmon required to be released may not be totally removed from the water, except anglers fishing from boats 30' or longer as listed on either their State or Coast Guard regulation are exempt. Single-point barbless hooks required.
East of Buoy 13 line 7/1-7/31	Closed.
East of Buoy 13 line 8/1-9/24	2 fish limit, 2 adults, 12" min size limit. Release wild Coho. Open to salmon angling only in the area described as Humptulips – North Bay (the area conforms to the commercial SMCRA 2C).
East of Buoy 13 line 10/1-11/30	1 fish limit, 12" min size limit. Release wild Chinook. Open to salmon angling only in the area described as East Grays Harbor (the area conforms to the commercial SMCRA 2D).

Westport Boat Basin and Ocean Shores Boat Basin

8/16-1/31	6 fish limit, 4 adults; 12" min size limit. Release Chinook.
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Area 3: Cape Alava to Queets River

7/1-8/21 (2,000 Chinook guideline)	Open 7 days per week; 2 fish per day; Coho retention not allowed; Chinook minimum size limit 24 inches; Chinook guideline: 2,000. In-season management may be used to sustain season length and keep harvest within the overall Chinook recreational TAC for north of Cape Falcon.
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Area 4: U.S./Canada border to Cape Alava and east to Sekiu River

7/1-8/21 (6,200 Chinook guideline)	Open 7 days per week; 2 fish per day; Coho retention not allowed. Chum non-retention during August. Chinook minimum size limit 24 inches; Chinook guideline: 6,200; Fishing east of Bonilla- Tatoosh line beginning August 1. Closed waters: east of a true north-south line running through Sail Rock in July; Closed to salmon angling inside the area bounded by a line from Kydaka Point to Shipwreck Point. In-season management may be used to sustain season length and keep harvest within the overall Chinook recreational TAC for north of Cape Falcon.
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Area 4A: Makah Bay Treaty Evaluation Marine Set Net Fishery

Chinook	Trty	Open 8/15 through 9/15 inside an area bounded by a line running from Strawberry Rock Point (48° 19' 07"N, 124° 40' 00"W) to the group of rocks (48° 19' 46"N, 124° 40' 35"W) which are located off Hobuck Beach and a line to the mouth of Hobuck Creek (48° 19' 54"N, 124° 39' 37"W), to be implemented per agreement between the Makah Tribe and WDFW.
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Part II. PUGET SOUND including STRAIT of JUAN de FUCA and SAN JUAN ISLANDS fisheries (All fisheries modeled in FRAM #2916 (Chinook) & #1637 (Coho))

2.1 Strait of Juan de Fuca Pre-terminal Areas

Areas 5, 6, 6C Treaty Troll (Ntrty net closed)

NOTE: Area 4B: 5/1-10/31 see Ocean Troll. For 11/1-12/31 & 1/1-4/15 see below.

5/1-6/15	Closed
6/16-9/30	Open for salmon, Chum and Coho release; Freshwater Bay closed, south of Angeles Pt./Observatory Pt. line; Pt. Angeles Harbor closed west of line from tip of Ediz Hook to ITT Rayonier Dock; Hoko Bay closed inside the area bounded by a line from Kydaka Point to Shipwreck Point; Area 6 closed east of a line true north from Green Point; 1,000-foot closure around stream mouths. The catch estimates for this fishery modeled in FRAM are statistically-derived predictions, and are the best available pre-season estimates of catch in this fishery. In order to have the actual catch reflect run strength, however, these estimates will not be treated as a ceiling when the managers make in-season fishery management decisions.
10/1-10/31	Closed.

11/1-4/15	<p>In Areas 4B, 5, 6, 6C the treaty troll fishery will be open from November 1, 2016 through April 15, 2017, or when the catch reaches the harvest ceiling of 8,500 Chinook, whichever comes first. 1,000-foot closures around stream mouths. Hoko Bay closed inside the area bounded by a line from Kydaka Point to Shipwreck Point for the month of November.</p> <p>The catch estimates for this fishery modeled in FRAM are statistically-derived predictions, and are the best available pre-season estimates of catch in this fishery. In order to have the actual catch reflect run strength, however, these estimates will not be treated as a ceiling when the managers make in-season fishery management decisions. The winter troll catch ceiling is 8,500 Chinook.</p>
4/16-4/30	Closed

Areas 4B, 5, & 6C Treaty Net (Ntrty net closed)

Note: The catch estimates for this fishery modeled in FRAM are statistically-derived predictions, and are the best available pre-season estimates of catch in this fishery. In order to have the actual catch reflect run strength, however, these estimates will not be treated as a ceiling when the managers make in-season fishery management decisions.

Chinook	<p>Open for setnet gear only, 6/19 through 8/20; 7 days a week; Hoko Bay closed, inside the area bounded by a line from Kydaka Point to Shipwreck Point; Freshwater Bay closed, south of Angeles Pt./Observatory Pt. line; 1,000-ft. closure around stream mouths.</p>
Sockeye	<p>Start to be determined by Fraser River Panel. The Co-managers have identified the following management actions to control by-catch of Chinook. Estimated by-catches are best estimates and are not quotas or ceilings. The priority for this fishery is to harvest the full Treaty share of Sockeye salmon, while managing the fishery so as to not greatly exceed the projected incidental harvest of Chinook salmon. All Chinook by-catch in this fishery will be promptly reported by each Tribe to the NWIFC TOCAS database and reported to the U.S. section of the Fraser Panel at least weekly, including take home and ceremonial and subsistence (C&S). If in-season the Chinook by-catch in this fishery exceeds 1,300, the Tribes will consider management actions to limit the Chinook by-catch, such as time or area restrictions, while continuing the priority objective of harvesting Sockeye salmon. If in-season the fishery is projected to result in a total Chinook by-catch exceeding 3,300 Chinook, the Tribes will, effective with that scheduled fishery opening, prohibit any commercial sales of Chinook salmon, and any Chinook salmon landed must be delivered to the fishers' respective Tribe.</p>
Coho	Closed.

Chum	Open for gillnets, starting at 6 days per week (day may be added if effort is low), 10/09 through 11/12; 1,000-foot closure around stream mouths. Hoko Bay closed, inside the area bounded by a line from Kydaka Point to Shipwreck Point.
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Area 5 Recreational

Kydaka Point Closure: Waters south of a line from Kydaka Point westerly approximately 4 miles to Shipwreck Point closed to salmon angling 7/1-8/15.

5/1-6/30	Closed
7/1-8/15	2 fish limit, plus 2 additional Sockeye salmon (Chinook 22" min size); release Chum, Coho and wild Chinook.
8/16-2/15	Closed
2/16-4/30	2 fish limit (Chinook 22" min size), release Coho and wild Chinook.

Area 6 Recreational

4/16-6/30	Closed
7/1-8/15	2 fish limit, plus 2 Sockeye salmon, release Chinook, Coho, and Chum, except W. of true N/S line through "2" buoy near tip of Ediz Hook retention of marked Chinook allowed (Chinook 22" min size);. South of Angeles Pt. /Observatory Pt. line – closed to angling. Pt. Angeles Hbr. W. of line from tip of Ediz Hook to ITT Rayonier Dock – closed to salmon angling.
8/16-11/30	Closed
12/1-4/15	2 fish limit (Chinook 22" min size). Release Coho and wild Chinook.

2.2 Strait of Juan de Fuca Terminal Areas

Area 6D Dungeness Bay Net

Note: The following applies to all 6D Dungeness Bay Coho fisheries (Tribal & WDFW): Co-managers will meet on, or prior to October 14, 2016 to review current in-season conditions. Absent in-season conditions which support the likely achievement of conservation goals, Dungeness Bay fisheries may close early.

Chinook	All	Closed
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Coho	Trty	Open 9/21 through 10/31; Additional days beyond 10/31 may be considered; 9/21 through 10/10, seven days per week, fishing 7 am to 7 pm only, nets must be attended by fisher, Chinook and Chum release; 10/11 through 10/31 (or 11/5 should conditions allow), seven days per week, 24 hours per day; 1,500 ft closure around mouth of Dungeness River.
	Ntrty	Open Wk 39 (wb 9/18) through Wk 44 (wb 10/23) for skiff gillnet gear; 7AM – 7PM; Wk 39 W-F, Wks 40-44 M-F; Chinook and Chum NR, release by cutting ensnaring meshes; 1,500 ft. (1/4 nautical mile) closure around each river mouth. Fishery may close early pending in-season information. Openings possible in Wk 45 (wb 10/30) based on in-season information.
Chum	All	Closed

Dungeness River (Treaty and Recreational)

Note: The following applies to all 6D Dungeness Bay Coho fisheries (Tribal & WDFW): Co-managers will meet on, or prior to October 14, 2016 to review current in-season conditions. Absent in-season conditions which support the likely achievement of conservation goals, Dungeness River fisheries may remain closed.

Dungeness River Treaty (Ntrty net closed)

Chinook	Trty	Closed
Coho	Trty	Commercial fishing up to 3 days/wk, to be determined in-season, for Coho only, is scheduled to open on 10/16 and will be restricted to areas below the Dungeness hatchery intake using species selective (hand-held) gear. Subsistence fishing using selective gear is scheduled to open on 10/16. Refer to the co-management agreement above for possible emergency openings.
Chum	Trty	Closed

Elwha River Treaty (Ntrty net closed)

Chinook	Trty	Closed except Ceremonial Harvest of 4 fish in July.
Coho	Trty	Closed
Chum	Trty	Closed

Dungeness Bay Recreational

Note: The following applies to all Dungeness river fisheries (Treaty & non-treaty); co-managers will meet on, or prior to October 14, 2016 to review in-season conditions. Absent in-season conditions which support likely achievement of conservation goals, Dungeness River fisheries may remain closed.

5/1-9/30	Closed to salmon.
10/1-10/31	2 fish limit, hatchery Coho only.
11/1-4/30	Closed to salmon.

Dungeness River Recreational

mouth to hatchery intake pipe at RM 11.3	10/16-11/27	4 fish limit, hatchery Coho only; 12" min size.
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Elwha River Recreational Closed to

salmon and gamefish. **Hoko River**

Recreational

mouth to cement bridge (mile 7.0) on Hoko/Ozette Hwy.	Closed to salmon.
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All other STRAIT OF JUAN DE FUCA REGION freshwater recreational closed to salmon angling.

2.3 San Juan Islands/Point Roberts Area

Areas 6, 7, & 7A Net

Chinook	All	Closed
Sockeye	Trty	Schedule to be determined. The Co-managers have identified the following management actions to track and control by-catch of Chinook. Estimated by-catches are best estimates and are not quotas. The priority for this fishery is to harvest the full treaty share of Sockeye salmon, while managing the fishery so as to not greatly exceed the projected incidental harvest of Chinook salmon. All Chinook by-catch in this fishery will be promptly reported by each Tribe to the NWIFC TOCAS database and reported to the U.S. Section of the Fraser Panel at least weekly, including take home and ceremonial and subsistence (C&S). Prior to achieving a by-catch of 4,200 Chinook there will be no restrictions on the retention or sale of Chinook salmon. If, during the season, the Fraser Panel schedules a fishery that is projected to result in a total Chinook by-catch exceeding 4,200 fish, the Tribes will, effective with that scheduled fishery, prohibit any commercial sales of Chinook salmon, and any Chinook salmon landed must be delivered to the fisher's respective Tribe. Further policy discussion may occur among the affected parties prior to the season.

	Ntrty	Schedule to be determined. The Co-managers have identified the following management actions to track and control by-catch. Modeled by-catches are best estimates and are not quotas. All vessel operators must complete best fishing practices certification prior to fishing. PS: brailing required. Chinook, Coho, and Chum NR. Reef net wild Coho, Chum, and unmarked Chinook NR. Reef net: fishers may retain hatchery Chinook, with a cap of 300 for all gears through 9/30. Estimates of by-catch will be shared at least weekly in the U.S. Section of the Fraser River Panel. Purse seine and gillnet fisheries will be managed to ensure that the non-treaty impact does not exceed 1,471 total Chinook (120% of pre-season estimate).
Coho	Trty	Reef net: 7 days/wk beginning at end of Fraser Panel management through 11/6; Chinook NR after 9/30; wild Coho NR through 9/30, then Coho retention. Chum NR through 9/30.
	Ntrty	Reef net: 7 days/wk beginning at end of Fraser Mgmt through Chum mgmt wk 41 (wb 10/2); Chinook NR after 9/30; unmarked-Coho release through 9/30, then Coho retention. Chum retention prohibited until after 9/30. All vessel operators must complete best fishing practices certification prior to fishing.
Chum	Trty	The Treaty fishery will open October 10 (dependent on run status updates from CDFO) and remain open through Friday October 14. Additional treaty fishing days will be scheduled based on the outcome of the co-manager conference call (scheduled for Friday October 14) and the remaining treaty share. See attached 2016 7/7A Chum Fishing Plan. Reef nets open from end of Fraser Panel management through end of Chum management (11/8), 7 days/wk. Reef net release requirements listed in Coho fishery description, above.
	Ntrty	Dependent on update of run status from CDFO. PS and GN open wk 42 (wb 10/9) through wk 46 (wb 11/6). Open 10/10, 10/12, 10/13 and will re-open through the end of the season on 10/15, 10/16, or 10/17 based on conditions outlined in the attached agreement. Co-managers will meet via conference call on Friday 10/14 to discuss catch to date. PS: brailing required, Chinook and Coho NR. GN: during wk 42, Chinook and Coho NR, live box required and limited soak times in effect. Reef nets open from end of Fraser Panel management through wk 46 (wb 11/7), 7 days/wk, must release all Chinook and wild Coho. All vessel operators must complete best fishing practices certification prior to fishing.
Subsistence	Trty	12/1 – 4/30 subsistence troll fishery (Chinook 22" min size). Bellingham Bay closed 4/1 – 4/30.

Area 7 Recreational

5/1-6/30	Closed
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7/1-7/31	2 fish limit, (Chinook 22" min size) plus 2 additional Sockeye salmon; release Coho and wild Chinook; Bellingham and Samish Bay closed to salmon.
8/1-9/30	2 fish limit, 1 Chinook (Chinook 22" min size) plus 2 additional Sockeye salmon; release Chum and Coho; Waters of Area 7 in Rosario Strait and the eastern portion of the Strait of Juan de Fuca southerly of a line running true south from the westernmost point on Fidalgo Head to Burrows Island, then westerly and southerly along the shore of Burrows Island to the Burrows Island Lighthouse, then westerly to Bird Rocks, then westerly from Bird Rocks to the southernmost point on Decatur Island, then southerly across Lopez Pass to Lopez Island and following the shore of Lopez Island southerly and westerly to Iceberg Point, then from Iceberg Point to Cattle Point, then south southwest to the Salmon Bank Buoy, and then true south from the Salmon Bank Buoy to the Area 7 boundary, closed to salmon. Samish Bay closed to salmon angling. Lummi Bay closure area: east of a line from Gooseberry Point to Sandy Point 9/8 – 9/30.
10/1-10/31	2 fish limit, (Chinook 22" min size); Release Coho and wild Chinook. Samish Bay closed to salmon angling 10/1-10/15. Lummi Bay closure area: east of a line from Gooseberry Point to Sandy Point 10/1 – 10/15.
11/1-11/30	Closed
12/1-4/30	2 fish limit, (Chinook 22" min size), release Coho and wild Chinook; Bellingham Bay and Samish Bay closed to salmon 4/1 – 4/30.

2.4 Nooksack/Samish Terminal Region

Bellingham Bay (Areas 7B, 7C, 7D; 7A On-Reservation) Net

Chinook	Trty	<p>Areas 7B, & 7D: August 1 through September 2, open weekly 4 PM Sunday to 4 PM Friday. Fishing pattern: 4,5,5,5,5.</p> <p>Area 7C: August 1 through September 16, open weekly 4 PM Sunday to 4 PM Friday. Fishing pattern: 4,5,5,5,5,5,5.</p> <p>Samish Bay is closed southeasterly of a line from Oyster Creek to the fisheries marker on Samish Island, except that hand pull gillnets may fish from 4 PM Sunday to 4 PM Wednesday south to a line from Oyster Creek to Fish Point on Samish Island, August 1 through September 14 Sunday 4 PM to Wednesday 4 PM, weekly. Fishing pattern: 2,3,3,3,3,3,3. 6 ½" mesh in 7C and off-reservation areas of 7B, except when open for Sockeye in Area 7 and 7A.</p>
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	Ntrty	Areas 7B & 7C: Wks 33 (wb 8/7) - 36 (wb 8/28); PS Coho NR. GN fishing pattern: 3, 4, 4, 5; PS fishing pattern: 1,1,1,1.
Coho	Trty	Area 7A on-reservation fishery: September 11 through October 5. Open weekly 4 PM Sunday to 4 PM Wednesday. Fishing pattern: 3,3,3,3.
		Areas 7B and 7D: September 4 through October 22, open Sunday 4 PM to Saturday 4 PM. Fishing pattern: 6,6,6,6,6,6,6.
		7C: On September 30, a Co-manager conference call will be held to determine the status of Samish Chinook escapement. If the escapement goal appears to be attainable, and through development of a Co-manager agreed in-season update methodology it is determined that there is a harvestable surplus of Samish Coho, then a Coho fishery will open October 2 to October 19, Sunday 4 PM to Wednesday 4 PM, weekly. Fishing pattern: 3,3,3.
	Ntrty	Area 7B: Wks 37 (wb 9/4) - 43 (wb 10/16); GN fishing pattern: 5,5,7,7,7,7,7 (24 hrs for all days); PS fishing pattern: 3,3,7,7,7,7,7.
Chum	Trty	Areas 7B & 7D: Oct. 23 – Dec.7; open weekly 4 PM Sunday to 4 PM Wednesday; Fishing pattern: 3,3,3,3,3,3,3,3.
	Ntrty	Area 7B: Wks 44 (wb 10/23) - 48 (wb 11/20); PS/GN; 7,5,5,5,5,5. Whatcom Creek Zone (east of line from Post Point to flashing red light at west entrance of Squalicum Harbor) open 7 days per week.

Nooksack River Treaty Net (Ntrty net closed)

Note: On a weekly basis, Nooksack Tribe commercial fisheries on the Nooksack River will open at 12:01 AM Sun, except that portion of the river between Marine Drive Bridge and the first turn (“Big Bend”) in the river upstream of the Slater Road Bridge (approximately ¼ mile upriver from the Slater Road Bridge), which will open at 4:00 PM Sunday. On a weekly basis the Nooksack Tribe’s commercial Chinook fisheries will close 4:00 PM Friday; Coho fisheries will close 4:00 PM Saturday and Chum fisheries will close 4:00 PM Wednesday.

Chinook	4/4-6/15	April to mid-June: limited ceremonial and subsistence fishery will be managed for a total mortality of 21 NOR Chinook. A traditional fishery will occur 500 feet upriver from the Highway 9 bridge in the lower North Fork and the Nugents Corner Boat Launch in the mainstem (the boat launch is located just down river from Nugent's Corner Bridge) (RM 30.6 and 36.8). A total of 49 Chinook are projected in this fishery with an anticipated 6 NORs among the 49. This fishery is by permit only. Another fishery will occur in the lower Nooksack River between the Slater Road bridge and the river mouth (between RM 0.0 and 3.5). The lower river fishery will be selective and is projected to encounter 39 NOR Chinook with an expected survival rate of 60% and an estimated mortality of 15 NOR Chinook.
	8/1-9/3	Open weekly 4 PM Sunday to 4 PM Saturday, August 1 through 4 PM September 3. Fishing pattern: 5,6,6,6,6. The river is divided into five zones during this period. These zones open in subsequent weeks, proceeding upriver, to protect migrating spring Chinook. The area in Zone 4 upriver of the Nooksack Tribal Works building will remain closed through September 17 to protect holding Spring Chinook Zone 1 is from Marine Drive Bridge to Slater Bridge. Zone 2 is from Slater Bridge to Hannegan Bridge In Lynden. Zone 3 is from Hannegan Bridge to Nugents Corner Bridge. Zone 4 is from Nugents Corner Bridge to the confluence of the north and south forks. Zone 5 is upriver of the confluence of the north and south forks.
Coho	9/4-10/22	Open weekly 4 PM Sunday through 4 PM Saturday. Fishing pattern: 6,6,6,6,6,6. The area upriver of the Nooksack Tribal Works Building (large blue pole bldg.) will remain closed through 4 PM Saturday September 17 to protect holding Spring Chinook.
Chum	11/3-4 or 11/10-11	Subsistence harvest only. The Lummi Nation and Nooksack Tribe will determine in-season which two days to hold this subsistence fishery.
	10/23 – 12/7	Commercial. Open weekly 4 PM Sunday to 4 PM Wednesday. Fishing pattern: 3,3,3,3,3,3,3.

Bellingham Bay Terminal Area Recreational

5/1-8/15	Closed to salmon.
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8/16-10/31	4 fish limit, 2 Chinook (Chinook 22" min size); release Coho and release wild Chinook from 10/1-10/31; Samish Bay closed to salmon through 10/15.
11/1-3/31	Same as Area 7.
4/1-4/30	Closed to salmon.

Nooksack River Recreational; mainstem and North Fork

from Lummi Indian Reservation boundary to yellow marker at the FFA high school barn	9/1 – 12/31	2 fish limit, plus 2 additional hatchery Coho; 12" min size. Release wild Coho. Release wild Chinook through 9/30.
from yellow marker at the FFA high school barn to confluence of North and South forks	10/1 – 12/31	2 fish limit, plus 2 additional hatchery Coho; 12" min size. Release wild Coho.
from confluence of North and South forks to Maple Creek on North Fork	10/1 – 11/30	2 fish limit, plus 2 additional hatchery Coho; 12" min size. Release wild Coho.

Nooksack River Recreational, South Fork

from mouth to Skookum Creek	10/1 – 12/31	2 fish limit, plus 2 additional hatchery Coho; 12" min size. Release Chum and wild Coho.
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Samish River Recreational

from mouth to I-5 Bridge	8/1-11/30	2 fish limit, 12" min size. Release wild Coho.
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Dakota Creek Recreational

mouth to Giles Road Bridge	10/1 – 12/31	2 fish limit, 12" min size. Release wild Chinook and wild Coho.
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Whatcom Creek Recreational

mouth to yellow markers below foot bridge below Dupont St. in Bellingham	8/1 – 12/31	6 fish limit, 2 adults; 12" min size. Release wild Coho.
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All other NOOKSACK/SAMISH TERMINAL REGION freshwater recreational: Closed to salmon angling.

2.5 Skagit Terminal Region

Terminal area fisheries will be managed so as not to exceed total projected incidental fishery mortalities of Skagit wild summer/fall Chinook.

In consideration of 2016 Coho “critical” management status (spawning escapement below 16,000), fisheries have been designed with a conservation goal, to minimize impacts on returning wild Coho. Co-managers will discuss and implement, if determined appropriate and agreed, additional conservation actions for enhancement of production and natural spawning prior to the Coho management period. The co-managers commit to establishment of a Coho management plan for future years, addressing rebuilding Skagit wild Coho abundance with one of the goals being to annually exceed the critical spawning level of 16,000.

Skagit Bay (Area 8) Net

Note: Fishing schedules for Skagit Bay, Skagit River, and Baker River are pre-season projections. Schedules may be changed in-season as necessary to meet management objectives and harvestable shares.

Spring Chinook	Area 8 – Trty	<u>Swinomish Tribe fishing pattern:</u> Wk 19 (wb 5/1) thru wk 21 (wb 5/15); 2,2,2; <u>Upper Skagit Tribe fishing pattern:</u> No scheduled fishery.
Sockeye	Area 8 – Trty	<u>Swinomish Tribe fishing pattern:</u> Wk 26 (wb 6/19) thru wk 29 (wb 7/10); 3,5,5,5; Swinomish fishery will be managed so as not to exceed their individual Sockeye share based on the preseason forecast and any in-season update that becomes available. Additional fishing dependent on ISU, per MOU. <u>Upper Skagit Tribe fishing pattern:</u> No scheduled fishery.
	Ntrty	Closed
Coho	Trty	No terminal treaty harvestable as a response to “Critical” abundance. If ISU changes abundance status, HR target may be modified following co-manager discussions.
	Area 8 – Trty	<u>Swinomish Tribe fishing pattern:</u> No scheduled fishery. <u>Upper Skagit Tribe fishing pattern:</u> No scheduled fishery.
	Ntrty	Closed
Chum	Area 8 – Trty	<u>Swinomish Tribe fishing pattern:</u> No preseason harvestable. <u>Upper Skagit Tribe fishing pattern:</u> No preseason harvestable.

Chum Test	Area 8	1 boat at Jetty 1 day/wk 44 (wb 10/23) & 45 (wb 10/30) and 1 boat in Bay 1 day/wk 44 (wb 10/23) & 45 (wb 10/30).
	Ntrty	Closed. May open pending co-manager agreement on ISU that indicates harvestable runsize.

Skagit River Treaty Net (Ntrty net closed)

Note: Fishers from the Sauk-Suiattle Tribe are invited to participate in the 2016 Swinomish salmon fishery in Skagit River Area 78C from the Mount Vernon bridge to the Spud House, subject to and in accordance with all provisions of fishing ordinances and regulations of the Swinomish Indian Tribal Community that apply to such fishery.

[Sauk-Suiattle Tribe reserves their treaty right to execute the release of C&S regulations that mirror their modeled impacts to obtain their species specific allocations if scheduled Skagit River fisheries are not implemented or an invitation to participate in commercial fisheries is not received.]

Chinook		Ceremonial and Subsistence – 650 fish (25 spring and 625 summer/fall) total Swinomish, Sauk-Suiattle, and Upper Skagit Tribes.
Spring Chinook	Area 78C	<u>Swinomish and Sauk-Suiattle Tribes fishing pattern:</u> wk 19 (wb 5/1) thru wk 21 (wb 5/15);2,2,2; <u>Upper Skagit Tribe fishing pattern:</u> wk 20 (wb 5/8) thru wk 22 (wb 5/22);0.583,0.667,0.667.
	Area 78D	<u>Upper Skagit Tribe fishing pattern:</u> wk 20 (wb 5/8) thru wk 22 (wb 5/22);0.583,0.667,0.667.
Sockeye	Area 78C	<u>Swinomish, Sauk-Suiattle, and Upper Skagit Tribes' fisheries will be managed so as not to exceed their individual Sockeye shares based on the preseason forecast and any in-season update that becomes available.</u> <u>Swinomish and Sauk-Suiattle Tribes fishing pattern:</u> wk 26 (wb 6/19) thru wk 29 (wb 7/10);3,5,5,5; Additional fishing dependent on ISU, per MOU. <u>Upper Skagit Tribe fishing pattern:</u> wk 27 (wb 6/26) thru wk 31 (wb 7/24);0.75,0.75,0.75,0.75,0.5; Additional fishing dependent on ISU, per MOU.

	Area 78D Area 78O	<p><u>Swinomish and Upper Skagit Tribes' fisheries will be managed so as to not exceed their individual Sockeye shares based on the preseason forecast and any in-season update that becomes available.</u></p> <p><u>Swinomish Tribe fishing pattern (Area 78D-4 and Baker River):</u> Wk 28 (wb 7/3) thru wk 29 (wb 7/10):1,1; Additional fishing dependent on ISU, per MOU; <u>Upper Skagit Tribe fishing pattern: Areas 78D-2, 78D-3, 78D-4, and 78O (Baker River): wk 27 (wb 6/26) thru wk 31 (wb 7/24);0.75,0.75,0.75,0.75,0.5; Additional fishing dependent on ISU, per MOU.</u></p>
	Coho	No terminal treaty harvestable as a response to "Critical" abundance. If ISU changes abundance status, HR target may be modified following co-manager discussions.
	Area 78C:	<u>Swinomish and Sauk-Suiattle Tribes fishing pattern: No preseason harvestable. Upper Skagit Tribe fishing pattern: No preseason harvestable.</u>
	Area 78D	<u>Upper Skagit Tribe fishing pattern: No preseason harvestable.</u>
Chum	Area 78C	<u>Swinomish and Sauk-Suiattle Tribes fishing pattern: No preseason harvestable. Upper Skagit Tribe fishing pattern: No preseason harvestable.</u>
	Area 78D	<u>Upper Skagit Tribe fishing pattern: No preseason harvestable.</u>
River Test	Chinook	Area 78C - Blakes wk 19 (wb 5/1) thru wk 35 (wb 8/21);1 boat, 6 hours/wk.
	Sockeye	Area 78C – Blakes wk 24 (wb 6/5) thru wk 29 (wb 7/10); 1 boat, 12 hours/wk; Area 78D-3 - Upper Skagit - wk 23 (wb 5/29) thru wk 30 (wb 7/17);1 boat, 4 hrs/wk.
	Coho	Area 78C - Blakes Drift, wk 38 (wb 9/11) thru wk 42 (wb 10/9), 12 hours/wk; Area 78C – Spudhouse Drift, Upper Skagit, wk 34 (wb 8/14) thru wk 42 (wb 10/9);1 boat, 12 hours/wk; Area 78D-3 Wk 35 (wb 8/21) thru wk 44 (wb 10/23);1 boat, 4 hours/wk.
	Chum	Area 78C - Blakes Drift wk 44 (wb 10/23) and wk 45 (wb 10/30);1 boat, 12 hours/wk.

Swinomish Channel Treaty Net (Ntrty net closed)

Coho	No separate openings. Area opens during Area 8 openings.
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Area 8-1 Recreational

5/1-10/31	Closed
11/1 – 4/30	2 fish limit (Chinook 22" min size). Release Coho and wild Chinook.

Baker River/Lake Recreational

mouth to Dam	Closed to salmon.
Baker Lake	7/10-9/7 5 fish limit, Sockeye only, 18" min. size.

Baker River and tributaries below dam are closed to gamefish 9/1-10/31.

Cascade River Recreational

mouth to Rockport- Cascade Road Bridge	6/1–7/15	4 fish limit, only 2 may be adults, hatchery Chinook only, 12" min. size.
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Cascade River and tributaries below anadromous barriers are closed to gamefish 9/1-10/31.

Skagit River Recreational

from Memorial Hwy Bridge to Gilligan Creek	6/16-7/15	3 fish limit, Sockeye only (12" min size). Release Chinook.
Hwy 530 Bridge at Rockport to Marblemount Bridge	6/1–7/15	4 fish limit, only 2 may be adults, hatchery Chinook only, 12" min size.

Skagit River and tributaries below anadromous barriers are closed to gamefish 9/1-10/31.

All other SKAGIT TERMINAL REGION freshwater recreational closed to salmon angling.

2.6 Stillaguamish/Snohomish Terminal Region

Area 8A Net

Chinook	Trty	Closed (Ceremonial set-aside of up to 100 Chinook, July-September period).
	Ntrty	Closed
Coho	Trty	Closed
	Test	Closed
	Ntrty	Closed

Chum	Trty	Closed
	Test	Closed
	Ntrty	Closed. May open pending co-manager agreement on ISU that indicates harvestable run size.

Area 8D Net

Chinook	Trty	BS, RH, GN gear outside Tulalip Bay may be open during the following periods: 5 days per week: 5/01 – 6/04 12:01 AM Sun – 11:59 PM Sat 6/05 – 8/13 12:01 PM Mon – 11:59 PM Thu 2 days per week: 8/14 – 8/27 12:01 PM Mon – 11:59 PM Thu Setnets inside Tulalip Bay may be open during the following period: 5 days per week: 5/01 – 8/13 12:01 AM Sun – 11:59 PM Sat 3 days per week: 8/14 – 9/10 12:01 AM Sun – 11:59 PM Sat
	Ntrty	Closed (see recreational SAF)
Coho	Trty	9/11 – 10/29; BS, RH, GN gear outside Tulalip Bay may be open two days per week to target Tulalip hatchery Coho. Setnet may be open three days per week.
	Ntrty	Closed
Chum	Trty	BS, RH, GN gear outside Tulalip Bay 10/30 – 11/12; <u>2 days per week</u> may be open to target Tulalip hatchery Chum. 11/13 – 11/26 <u>3 days per week</u> . Setnet. 10/30 – 11/12; <u>3 days per week</u> . 11/13 – 11/26 – <u>5 days per week</u> . Managed to allow for hatchery egg take needs based on Tulalip hatchery escapement updates and projections. All Area 8D fisheries will close to ensure egg take requirements are met.
	Ntrty	Closed

Stillaguamish River Treaty Net (Ntrty net closed)

Chinook	C&S fishery only; Open 6/1 – 8/6; Up to 7 days per week; maximum catch of 30 Chinook; Open from mouth of Hatt Slough (RM 0) to Danielson Hole (RM 14).
Coho	C&S fishery only; Open 9/4 – 10/29; Up to 5 days per week; Maximum catch of 40 Coho; Open from mouth of Hatt Slough (RM 0) to Danielson Hole (RM 14).

Chum	C&S fishery only; Open 10/30 – 12/3; Up to 3 days per week; max catch of 300 Chum; Open from mouth of Hatt Slough (RM 0) to Danielson Hole (RM 14).
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Snohomish River Treaty Net (Ntrty net closed)

Chinook, Coho, Chum	Closed
Coho Test	Closed

Area 8-2 Recreational

5/1-10/31	Closed
11/1–4/30	2 fish limit (Chinook 22" min size). Release Coho and wild Chinook.

Tulalip Special Area Recreational Fishery

Same as Area 8- 2 Recreational, except during the period 5/30-9/27:	5/27-9/5	Open 12:01 AM Friday – 11:59 AM Monday each week. Closed June 11. Open within Tulalip Special Area boundaries only. Closed to all angling east of the line from Mission Point to Hermosa Point. 2 fish limit salmon, 2 pole endorsement (Chinook 22" min. size). Release Coho and wild Chinook.
	9/10-9/25	Open Saturday and Sunday each week. Open within Tulalip Special Area boundaries only. Closed to all angling east of the line from Mission Point to Hermosa Point. 2 fish limit salmon, 2 pole endorsement (Chinook 22" min. size). Release Coho and wild Chinook.

Snohomish River Recreational

mouth to confluence of the Skykomish and Snoqualmie rivers	Closed to salmon.	mouth to confluence of the Skykomish and Snoqualmie rivers
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Snohomish River and tributaries below anadromous barriers are closed to gamefish 9/1-10/31.

Snoqualmie River Recreational

mouth to Snoqualmie Falls	Closed to salmon.
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Snoqualmie River and tributaries below anadromous barriers are closed to gamefish 9/1-10/31.

Skykomish River Recreational

from mouth to Wallace River	6/1–7/30	4 fish limit, only 2 may be adults, hatchery Chinook only 12" min. size.
mouth to confluence of North and South forks	9/1-12/31	Closed to salmon.

Skykomish River and tributaries below anadromous barriers are closed to gamefish 9/1-10/31.

Wallace River Recreational

mouth to 200' upstream of water intake of salmon hatchery	Closed to salmon.
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Wallace River and tributaries below anadromous barriers are closed to gamefish 9/1-10/31.

Stillaguamish River Recreational

mouth to forks	Closed to salmon.
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Stillaguamish River and tributaries below anadromous barriers are closed to gamefish 9/1-10/31.

All other STILLAGUAMISH/SNOHOMISH TERMINAL REGION freshwater recreational closed to salmon angling.

2.7 Admiralty Inlet Area

Area 9 Net

Chinook	Trty	Ceremonial and Subsistence – Up to 500 Chinook as agreed upon by those Tribes with U&A in Area 9, (PS and Hook & Line, release all Chum 6/1 – 9/30).
	Ntrty	Closed
Chum	Research	Wks 42 (wb 10/9) – 47 (wb 11/13) research fishery to develop stock composition/timing information. Research catch quota of 2,400 Chum. Details of research program will be based on previously agreed sampling design and a review of prior years' sampling results. Reference 2016 Area 9 Chum Salmon Research Fishery Plan.

	Trty	The Suquamish Tribe has submitted a treaty commercial Chum fishing plan that was modeled during NOF. Currently, there is no tribal agreement on proposed treaty Chum fisheries in this management area.
	Ntrty	Closed

Area 9 Recreational

5/1 – 6/30	Closed
7/1 – 7/15	2 fish limit. Release Chinook, Coho and Chum.
7/16 – 8/15	2 fish limit; (Chinook 22" min size) release Coho, Chum and wild Chinook. Closed south and west of a line from Foulweather Bluff to Olele Point.
8/16 – 10/31	Closed
11/1 – 11/30	2 fish limit, (Chinook 22" min size), release Coho and wild Chinook.
12/1 – 1/15	Closed
1/16 – 4/15	2 fish limit, (Chinook 22" min size), release Coho and wild Chinook.
4/16 – 4/30	Closed

Edmonds Pier Recreational

Year-Round	2 fish limit, 1 Chinook (Chinook 22" min size), release Coho, release Chum 8/1-8/31. Closed 9/1-10/30.
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3.0 South Sound Region

3.1 Area 10 Sub region

Area 10 Net

Chinook	Closed	
Sockeye	Trty	Fishery dependent upon ISU (Ballard lock counts)
	Ntrty	Closed
Coho	Test	Gillnet: Wk 37 (wb 9/4) - wk 39 (wb 9/18); 3 boats, 3 sites; fishing pattern: 2,2,2.
	Trty	On-Reservation only; wk 38 (wb 9/11) – wk 43 (wb 10/16); gillnet/beach seine; 7 days/wk. Off reservation A10 closed until further notice.
	Ntrty	Closed

Chum	In order to allow fishing opportunity that allows both the treaty and non-treaty fleets to have the ability to catch their shares; better communication and cooperation is expected from both non-treaty and treaty co-managers to allow both parties the opportunity to access their shares. The Co-managers established a South Sound Chum ISU model technical workgroup in 2016, with a goal of improving in-season management tools for South Sound Chum prior to the 2016 Chum season. The workgroup will meet during late May/early June, once the 2015 Chum run reconstruction becomes available, to develop a technical task agenda and products for policy consideration.	
	Test	Purse Seine: Wk 41 (wb 10/2) - wk 46 (wb 11/6); 1 site, fishing pattern: 1,1,1,1,1,1.
	Trty	Treaty allocation based on intertribal sharing agreement; wk 41 (wb 10/2) – wk 48 (wb 11/20) fishing pattern – ISU dependent; Fishing schedule for Area 10 shall be set consistent with the MST agreement (1983). <u>Suquamish</u> – On-Reservation only (set net gear only): wk 42 (wb 10/9) – wk 50 (wb 12/4) up to 3 days per week dependent upon Chum return to the Grovers Creek Hatchery.
	Ntrty	Wks 42 (wb 10/9) - 48 (wb 11/20); PS Chinook and Coho NR; PS fishing pattern: 0,1,1,1,1,2,1; GN fishing pattern: 0,2,2,2,2,2,2. ISU Dependent. The area east of a line from Four Mile Rock south to Alki Point is closed.

Area 10A Treaty Net (Ntrty net closed): That portion of Elliott Bay east of the line from Pier 91 to the light at Duwamish Head.

Chinook	Trty Test	Gillnet: Wks 30-32, 7/17, 7/24, 7/31; 5 sites (Wednesday nights, if possible)
	Trty	Closed
	Trty	Ceremonial and subsistence fisheries
Coho	Trty	Closed: Fishery will remain closed if the Duwamish/Green River ISU does not show harvestable Coho. If the ISU shows harvestable Coho, the fishing pattern will be as follows: Fishery will open Wk 38 (wb Sept 11 th) – Wk 42 (wb 10/9) up to 5 days per week (Sun – Fri).
	Trty	Ceremonial and subsistence fisheries
Chum	Trty	Gillnet: Wk 43 (wb 10/16)-Wk 48 (wb 11/20); fishing pattern: up to 5 days per week (Sun – Fri).
	Trty	Ceremonial and subsistence fisheries

Duwamish/Green River (Area 80B) Treaty Net (Ntrty net closed)

Chinook	Trty	Closed
	Trty	Ceremonial and subsistence fisheries
Coho	Trty Test	Wk 37 (wb 9/4) Coho ISU test fishery on the river (from the mouth of the East and West waterways up to 16 th Ave. Bridge). The 6 sites are as follows: East Waterway, West Waterway, Old Riverside Marina, Kellogg Island, 1 st Ave Bridge and 16 th Ave Bridge.
Coho	Trty	Closed: Fishery will remain closed if the ISU does not show harvestable Coho. If the ISU shows harvestable Coho, the fishing pattern will be as follows: Fishery will open Wk 38 (wb Sept 11) up to the 16 th Ave Bridge. Starting on Wk 39 (wb Sept. 18 th) the fishery will open up to the Boeing St Bridge. Starting Wk 40 (wb Oct 1 st) – Wk 43 (wb 10/16) the fishery will open up to the Hwy 99 Bridge. Up to 5 days per week (Sun – Fri).
	Trty	Ceremonial and subsistence fisheries
Chum	Trty	Gillnet: Wk 44 (wb 10/23) - Wk 48 (wb 11/20); fishing pattern: 5 days per week (Sun – Fri).
	Trty	Ceremonial and subsistence fisheries

Area 10E Treaty Net (Ntrty net closed; see below for recreational SAF)

Chinook	Trty	Wk 30 (wb 7/17) - wk 38 (wb 9/11); fishing pattern: 7 days/wk. Possible extension for Sinclair Inlet.
Coho	Trty	On-Reservation only; wk 38 (wb 9/11) - wk 43 (wb 10/16); gillnet/beach seine; 7 days/wk.
Chum	Trty	Wk 43 (wb 10/16) - wk 50 (wb 12/4); schedule dependent upon ISU.

Lake Washington System (includes Lake, Lake Union, Ship Canal, & Lake Sammamish)

Areas 10F, 10G, 10C, 10D Treaty Net (Ntrty net closed)

Sockeye	Wk 23 (wb 5/29) – Wk 33 (wb 8/7) Based on ISU (lock counts)	
	Wk 26 (wb 6/19) PSC test fishery	
	Ceremonial and subsistence fisheries	
Chinook	Based on ISU and adaptive management consistent with the harvest plan.	
	Ceremonial and subsistence fisheries	

Coho	Closed. Coho fisheries in the four following areas are dependent upon the ISU (if lock counts project run size <10,000 Coho entering the lake, then the Coho fishery will remain closed in all four areas including Lake Sammamish).	
	Ceremonial and subsistence fisheries	
Lower ship canal (below Ballard Locks)	Closed: If the ISU is > than 10,000 the fishery could open as early as Wk 38 (wb 9/11) – Wk 45 (wb 10/30) with the fishing pattern up to 7 days per week (Sun – Sat).	
Upper ship canal (above Ballard Locks):	Closed: If the ISU is > than 10,000 the fishery could open as early as Wk 38 (wb 9/11) – Wk 45 (wb 10/30) with the fishing pattern up to 5 days per week (Sun – Fri).	
North end Lake Washington (North of Hwy. 520 bridge):	Closed: If the ISU is > than 10,000 the fishery could open Wk 40 (wb 9/25) – Wk 47 (wb 11/13) with the fishing pattern up to 5 days per week (Sun – Fri).	

Lake Sammamish Treaty Net

Chinook	Based on ISU and adaptive management consistent with the harvest plan
	Ceremonial and subsistence fisheries
Coho	Closed: If the ISU is > than 10,000 the fishery could open Wk 42 (wb 10/9) – Wk 48 (wb 11/20) with the fishing pattern up to 5 days per week (Sun – Fri).
	Ceremonial and subsistence fisheries

Area 10 Recreational

5/1-5/31	Closed
6/1-6/30	Catch-and-release only. North of a line from Point Monroe to Meadow Point only.
7/1-7/15	2 fish limit, release Chinook, Coho and Chum.
7/16-8/15	2 fish limit, release Coho and wild Chinook, release Chum through 9/15.
8/16-10/31	Closed
11/1-2/28	2 fish limit, release Coho and wild Chinook (Chinook 22" min size).
3/1-4/30	Closed

Shilshole Bay (East of Meadow Point/West Point line) closed to salmon 7/1-8/15.

Outer Elliott Bay (E of West Pt. /Alki Pt line to Pier 91/Duwamish Head line) closed to salmon 7/1-8/15.

Inner Elliott Bay (E of Pier 91/Duwamish Head line) closed to salmon 7/1-8/15.

Area 10 Piers Recreational

Seacrest Pier, Pier 86, Waterman Pier, Bremerton Boardwalk, Illahee State Park Pier	Year-Round	2 fish limit, 1 Chinook (22" min size), release Chum 8/1-9/15. Release Coho, except release wild Coho in Sinclair Inlet Piers. Closed 9/1-10/30, except Sinclair Inlet Piers.
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Elliott Bay Recreational SAF

5/1- 6/30	Same as Area 10.
7/1- 8/31	Closed
9/1- 4/30	Same as Area 10.

Sinclair Inlet Recreational SAF

5/1-6/30	Same regulations as Area 10.
7/1-9/30	Open S of Manette Bridge, S of line drawn true W from Battle Point, and W of line drawn true S from Point White; 3 fish limit, (Chinook 22" min size), release wild Chinook and wild Coho, release Chum 8/1-9/15, 2 pole endorsement.
10/1-4/30	Same regulations as Area 10.

Green River Recreational

1st Ave South Bridge to Auburn-Black Diamond Rd Bridge	11/1 – 12/31	Daily limit 6. No more than 3 adults may be Chum, 12" min size, release Chinook and Coho.
from Auburn-Black Diamond Rd Bridge to Tacoma Headworks Dam	11/1 – 12/31	Daily limit 6. No more than 3 adults may be Chum, 12" min size, release Chinook and Coho, Closed waters - within 150' of the Palmer Ponds outlet rack and within 150' of the mouth of Keta (Crisp) Creek.

The 2016/2017 WDFW sport pamphlet will reflect the following season end dates for trout and other game fish fall/winter season.

Mouth to S. 277th Bridge in Auburn: Jan. 15

S. 277th Bridge to Tacoma Headworks Dam: Jan. 31

Green River and tributaries below anadromous barriers are closed to gamefish 9/1-10/31.

Soos Creek Recreational

Closed

Lake Washington Recreational

July-October	Closed to salmon. Re-opening dependent upon ISU (lock counts) and co-manager agreement. Potential fishery starting date to be determined: Sockeye: 2 fish limit, Sockeye only East of the Montlake Bridge, Coho: 12" min. size. 4 fish limit, Coho only.
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Lake Washington and tributaries below anadromous barriers are closed to gamefish 9/1-10/31.

Lake Sammamish Recreational

October- November	Closed to salmon. Re-opening dependent upon ISU (lock counts) and co-manager agreement. Potential fishery starting date to be determined: Coho: 12" min size. 4 fish limit, Coho only.
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Lake Sammamish and tributaries below anadromous barriers are closed to gamefish 9/1-10/31.

All other SOUTH SOUND AREA 10 REGION freshwater: Closed to salmon angling.

3.2 Area 11 Sub region

Area 11 Net

Chinook	All	Closed
Coho	Trty:	Closed.
	Ntrty:	Closed
Chum	In order to allow fishing opportunity that allows both the treaty and non-treaty fleets to have the ability to catch their shares; better communication and cooperation is expected from both non-treaty and treaty co-managers to allow both parties the opportunity to access their shares.	
	Trty:	Commercial fishery open Wk 45 (wb 10/30) - wk 48 (wb 11/20); gillnets 7 nights/wk, could close at any time. Beach seine daylight hours only, 7 days/wk.
	Ntrty	Wks 42 (wb 10/9) - 48 (wb 11/20); PS Chinook and Coho NR; PS fishing pattern: 0,1,1,1,1,2,1; GN fishing pattern: 0,2,2,2,2,2,2. ISU dependent.

Area 11A Net Treaty Net (Ntrty net closed)

Chinook	Closed
Coho	Closed.
Chum	Commercial fishery open Wk 46 (wb 11/6) – Wk 53 (wb 12/25) 3 nights/wk.

Puyallup River (Area 81B) Treaty Net (Ntrty net closed)

Chinook	Spring Chinook	Ceremonial and Subsistence
	Summer - Fall	Commercial fishery Wk 33 8/7, fishing pattern: 6 hours.
Coho	Commercial fishery Wk 36 (wb 8/28) - wk 42 (wb 10/9) fishing pattern: 1,2,2,2,2,2.	
Chum	Test fishery Wk 43 (wb 10/16) - wk 46 (wb 11/6) 1 day/wk, drift net only.	
Winter Chum	Commercial fishery wk 46 (wb 11/6) – wk 2 (wb 1/8/2017) 1 to 3 days a week	

White River Treaty Net

Ceremonial and subsistence fisheries. Fishing pattern 7 days/wk.

Area 11 Recreational

5/1-5/31	Closed
6/1-8/31	2 fish limit (Chinook 22" min. size), release Coho and wild Chinook; Commencement Bay (E. of Cliff House Restaurant/Sperry Ocean Dock line) closed to salmon through 7/31.
9/1-1/31	Closed.
2/1-4/30	2 fish limit (Chinook 22" min size), release Coho and wild Chinook. Commencement Bay (E. of Cliff House Restaurant/Sperry Ocean Dock line) closed to salmon 4/1-4/30.
Dash Point Dock, Point Defiance Boathouse Dock, Les Davis Pier, Des Moines Pier and Redondo Pier	Year-Round 2 fish limit, 1 Chinook (Chinook 22" min size). Release Coho. Closed 9/1-10/30.

Puyallup River Recreational

Clarks Creek Closure: closed to all angling within 400' of creek mouth.

from 11 th St. Bridge to Carbon River	10/16 – 12/31	2 adults, Chum only.
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Carbon River Recreational

From mouth to Voight Creek	9/10 – 9/24	6 fish limit, 2 adult Chinook, 12" min size, release Coho, Chum and wild adult Chinook.
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Carbon River and tributaries below anadromous barriers are closed to gamefish 10/1-11/30.

All other SOUTH SOUND AREA 11 REGION freshwater recreational Closed to salmon angling

3.3 Area 13 Sub region

Fox Island/Ketron Island (Area 13)

Chinook	Treaty	8/1-8/31, 7 days/wk
	Ntrty	Closed
Coho	Treaty	Closed
	Ntrty	Closed
Chum	Treaty	Closed unless opened by Medicine Creek Treaty Tribes' agreement
	Ntrty	Closed

Area 13 Treaty Net (Ntrty net closed)

Chinook	Closed
Coho	Closed
Chum	Closed

Carr Inlet (Area 13A) Treaty Net ¹(Ntrty net closed) ¹Based on Medicine Creek Treaty Tribal proposal annual regulations. Individual Tribal regulations may deviate from this schedule.

Chinook	8/1 - 8/31, 7 days/wk, opens in sections.
Coho	Closed
Chum	11/16 – 12/3, 7 days/wk.

Chambers Bay (Area 13C) Treaty Net¹ (Ntrty net closed)

Chinook	7/26 – 8/31; Beach seines Sunday noon to Tuesday noon. Set nets Wednesday noon to Friday noon.
Coho	Closed

Chum	11/15 – 11/26; Beach seines Sunday noon to Tuesday noon. Set nets Wednesday noon to Friday noon.
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Area 13D Treaty Net (Ntrty net closed)

Chinook	7/15 - 9/9 or earlier date dependent on in-season management needs; 7 days/wk
Coho	9/10 - 10/31 or earlier date dependent on in-season management needs.
Dana Pass (13D-1)	7 days/wk
Pickering Pass (13D-2)	7 days/wk
Peale Pass (13D-3)	7 days/wk
Southern Case (13D-4)	7 days/wk
Chum	Open approximately 10/9; 2-3 days per week; managed weekly by updates (~10/9).
Area 13E Net	Closed to all fishing

Budd Inlet (Area 13F) Treaty Net (Ntrty net closed)

Chinook	7/15-9/9 or earlier date dependent on in-season management needs; 7 days/wk 9/10-9/23 open dependent on in-season monitoring to meet hatchery escapement needs.
Coho	Closed
Chum	Open approximately 11/6, 2-3 days per week, managed by weekly in-season updates

Eld Inlet (Area 13G) Treaty Net (Ntrty net closed)

Chinook	7/15-9/9; opening dependent upon in-season data, outer portion only.
Coho	Closed
Chum	Open approximately 11/6, 2-3 days per week, managed by weekly escapement updates

Totten Inlet (Area 13H) Treaty Net (Ntrty net closed)

Chinook	8/1-9/9; schedule dependent on in-season data
Coho	Closed
Chum	Open approximately 10/9, 2-3 days per week; managed by weekly escapement updates

Little Skookum Inlet (Area 13I) Treaty Net (Ntrty net closed)

Chinook	8/1-9/9; schedule dependent upon in-season data
Coho	Closed
Chum	Open approximately 11/6, 2-3 days per week; managed by weekly escapement updates

Hammersley Inlet (Area 13J) Treaty Net (Ntrty net closed)

Chinook	8/1-9/9 or earlier date dependent on in-season management needs
Coho	Closed
Chum	Open approximately, 10/9 - 12/31, 2-3 days/wk; managed by weekly escapement updates

Northern Case Inlet (Area 13K) Treaty Net (Ntrty net closed)

Chinook	7/15-9/9
Coho	9/10-10/31 or earlier date dependent on in-season management needs
Chum	Open approximately 10/9-12/31; 2-3 days/wk; managed by weekly escapement updates

Nisqually River (Area 83D) Treaty Net (Ntrty net closed)

Chinook	Gill Net 2 days/wk during the following weeks: wk 31 (wb 7/24) through wk 35 (wb 8/21).
Coho	Closed for Coho Conservation.
Chum	Proposed schedule: Gill Net 3-4 days/wk during the following weeks: wk 48 (wb 11/20) through wk 5 (wb 1/29/2017) per annual Nisqually River Chum ISU. ISU agreement by co-managers prior to October 14 th , 2016 to be included in Chum/Steelhead management plan.

McAllister Creek (Area 83F) Treaty Net (Ntrty net closed)

Chinook	Closed.
Coho	Closed.
Chum	Closed.

Area 13 Recreational

5/1-8/31	2 fish limit (Chinook 22" min. size), release Coho and wild Chinook. 2 pole endorsement. Minter Creek mouth closed 4/16 through 9/30; Lower Budd Inlet closure zone 7/16-10/31.
9/1-9/30	Closed

10/1-4/30	2 fish limit (Chinook 22" min. size), release Coho and wild Chinook. 2 pole endorsement. Minter Creek mouth closed 4/16 - 9/30; Lower Budd Inlet closure zone 7/16-10/31.
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Fox Island Pier Recreational

Year-Round	2 fish limit, 1 Chinook (Chinook 22" min size), release Coho. Closed 9/1-10/30.
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Chambers Creek Estuary Recreational

downstream of markers 400' below Boise-Cascade Dam to Burlington Northern Railroad Bridge	7/1 – 11/15	6 fish limit, 4 adults; 12" min size, release Coho.
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Deschutes River Recreational

Capitol Lake (from outlet to 400' below lowest Tumwater Falls (Deschutes River) fish ladder).	7/1 – 10/15	Closed
from Old Hwy 99 Bridge on Capitol Blvd in Tumwater to Henderson Blvd Bridge	7/1 – 10/15	6 fish limit, 2 adults, 12" min size, release Coho.
upstream of Henderson Blvd Bridge	7/1 – 10/15	6 fish limit, 2 adults, 12" min size, release Coho.

Kennedy Creek Recreational

mouth to northbound Hwy. 101 Bridge	10/1 – 11/30	6 fish limit, 2 adults, 12" min size, release Coho.
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McLane Creek Recreational

from a line 50' north of and parallel to the Mud Bay Rd. Bridge to a line 100' upstream of and parallel to the south bridge on Hwy.101	Same as Area 13	Same as Area 13.
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Minter Creek Recreational

mouth to 50' downstream of hatchery rack	11/1 – 12/31	4 fish limit, 12" min size, Chum only.
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Nisqually River Recreational

mouth to the military tank crossing bridge, one mile upstream of the mouth of Muck Creek	7/1 – 8/31	6 fish limit, 3 adults, 12" min. size; release Coho and wild Chinook.
	11/16-1/31	6 fish limit, 2 adults, 12" min. size; release Coho and wild Chinook.
McAllister Cr. - mouth to Olympia-Steilacoom Rd Bridge	7/1 – 9/30	6 fish limit, 2 adults, 12" min size. Release Coho.
	11/16-11/30	6 fish limit, 2 adults, 12" min size. Release Coho.

Nisqually River and tributaries below anadromous barriers are closed to gamefish 10/1-11/15.

All other SOUTH SOUND AREA 13 REGION freshwater recreational closed to salmon angling.

4.0 Hood Canal Region (All fisheries modeled in FRAM #2916 (Chinook) & #1637 (Coho))

Hood Canal Mainstem (Areas 12, 12B, 12C, 12D)

Treaty: 1,000 feet closure around streams that are closed to net fishing. Beach seines and hook and line gear release Chum through 9/30 (through 10/10 if within 500' of western shore of Areas 12B and 12C).

Nontreaty: See WAC 220-47-307 for Nontreaty exclusion zones.

Chinook	Trty	<p>Areas 12, 12B and 12D: Closed</p> <hr/> <p>Area 12C: Beach seines open 7/24 - wb 8/21; 3 days/wk; release Chum 8/1-8/31. Open 7/24 – wb 8/21 for gillnets 3 days/wk; restricted to 7" min mesh starting 8/1.</p> <hr/> <p>Area 12H: Open wb 7/10 through wb 9/11; hook and line gear continuous; beach seines daylight hours Tues and Thur each week; possible in-season modifications; Chum release.</p>
	Ntrty	<p>Area 12H: Hoodsport Hatchery Zone, Wks 31 (wb 7/24) – 36 (wb 8/28); 5000 Chinook quota. Netting schedules will be finalized in regional meetings with comanagers prior to start of the season; Release all Chum per the SCSCI.</p> <p><i>*We are using the tribal designation of 12H and will modify the WAC to accommodate that area which is currently 12C: Hoodsport Hatchery Zone.</i></p>
Coho	Trty	<p>Area 12: Open 9/25 through 10/08 for gillnets. Beach seines for Coho only (release all Chinook and Chum through 9/30) may start no earlier than 9/16. Both gear types open 7 days/wk.</p>
		<p>Area 12B: Open 10/1 through 10/15 for gillnets; 500-foot closure along western shore through 10/10; beach seines for Coho only (release all Chinook and Chum through 9/30) may start no earlier than 9/16. Both gear types open 7 days/wk.</p>
		<p>Area 12C: Open 10/1 through 10/15 for gillnets; with 500-foot beach closure from Ayock Pt. to approx. 2,000 feet south of Lilliwaup (at the large house, north of Octopus Hole) through 10/10; beach seines for Coho (release all Chum through 9/30) may start no earlier than 9/21. Both gear types may fish 3 days/wk when open.</p>
		<p>Area 12D (west of Madrona Pt. - local name): Open for gillnets no earlier than 10/1. Weekly schedules identical to Area 12C.</p>

	Ntrty	Closed
Chum	The Co-Managers have reached agreement on a co-management process to assess and agree on in-season abundance estimation methods. Chum fishing schedules may be modified if pre-season harvestable abundance and catch shares are changed using the agreed ISU, based on Non-Treaty purse seine cumulative CPUE for October 15 through October 31.	
	Trty	Area 12: Open 10/09 through 11/20; 7 d/wk
		Area 12B: Open 10/16 through 11/20; 7 d/wk; except north of an East-West line from Zelatched Point to Seal Rock open through 11/27.
		Area 12C: Open 10/16 through 11/27; 7 d/wk.
		Area 12D: Closed.
Area 12H: Hook and line gear open from wb 10/09 through 11/26; beach seines open Tuesday and Thursday of each week. Then Monday and Wednesday for the week beginning 11/06; possible in-season adjustments to 3 days/wk. Starting 11/06, hatchery escapement control measures will go into effect.		
Ntrty	Areas 12 and 12B: Wks 42 (wb 10/9) - 47 (wb 11/13): PS Chinook NR; PS fishing pattern: 0,1,1,1,1,2; GN fishing pattern: 0,2,2,2,2,2 daylight hours. PS closed within 2 miles south of the Hood Canal Bridge in wks 44-45. Hazel Point Closure in wks 44-45.	
	Area 12C: Fisheries scheduled Wks 45 (wb 10/30) - 48 (wb 11/20): PS Chinook NR; PS fishing pattern: 1,1,2,1; GN fishing pattern: 2,2,2,2 daylight hours. Fishing is contingent upon the results of the agreed-to ISU.	
	Hoodsport Hatchery Zone (12H): Beach seine fishery wks 45-48; fishing pattern: 2,2,2,2. Fishing is contingent upon the results from the agreed-to ISU.	
	Area 12D Closed	
Port Gamble (Area 9A)		
Chinook	All	Closed
Coho	Trty	Open wb 8/14 through wb 10/29; 7 days/wk; gillnet only. Ceremonial Harvest of 20 Chinook in August.

	Ntrty	Open Wks 34 (wb 8/14) - 44 (wb 10/23) skiff GN limited to 100 fathoms length and 60 meshes in depth; 7 days/wk; Chinook NR; Chum NR through 9/30; release NR fish by cutting ensnaring meshes. The beach area of the Port Gamble Indian Reservation, between Pt. Julia and the boundary marker at the south end of the reservation - closed to all fishing.
Chum	Trty	Open 10/30 through 11/26; 7 days/wk; gillnet only.
	Ntrty	Closed

Quilcene / Dabob (Area 12A)

Coho	Trty	Open 8/21 through 10/08; Chum and Chinook release from hook and line and beach seine gear through 9/30; beach seines 5 days/wk, daylight hours. Hook and line fisheries for Coho only, open continuously. Gillnets closed until Summer Chum escapement exceeds 1,500, then (1) GN day/wk; when escapement reaches 2,500 (2) GN day/wk; when escapement reaches 3,500 GN will be determined. Beach seine advance notification required prior to fishing.
	Ntrty	Beach seine open wks 35 (wb 8/21) – 40 (wb 9/25); Limited participation (4 permits/day); Chinook and Chum NR; fishing pattern 5,5,5,5,5,5; GN closed unless Treaty GN opening. Fishery will be managed consistent with SCSCI.
Chum	Trty	Open to set and drift gillnets wb 10/09 through 11/20, South of an E-W line through Pt. Whitney.
	Ntrty	Closed

Big Quilcene River (Area 82F) Treaty (Ntrty net closed)

Coho	Openings to be determined in-season, for Coho only, from 9/1 through 10/15. Closed below Rogers St. From Rogers St. to U.S. Hwy 101, hook and line gear only, release all other salmon. The hatchery area, from U.S. Hwy 101 to the Quilcene Hatchery rack, may be opened for short periods to take surplus Coho. Hand held gear only (dipnets, hand lines, etc.).
Chum	Closed

Skokomish River (Area 82G) Treaty (Ntrty net closed)**Purdy Creek (Area 82J) Treaty Net (Ntrty net closed)**

The Skokomish Tribe will continue to sample all agreed to fisheries in order to provide weekly in-season updates (i.e. CWT, species, mark status, and mark rates). The WDFW will provide weekly in-season updates for Chinook returns to the George Adams Hatchery rack. Note: Hook and line gear and beach seines release Chum through 10/15 above Hwy 106 Bridge.

Skokomish River – Mouth to HWY 106 Bridge (Area 82G) Treaty

Coho	Open wb 10/09 – wb 10/30, 7 days/wk.
Chum	Open wb 11/06 through wb 11/20, 7 days/wk.

Skokomish River – HWY 106 Bridge to HWY 101 Bridge (Area 82G) Treaty

Chinook	Open wb 7/31 - wb 8/14, 3 days/wk.
Coho	Open wb 10/9 – wb 10/30, 7 days/wk.
Chum	Open wb 11/06 through wb 11/20; 7 days/wk.

Purdy Creek (Area 82J) Treaty Net 250 feet from the confluence/mouth of Purdy Creek to the HWY 101 Bridge (fishing nets may not be attached to any abutment or railings on the HWY 101 Bridge).

Chinook	Gill Nets only: Open Saturdays only beginning July 10 – August 6. In-season adjustments will occur to ensure weekly broodstock targets are achieved.
Chum	Gill Nets, Dip Nets and Hook & Line: Open wb 11/13 as necessary to reach tribal share.

Misc. Hood Canal Rivers (Dosewallips, Duckabush, Hamma Hamma, Tahuya, Dewatto, Union)

All species	Closed to commercial harvest.
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Area 12 Recreational (Including Quilcene/Dabob Bay)

Note: Release all Chum from 8/1 to 10/15, per the SCSCI. 7/1-10/ 15: All waters within channels created by exposed tidelands including - the free flowing waters of the Skokomish River downstream (north) of the City of Tacoma PUD overhead transfer powerlines are CLOSED to fishing for finfish. Mouth closures apply to Dosewallips, Duckabush, Dewatto, and Hamma Hamma Rivers.

5/1-6/30	Closed
7/1-8/15	Closed North of Ayock.
7/1-9/30	South of Ayock Pt. – 4 fish limit, (Chinook 20" min size); release Chum and wild Chinook. 2 pole endorsement.
8/16-9/30	North of Ayock Pt. – 4 fish limit, release Chinook and Chum. Closed Tarboo Bay north of Broad Spit 9/16-9/30.

10/1-12/31	4 fish limit, 2 Chinook (Chinook 22" min size). Release wild Chinook, release Chum through 10/15. Closed in Tarboo Bay N of Broad Spit. 2 pole endorsement 10/1-10/31 South of Ayock.
1/1-4/30	2 fish limit (Chinook 22" min size), release wild Chinook.

Hoodsport Hatchery Zone Recreational, Same as Area 12 (above) except:

7/1-12/31	4 fish limit, no minimum size; Release wild Chinook and release Chum 7/1-10/15. 2 pole endorsement 7/1-10/31.
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Dewatto River Recreational

mouth to Dewatto-Holly Rd. Bridge	10/1 – 10/31	2 fish limit, 12" min size, Coho only.
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Dosewallips River Recreational

mouth to Hwy. 101 Bridge	11/1 – 12/15	2 fish limit, 12" min size, Chum only.
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Duckabush River Recreational

mouth to Mason Co. PUD #1 overhead electrical line	11/1 – 12/15	2 fish limit, 12" min size, Chum only.
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Quilcene River Recreational

Rodgers St. to Hwy 101 Bridge	8/16 – 10/31	4 fish limit, 12" min size, Coho only.
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Skokomish River Recreational

Closed to salmon.		
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Tahuya River Recreational

Closed to salmon.		
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All other HOOD CANAL REGION freshwater recreational closed to salmon angling.

APPENDIX A.

Puget Sound Recreational Coho Seasons - 2015 FINAL

Area	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
5			M M M	M M M	M NS	NS NS					NS NS NS NS	NS NS
6			M M M	M M M	M M	NS NS		NS NS	NS NS	NS NS	NS NS NS NS	NS NS
7			NS NS	M M M	M M	NS NS		NS NS	NS NS	NS NS	NS NS NS NS	NS NS
81				NS NS	NS NS	NS NS	NS NS	NS NS	NS NS	NS NS	NS NS NS NS	NS NS
82				NS NS	NS NS	NS NS	NS NS	NS NS	NS NS	NS NS	NS NS NS NS	NS NS
9			NS NS	NS NS	NS NS	NS NS	NS NS	NS NS	NS NS	NS NS	NS NS NS NS	NS NS
10		NR NR	NS NS	NS NS	NS NS	NS NS	NS NS	NS NS	NS NS	NS NS	NS NS	NS NS
11		NS NS	NS NS	NS NS	NS NS	NS NS	NS NS	NS NS	NS NS	NS NS	NS NS NS NS	NS NS
12			NS NS	NS NS	NS NS	NS NS	NS NS	NS NS	NS NS	NS NS	NS NS NS NS	NS NS
13	NS NS	NS NS	M M	M M	M M	M M	M M	NS NS	NS NS	NS NS	NS NS NS NS	NS NS

Puget Sound Recreational Chinook Seasons - 2015 FINAL

Area	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
5			M M M	R NR NR	NR NR	NR NR					M M M M	M M
6			M M M	NR NR NR	M M			M M M M	M M M M	M M M M	M M M M	M M
7			NS NS	NS NS	NS NS	M M		M M M M	M M M M	M M M M	M M M M	M M
81				NR NR	NR NR	NR NR	M M	M M M M	M M M M	M M M M	M M M M	M M
82				NR NR	NR NR	NR NR	M M	M M M M	M M M M	M M M M	M M M M	M M
9			NR M	M NR NR	NR NR	NR NR	M M		M M M M	M M M M	M M M M	M M
10		NR NR	NR NR	NR NR	NR NR	M M	M M	M M M M	M M M M	M M M M	M M M M	M M
11		M M	M M	M M	M M	M M	M M	M M M M	M M M M	M M M M	M M M M	M M
12 NoA			NR NR	NR NR	NR NR	NR NR	M M	M M M M	M M M M	M M M M	M M M M	M M
12 SoA			M M	M M	M M	M M	M M	M M M M	M M M M	M M M M	M M M M	M M
13	M M	M M	M M	M M	M M	M M	M M	M M M M	M M M M	M M M M	M M M M	M M

NR Non-Retention
 NS non-sel
 M Mark Selective
 Closed

APPENDIX B

2016 7/7A Chum Fishing Plan
05/24/16

In 2014, the U.S. landed 146,571 Chum salmon from Area 7/7A, exceeding the U.S. catch ceiling of 130,000 by 16,571 Chum salmon. This overage triggered the payback mechanism outlined in Chapter 6.10. (h) of the Pacific Salmon Treaty.

“Catches in excess of 135,000 Chum shall result in an overage being calculated by subtracting 130,000 from the total Chum catch. Overage will be accounted for by reducing the U.S. annual catch ceilings in up to two subsequent non-critical Inside Southern Chum salmon years;”

In 2015, the co-managers landed 125,057 Chum salmon, effectively paying back 4,943 Chum from the 2014 overage (Table 1). As a result, the 2016 U.S. target for Area 7/7A Chum harvest shall be 118,372 (Table 2).

Table 1. U.S. 7/7A Chum catches, 2009-2015

Year	NT catch	Treaty catch	Total U.S. catch	Total U.S. Share	Uncaught share	Overage	Paid Back
2009	16,406	7,667	24,073	130,000	105,927	0	
2010	6,062	17,342	23,404	130,000	106,596	0	
2011	24,084	36,401	60,485	130,000	69,515	0	
2012	32,157	40,709	72,866	130,000	57,134	0	
2013	30,239	49,411	79,650	130,000	50,350	0	
2014	60,135	86,436	146,571	130,000	0	16,571	
2015	59,754	65,303	125,057	130,000	4,943	0	4,943

Table 2. Payback approach to Canada for 2014 U.S. Chum overage in Area 7/7A.

Year	Number of Chum			
	Payback to Canada	Treaty Harvest or Target	Non-Treaty Harvest or Target	Total U.S. Harvest or Target
Yr 1 2015	4,943	65,303	59,754	125,057
Yr 2 2016	11,628	53,372	65,000	118,372

Beginning in 2013, the co-managers began adopting annual pre-season Chum fishing plans for Area 7/7A to help guide in-season management. To continue to promote fishing opportunity that allows both the treaty and non-treaty fleets to catch their full shares, while also considering the necessary payback to Canada for the Chum overage in 2014 per the PST language above, the co-managers will use the management approach below for the 2016 season.

- Treaty and non-treaty reef net fisheries will remain open continuously from the end of Fraser management to the end of the Chum season or until their respective shares are harvested, whichever comes first. Reef nets will release all Chum, unmarked Coho and unmarked Chinook through September 30. Release all Chinook beginning October 1.
- Treaty purse seine (PS) and gillnet (GN) fisheries will open on Monday October 10 and remain open through Friday October 14. Additional treaty fishing days will be scheduled based on the outcome of the co-manager conference call scheduled for October 14 and the remaining treaty harvest share.
- Non-treaty PS and GN fisheries will open on Monday October 10, Wednesday October 12 and Thursday October 13.

Table 3. 2016 Treaty and Non-Treaty Chum fishing schedule for Area 7 & 7A

	10/10 MON	10/11 TUE	10/12 WED	10/13 THU	10/14 FRI
Treaty and Non-Treaty Reef Net					
Treaty Gillnet and Purse Seine					
Non-Treaty Gillnet and Purse Seine					
Co-manager Conference Call					

- Non-treaty purse seine and gillnet fisheries will be evaluated relative to the thresholds below based on non-treaty Chum catch reported on the in-season management conference call scheduled for Friday, October 14, 2016. Non-treaty fisheries will re-open on the prescribed dates and remain open continuously until the end of the season or until the non-treaty share is harvested, whichever comes first.
 - If total non-treaty catch is:
 - < 15,000; non-treaty fishery will reopen on Saturday, October 15.
 - >15,000 and <25,000; non-treaty fishery will reopen Sunday, October 16.
 - >25,000; non-treaty fishery will reopen Monday, October 17.
- Whereas this is the second and final year for paying back the remainder of the 2014 overage, a precautionary approach will be taken to ensure the remaining 11,628 Chum are paid back during the 2016 season as outlined in Chapter 6.10.(h) of the Pacific Salmon Treaty.
- The co-managers will exchange data on by-catch throughout the season, and take appropriate management actions should levels of by-catch greatly exceed expectations.
- The co-managers will meet by conference call and adjust schedules if needed in response to in-season notification by Canada's Department of Fisheries and Oceans that Chum salmon returns are below the critical thresholds identified in Chapter 6, paragraph 10 of the Pacific Salmon Treaty.

APPENDIX C:

2016 In-Season Management Protocols

The parties will meet during the season as identified within the LOAF to review catch information and make management adjustments as necessary to achieve stock conservation objectives and conduct orderly fisheries. In addition, in-season meetings/conference calls also will occur should fishery performance (e.g. CPUE or average fish size) significantly deviate from pre-season expectations. If pre-terminal or terminal fishery independent or fishery dependent information indicate that the run is much smaller in number or size than predicted by the pre- season forecasts, then potential in-season adjustments to subsequent pre-terminal and terminal fisheries will be deliberated, and appropriate adjustments that are agreed upon will be implemented as expeditiously as possible.

Notice of such meetings and conference calls will be provided in advance to all parties affected by the fishery in question. Distribution of the pertinent fishery information and catch data will occur at least 24 hours prior to the meeting/conference call. All parties will have both policy and technical representation to provide a fair procedure through which timely decisions can be made and implemented within agreed-to timeframes.

7 9-Year Spawning Escapements

Nooksack Early Management Unit. Spawning escapement in the South Fork Nooksack River, are a complex of multiple origin and run-timing Chinook populations. The portion of the complex estimated to be of SF early NOR returns are highlighted for convenience.

Year	N./Mid. Fork		South Fork					
	NOR	HOR	SF Native NOR	SF HOR	N. Fk Early NOR	Fall NOR	Kendall Cr. HOR	Fall/other HOR/Unk
2006	275	909	61 (1)		102 (2)	192	84	90
2007	334	1,104	26 (3)		38(6)	128	112	35
2008	307	959	80 (3)		105 (1)	126	109	23
2009	269	1,634	45		58	187	128	38
2010	204	1,844	21 (0)		43 (0)	107 (0)	293	29 (0)
2011	99	766	90 (3)		61 (1)	96 (1)	176	48 (8)
2012	281	477	116 (1)		172 (1)	93 (2)	79 (17)	42 (0)
2013	100	1,247	10 (1)		39 (0)	16 (2)	162 (39)	15 (2)
2014	91	1,307	22 (1)	10 (0)	56 (1)	11 (0)	99 (2)	10 (0)
2015	401	1,316	7 (0)	11 (0)	39 (0)	32 (0)	9 (0)	37 (0)

Note: Numbers in parentheses represent additional pre-spawn mortalities encountered.

Skagit Springs Management Unit.

Year	Upper Sauk	Suiattle	Upper Cascade
2007	282	108	223
2008	983	203	284
2009	367	273	338
2010	768	263	330
2011	345	215	265
2012	1,826	460	488
2013	1,080	620	310
2014	923	460	225
2015	743	478	188

Skagit Summer/Falls Management Unit.

Year	Upper Skagit	Lower Sauk	Lower Skagit
2007	9,845	383	1,053
2008	8,441	538	2,685
2009	5,290	250	1,439
2010	6,644	356	1,017
2011	4,480	210	820
2012	9,808	715	3,295
2013	8,801	530	1,551
2014	8,308	364	1,808
2015	10,705	406	2,203

Stillaguamish Management Unit. Stillaguamish River escapement estimates for both summer and fall Chinook populations proportioned by HOR/NOR adult returns. Numbers in parentheses from represent additional fish (both HOR and NOR) collected for brood-stock utilization.

Year	N. Fork		S. Fork & Mainstem	
	NOR	HOR	NOR	HOR
2007*	214	353	40	-
2008	872	521	278	-
2009	497	461	43	-
2010	479 (48)	284 (92)	21	-
2011	538 (38)	376 (135)	104	-
2012	714 (109)	631 (70)	172	17
2013	470 (73)	303 (59)	51	30
2014	141 (57)	276 (87)	12	3
2015	242 (61)	128 (68)	78	11

Snohomish Management Unit.

Year	Skykomish		Snoqualmie	
	NOR	HOR	NOR	HOR
2007	1,510	1,138	1,174	160
2008	4,780	1,033	2,190	370
2009	1,146	268	649	246
2010	1,836	676	1,585	203
2011	881	299	479	221
2012	2,462	1,283	891	488
2013	1,860	495	770	119
2014	1,654	1,409	698	140
2015	1,585	1,449	694	135

Lake Washington Management Unit.

Year	Cedar River		N. Lake Washington	
	NOR	HOR	NOR	HOR
2007	1,893	255	168	1,132
2008	1,346	152	155	1,146
2009	577	136	47	877
2010	546	109	83	1,698
2011	646	159	33	700
2012	910	173	161	1,873
2013	1,605	245	248	2,399
2014	306	262	35	447
2015	1,199	609	92	896

Green River Management Unit.

Year	NOR	HOR
2007	1,904	2,397
2008	3,974	1,997
2009	169	519
2010	925	1,162
2011	397	596
2012		
2013	524	1,517
2014	756	1,974
2015	864	3,223

Puyallup River Fall Management Unit.

Year	NOR	HOR
2007	1,200	1,732
2008	1,779	946
2009	501	1,025
2010	481	1,082
2011	343	1,143
2012	353	419
2013	175	599
2014	518	926
2015	936	1,139

White River Spring Management Unit.

Year	NOR	HOR
2007	2,838	2,147
2008	1,329	859
2009	573	334
2010	521	486
2011	2,640	451
2012	1,121	1,273
2013		
2014	245	637
2015	607	4,074

Nisqually River Management Unit.

Year	NOR	HOR
2007	741	1,003
2008	1,368	2,031
2009	185	687
2010	353	1,714
2011	302	1,962
2012	617	1,850
2013	738	933
2014	528	512
2015	715	1,295

Skokomish River Management Unit.

Year	NOR	HOR
2007	419	112
2008	257	877
2009	304	762
2010	312	902
2011	157	1,164
2012	199	1,334
2013	233	1,489
2014	208	641
2015	138	294

Mid-Hood Canal Management Unit.

Year	Hamma Hamma	Duckabush	Dosewallips
2007	60	4	9
2008	255	0	18
2009	98	9	23
2010	67	0	15
2011	279	5	11
2012	416	6	7
2013	661	4	7
2014	117	13	11
2015	236	20	3

Dungeness River Management Unit.

Return year	Natural Spawners ^{1/}			Broodstock Collection ^{2/}			Total Returns (Natural Spawners + Broodstock)		
	NOR	HOR	Total	NOR	HOR	Total	NOR	HOR	Total
2007	146	159	305	47	51	98	193	210	403
2008	86	54	140	53	36	89	139	90	229
2009	71	57	128	42	50	92	113	107	220
2010	76	269	345	18	94	112	94	363	457
2011	83	452	535	21	109	130	104	561	665
2012	212	296	508	38	68	106	250	364	614
2013	46	122	168	31	79	110	77	201	278
2014	21	87	108	22	74	96	43	161	204
2015	65	200	265	37	105	142	102	305	407

1/ Natural spawners: Chinook that spawned naturally in the river. Natural spawner estimate based on redd surveys.

2/ Broodstock collection: Chinook that were collected in the river or returned to the hatchery and used for broodstock. Includes pre-spawned mortalities as well.

3/ NORs and HORs determined by CWT, otolith, scales, or visible marks from broodstock and river carcasses sampled.

Elwha River Management Unit.

Year	HOR/NOR
2007	1146
2008	1153
2009	2192
2010	1278
2011	1863
2012	2136
2013	5510
2014	4360
2015	4112

Hoko River Management Unit.

Year	HOR/NOR
2007	558
2008	483
2009	385
2010	793
2011	1504
2012	663
2013	1406
2014	1534
2015	2998