

# **2005-2006 Chinook Management Report**

Washington Department of Fish and Wildlife

and

Puget Sound Treaty Indian Tribes

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## Executive Summary

Landed Chinook catch was lower than projected in pre-terminal net and troll fisheries in the Strait of Juan de Fuca and Georgia – Rosario Strait, in the Nooksack-Samish and South Puget Sound terminal areas. Net catch was slightly higher than projected in the Skagit and Snohomish terminal areas, and substantially higher than expected in Hood Canal.

Natural spawning escapements in the Stillaguamish, Snohomish, Green, White, Puyallup, Mid-Hood Canal, and Hoko rivers were more than 20% below their projected levels. Escapement for the Skagit summer / fall, Cedar, and Elwha river populations were 10% or less below the projected level. Escapement of Nooksack early Chinook, and to the Mid-Hood Canal rivers, were below their critical abundance thresholds. Nonetheless, spawning escapement exceeded the upper management thresholds for Upper Skagit summer, North Fork Stillaguamish, Snoqualmie, White, Nisqually, Skokomish, and Dungeness populations.

Post-season analysis for management years 2000 – 2003 showed that, for most management units, exploitation rates did not exceed the ceilings established by the Harvest Management Plan.

Commercial and recreational catch sampling programs to recover coded-wire tags achieved their objectives in 2004, and substantially exceeded their target rates in many fishing areas. Sampling effort increased in collecting biological samples (i.e. scales or otoliths) from spawning grounds in 2005, with the express purpose of improving the accuracy of age composition.

## 1. Introduction

The Co-managers' Puget Sound Chinook Harvest Management Plan (HMP) mandates annual reporting of the performance of Chinook harvest management relative to the standards and guidelines of the plan (PSIT and WDFW 2004). This report fulfills that requirement by assessing the performance and effectiveness of fishery management actions adopted for the most recent management year. Included in this report are:

- Management objectives for the 2005-2006 management year
- Projected and actual spawning escapement for all Puget Sound Chinook populations in 2005
- Projected and actual commercial landed catch in Puget Sound, and descriptions of 2005 fisheries
- Post-season estimates of exploitation rates in 2000 - 2003
- Descriptions of fishery monitoring programs.
- Description of CWT and biological sampling

The 2005 – 2006 management year extended from May 1, 2005, through April 30, 2006. Preliminary estimates of commercial landed catch are available, but review of these estimates is still underway. Estimates of escapement are, likewise, subject to further review.

Puget Sound recreational fishery harvest estimates are not available for 2005, because the process of collecting and verifying catch record cards, data input, editing and analysis is not complete. Exploitation rates associated with 2004-05 fisheries cannot be calculated until all the contributing cohort have fully matured, and all related catch and escapement data are compiled.

## 2. Management Objectives

Planning objectives, including Rebuilding Exploitation Rates (RERs), Critical Exploitation Rate Ceilings (CERCs) and spawner thresholds for 2004-05 fisheries are presented in Table 2-1. The derivation for these objectives is described in the Harvest Management Plan.

Forecast abundance and preliminary pre-season fishery planning for 2005-2006 fisheries determined that natural spawning escapement would fall below the critical abundance threshold for the Nooksack early and Mid-Hood Canal management units. As a result, the fishing regime was planned to not exceed the ceiling exploitation rate on these two management units, derived from a model run that incorporated 2005 forecast abundance and the minimum fisheries regime.

It was also determined that the total exploitation rate on the Snohomish management unit would exceed its rebuilding exploitation rate ceiling, although natural escapement was projected to greatly exceed its upper management threshold. Fisheries were planned so that the critical exploitation rate ceiling was not exceeded for the Snohomish management unit.

**Table 2-1 2005 Puget Sound Chinook Harvest Management Objectives**

Management Unit	RER	CERC	Upper Management Threshold	Low Abundance Threshold
Nooksack		7% / 9% SUS	4,000	
North Fork			2,000	1,000
South Fork			2,000	1,000
Skagit summer / fall	50%	15% SUS even-years; 17% SUS odd-years	14,500	4,800
Upper Skagit summer				
Sauk summer				
Lower Skagit fall				
Skagit spring	38%	18% SUS	2,000	576
Upper Sauk				
Cascade				
Suiattle				
Stillaguamish	25%	15% SUS	900	650
North Fork summer			600	500
South Fork & MS fall			300	Na
Snohomish	21%	15% SUS	4,600	2,000
Skykomish			3,600	1,745
Snoqualmie			1,000	521
Lake Washington	15% PTSUS	12% PTSUS		
Cedar River			1,200	200
Green	15% PTSUS	12% PTSUS	5,800	1,800
White River spring	20%	15% PTSUS	1,000	200
Puyallup fall	50%	12% PTSUS		500
South Prairie Creek			500	
Nisqually			1,100	
Skokomish	15% PTSUS	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 JDF	<10% SUS	6% SUS	850	500

### 3. Commercial Harvest

This section of the annual report compares pre-season projections of Chinook catch to actual catch in Puget Sound commercial fisheries. This comparison involves only landed catch, although non-landed mortality is significant, and is estimated and accounted for during pre-season planning, and included in projections of exploitation rate. Recreational catch is discussed in a subsequent section.

Projected landed catch is derived by modeling the fishing regime that is negotiated and agreed-to at the PFMC and North of Cape Falcon planning forum. This regime, described in detail in Appendix A, comprises fishing regulations (i.e. quotas, time / area season structure) for all areas in Puget Sound and the Washington coast. Non-treaty commercial fishing regulations are also posted on the WDFW website: <http://wdfw.wa.gov/fish/regs/commregs/salregs.htm>. The final pre-season projection of catch was FRAM run number 2705.

Actual catch in commercial fisheries is accounted by summarizing the sales receipts that record every commercial transaction. Fish tickets are recorded in a database that is maintained jointly by WDFW and the Puget Sound tribes. Landed Chinook catch in this report is a preliminary summary of fish tickets. Incidental Chinook catch during chum fisheries in the late fall may not be completely reported, but is generally very low.

The comparison of projected and actual catch is organized into two 'pre-terminal' areas (Strait of Juan de Fuca and Georgia Strait / Rosario Strait) and five regional terminal fisheries. Conduct of fisheries is described briefly, noting in-season management actions that deviated from the pre-season plan, and explanations of the differences between projected and actual catch.

Chinook catch by commercial and recreational fisheries in British Columbia exceeded pre-season projections, particularly in troll fisheries in North-Central B.C. and in troll and recreational fisheries on the west coast of Vancouver Island. Non-treaty troll and recreational catches in Washington and Oregon coastal fisheries north of Cape Falcon were less than the projected quotas. The treaty troll catch on the Washington coast exceeded its quota (Table 3-1).

Commercial catch in Puget Sound pre-terminal areas (i.e., the Strait of Juan de Fuca and Rosario / Georgia Straits) was less than projected. Commercial catch in the Skagit and Snohomish terminal areas was slightly higher than projected, and substantially higher than projected in Hood Canal. Commercial catch was lower than projected in the Nooksack – Samish and South Sound terminal areas (Table 3-1). A more detailed tabulation of projected and actual catch, and discussion of in-season management in each of these areas follows.

Recreational catch estimates for Puget Sound areas in 2005 will be available in the fall of 2006, and reported in next annual report. Creel survey-based estimates of catch for some 2005 recreational fisheries are included Chapter 4

**Table 3-1. Summary of 2005-06 Chinook Catch**

<b>Fishery</b>	<b>Projected</b>	<b>Actual</b>	<b>Difference</b>
North/Central BC, WCVI, & Georgia Strait	516,475	707,939	191,464
Washington Ocean Nontreaty Troll	43,250	45,151	1,901
North of Cape Falcon Ocean Recreational	43,250	40,011	-3,239
Washington Ocean Treaty Troll	48,000	41,973	-6,027
Puget Sound Preterminal Net & Troll	14,374	9,436	-4,938
Nooksack-Samish Terminal Net	18,504	10,971	-7,533
Skagit Terminal Net	1,401	2,660	1,259
Stillaguamish-Snohomish Terminal Net	7,469	8,007	538
South Puget Sound Terminal Net	35,903	32,022	-3,881
Hood Canal Terminal Net	8,764	25,494	16,730
Strait Tribs Terminal Net	12	6	-6
Puget Sound Marine Sport	36,130		
Puget Sound Freshwater Sport	90,421		

### 3.1 Strait of Juan de Fuca and Georgia / Rosario Straits

#### Strait of Juan de Fuca troll

The winter treaty troll fishery in the Strait of Juan de Fuca (Catch Areas 4B/5/6C) opened, as predicted pre-season, on November 1, 2005 and is expected to close on February 28, 2006. The pre-season projected catch for the winter troll fishery (i.e., November 1, 2005 through April 30, 2006) was 8,500. At this writing, actual catch was approximately 4,000 and is not expected to exceed 4,500. Poor weather conditions, low fishing effort, and lower abundance of Chinook in the area contributed to catch being lower than expected.

**Table 3-2. Chinook catch in commercial net fisheries in the Strait of Juan de Fuca and Georgia / Rosario Straits.**

Area	Projected	Actual	Difference
4B, 5, & 6C Treaty Troll	8,999	4,386	-4,613
June 16 - Sept 30	500	270	-230
Nov 1 - Feb 28	8,499	4,116	-4383
4B, 5, & 6C Treaty Net	1,100	170	-930
6/7/7A Treaty Net	2,983	4,718	1,735
Sockeye / Pink	2,560	4,716	2,156
Chum	423	2	-421
6/6/7A Non Treaty Net	1,292	162	-1,130
Sockeye / Pink	1,244	162	-1,082
Chum	48	0	-48
<b>Total</b>	<b>14,374</b>	<b>9,436</b>	<b>-4,938</b>

Fraser sockeye and pink salmon fisheries

The pre-season fishing plan for Fraser River sockeye and pink salmon scheduled the start of treaty fishing in the week of July 24 – 30 in the Strait of Juan de Fuca (Catch Areas 4B/5/6C), but the opening delayed one week until August 1, due to late return timing of sockeye. The predicted duration of fishing was three weeks, whereas actual duration was six weeks. Effort for the fishery was lower than predicted; only two to three boats fished most days, instead of the expected ten to fifteen. Predicted bycatch of Chinook for the Strait of Juan de Fuca was 1,100 fish, but actual bycatch was 170.

Fraser sockeye fisheries in Rosario Strait and Georgia Strait (Catch Areas 6/7/7A) were expected to start between July 29 and August 1, extend for three weeks. Actual starting dates were August 25 for Non-Treaty and August 26 for treaty fishers with both fisheries running for four weeks. Expected effort in the treaty fishery was 11 purse seines and 200 gillnets; actual effort was higher, with 18 purse seine and 141 gillnet vessels participating. Expected effort in the non-treaty fishery was projected to include 25 purse seines, 75 gillnets, and 20 reefnets; actual non-treaty effort of 32 purse seines, 77 gillnets, and 11 reefnets.

Predicted bycatch for the treaty fishery was 2,560 Chinook, but actual bycatch was 4,716 (Table 3-2). The majority of the Chinook were caught between August 26 and September 5. Predicted bycatch was based on the average of recent years' catch, which was adjusted to reflect conditions that were expected to control the 2005 fishery. The average included only those weeks scheduled in the pre-season fishing plan, and so did not include the later weeks when most of the Chinook bycatch occurred. Chinook bycatch in the non-treaty sockeye – pink fishery was projected to be 1,292; actual bycatch was 162.

## 3.2 Nooksack - Samish Terminal Area

### Treaty Ceremonial & Subsistence Fisheries in the Nooksack River

The Lummi Nation conducted ceremonial fisheries in the Nooksack River on April 20, May 5, May 25 and June 3, and subsistence fisheries was on July 2 and 3, 2005. The Nooksack Tribe conducted subsistence fisheries on May 25 and June 30. The total catch was 73 Chinook, 23 of which were caught in the lower North Fork between RM 36.7 and RM 40.8, and the remainder in the lower mainstem.

Seventy Chinook were sampled for otoliths, adipose fin clips, and coded wire tags. Sample analysis 57 of these Chinook originated from the Kendall Creek Hatchery program and its off-station releases. One adipose-clipped fish did not contain a CWT, so it was assumed to be a fall Chinook stray. The remaining 12 adults that did not have marks identifying them as hatchery origin are considered the natural origin catch. Eight were estimated to be of North/Middle Fork origin, four of South Fork origin (Table 3-3).



**Table 3-3. Origin of early Chinook caught in the 2005 tribal C&S fishery in the Nooksack River**

Date	# Sampled	Otolith Marked	CWT'd	Ad Clip No-tag	Not Marked	Not Sampled
April 20	6	4	1		1	0
May 5	4	4				0
May 24	20	15	1		4	0
May 25	14	13	1		0	0
June 3	5	4			1	0
June 30	9	4	0		2	3
July 2 - 3	16	7	3	1	4	0
Total	73	51	6	1	12	3

These estimates assume that two unmarked Chinook caught in the lower North Fork caught were of North/Middle Fork origin, and that the composition of the 10 unmarked Chinook caught in the mainstem reflected the NOR spawning escapement to the North/Middle Fork (210 NORs, or 64%) and South Fork population (120 NORs or 36%). As 89.5% of the lower North Fork sampled Chinook were hatchery origin, the three unsampled adults are also most likely hatchery origin, resulting in a total NOR estimate of 4 South Fork Chinook and 8 North/Middle Fork Chinook. The pre-season projection was that 10 natural origin Chinook would be caught in the ceremonial fishery and 20 natural origin Chinook in the subsistence fishery.

Otolith analysis further determined that of 51 samples, 13 (25%) were age-3, 33 (65%) were age-4, and 5 (10%) were age-5.

**Table 3-4. Chinook catch in the Nooksack Samish terminal area in 2005.**

Area	Management Period	Projected	Actual	Difference
7B, 7C, & 7D Treaty Net	Chinook	10,820	2,957	-7,863
	Coho	170	3,038	2,868
	Chum			
7B,7C, & 7D Non-Treaty Net	Chinook	6,888	4,699	-2,189
	Coho	112	0	
	Chum			
Nooksack River Treaty Net	Early chinook	37	73	36
	Fall chinook	477	204	-273
	Coho			
	Chum			
Total		18,504	10,971	-7,421

### Bellingham Bay, Samish Bay, Lummi Bay

Fall Chinook-directed fisheries in Areas 7B, 7C, and 7D harvested 7,656 Chinook, substantially fewer than were projected pre-season (Table 3-4). The treaty Chinook fishery in the Nooksack River also caught fewer Chinook than expected. Treaty coho-directed fisheries were extended three weeks, through November 12, to harvest surplus hatchery coho. Non-treaty Chinook catches were also substantially lower than projected. In 2005, non-treaty purse seine vessels landed 1510 Chinook.

### 3.3 Skagit Bay and Skagit River Terminal Area

Almost all Skagit terminal area impacts on Chinook were expected to occur during commercial fisheries targeted at pink and coho salmon, during Skagit River test fisheries, and during a (first-time ever) mark-selective sport fishery on spring Chinook. Chinook release was required in Upper Skagit Tribal sockeye fisheries, the last two weeks (weeks 38 and 39) of Upper Skagit pink fisheries, Upper Skagit coho fisheries through week 41, Non-treaty purse seine fisheries, and river sport fisheries after July 8. Chinook retention was permitted in Non-treaty and Swinomish gillnet fisheries, the first week in Swinomish beach seine fisheries, Sauk-Suiattle fisheries, Upper Skagit fisheries from week 35 through 37 and then after week 41, the test fisheries, and before July 9 (for marked fish only) in the river sport fishery.

A mark-selective recreational fishery was opened on the Skagit River from June 1 to July 8 (from the highway 530 bridge at Rockport to the Cascade River). The preseason expectation of encounters was 403 (20% of the run above Rockport), of which it was expected that 277 would be marked and 126 would be unmarked and released (109 of the unmarked fish were expected to be wild Chinook; the others were unmarked CWT DIT fish) -- assuming a 10% release mortality, this would result in a total mortality during the mark-selective fishery of 289 fish (277 marked and 13 unmarked), of which 11 would be wild fish. The actual postseason estimate of encounters is 304 fish; 146 marked Chinook were retained and 158 unmarked fish were released, which, at a 10% release mortality, results in 16 release mortalities. Total mortality was therefore estimated at 162 spring Chinook, or 127 less than preseason projections. The hatchery/wild split is not available for the release mortalities.

The Baker sockeye run was almost 14,500 fish under the preseason forecast (17,891); consequently, the Upper Skagit Tribal gillnet fishery was conducted for only 1/2 day (July 7), at the mouth of the Baker River. The sockeye run was one day later than the odd year average, and sockeye catches (264 sockeye) were good on that one day. Three Chinook were encountered and released.

For pink salmon, preseason expectations were for a moderate harvest, and the in-season update seemed to confirm that assessment (the post-season estimate, however, shows many fewer pinks than were projected in-season). The Swinomish fishery opened as scheduled on Sunday, August 21 (week 35), and was supposed to close Thursday, August 25, with a 2-day opening the following week. However, by Wednesday morning (August 24) it was apparent that the preseason expectation of incidental Chinook catch would be exceeded by several hundred Chinook that week; consequently, several actions were taken to slow the catch of Chinook in the Swinomish fishery: 1) the pink fishery closed that day; 2) the gillnet opening the next week was delayed to the end of the week (to give milling Chinook a chance to move upriver); 3) the next week's (week 36) gillnet opening was cut to 1 day; and 4) beach seiners, who had their next opening extended to 4 days (actually, 3.625 days), would be required to release Chinook. Subsequently, the week 37 openings went as planned preseason, and the week 38 opening was extended by 2 days (see Table 3-5 for a comparison between preseason expectations and post-season catches and openings). The Sauk-Suiattle fisheries were conducted according to their preseason schedules, except that two days were also added on to week 38; however, nobody fished, so no Chinook were caught. The Upper Skagit pink fishery was conducted according to their preseason schedule, with Chinook non-retention starting week 38. Chinook encounters were more than predicted preseason for the Swinomish and Upper Skagit Tribes' pink fisheries (Table 3-5).

The coho run, with an ISU of 110,000 fish, appeared to be somewhat larger than predicted preseason. This changed the coho run's status from "Moderate" to "Abundant", and coho fisheries were expanded to harvest at a 20% harvest rate, rather than the 12.5% harvest rate modeled preseason. The first two weeks of the fishery were conducted according to the preseason schedule for all three tribes. The Swinomish schedule was increased the next week and two more weeks of fishing were added, through week 43. Chinook encounters were lower than predicted in weeks 39 and 40, higher than predicted during week 41; 2 Chinook were encountered in week 42 and zero in week 43 (Table 3-5). The Sauk-Suiattle fisheries were conducted according to their preseason schedule and no Chinook were caught. The Upper Skagit Tribe reduced the number of open days in week 41, added two days to week 42, and did not fish in week 43. Inseason adjustments to the Upper Skagit Tribal fisheries were primarily due to large coho catches and more Chinook encounters than were predicted preseason.

The test fisheries were conducted mostly as scheduled, except that, due to scheduling problems, the Blake's Drift Chinook test was not conducted during week 35 and the Blake's Drift and Spudhouse sites were not fished in week 42. The week 37 Blake's Drift fishery occurred on 2 days because of boat problems the first day; the week 44 River Area 2 coho test fishery was not conducted; and the Bay chum test fishery did not take place during weeks 44 and 45 – instead, the Jetty test fishery was conducted for two days each week. The Hoypus point (N. Skagit Bay), pink test fishery was conducted during weeks 35-37, but not week 38. Chinook catches in the test fisheries were less than expected during

the spring (catch was 43; expected catch was 48), and were greater than projected during the coho test fisheries in the late summer (Table 3-5).

While no chum fisheries were planned preseason, the Skagit chum run appeared to return larger than was expected preseason, and fisheries were conducted in weeks 44, then during weeks 46-48. Eight Chinook were caught in these fisheries.

It is estimated that there were 2,950 total Chinook mortalities (including non-retention mortalities) in Skagit terminal area net fisheries during the adult accounting period: 540

**Table 3-5. Chinook harvest in the Skagit terminal area in 2005.**

Fishery	Preseason Projected			Observed/Estimated			Difference	
	Schedule	Landed Catch	Total Mortality	Schedule	Landed Catch	Total Mortality	Landed Catch	Total Mortality
<b>Test:</b>								
Chinook	1 site, wks 19-35	156	156	Same	171	171	15	15
Pink	1 site, wks 35-38	3	3	1 site, wks 35-37	0	1	-3	-2
Coho	3 sites, wks 34-45	149	149	Same	368	368	219	219
<b>Baker Sockeye:</b>								
Week 28	1 day	0	0	Same	0	2	0	2
Week 29	1 day	0	0	None	0	0	0	0
<b>Area 8/78C Pink Swinomish/Sauk-Suiattle Tribes:</b>								
Week 35	4 days/ 4 days	265	265	3.625 days/ 4 day	742	742	477	477
Week 36	2 days/ 2 days	120	120	1 day GN, 3.625 days BS/ 2 days	69	70	-51	-50
Week 37	3 days/ 4 days	161	161	3 days/ 4 days	208	208	47	47
Week 38	1 day/ 1 day	49	49	3 days/ 3 days	110	110	61	61
<b>Area 78C and 78D Pink Upper Skagit Tribe:</b>								
Week 35	2.167 days	149	149	2.167 days	439	439	290	290
Week 36	2.167 days	198	198	2.167 days	337	337	139	139
Week 37	2.167 days	92	92	2.167 days	119	119	27	27
Week 38	3.167 days, chin NR	0	149	3.167 days	0	146	0	-3
<b>Area 8/78C Coho Swinomish/Sauk-Suiattle Tribes:</b>								
Week 39	2 days/ 4 days	36	36	2 days/ 4 days	32	32	-4	-4
Week 40	1 day/ 4 days	15	15	1 day/ 4 days	7	7	-8	-8
Week 41	1 day/ 4 days	5	5	2.67 days/ 4 days	26	26	21	21
Week 42	0 days/ 4 days	0	0	4.33 days/ 4 days	2	2	2	2
Week 43	0 days/ 4 days	0	0	1 day/ 4 days	0	0	0	0
<b>Area 78C and 78D Coho Upper Skagit Tribe:</b>								
Week 39	3.167 days, chin NR	0	59	3.167 days	0	26	0	-33
Week 40	3.167 days, chin NR	0	7	3.167 days	0	42	0	35
Week 41	3.167 days, chin NR	0	22	2 days	0	74	0	52
Week 42	2.167 days	2	2	4.167 days	22	22	20	20
Week 43	2.167 days	1	1	None	0	0	-1	-1
<b>Area 8/78C Chum Swinomish/Sauk-Suiattle Tribes:</b>								
Week 44	None	0	0	1 day/ 1 day	8	8	8	8
Week 45	None	0	0	Same	0	0	0	0
Week 46	None	0	0	3 days/ 3 days	0	0	0	0
Week 47	None	0	0	3 days/ 5 days	0	0	0	0
Week 48	None	0	0	3 days/ 5 days	0	0	0	0
<b>Area 78C and 78D Chum Upper Skagit Tribe:</b>								
Week 44	None	0	0	1 day	0	0	0	0
Week 45	None	0	0	None	0	0	0	0
Week 46	None	0	0	3.167 days	0	0	0	0
Week 47	None	0	0	0.54 day	0	0	0	0
Week 48	None	0	0	None	0	0	0	0
<b>Total Skagit Terminal Area</b>		<b>1401</b>	<b>1638</b>		<b>2660</b>	<b>2952</b>	<b>1259</b>	<b>1314</b>

in test fisheries, 2,171 in pink fisheries, 231 in coho fisheries, and 10 in chum or river sockeye fisheries. In comparison, it was projected preseason that there would be 1,638 total Chinook mortalities in Skagit terminal area net fisheries: 308 in test fisheries, 1,183 during pink fisheries, 147 during coho fisheries, and zero during chum and river sockeye fisheries. Thus, post-season estimated Chinook mortalities were 1,312 greater than what was projected preseason. This increase in mortalities occurred only for summer/fall Chinook (spring Chinook catches were less than predicted), and was probably due in large part to river

conditions during the late summer, when flows were low and Chinook were available to the fishery longer, and because effort was higher than in recent years; likely due to the large Chinook preseason forecast and good inseason catches. Of the post-season estimated mortalities, 2,660 were landed catch. In comparison, it was projected preseason that the landed catch would be 1,402 in Skagit terminal area net fisheries. The remainder of the mortalities, 290, were release mortalities during non-retention fisheries.

Despite these higher-than-expected mortalities during the late summer, the spawning escapement of Skagit summer/fall Chinook (20,803) was substantially higher than the Upper Escapement Threshold (14,500), which means that the spawning escapement exceeded the level above which fisheries can be directed at wild Chinook. And even with this higher terminal area catch, assuming all other fisheries and abundances remained as modeled preseason, the total exploitation rate on Skagit summer/fall Chinook would increase only from the preseason estimate of 40% to 42%, which is still well under the ceiling of 50%.

Chinook encounters in the Upper Skagit pink fisheries during week 38 (which were Chinook non-retention) were estimated by multiplying the Upper Skagit Tribe's observed pink catch by the Chinook/pink ratio in week 38 test fisheries in the same area. Chinook encounters in the Upper Skagit Tribe's coho fisheries during weeks 39-41 were estimated by multiplying the tribe's coho catch for each week by the Chinook/coho ratio in that week's test fisheries in that area. The preseason mortality rate (52.4% for gillnets) was applied to these encounters to estimate their non-retention mortalities. To estimate beach seine mortality during weeks 36-38 (when Chinook retention was not allowed), we assumed 50% mortality for any Chinook released by an observer, and 100% mortality for any other Chinook that were encountered. Beach seine catches and effort were very low during those weeks, and only 1 Chinook was observed and released by an observer. By expanding to unobserved landings, we estimated that seven additional Chinook were encountered by beach seines during weeks 36-38.

### 3.4 Stillaguamish and Snohomish Terminal Area

The tribal fisheries in Possession Sound (Area 8A) occurred as planned, with the with the exception of additional chum days due to reduced fleet size and chum catches staying below harvestable numbers. Chinook catch in the ceremonial fishery in Area 8A was within the expected bounds (Table 3-6) Gear and fishing time were limited to constrain catch within the guidelines. Incidental Chinook harvest during the 8A pink fishery was low due to lower than expected effort. Incidental Chinook catch in the Area 8A coho fishery was slightly higher than expected, likely because of later than normal Chinook return timing and the higher than expected run size of Tulalip hatchery Chinook.

Three non-Treaty vessels that participated in the 2005 Area 8A limited participation coho fishery, and landed 106 coho. Incidental catch of Chinook was very low.

Tribal fisheries in Area 8D occurred as planned. Chinook catch was above the expectation, but within bounds of normal variation of around the forecasted abundance of Tulalip hatchery Chinook.

**Table 3-6 Commercial Chinook catch in the Stillaguamish – Snohomish terminal area in 2005.**

Area		Projected	Actual	Difference
8A Chinook	Trty	100	47	-53
	Ntrty	0		
8A Pink	Trty	534	33	-501
	Ntrty	0		
8A Coho	Trty	283	318	35
	Test	4	0	-4
	Ntrty PS			
	Ntrty GN	28		
8A Chum	Trty	0	0	0
	Test	0	0	0
	Ntrty	42		
8D Chinook	Trty	6,227	7,407	1,180
	Ntrty	0		
8D Coho	Trty	202	202	0
	Ntrty	17		
8D Chum	Trty	10	0	-10
	Ntrty	0		
Stillaguamish R. Chinook, Pink, Coho, & Chum	Treaty	22	0	0
<b>Total</b>		<b>7,469</b>	<b>8,007</b>	<b>538</b>

### 3.5 South Puget Sound Terminal Areas

Area 10 and 11. Chinook-directed fishing occurred only in Sinclair Inlet (Area 10E) in 2005, in accordance with the pre-season fishing plan, but the return, and catch, were lower than projected. The Lake Washington (Cedar River) sockeye return was much lower than forecast, and did not allow any directed harvest in Area 10. Coho and chum fisheries in Area 10 and 11 proceeded as planned, with very low incidental catch of Chinook. Chum research fisheries in Area 9 and at Apple Cove Point (Area 9-10 boundary) involved very low incidental catch of primarily immature Chinook.

Non-treaty chum fisheries began in Areas 10 and 11 in the week beginning October 9 (Week 42). During the Area 10 and 11 chum directed fishery, purse seines were not allowed to keep Chinook or coho.

Ship Canal & Lake Washington. Chinook-directed fisheries were not planned, and did not occur in the Ship Canal or Lake Washington. The Cedar River sockeye return was much lower than forecast, and allowed only very limited research and C&S harvest, which involved no incidental Chinook catch. Coho fisheries were opened on September 25<sup>th</sup> in the Ship Canal, and on October 5<sup>th</sup> in northern Lake Washington, for five days per week. Incidental Chinook catch of 750 occurred during the coho fishery. The coho fishery was shortened (i.e. Area 10F was closed on October 14<sup>th</sup>) and part of Area 10F closed, with the intent of reducing incidental Chinook impacts, but these measures were apparently ineffective. One hypothesis is that most Chinook were milling returns to the University of Washington hatchery on Portage Bay.

10E Sinclair Inlet. The pre-season forecast of the return to area 10E was 10,769. The actual return was 6,632, including commercial catch, estimated sport catch, and escapement into Gorst Creek other Independent 10E streams. This illustrates that the 10E return was below expected. Escapement to Grover's Creek Hatchery was 2,746, less than the forecast of 2,900 (J. Oleyar, Suquamish Tribe, pers comm. March 3, 2006).

10A/Duwamish River . The planned tribal Chinook fishery in Elliott Bay (Area 10A) and the lower Duwamish River was halted, ins-season, after catch in the test fishery and first, 12-hour, commercial opening suggested that abundance was much lower than forecast. The subsequent coho fishery, which was delayed one week and opened on September 4<sup>th</sup>, was reduced from seven to five days per week. The chum fishery was opened on November 6<sup>th</sup>, for three days per week.

Total Chinook catch in Area 10A and the Duwamish River was far below the pre-season projection because run strength was less than forecast (Table 3-7). Coho catch was also below expectations because run strength was less than forecast.

Puyallup River. Fisheries in the Puyallup River were conducted as planned, without changes from the 2005/06 State/Tribal agreed to fisheries document. The Puyallup Tribe conducted a spring Chinook-directed C&S fishery, in the Puyallup River, fishing 12 hours per week during weeks 25-28. The Puyallup Tribe's C&S catch of 51, combined with the Muckleshoot Tribe C&S catch of 148 (see below), was lower than the expected catch of 246. However, ten of the 51 Chinook caught in the Puyallup fishery were ad-clipped (i.e. hatchery-origin) fall Chinook. The Puyallup Tribe also conducted two C&S fisheries during the fall Chinook management period, to provide fish to a funeral ceremony and the annual Pow-Wow celebration. These two fisheries caught a total of 151 fall Chinook.



The fall Chinook test fishery was conducted as planned one day a week in weeks 30-34. The catch of 250 was exactly as projected. The single commercial directed Chinook fishery occurred on August 21 from 6 am to 6 pm, and caught 612 fish. Coho-directed fishing occurred from week 36 through week 42; this fishery was open 1,3,3,4,4,4,3, and 5 days per week through this period. A total of 1507 Chinook were harvested during the coho fishery; 1105 of these were harvested in weeks 36 and 37.

The total commercial catch of 2119 Chinook during the Chinook and coho fisheries was below the pre-season projection of 2804. Low flow during the coho fishery, causing accumulation of fish in the lower river where the fishery is concentrated, may have contributed to higher than expected incidental catch during the coho fishery,

White River The Muckleshoot Tribe conducted a subsistence fishery on reservation, in the White River, which caught 148 spring Chinook.

**Table 3-7 Commercial Chinook catch in South Puget Sound, 2005.**

Area	Management Period	Projected	Actual	Difference
Area 9	Chum Test	59	0	-59
Area 10	Coho Test	129	27	-102
	Treaty Coho	188	43	-145
	Chum Test	87	34	-53
	Treaty Chum	159	4	-155
	Non-Treaty Chum	365	6	-359
Area 10E	Treaty Chinook	5250	3701	-1549
Area 10A	Chinook Test	268	150	-118
	Treaty Chinook	4493	775	-3718
L. Washington - Ship Canal	Treaty Sockeye	0	0	0
	Treaty Chinook	0	0	0
	Treaty Coho	705	750	45
Duwamish River	Treaty Chinook	5312	1300	-4012
	Treaty Coho			
	Treaty Chum			
Puyallup River	Spring Chinook C&S		51	
	Fall Chinook C&S		151	
	Chinook Test	250	250	0
	Treaty Chinook	1708	612	-1096
	Treaty Coho	1096	1507	411
White River	Treaty C & S	246	148	-98
Areas 13, 13D-K Treaty	Treaty chinook	1136	4904	3768
Area 13A Treaty	Treaty chinook	1560	2951	1391
Area 13C & Chambers Cr.	Treaty Chinook	1422	3675	2253
Nisqually River	Treaty chinook & coho	11,470	10,983	-487
Total		35903	32022	-3881

Nisqually River. The treaty Chinook fishery in the Nisqually River was open as planned, three days per week for management weeks 27 – 38 (July 10 - September 17), then closed for weeks 39 and 40 to assure meeting the escapement goal. Catch rates were average until the closure. Low flow and clear water were beneficial to the catch in the tide water affected area in the lower river. The fishery was re-opened during the coho management period, through October 19<sup>th</sup>. The total Chinook catch was 10,983, about 96% of the projected catch of 11,470.

Nisqually tribal and WDFW technical staff calculated two in-season updates of Chinook terminal abundance, based on catch rates observed in the river fishery.. The first update, made on August 19<sup>th</sup>, was 14,166. A planned second update fell on a weekend so no additional data were available. The second update on August 23<sup>rd</sup> was 19,923. AT this point, Nisqually and WDFW biologists agreed to closely monitor hatchery natural escapement to verify the update estimate. A third update on August 30 indicated a terminal run size of 25,310 (this update was not formally agreed-to by WDFW).

When the second updates was made, escapement to the hatcheries and to natural spawning areas appeared to be lower than expected. Up-river migration may have been delayed by low flow and turbidity. However, the co-managers agreed that closure of the last two weeks in the Chinook management period was prudent in order to assure adequate escapement. Subsequent precipitation, and freshets associated with higher releases from the upstream dams on September 15<sup>th</sup> and 20<sup>th</sup>, increased flow and turbidity. Natural escapement was estimated to be 2,159, well in excess of the escapement goal of 1,200. Escapement to the hatcheries was also far in excess of the broodstock requirements.

Deep South Sound. Tribal fisheries in Area 13C and Chambers Creek, Carr Inlet (Area 13A), and in Areas 13, and 13D-K, were conducted on the same schedule agreed-to in the pre-season plan. Actual fishing effort was higher than projected, however, so the Chinook catch exceeded the pre-season projections in all areas. Actual catch for these areas combined was 11,530; substantially higher than the projected catch of 4118 (Table 3-7).

Fishing effort varies annually in these deep South Sound fisheries, dependent on market conditions, and availability of other fishing opportunities. The abbreviated Chinook fishery in the Puyallup River perhaps prompted Puyallup fishermen to redirect their effort into area 13A, and higher prices for Chinook also led to heightened effort by Squaxin Island tribal fishermen.

### 3.6 Hood Canal

Tribal Chinook-directed fisheries occurred in Areas 12C, 12H, and the Skokomish River. Tribal coho- and chum-directed fisheries occurred in Areas 12, 12B, 12C, 12H, Quillcene – Dabob Bay (Area 12A), Port Gamble (Area 9A), and

in the Skokomish River. Non-treaty net fisheries directed at chum occurred in Areas 12 and 12B. The total Chinook catch in these fisheries exceeded the pre-season projection (Table 3-8). Most of this overage occurred in the tribal fishery in the Hoodspout Hatchery zone (Area 12H).

**Table 3-8 Chinook catch in Hood Canal terminal fisheries in 2005.**

Area	Management Period	Projected	Actual	Difference
9A Treaty Net	Coho & chum	42	6	-36
12A Treaty Net	Coho & chum	14	71	57
9A/12A Non Treaty Net	Coho	14	0	-14
12, 12B & 12C Treaty Net	Chinook, coho & chum	550	1,923	1,373
12 and 12B Non Treaty Net	Coho & chum	64	3	-61
12H Treaty Net	Chinook & chum	5,656	20,264	14,608
Skokomish River	Chinook, coho, & chum	2,424	3,227	803
Total		8,764	25,494	16,730

Deviations from the pre-season fishing plan were as follows. In Area 12C, tribal Chinook fisheries began a week later than planned. The Chinook fishery in Area 12H began on August 22, two weeks later than planned, to ensure adequate escapement to the hatchery, and ended on September 18<sup>th</sup>. In Area 12A, the tribal coho fishery began a week late, on August 28<sup>th</sup>. Chum fisheries also began a week late on October 23<sup>rd</sup>. Tribal fisheries in the Skokomish River occurred on the planned schedule. The Quilcene River coho fishery was opened for one day – September 16<sup>th</sup>.

The total catch of Chinook was higher than expected, primarily in the Hoodspout Hatchery zone (Area 12H), but also in southern Hood Canal (Area 12C). Incidental Chinook catch during coho and chum fisheries was low. The high Chinook catch is attributed to stronger than forecasted Chinook returns to George Adams and Hoodspout hatchery facilities. Tribal coho and chum catches were lower than expected.

### 3.7 Strait of Juan de Fuca

Chinook catch by terminal fisheries in the Elwha River, Dungeness Bay, and Dungeness River were very low, as projected (Table 3-9). The treaty net fishery for coho salmon in Dungeness Bay (Area 6D) began on September 18, 2005, per the letter of intent stating the rationale that an early opening would not have significantly higher impact on summer chum in the area. The fishery was open during daylight hours through October 10<sup>th</sup>, then open 24 hours per day, from October 11 through the closure on November 5. The fishery was closely monitored, with two Chinook incidentally killed (Scott Chitwood, Jamestown S’Klallam Tribe, pers comm. October 9, 2005).

The treaty ceremonial and subsistence fishery for Chinook in the Elwha River, in August, caught 4 Chinook. The coho fishery was open from September 18

through October 2 for two days per week, then from October 9 to October 30 for four days per week. The coho fishery did not involve any incidental Chinook mortality.

There were no Chinook caught in the Hoko River.

**Table 3-9. Chinook catch in Strait of Juan de Fuca terminal fisheries in 2005.**

Area	Management Period	Projected	Actual	Difference
Area 6D & Dungeness River Treaty	Coho	1	2	1
Area 6D Non-treaty	Coho	0	0	0
Elwha River Treaty	Chinook & coho	5	4	-1
Hoko River Treaty	Chinook	6	0	-6
Total		12	6	-6

### 3.8 Historical Commercial Catch

Tables 3-10 and 3-11 show recent historic commercial catches, including ceremonial and subsistence and take home catches reported on fish tickets, as well as any estimates recorded on fish tickets of the number of carcasses associated with egg sales.

**Table 3-10 Treaty Indian Puget Sound Commercial Chinook Catch, 1997-2004**

Area	1997	1998	1999	2000	2001	2002	2003	2004
Troll 4B PFMC	1299	272	663	587	7094	1461	87	7136
Non-PFMC Troll	847	707	658	347	1974	1783	436	20140
<b>NET GEAR:</b>								
4B/5/6/6C	492	265	589	782	931	1074	908	593
7/7A	18476	3308	3	768	953	2170	4761	5108
6D	0	1	0	0	0	0	1	0
Elwha R.	1	2	17	0	0	0	0	0
7B,C,D	9054	9593	22796	17510	30896	20701	9943	5332
Nooksack R	1749	405	2248	997	806	408	562	272
8	229	0	35	0	21	1	67	5
Skagit River <sup>1</sup>	850	297	328	289	211	286	245	545
8A/8D	8626	7227	15438	7726	5458	5520	9257	6089
Stillaguamish R.	0	5	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0
10	53	569	69	280	246	91	214	157
10A	473	1866	646	3558	4364	1657	1339	3997
Green R.	167	1670	2152	4105	4696	9877	2876	4776
10C,D,F,G	58	4	0	591	3297	182	396	826
10E	1932	2924	4935	3540	8087	5188	7806	3346
11	0	0	0	0	0	0	1	0
11A	109	107	25	0	148	0	0	0
Puyallup R.	2700	1581	1884	1982	6712	4749	2290	3600
White R.	0	9	0	3	83	0	115	6
13	5	413	153	4458	120	152	65	3
Nisqually R. & McAll.	7675	8405	16395	4531	10528	17027	17788	13743
13A	75	259	3836	2430	2380	973	2166	1045
13C	1148	4860	559	1408	336	689	922	3786
Chambers Cr	67	0	0	0	0	0	0	0
13D-K	414	632	5194	4817	3030	1005	1146	883
12, 12B	1	0	0	0	34	90	0	1
9A, 12A	11	66	83	30	338	4	0	22
12C,D,H	6	1059	7956	11094	21481	21080	17850	3784
Skokomish R.	0	1	1080	943	5830	2649	2852	4305
Purdy Ck.	0	0	0	0	0	0	0	0

<sup>1</sup> Skagit River catch includes test fisheries

**Table 3-11. Nontreaty Puget Sound Commercial Chinook Catch, 1996-2005**

Area	1997	1998	1999	2000	2001	2002	2003	2004
6/7/7A	10739	496	0	61	17	59	66	25
7B/7C	10690	11910	9243	11369	18002	17564	8406	5008
8	14	0	0	0	8	0		0
8A/8D	0	0	4	0	0	0		0
10/11	67	12	247	30	2	0	93	8
9A/12	3	10	18	8	0	3	2	0

## 4. Recreational Harvest

This chapter presents expected recreational catch, in marine and freshwater areas, for the 2005-06 management year. For most areas, estimates of actual catch during the 2005-06 management year are not available, because recovery and analysis of the Catch Record Cards submitted by anglers is still in progress. However, in-season creel survey estimates of actual catch are included for Areas 5 and 6 in July and August, the Skagit River spring Chinook fishery, the winter fishery in Areas 8-1 and 8-2, and the Skokomish River. Detailed creel survey results are included for the latter two areas. Projected and actual recreational catch for the 2004 – 05 management years are compared, in the context of recent historical catch.

Expected catch reflects either pre-season quotas or landed catch estimated by the final pre-season Chinook FRAM run. For the purposes of preseason versus postseason comparison, catch figures provided in this document are landed catch only. Because of this, expected catch figures appearing in this document will not match the figures provided in most of the preseason FRAM reports, since the latter provide total mortality estimates (i.e. landed catch plus mortality caused by release or encounter with fishing gear).

Because direct harvest of Chinook is prohibited in many cases, non-landed fishing mortality comprises a significant proportion of total recreational fisheries mortality for Chinook. Non-landed mortality occurs when sub-legal Chinook are encountered and released, and when regulations forbid the retention of Chinook. Non-landed mortality is incorporated into preseason estimates of mortality and exploitation rates), however this report compares pre-season projections with post-season estimates of landed catch.

### 4.1 2004-05 Recreational Catch

Total recreational Chinook catch in 2004 – 05 was more than 14,000 fish lower than the pre-season projection (table 4-A). This was due, primarily, to the catches in marine areas 5, 6, 7, 9, and 13, and in the Samish River, falling sharply lower than projections. Catch was higher than projected in Area 12 (Hood Canal) and the Skokomish River.

**Table 4-1 Recreational landed catch of Chinook in Puget Sound in 2004.**

<b>Fishing Area</b>	<b>Projected</b>	<b>Actual</b>	<b>Difference</b>
Area 5,6	6,792	4,510	-2,282
Area 5/6 MSF	3,500	3,576	76
Strait Tributaries	0	0	0
Area 7	3,856	1,998	-1,858
Nooksack Samish FW	5,050	1,061	-3,989
Area 8-1 & 8-2	1,886	2,246	360
Skagit R.	20	151	131
Area 8D SAF	1,981	n/a	
Stillaguamish R.	6	4	-2
Snohomish R..	11	98	87
Skykomish River MSF	0	87	87
Area 9	5,754	1,676	-4,078
Area 10/11	12,939	12,390	-549
Area 10E SAF	1,500	n/a	
Lake Washington, Sammamish R	103	245	142
Area 10A SAF	3,000	2733	-267
Green R.	0	57	57
Puyallup/White R.	1,396	872	-524
Area 13	4099	1,172	-2,927
Nisqually/McAllister	1418	1100	-318
Misc Area 13 Freshwater	145	250	105
Area 12	1037	1,973	936
Skokomish R.	1461	1,897	436
<b>Total</b>	<b>55,954</b>	<b>38096</b>	<b>-14,377</b>

## 4.2 2005 – 2006 Recreational Catch

Projected landed recreational Chinook catch in marine and freshwater areas for the 2005-2006 management year are detailed in Table 4-2, from FRAM 2705. The recreational fishing regime included mark selective fisheries in marine areas 5, 6, 8-1, and 8-2, and in the Skagit River, Skykomish River, and Carbon River.



**Table 4-2. Projected recreational Chinook catch in Puget Sound in 2005.**

<b>Marine Areas</b>	<b>Projected</b>	<b>Actual</b>
Area 5-6 Strait of Juan de Fuca	6065	
July - September		2078
Area 7 San Juan Islands	3842	
Area 8-1 & 8-2 Possession Snd	1499	796
Tulalip Bay MSF	1886	
Area 9 Admiralty Inlet	3660	
Area 10/11 Mid Sound	14352	
Area 12 Hood Canal	1172	
Area 13 South Sound	3554	
<b>Freshwater Areas</b>		
Nooksack - Samish	2200	
Skagit River	309	
Stillaguamish River	6	
Snohomish River	936	
Skykomish MSF	90	
Lake Washington & Sammamish	511	
Green River	1293	
Puyallup River	1447	
Carbon River MSF		738
Nisqually River	1447	
Chambers, Deschutes, Kennedy	147	
Skokomish River	3818	4842
Strait Tributaries	1	
<b>Total</b>	<b>48235</b>	

### 4.3 Monitoring and Creel Surveys

#### 4.3.1 Area 8-1 and 8-2 Selective Chinook Fishery - February 2006 Report

On October 1, 2005 the Puget Sound Sampling Program began intensively monitoring the selective Chinook fishery in Areas 8-1 and 8-2. We are generating estimates of salmon catch (including total Chinook and coho landed and released) and angler effort (total boats and anglers) and reporting these estimates on a monthly basis, for the period from October 1, 2005 through April 30, 2006.

During the month of February, as in the previous months of the fishery, sampling was implemented as planned in our sample design document. The study design was based on Murthy's estimator (Cochran 1977) to obtain daily estimates of total catch and effort. Two ramp samplers were stationed at selected sampled sites in Area 8-1, and two ramp samplers were stationed at selected sampled sites in Area 8-2. Permanent sampling staff conducted four boat surveys in Area 8-1 and four boat surveys in Area 8-2 during February, to estimate the percent of effort from sampled sites (versus non-sampled sites) and the proportion of angler effort at each sampled site.

We operated two test boats, one in Area 8-1 and the other in Area 8-2. The crew consisted of two WDFW technicians per boat. These test boats fished approximately four to five days per week during February, but less days during weeks when adverse weather and unsafe conditions on the water precluded fishing. For each hook-up, the encounter number, time sampled, species, mark status, and DNA vial number (if applicable) was recorded. Samplers collected scales, fork lengths, and total lengths on all Chinook brought on board. All fish were immediately released.

In this progress report we include in-season preliminary estimates of catch, effort, and encounter rates with accompanying variance estimates for the month of February 2006. In addition, we present cumulative estimates to date for the months of October 2005 through February 2006 combined. We also include preliminary test fishing results, documentation of how the fishery is going to date, progress of implementing the sampling plan, and any adjustments needed.

## **Dockside Sampling Methods**

### Sampling Strata and Shifts

Sampling strata were divided into weekday (Monday through Thursday) and 'weekend' (Friday, Saturday, and Sunday) strata. Each week we randomly selected two days from the Monday through Thursday stratum for dockside sampling. Selected sample days within weekday strata included February 2<sup>nd</sup>, 8<sup>th</sup>, 9<sup>th</sup>, 14<sup>th</sup>, 15<sup>th</sup>, and 23<sup>rd</sup>. In addition, we sampled every Friday, Saturday, and Sunday during the month. We did not sample on the President's Day holiday, which was on Monday, February 20<sup>th</sup>. We assumed fishing behavior on this holiday would be similar to that of a typical weekend day, thus we included President's Day in a 'weekend' stratum definition for the period from February 18<sup>th</sup> through 20<sup>th</sup>. Dockside sampling shifts lasted from approximately dawn until dark in order to intercept all boats.

### **Sampled Sites**

Sites to be sampled were selected as follows: Access sites in Areas 8-1 and 8-2 were divided into sampled and non-sampled sites. Access sites with low effort, as determined from boat survey data (see section 3 below) were excluded in the sample. All anglers and fish exiting the fishery through the sampled sites were counted. Any boats that were missed at sampled sites were counted and recorded on the sampling forms.

**Area 8-1 Sites**

In Area 8-1, for each scheduled sampling day, two sites were randomly selected for sampling based on a weighted random site selection process. We calculated the “weights” (or “size measures”) of Area 8-1 sites based on the most recently available boat survey data. We conducted four boat surveys in Area 8-1 during February to update the size measures, as documented in section 3 below. The ‘sampled sites’ for Area 8-1 included Camano Island State Park Ramp, Cornet Bay Public Ramp, Freeland Ramp (also called Holmes Harbor Ramp), Oak Harbor Public Ramp, Maple Grove Ramp, Utsalady Ramp, LaConner Ramp, and Coupeville Ramp (Table 4-3). Table also lists the dates that these ramps were randomly selected for sampling during February.

**Table 4-3.** List of possible ‘sampled sites’ for the Area 8-1 selective Chinook fishery and dates that the sites were actually sampled during February 2006.

Sites Sampled in Area 8-1	Dates sampled in February 2006
Camano Is State Park Ramp	2 <sup>nd</sup> , 4 <sup>th</sup> , 5 <sup>th</sup> , 9 <sup>th</sup> , 10 <sup>th</sup> , 11 <sup>th</sup> , 12 <sup>th</sup> , 14 <sup>th</sup> , 23 <sup>rd</sup> , 24 <sup>th</sup> , 25 <sup>th</sup>
Cornet Bay Public Ramp	
Freeland Ramp	8 <sup>th</sup> , 19 <sup>th</sup>
Oak Harbor Public Ramp	2 <sup>nd</sup> , 4 <sup>th</sup> , 5 <sup>th</sup> , 9 <sup>th</sup> , 11 <sup>th</sup> , 12 <sup>th</sup> , 14 <sup>th</sup> , 17 <sup>th</sup> , 18 <sup>th</sup> , 25 <sup>th</sup>
Maple Grove Ramp	3 <sup>rd</sup> , 10 <sup>th</sup> , 15 <sup>th</sup> , 19 <sup>th</sup> , 26 <sup>th</sup>
Utsalady Ramp	8 <sup>th</sup> , 17 <sup>th</sup> , 18 <sup>th</sup> , 23 <sup>rd</sup> , 24 <sup>th</sup> , 26 <sup>th</sup>
La Conner Ramp	15 <sup>th</sup>
Coupeville Ramp	3 <sup>rd</sup>

**Area 8-2 Sites**

In Area 8-2, for each scheduled sampling day, two samplers were stationed at the Everett Ramp. In addition, during each week, one day in the weekday stratum and one day in the weekend stratum was randomly selected for sampling at an additional site in order to compute a variance between sites. A third sampler (existing permanent staff based in Central Sound) was stationed at the alternate site on the randomly selected days in each stratum. We sampled an alternate site on the following randomly selected days in February: 3<sup>rd</sup>, 8<sup>th</sup>, 12<sup>th</sup>, 14<sup>th</sup>, 19<sup>th</sup>, and 26<sup>th</sup>. In addition to Everett Ramp, the possible alternate ‘sampled sites’ are listed in Table 4-4, as well as the dates that the ramps were randomly selected for sampling during February. We calculated the weights of Area 8-2 sites based on the most recently available boat survey data. We conducted four boat surveys in Area 8-2 during February to update the weights, as documented in section 3 below.

**Table 4-4.** List of possible ‘sampled sites’ for the Area 8-2 selective Chinook fishery and dates that the sites were actually sampled during February 2006.

Area 8-2 Sampling Sites	Dates sampled in February 2006
Everett Ramp	2 <sup>nd</sup> , 3 <sup>rd</sup> , 4 <sup>th</sup> , 5 <sup>th</sup> , 8 <sup>th</sup> , 9 <sup>th</sup> , 10 <sup>th</sup> , 11 <sup>th</sup> , 12 <sup>th</sup> , 14 <sup>th</sup> , 15 <sup>th</sup> , 17 <sup>th</sup> , 18 <sup>th</sup> , 19 <sup>th</sup> , 23 <sup>rd</sup> , 24 <sup>th</sup> , 25 <sup>th</sup> , 26 <sup>th</sup>
Camano Is State Park Ramp	3 <sup>rd</sup> , 8 <sup>th</sup> , 12 <sup>th</sup> , 26 <sup>th</sup>
Dagmar’s Landing	19 <sup>th</sup>
LangleyRamp	14 <sup>th</sup>
Mukilteo Public Ramp	
Kayak Point Ramp	

## Boat Surveys

### Methods

Boat surveys were used to estimate the percent of effort from sampled sites (versus non-sampled sites) and the proportion of angler effort at each sampled site. Boat surveys covered the entire area to pick up effort from all launch sites. We asked boat occupants where they intended to tie up or exit the fishery rather than where they launched. We excluded non-fishing vessels and charter boats from the boat survey data. Charter boats were treated separately and excluded from our Murthy estimate due to their significantly higher CPUE compared to kicker boats, and because charter vessels were not necessarily exiting the fishery via our “sampled sites,” which precluded sampling their catch (see the subheading “Charter Boats” within Section 4: Estimated Harvest and Effort).

### Results

In Area 8-1, we conducted boat surveys on February 3<sup>rd</sup>, 8<sup>th</sup>, 11<sup>th</sup>, and 19<sup>th</sup> (two week days and two weekend days). For these four boat surveys combined, and including the four boat surveys conducted in January, a total of 109 boats and 208 anglers were surveyed. Of these anglers, 85% exited the fishery via sampled sites.

In Area 8-2, we conducted boat surveys on February 11<sup>th</sup>, 15<sup>th</sup>, 24<sup>th</sup> and 25<sup>th</sup> (two week days and two weekend days). For these four boat surveys combined, plus the four boat surveys conducted in January, a total of 143 boats and 273 anglers were surveyed. Of these anglers, 79% exited the fishery via sampled sites.

As of statistical week 9, we added Mukilteo Public Ramp back into our pool of possible “sampled sites” for our site selection process, because this site was once again showing up regularly in our boat survey data. Apparently, even though the docks are not yet re-installed at the Mukilteo Ramp, some boats are able to operate from this site on days when the weather is favorable enough for launching and exiting.

## Harvest and Effort Estimates

The catch and effort (excluding charter vessels) observed at sampled sites was expanded to all access sites, based on their “size measure”, to estimate total daily catch and effort in Areas 8-1 and 8-2. Sample data were combined and expanded to create stratum estimates of harvest and effort with variances (Tables 3 through 6).

### Area 8-1

We estimated that a total of 121 Chinook (118 marked and 3 unmarked) were landed in 640 angler trips during the month of February, with a catch per unit effort (CPUE) of 0.19 Chinook per angler trip (Table 3). For the months of October through February combined, we estimated that a total of 292 Chinook (289 marked and 3 unmarked) were landed in 2,866 angler trips, with an overall CPUE of 0.10 Chinook per angler trip (Table 4).

In addition, we estimated that 238 Chinook were released during February (44 marked, 122 unmarked, and 72 unknown mark status). The total number of Chinook encountered (retained plus released) in Area 8-1 during February was estimated at 359 (Table 3).

From October 1 through February 26, we estimated that a total of 934 Chinook were released (304 marked, 351 unmarked, and 279 unknown mark status) (Table 4). The total number of Chinook encountered (retained plus released) in Area 8-1 during the five months of the fishery was estimated at 1,226.

Other than Chinook, we estimated that there were 3 unmarked coho landed and 3 coho of unknown mark status released during February in Area 8-1. In comparison, during the months of November through January we estimated that no species of salmon other than Chinook were landed or released. During October we estimated that 55 coho (24 marked and 31 unmarked) and 7 chum were landed, while 8 unknown species of salmon were released (Table 4).

### Area 8-2

We estimated that a total of 216 Chinook (205 marked and 11 unmarked) were landed in 1,280 angler trips in Area 8-2 during the month of February, with a CPUE of 0.17 Chinook per angler trip (Table 5). For October through February combined, we estimated that a total of 504 Chinook (480 marked and 24 unmarked) were landed in 5,570 angler trips, with an overall CPUE of 0.09 Chinook per angler trip (Table 6).

In addition, we estimated that 578 Chinook were released during February (150 marked, 201 unmarked and 227 unknown mark status). The total number of Chinook encountered (retained plus released) during the month was estimated at 794.

From October through February, we estimated that a total of 1,647 Chinook were released (279 marked, 491 unmarked, and 877 unknown mark status) in Area 8-2. Thus, the total number of Chinook encountered (retained plus released) in this area during the five months of the fishery was estimated at 2,151 (Table 6).

In addition to Chinook, we estimated that anglers landed 404 coho (105 marked and 299 unmarked), 8 chum, and one pink salmon during the months of October through February. Total estimates of released salmon other than Chinook for the five months included 149 coho (5 marked, 16 unmarked, and 128 unknown mark status), 4 chum, 1 pink, and 148 unknown species of salmon (Table 6).

## Charter Boats

### Methods

After consulting with the WDFW biometrician early in the study, we elected to separate charter vessels from kicker boats in generating the catch estimates for Areas 8-1 and 8-2, to reduce potential bias and improve the precision in our estimates. Charter boats were treated separately and excluded from our Murthy estimate due to their high catch per unit of effort compared to kicker boats. In addition, charter boats were not necessarily exiting the fishery via our “sampled sites”, and the landed catch from these vessels was not being sampled.

This stratification of charter and kicker vessels was an adjustment compared to our initial study design due to the unique situation of this fall/winter fishery in which the fishery is very slow and sample sizes are extremely low (unlike high effort summer fisheries, such as the Chinook selective fishery in Areas 5 and 6). We modified our approach to include a census of catch from the charter boats operating in the fishery. We relied on the Murthy estimator method to estimate total salmon encounters for kicker boats in Areas 8-1 and 8-2, while a complete census approach was used for charter boats.

We contacted all possible charter boat operators that fished in Areas 8-1 or 8-2 during the months of October through February. The charter operators reported complete counts of salmon encounters and number of trips via Voluntary Trip Report (VTR) forms. VTR data included the date of the fishing trip, number of anglers, target species, CRC Area, each Chinook or coho hooked, whether the fish was kept or released, species (if they positively identified the fish), total length to the nearest 1/8th inch, and whether the fish was adipose fin-clipped or not clipped.

### Results

Two charter boat operators fished in Area 8-2 during February and reported a total of 10 Chinook encounters in 11 angler trips. These 10 encounters included 2 ad-marked retained Chinook and 8 released Chinook (7 ad-marked and 1 unmarked) (Table 7).

The CPUE for charter boats was 0.19 Chinook per angler trip in Area 8-2 during February. In comparison, the CPUE for kicker boats was estimated at 0.17 Chinook per angler trip for the month, nearly the same as that for charter boats. In contrast, in previous months of the Area 8-2 fishery, the CPUE for charter boats was four to six times higher than that of kicker boats.

For the months of October through February combined, the CPUE for kicker boats fishing in Area 8-2 was 0.09 Chinook per angler trip, while that for charter boats was 0.50 Chinook per angler trip. Thus, over the five months of the fishery, anglers were nearly six times more successful in landing Chinook on charter vessels compared to kicker vessels under the particular circumstances of this fishery (Table 7).

#### Total Estimates: Areas 8-1 and 8-2 Combined

Adding the estimated Chinook encounters in Area 8-2 for kicker boats (794) to the counts of Chinook encounters reported from charter boats (10), estimates that a total of 804 Chinook were encountered in Area 8-2 during February (218 retained and 586 released) (Table 7).

Combining the Area 8-1 and Area 8-2 estimates results in a total of 1,163 estimated Chinook encounters (339 retained and 824 released) for the two areas during the month of February. To date, for the months of October through February, we estimated a total of 3,549 Chinook encounters in Areas 8-1 and 8-2 combined (Table 7).

#### **Observed versus Predicted Mortalities**

In a preliminary analysis, we compared observed versus predicted mortalities for unmarked Chinook encountered in the fishery during the months of October through February, for Areas 8-1 and 8-2 combined (Table 8). The observed unmarked Chinook mortalities were determined based on preliminary estimates of Chinook encounters from creel surveys and an assumed mortality rate of 20% for released Chinook.

The Fishery Regulation Assessment Model (FRAM) predicted a total of 2,608 impacts on unmarked Chinook encountered in the fishery from October through April, for Areas 8-1 and 8-2 combined. We applied the monthly proportions of effort used in FRAM to the total number of modeled impacts for the fishery in order to determine the predicted monthly impacts shown in Table 8.

Results of our comparison showed that the observed unmarked mortalities were far below the mortalities predicted from FRAM. The modeled cumulative mortalities totaled 1,995 through February, whereas cumulative observed impacts totaled 343 (Table 8). In this preliminary analysis we did not separate out legal versus sub-legal sized Chinook to estimate the mortalities; we applied an assumed mortality rate of 20% (mortality rate assumed for sub-legal Chinook)

for all released fish. Therefore, the estimate of observed impacts is considered a high estimate.



**Table 4-5. Preliminary Area 8-1 Recreational Fishery In-season Catch Estimates (Extrapolated Numbers), Based on Dockside Angler Interviews, January 30 through February 26, 2006.**

Start Date	End Date	Est. Effort		Est. Retained Catch						Est. Releases											
		Boats	Angler	Chinook		Coho		Chum	Pink	Chinook				Coho				Chum	Pink	Unk. Salmon	
				Marked	Unmrk	Markd	Unmrk			Total	Mark	Unmrk	Unk.	Total	Mark	Unmrk	Unk.				
30-Jan	2-Feb	13	26	6	0	0	0	0	0	6	0	3	3	0	0	0	0	0	0	0	
3-Feb	3-Feb	5	10	7	0	0	0	0	0	6	2	2	2	0	0	0	0	0	0	0	
4-Feb	4-Feb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
5-Feb	5-Feb	6	11	3	0	0	0	0	0	4	2	2	0	0	0	0	0	0	0	0	
6-Feb	9-Feb	74	110	22	0	0	0	0	0	41	0	32	9	0	0	0	0	0	0	0	
10-Feb	10-Feb	19	44	5	0	0	0	0	0	9	2	6	1	1	0	1	0	0	0	0	
11-Feb	11-Feb	35	61	13	0	0	0	0	0	34	3	14	17	2	0	0	2	0	0	0	
12-Feb	12-Feb	45	77	11	3	0	3	0	0	32	12	14	6	0	0	0	0	0	0	0	
13-Feb	16-Feb	14	24	6	0	0	0	0	0	11	0	7	4	0	0	0	0	0	0	0	
17-Feb	17-Feb	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
18-Feb	20-Feb	68	147	23	0	0	0	0	0	51	13	16	22	0	0	0	0	0	0	0	
21-Feb	23-Feb	5	10	0	0	0	0	0	0	10	0	10	0	0	0	0	0	0	0	0	
24-Feb	24-Feb	5	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
25-Feb	25-Feb	36	64	7	0	0	0	0	0	28	7	16	5	0	0	0	0	0	0	0	
26-Feb	26-Feb	19	46	15	0	0	0	0	0	6	3	0	3	0	0	0	0	0	0	0	
TOTAL		347	640	118	3	0	3	0	0	238	44	122	72	3	0	1	2	0	0	0	
<b>Statistics for Grand Total Estimates:</b>																					
Standard Error	54	110	24	3		3				36	11	26	22	1		1	1				
CV (%)	15.46	17.16	20.31	90.42		90.42				14.98	25.22	21.27	30.27	31.16		57.65	36.79				
Upper 95% CI	453	856	165	37		37				308	66	173	115	15		8	11				
Lower 95% CI	241	424	71	1		1				168	22	71	29	2		1	1				



**Table 4-6. Total Area 8-1 Recreational Fishery In-season Catch Estimates (Extrapolated Numbers), Based on Dockside Angler Interviews, October 1 2005 through February 26 2006.**

Month	Dates	Est. Effort		Est. Retained Catch						Est. Releases							
		Boats	Anglers	Chinook		Coho		Chum	Pink	Total	Chinook			Coho	Chum	Pink	Unk. Salmon
				Marked	Unmark	Marked	Unmark				Mark	Unmark	Unk.				
OCT	Oct 1 - Oct 30	637	1,154	41	0	24	31	7	0	305	130	88	87	0	0	0	8
NOV	Oct 31 - Dec 1	200	350	44	0	0	0	0	0	100	26	49	25	0	0	0	0
DEC	Dec 2 - Dec 31	236	427	49	0	0	0	0	0	169	65	68	36	0	0	0	0
JAN	Jan 1 - Jan 29	161	295	37	0	0	0	0	0	122	39	24	59	0	0	0	0
FEB	Jan 30 - Feb 26	347	640	118	3	0	3	0	0	238	44	122	72	3	0	0	0
<b>TOTAL Oct-Feb</b>		<b>1,581</b>	<b>2,866</b>	<b>289</b>	<b>3</b>	<b>24</b>	<b>34</b>	<b>7</b>	<b>0</b>	<b>934</b>	<b>304</b>	<b>351</b>	<b>279</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>8</b>
<b>Statistics for Grand Total Estimates:</b>																	
Standard Error		194	348	49	3	15	18	6		105	73	56	51	1			8
CV (%)		12.25	12.16	17.12	90.42	61.01	52.46	85.67		11.21	23.97	15.84	18.12	31.16			94.04
Upper 95% CI		1,961	3,549	386	37	54	70	22		1,139	447	460	378	15			26
Lower 95% CI		1,201	2,183	192	1	4	7	1		729	161	242	180	2			1

**Table 4-7. Preliminary Area 8-2 Recreational Fishery In-season Catch Estimate (Extrapolated Numbers), Based on Dockside Angler Interviews, January 30 through February 26, 2006.**

Start Date	End Date	Est. Effort		Est. Retained Catch						Est. Releases											
		Boats	Angler	Chinook		Coho		Chum	Pink	Chinook				Coho				Chum	Pink	Unk. Salmon	
				Marked	Unmrk	Marked	Unmrk			Total	Mark	Unmrk	Unk.	Total	Mark	Unmrk	Unk.				
30-Jan	2-Feb	21	54	9	4	0	0	0	0	48	13	31	4	0	0	0	0	0	0	0	
3-Feb	3-Feb	8	12	2	0	0	0	0	0	23	4	11	8	0	0	0	0	0	0	0	
4-Feb	4-Feb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
5-Feb	5-Feb	13	22	0	0	0	0	0	0	20	4	7	9	0	0	0	0	0	0	0	
6-Feb	9-Feb	117	225	72	4	0	0	0	0	110	32	59	19	0	0	0	0	0	0	0	
10-Feb	10-Feb	33	59	9	0	0	0	0	0	18	2	7	9	0	0	0	0	0	0	0	
11-Feb	11-Feb	127	234	24	0	0	0	0	0	116	31	15	70	2	0	0	2	0	0	0	
12-Feb	12-Feb	105	208	19	3	0	0	0	0	64	21	20	23	1	1	0	0	0	0	0	
13-Feb	16-Feb	11	17	3	0	0	0	0	0	6	3	3	0	0	0	0	0	0	0	0	
17-Feb	17-Feb	2	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
18-Feb	20-Feb	92	185	34	0	0	0	0	0	92	31	21	40	2	0	2	0	0	0	0	
21-Feb	23-Feb	7	14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
24-Feb	24-Feb	12	23	2	0	0	0	0	0	7	0	0	7	0	0	0	0	0	0	0	
25-Feb	25-Feb	65	134	17	0	0	0	0	0	31	5	12	14	0	0	0	0	0	0	0	
26-Feb	26-Feb	44	89	14	0	0	0	0	0	43	4	15	24	0	0	0	0	0	0	0	
TOTAL		657	1,280	205	11	0	0	0	0	578	150	201	227	5	1	2	2	0	0	0	
<b>Statistics for Grand Total</b>																					
<b>Estimates:</b>																					
Standard Error	32	67	25	5						37	20	27	15	1	1	0	0				
CV (%)	4.92	5.24	11.99	43.93						6.38	13.12	13.57	6.65	12.48	62.40	0.00	0.00				
Upper 95% CI	720	1,411	253	22						650	189	255	257	7	9	2	2				
Lower 95% CI	594	1,149	157	5						506	111	147	197	3	1	2	2				

**Table 4-8.** Total Area 8-2 Recreational Fishery In-season Catch Estimates (Extrapolated Numbers), Based on Dockside Angler Interviews, October 1 2005 through February 26 2006.

onth	Dates	Est. Effort		Est. Retained Catch						Est. Releases										
		Boats	Angler	Chinook		Coho		Chum	Pink	Chinook				Coho				Chum	Pink	Unk. Salmon
				Markd	Unmrk	Marked	Unmrk			Total	Mark	Unmrk	Unk.	Total	Mark	Unmrk	Unk.			
OCT	Oct 1 - Oct 30	1,486	2,911	27	2	104	299	7	1	330	15	17	298	141	4	14	123	2	1	144
NOV	Oct 31 - Dec 1	187	343	21	2	0	0	1	0	63	0	14	49	0	0	0	0	2	0	4
DEC	Dec 2 - Dec 31	249	461	90	4	1	0	0	0	246	26	76	144	1	0	0	1	0	0	0
JAN	Jan 1 – Jan 29	306	575	137	5	0	0	0	0	430	88	183	159	2	0	0	2	0	0	0
FEB	Jan 30 – Feb 26	657	1,280	205	11	0	0	0	0	578	150	201	227	5	1	2	2	0	0	0
Total Oct-Feb		2,885	5,570	480	24	105	299	8	1	1,647	279	491	877	149	5	16	128	4	1	148
<b>Statistics for Grand Total Estimates</b>																				
Standard Error	146	284	41	6	16	27	2	0.43	86	23	40	72	17	2	4	16	1	0.43	25	
CV (%)	5.04	5.10	8.50	27.06	15.11	9.04	22.22	42.74	5.22	8.10	8.24	8.26	11.34	34.79	22.13	12.83	27.80	42.74	17.08	
Upper 95% CI	3,170	6,127	560	37	136	352	12	6	1,816	324	571	1,019	182	11	24	160	9	6	198	
Lower 95% CI	2,600	5,013	400	11	74	246	4	1	1,478	234	411	735	116	2	8	96	2	1	98	

**Table 4-9.** Total Chinook Encounters Estimated for Kicker Vessels in Areas 8-1 and 8-2, and censused from charter vessels in Area 8-2, October 1 2005 through February 26 2006.

Area	Month	Fishing Method <sup>1/</sup>	Angler Trips	CHINOOK ENCOUNTERS						Total Encounters (Retained + Released)
				Retained		Released				
				Marked	Unmrk	Total	Mark	Unmark	Unk.	
8-2	OCT	Kicker	2,911	27	2	330	15	17	298	359
		Charter	56	14	0	11	2	9	0	25
	Total Oct.		2,967	41	2	341	17	26	298	384
	NOV	Kicker	343	21	2	63	0	14	49	86
		Charter	19	8	0	17	12	5	0	25
	Total Nov.		362	29	2	80	12	19	49	111
	DEC	Kicker	461	90	4	246	26	76	144	340
		Charter	22	16	0	42	22	20	0	58
	Total Dec.		483	106	4	288	48	96	144	398
	JAN	Kicker	575	137	5	430	88	183	159	572
		Charter	15	21	0	27	14	13	0	48
Total Jan.		590	158	5	457	102	196	159	620	
FEB	Kicker	1,280	205	11	578	150	201	227	794	
	Charter	11	2	0	8	7	1	0	10	
Total Feb.		1,291	207	11	586	157	202	227	804	
Area 8-2 Total Oct-Feb		5,693	541	24	1,752	336	539	877	2,317	
8-1	OCT	Kicker	1,154	41	0	305	130	88	87	346
		Charter	0	0	0	0	0	0	0	0
	Total Oct.		1,154	41	0	305	130	88	87	346
	NOV	Kicker	350	44	0	100	26	49	25	144
		Charter	0	0	0	0	0	0	0	0
	Total Nov.		350	44	0	100	26	49	25	144
	DEC	Kicker	427	49	0	169	65	68	36	218
		Charter	0	0	0	0	0	0	0	0
	Total Dec.		427	49	0	169	65	68	36	218
	JAN	Kicker	295	37	0	122	39	24	59	159
		Charter	2	0	0	6	2	4	0	6
Total Jan.		297	37	0	128	41	28	59	165	
FEB	Kicker	640	118	3	238	44	122	72	359	
	Charter	0	0	0	0	0	0	0	0	
Total Feb.		640	118	3	238	44	122	72	359	
Area 8-1 Total Oct-Feb		2,868	289	3	940	306	355	279	1,232	
GRAND TOTAL (Areas 8-1 & 8-2)			8,561	830	27	2,692	642	894	1,156	3,549

We applied the Murthy estimator method to estimate total salmon encounters for kicker boats in Area 8-2, while a complete census approach was used for charter boats.

**Table 4-10. Observed unmarked Chinook mortalities in the Areas 8-1 and 8-2 selective Chinook fishery, based on preliminary estimates of Chinook encounters from creel surveys, versus impacts predicted from the FRAM model, by month for Areas 8-1 and 8-2 combined.**

Month	Proportion of Effort	Estimated Mortalities: Unmarked Chinook Encounters			
		Modeled Impacts	Modeled Cumulative	Observed <sup>1/</sup> Impacts	Observed Cumulative
October	0.1898	495	495	68	68
November	0.1181	308	803	25	93
December	0.1397	364	1,167	60	152
January	0.1189	310	1,477	76	228
February	0.1983	517	1,995	115	343
March	0.1204	314	2,309	TBD	TBD
April	0.1148	299	2,608	TBD	TBD

<sup>1/</sup> For this preliminary analysis we did not separate out legal versus sub-legal sizes of Chinook to estimate mortalities; we applied the mortality rate of 20% (assumed rate for sub-legal Chinook) for all released fish. Therefore, the estimated observed impacts are considered a high estimate.

**Methods**

During dockside interviews, samplers recorded the predominant (based on time) angling method employed by the boat being interviewed, for the boats that actually encountered Chinook. Responses were recorded on the sampling form according to the following five fishing method categories:

Weight & Bait (W): Mooching or slow trolling with lead and herring/anchovy.

Downrigger Trolling (DR): Using either hardware or bait or any combination.

Jigging (J): Drifting, jerking pole up and down; for example using Buzz Bombs, Point Wilson Darts, or Crippled Herring.

Diver Trolling (DV): For example trolling with a Deep Six or a Pink Lady, using either hardware or bait or any combination.

Other (O): For example fly fishing, or trolling bucktails with or without weight.

The sampling supervisor summarized the above information for anglers encountering Chinook and instructed test boat samplers on which method to employ in order to adequately represent the fishing methods used by the recreational fleet. We assigned proportions of time that the test boat should spend on the different fishing methods on weekly basis, based on the dockside fishing method summary from the previous statistical week. Fishing methods employed by the test boat were also scheduled in a way that made sense as far

as the tides, what was happening in the fishery, and other environmental variables.

The test boat samplers recorded the fishing method that they implemented on their sampling form. At the end of a test fishing day, the test boat crew summarized the amount of time they spent on fishing each method (see section 6 below, "Test Fishing").

## Results

As in previous months of the fishery, downriggers were the predominant fishing method employed by anglers in Areas 8-1 and 8-2 during February. In Area 8-1, out of 150 interviews with anglers that successfully encountered Chinook, all 150 boats used downriggers as their predominant fishing method. In Area 8-2, out of 228 interviews with anglers that successfully encountered Chinook, 226 (99.2%) boats employed downriggers as their predominant fishing method, while one boat (0.4%) used the weight and bait method, and another boat (0.4%) used the jigging method. Thus, for Areas 8-1 and 8-2 combined, 99.5% of the boats that successfully encountered Chinook used downriggers as their predominant fishing method.

For the months of October through February combined, we recorded a total of 1,028 responses to the fishing method question for anglers that successfully encountered Chinook (366 boats in Area 8-1 and 662 boats in Area 8-2). Of these, 1,024 boats (99.6%) used downriggers as the predominant fishing method, while 3 boats (0.3%) employed the weight and bait method, and one boat (0.1%) used the jigging method.

## Test Fishing

### Methods

We operated two test boats, one in Area 8-1 and the other in Area 8-2. The crew on each boat consisted of two WDFW technicians per boat. These test boats fished approximately four to five days per week (Monday through Friday) on average throughout February (weather permitting). If adverse weather conditions precluded test fishing on a scheduled fishing day, the sampling supervisors rescheduled test fishing to an alternate day on the weekend, or the crew worked on boat maintenance and other duties.

For each hook-up, the encounter number, time sampled, species, mark status, and DNA vial number (if applicable) was recorded. Care was taken to handle all fish as gently as possible. Chinook were brought on board in a cotton mesh net and measured while still in the net. Samplers collected three scales for each Chinook brought on board. In addition, samplers recorded the fork length, total length, and mark status for each Chinook on the scale card (legal size Chinook were 22 inches and larger, while and sub-legal size Chinook were less than 22 inches total length). Samplers also used scissors to remove a 1 cm<sup>2</sup> piece of the caudal fin for DNA analysis. All fish were released carefully and as soon as possible.



The test boat samplers recorded the fishing method that they implemented on their sampling form. At the end of a test fishing day, the test boat crew summarized the amount of time they spent on fishing each method.

## Results

The test boat in Area 8-1 encountered a total of 71 Chinook (30 legal and 41 sub-legal) during February, and the test boat in Area 8-2 encountered a total of 50 Chinook (25 legal and 25 sub-legal) (Table 9). Samplers collected DNA samples from each of these fish, as well as scale samples, fork lengths, and total lengths.

The test boats in both areas employed downriggers 100% of the time during February. Adverse weather conditions precluded fishing five days per week during certain weeks in the month, with particularly rough conditions on the water in both areas during the third week of February (statistical week 8).

To date, for the months of October through February combined, the test boat in Area 8-1 has encountered a total of 340 Chinook (105 legal and 235 sub-legal), while the test boat in Area 8-2 has encountered a total of 216 Chinook (92 legal and 124 sub-legal) (Table 9).

Based on the combined test fishing data for October through February, the adipose mark rate in Area 8-1 was 61% for legal-sized Chinook and 56% for sub-legal Chinook. In Area 8-2, the adipose mark rate was 57% for legal-sized Chinook and 65% for sub-legal Chinook (Table 9).

**Table 4-11.** Total weekly Chinook encounters and number of DNA samples collected in the Areas 8-1 and 8-2 test fishery from October 1 2005 through February 26 2006 (statistical weeks 41 through 9), by mark status (M=marked; UM=unmarked) and legal or sub-legal size<sup>1/</sup>.

Month	Statistical Week	AREA 8-1						AREA 8-2					
		LEGAL <sup>1/</sup>			SUB-LEGAL <sup>1/</sup>			LEGAL <sup>1/</sup>			SUB-LEGAL <sup>1/</sup>		
		M	UM	Total	M	UM	Total	M	UM	Total	M	UM	Total
OCT	41	2	0	2	10	6	16	0	0	0	1	0	1
	42	0	0	0	5	2	7	0	1	1	4	3	7
	43	2	0	2	5	2	7	0	2	2	14	5	19
	44	0	0	0	8	4	12	1	0	1	5	6	11
OCT TOTAL		4	0	4	28	14	42	1	3	4	24	14	38
Percent		100%	0%		67%	33%		25%	75%		63%	37%	
NOV	45	0	0	0	2	2	4	0	1	1	3	1	4
	46	1	1	2	2	2	4	1	0	1	6	2	8
	47	2	6	8	8	5	13	2	0	2	5	3	8
	48	4	2	6	4	2	6	4	3	7	5	1	6
	49	4	3	7	11	8	19	1	4	5	3	3	6
NOV TOTAL		11	12	23	27	19	46	8	8	16	22	10	32
Percent		48%	52%		59%	41%		50%	50%		69%	31%	
DEC	50	4	0	4	4	10	14	4	5	9	1	4	5
	51	2	1	3	3	4	7	3	2	5	0	1	1
	52	0	0	0	1	2	3	1	0	1	2	2	4
	53-1	3	3	6	1	1	2	6	2	8	2	2	4
DEC TOTAL		9	4	13	9	17	26	14	9	23	5	9	14
Percent		69%	31%		35%	65%		61%	39%		36%	64%	
JAN	2	2	1	3	2	5	7	0	0	0	0	0	0
	3	1	4	5	12	10	22	0	0	0	0	0	0
	4	7	11	18	9	7	16	11	7	18	8	3	11
	5	7	2	9	20	15	35	4	2	6	2	2	4
JAN TOTAL		17	18	35	43	37	80	15	9	24	10	5	15
Percent		49%	51%		54%	46%		63%	38%		67%	33%	
FEB	6	8	0	9	8	5	13	5	6	11	5	1	6
	7	10	3	13	9	4	13	6	4	10	6	4	10
	8	1	2	3	4	4	8	1	0	1	2	0	2
	9	4	2	6	4	3	7	2	1	3	6	1	7
FEB TOTAL		23	7	30	25	16	41	14	11	25	19	6	25
Percent		77%	23%		61%	39%		56%	44%		76%	24%	
GRAND TOTAL		64	41	105	132	103	235	52	40	92	80	44	124
Percent		61%	39%		56%	44%		57%	43%		65%	35%	

<sup>1/</sup> Legal size Chinook were 22 inches and larger in total length, while sub-legal size Chinook were less than 22 inches total length.

## 4.3.2 Carbon River Selective Fishery

### INTRODUCTION

The Washington Department of Fish and Wildlife (WDFW) conducted a third year of creel surveys during the Chinook selective fishery on the Carbon River in the fall of 2005. This survey was designed to estimate angler effort, numbers of salmon retained and released by species, and percent of Chinook that were marked (adipose fin clipped).

The WDFW implemented a pilot Chinook selective recreational fishery on the Carbon River in 2003, which was one of very few selective salmon fisheries occurring in freshwater in Washington, and continued this fishery in 2005. Regulations, detailed in the Sport Fishing Rules 2005/2006 pamphlet, can be summarized as follows:

Salmon fishing was open from the mouth of the Carbon River to Voights Creek (approximately 4 miles), from September 1 through November 30, 2005. Daily limit 6 salmon. No more than 4 adults may be retained, of which no more than 2 may be adult hatchery Chinook. Release wild adult Chinook and chum.

This survey provided a third year of information on angler participation and catch numbers during the salmon fishery in the Carbon River.

### METHODS

#### Data Collection

We used a random stratified creel survey at three access sites to monitor the Carbon River recreational fishery. Sampling was stratified by weekday and weekend days, as well as by time of day (1<sup>st</sup> half of daylight period, 2<sup>nd</sup> half of daylight period). Sampling occurred during three randomly selected weekdays and both weekend days during each of the nine weeks of the survey. The creel survey was conducted from September 1 through October 31, covering two of the three months that salmon fishing was open on the Carbon River. A total of 45 of the 61 days of the survey period was sampled: 18 weekend days and 26 weekdays plus Labor Day. Chinook catches after October 31 were expected to be negligible.

Sampling days were stratified into AM and PM strata. Each stratum represented half of the available fishing hours each day. Fishing was prohibited from one hour after sunset to one hour before sunrise, thus limiting the available fishing hours. A total of four sampling strata was established; weekday AM, weekday PM, weekend AM, and weekend PM.

We used an access point survey to monitor the Chinook selective recreational fishery on the Carbon River. This entailed conducting angler interviews at three access sites to collect data to evaluate the fishery. The primarily shore-based fishery is accessed through four primary sites (145<sup>th</sup> St. at river mile 0.5, Sewage Treatment Facility (STF) at river mile 2.0, River Road at river mile 2.8, and the Skate Park at river mile 3.6). We originally scheduled surveys at the 145<sup>th</sup> St. access site, where one survey was conducted. However, conflicts with an adjacent landowner necessitated discontinuing surveys at this site. We did conduct vehicle counts at this site throughout the survey duration to estimate angler effort. Angler interviews and periodic counts of vehicles were conducted at STF, River Road, and Skate Park sites.

Another change that occurred in 2005 was conducting angler interview at the Skate Park access site instead of the Grange access site. The Grange access was closed to anglers by the landowner at the end of the 2004 fishery. Anglers used the Skate Park access site in 2005 to access the portion of river historically accessed through the Grange access site.

Samplers interviewed anglers returning to vehicles at the three access sites. Anglers were asked what time they started and stopped fishing, what species they were targeting, how many of each species they caught and retained, how many they released, and whether the fish they encountered were adipose-fin clipped. Anglers were also questioned to determine the number of anglers per vehicle.

Periodic vehicle counts were conducted at four access sites. At the beginning and end of each stratum, samplers counted vehicles at the access sites, then again roughly every two hours throughout the stratum. A total of four counts per day was made for each stratum and access site.

Angler effort and fish encounters were estimated using data collected during angler interviews and vehicle counts. These data were used to estimate weekly catch and effort in the fishery. Weekly effort was estimated by averaging effort estimates from AM and PM strata, then expanding by weekday and weekend day strata.

## **Data Analysis**

We estimated angler effort by creating an Excel spreadsheet to perform calculations on input data collected from vehicle counts and angler interviews. We input the number of vehicles from each vehicle count, time of each count, and the estimated number of anglers per vehicle. This produced the number of anglers participating and hours they fished in the fishery during the time segment between individual vehicle counts. The products from individual time segments were summed to estimate total angler hours for the stratum.

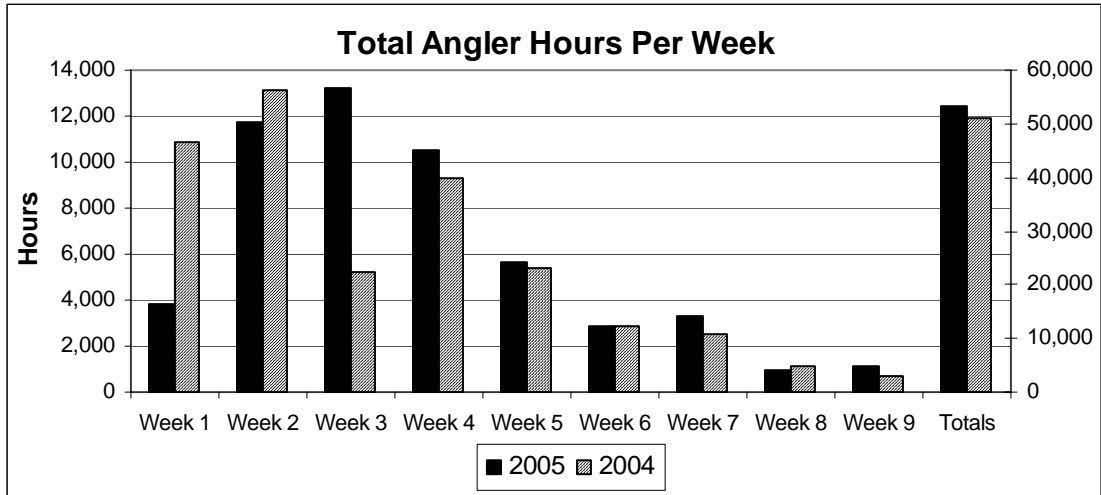
After calculating angler effort, fish harvest and encounters were estimated. This was done by dividing the total numbers of fish retained and released, as reported

by anglers, by the total angling hours for each stratum. This produced an estimated Harvest Per Unit Effort and Catch Per Unit Effort (CPUE).

## RESULTS

This survey provides a third year of angler effort and fish encounter data during the recreational salmon fishery on the Carbon River. Data used to estimate angler effort and fish encounters came from about 2,200 angler interviews during the survey.

Anglers spent an estimated 53,182 hours fishing the Carbon River from September 1 through October 31, 2005 (Figure 4-1). We estimate that there were 14,544 angler trips made to the Carbon River during this fishery. Anglers fished an average trip length of 3.7 hours. The trip length varied from week to week, with the longest trip length occurring during the first week of the fishery (September 1 to 3) of 4.2 hours to the shortest occurring during the last week of the survey (October 23 to 31) of 2.6 hours.



**Figure 4- 1. Total estimated angler hours each week (Week 1 in 2005 had only three days).**

Anglers retained an estimated 748 adult Chinook, 11 jack Chinook, and 812 coho during the 53,182 hours fishing the Carbon River. They also retained an estimate 8,505 pink salmon. Anglers released an estimated 1,494 Chinook and 773 coho (Table 4-12). What is most impressive is that the anglers reported releasing an estimated 60,517 pink salmon.

**Table 4-12. The actual number of Chinook observed during the 2005 creel survey and the expanded number for the fishery.**

Origin		Retained fish		Released fish	
		Observed	Expanded	Reported	Expanded
Adults	Marked	118	738	78	737
	Unmarked	0	0	72	508
	Mark status unknown	1 <sup>1/</sup>	10	27	249
Jacks		3	11		
<b>Total</b>		122	759	177	1,494

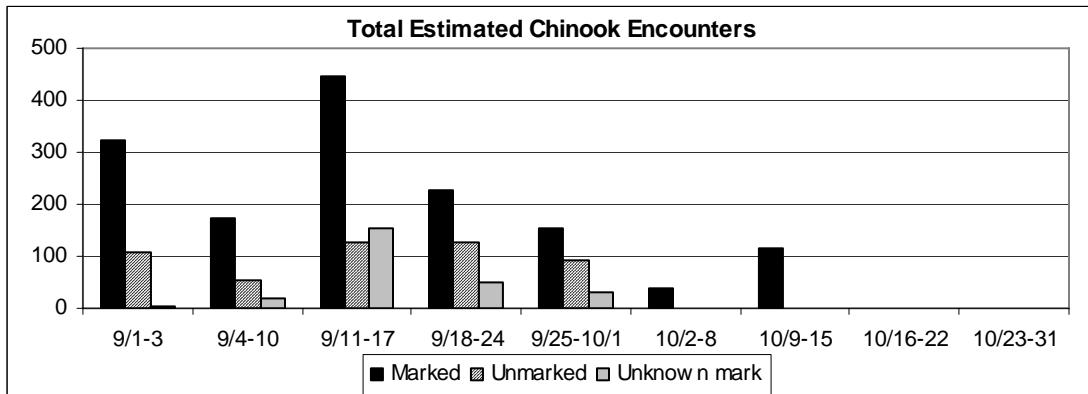
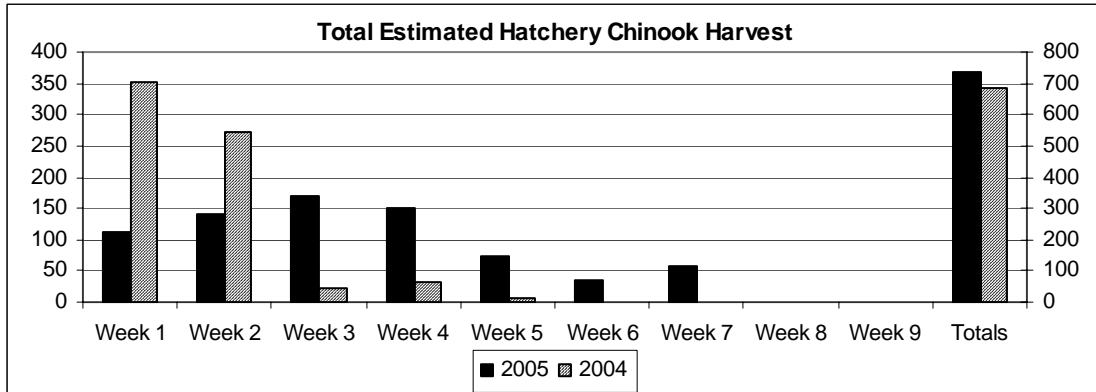
*1/ - The adipose fin of this fish appeared to be a bad fin clip; only part of the adipose fin was present and no apparent sign of recent wound was observed.*

Biological data (scales for age analysis, fork length, and identification for sex) were collected from 109 of the 18 Chinook observed. Of these, only three were less than 24 inches, which is the regulatory definition for jack Chinook. All of the jack Chinook were marked. Based on the biological data, jack Chinook made up about 2.75 percent of the Chinook harvest.

The mark rate of retained Chinook was between 99.2 and 100 percent. The variation accounts for the one Chinook with mark status unknown. The sampler reported this was probably a bad fin clip based on the physical characteristics of the adipose fin (a small portion of the fin present and the top of fin was straight with no apparent sign of recent wound). Of the Chinook caught and released, 49 percent were marked, 34 percent were not marked, and 16 percent mark status was unknown.

Figures 2 and 3 illustrate the harvest and encounter trends of Chinook throughout the fishery. There were a few more adult hatchery-origin Chinook harvested in 2005 compared to 2004; 738 in 2005 and 684 in 2004. Unlike 2004, the peak of hatchery Chinook harvest in 2005 occurred during the third week. Factors that may have contributed to the change in Chinook harvest timing include Chinook run timing, inclement weather, or river flow variation.

**Figure 4-2. Estimated number of hatchery Chinook harvested by week during the 2004 and 2005 recreational salmon fishery on the Carbon River.**



**Figure 4-3. Estimated total Chinook encounters by week during the 2005 recreational salmon fishery in the Carbon River.**

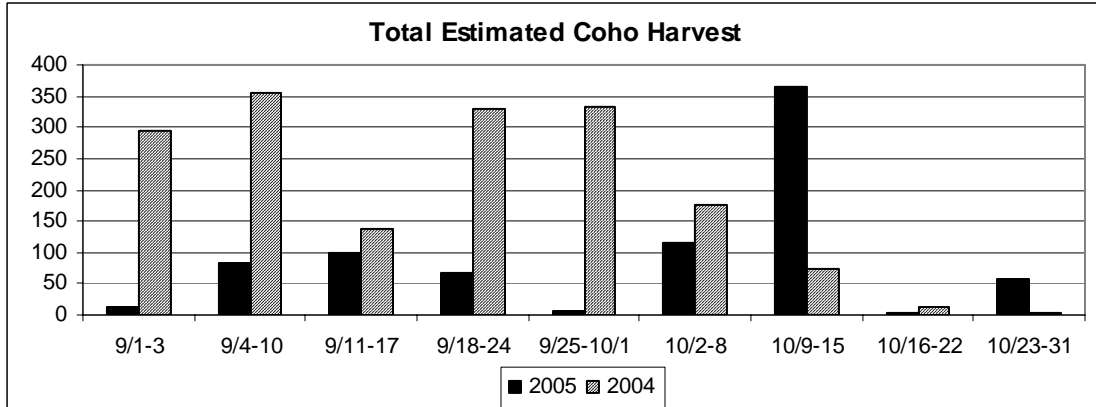
Coho catch was considerably lower in 2005. An estimated 812 coho were retained during September and October and another 534 were released (Table 4-13). The estimate harvest of coho is less than half of the harvest estimated in 2004.

**Table 4-13. The actual number of coho observed during the 2005 creel survey and the expanded number for the fishery.**

Origin		Retained fish		Released fish	
		Observed	Expanded	Reported	Expanded
Adults	Marked	62	616	5	41
	Unmarked	33	179	46	350
	Mark status unknown	3	17	21	143
<b>Total</b>		<b>98</b>	<b>812</b>	<b>72</b>	<b>534</b>



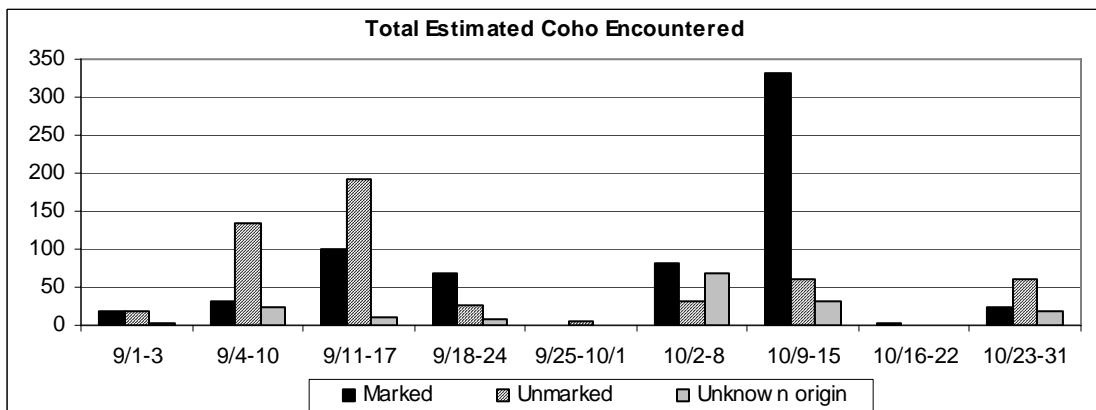
Unlike the 2004 harvest trend, which was consistent from Week 1 through Week 5, one week in 2005 produced most of the total coho harvest. This occurred in Week 7 when more than half of the total coho harvest occurred (Figure 4-3). There appeared to be only one good week for coho fishing in 2005.



**Figure 4-3. Estimated number of coho harvested by week during the recreational salmon fishery on the Carbon River.**

Figure 4-4 illustrates the trend of coho encounters during the 2005 Carbon River fishery. Coho catch during the 2005 fishery was much lower than the previous two years.

A couple of the objectives of this creel survey were to identify effort and catch patterns on the Carbon River. Data analysis revealed that both effort and catch were higher in the upper portion of the fishery. Angler effort was considerably higher at the Skate and River Road accesses as compared to the STF and 145<sup>th</sup> St. accesses. More than 70 percent of the angler effort during the Carbon River fishery was accounted from the two upper river access sites (Figure 4-5).



**Figure 4-4. Estimated total coho encounters by week during the 2005 recreational salmon fishery on the Carbon River.**

Catch of Chinook and coho was also higher in the upper portion of the fishery. Catch of Chinook was almost eight times higher at the Skate access than the STF, however coho catch was only about 1.5 times greater (Figure 4-6).

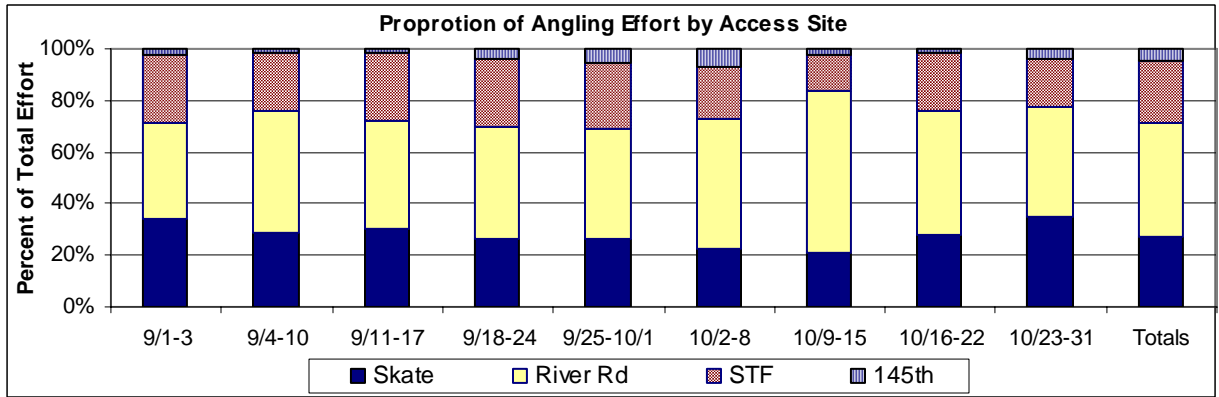


Figure 4-5. Angler effort as estimated by access site.

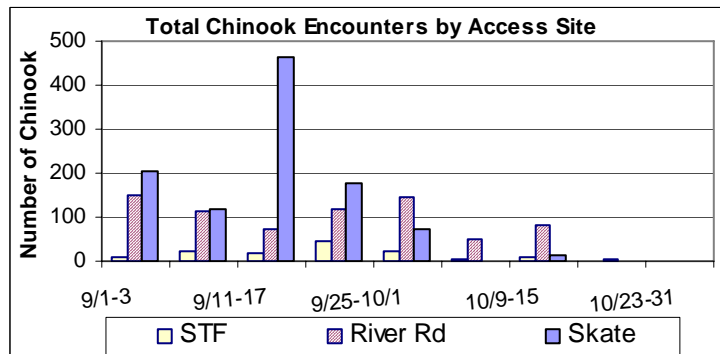


Figure 7. Chinook encounters as estimated by

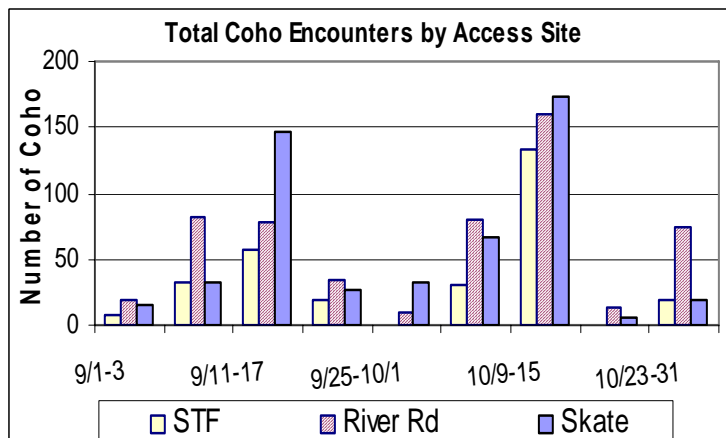


Figure 8. Coho encounters as estimated by access sites

Figure 4-6. Coho and chinook encounters at three Carbon River access sites

## DISCUSSION

This was the third year WDFW conducted a creel survey of the recreational salmon fishery on the Carbon River. The creel survey design was the same as the previous year, however minor changes did occur. Results from reconnaissance visits identified a new access site to the Carbon River fishery. The Skate Park, located in the town of Orting provides access to the portion of the Carbon River that the Grange access provided in 2004. Angler interviews were conducted at this site instead of the Grange site. Private landowners closed the Grange access after the conclusion of the 2004 fishery. Also, only one day of angler interview data were collected from the 145<sup>th</sup> St. access site. An adjacent landowner was very agitated with anglers parking along this street. He confronted the WDFW sampler during sampling at this site on September 2, 2005. The WDFW Enforcement officers advised us not to sample at this site. However, we were able to collect vehicle counts at this site throughout the survey duration.

The total angler effort was very similar during the 2004 and 2005 fisheries. Total angler hours in 2005 were estimated to be 52,182, while 51,851 angler hours were estimated during the 2004 fishery. This is about a 2.5 percent increase in angler effort in 2005.

What was interesting however, was an estimated decline by about 15 percent in angler trips in 2005. There was an estimated 17,192 angler trips made during the 2004 fishery compared to 14,544 in 2005. This means that anglers spent more time fishing during each trip in 2005 than 2004. The average angler trip length in 2005 was 3.7 hours and only 2.8 hours in 2004.

A note of clarification in reference to the 2004 Carbon River Creel Survey Report, the angler effort numbers for 2004 are different. The discussion in that report refers to data collected at only the Grange and STF sites, as these were the only two sites data were collected in 2003. The 2005 report discusses data collected at all sites during the 2004 and 2005 surveys.

Peak effort during the Carbon River fishery occurs within the first four weeks of the fishery. Figure 1 shows the peak angling effort occurred in Week 2 in 2004 and Week 3 in 2005. During the 2003 fishery, effort peaked during the fourth week.

The closure of the Grange access site impacted angler patterns in 2005. As with 2004, most of the angling effort occurred in the upper river sections (Figure 6). But a shift in angler effort to the River Road access site was observed in 2005. The proportion of the total angling effort to the Carbon River fishery contributing from the River Road access site in 2004 was about 25 percent; in 2005, the River Road access site contributed more than 45 percent of the total effort.

There was also an increase in effort contribution from the STF access site. The STF access site contributed about 10 percent of the 2004 effort, while in 2005

about 22 percent of the total angling effort came from this site. The efforts of the unhappy landowner adjacent to the 145 St. site may have contributed to the increase effort at the STF site, as about a 60 percent decrease in effort was observed at the 145 St. in 2005. Anglers may have avoided conflict with this landowner and used the next closest access, the STF site, to get to the fishery.

The number of adult hatchery Chinook harvested during the 2005 Carbon River fishery was estimated to be 738 fish. This is a seven percent increase over the 2004 harvest estimate of 684 fish. This compares to the 14 percent increase in the number of Chinook that returned to Voight's Creek hatchery in 2005. As observed in 2003 and 2004, most of the Chinook harvest in 2005 occurred within the first four weeks of the fishery (in the month of September.)

There were no unmarked Chinook reported during the 2005 Carbon River fishery. This is a marked improvement over the last two years. Unmarked Chinook made up seven percent of the reported Chinook harvest in 2004 and five percent in 2003. However, the mark rate of Chinook encountered (harvest and catch and released fish) was very similar during each of the last three fisheries. Marked Chinook made up 67.7, 62.6, and 66.2 percent of the Chinook encountered by anglers during the 2003, 2004, and 2005 Carbon River fisheries. Likewise, the proportion of unmarked Chinook was very similar from year to year—25.3, 28.4, and 24.3 percent in 2003, 2004, and 2005 respectively. The remaining Chinook encounters were unknown mark status, due to anglers not remembering the mark status of Chinook caught and released.

The CPUE for adult hatchery-origin Chinook during the 2005 fishery was almost identical to the 2004 fishery. Based on data collected during angler interviews, the CPUE for adult hatchery-origin Chinook was 0.013 in 2005 and 0.012 in 2004. The 2003 CPUE estimate for adult hatchery-origin Chinook was 0.022. These estimates are based on total angler effort from September 1 through October 31 each year. If we look at CPUEs during September, the time period that most of the Chinook are caught—84 percent of the total Chinook harvest in 2005, 100 percent in 2004, and 91 percent in 2003—the CPUEs are 0.015, 0.017, and 0.035 respectively.

The harvest estimates for Chinook development from data collected during creel surveys monitoring the Carbon River selective Chinook fishery are comparable to harvest estimates produced by the Catch-Record-Card (CRC) method. In 2003, a harvest estimate of 1,287 during September and October was developed based on data collected during the 2003 Carbon River creel survey. The CRC method estimated harvest during the same time frame at 1,267 fish. In 2004, a harvest estimate of 684 was developed for creel survey data, and 566 during this same time frame by the CRC method.

Harvest estimates for coho in 2004 based on creel survey data was 1,715. For the same time period, the CRC method estimated coho harvest at 1,317. Harvest estimates developed from creel survey data tends to estimate a little higher harvest numbers than the CRC method. However, harvest estimates

based on creel data for coho and pink salmon during the 2003 fishery were smaller than the CRC method, 3,966 coho and 2,936 pink using creel data, and 5,980 coho and 4,550 CRC method. Enough data has not been collected to determine which method more accurately estimates salmon harvest.

Estimated harvest of coho declined by 54 percent in 2005 compared to 2004. This is somewhat surprising in that the harvest of coho during the tribal fishery declined by only 27 percent and there was a 14 percent increase in the number of coho that returned to the Voight's Creek hatchery. The natural spawning escapement estimates are also higher than 2004. The numbers of fish available in the fishery and angler effort don't seem to be issues. Figure 1 shows that effort is similar between years, and escapement to the hatchery and spawning ground was higher in 2005.

Creel samplers noted that many anglers were misidentifying pink salmon in their creel as coho during the 2005 Carbon River fishery. It was not possible to quantify the numbers of misidentified pinks, but samplers noted the problem as common. When samplers noted the problem, they recorded the correct species on interview forms. The CRC method for estimating harvest may overestimate the coho harvest in the Puyallup and Carbon rivers in 2005 due to anglers recording pink salmon as coho on their catch record cards.

The estimated harvest of pink salmon during September and October in the 2005 Carbon River fishery was 8,505, with another 60,517 pinks released. During the peak of the pink salmon encounters (September 11 – 17), the CPUE of pinks was more than 1.7 fish per hour. An estimated 433,000 pink salmon returned to the Puyallup River basin in 2005.

What impact do these fish have on a salmon fishery? Was the vast number of pinks responsible for the decline in coho harvest in 2005? Maybe anglers fished a little longer each trip because the overall salmon catch rate was higher due to pink salmon presence.

## RECOMMENDATIONS

The estimated harvest of coho in the Puyallup and Carbon rivers may be overestimated by the CRC method for 2005. Creel samplers noted many anglers misidentifying pink salmon as coho during the 2005 Carbon River salmon fishery. Creel samplers recorded the correct species when they encountered this problem. Harvest estimates developed using the 2005 creel survey data may more closely represent actual harvest rates for 2005.

## 2005 SKOKOMISH RIVER RECREATIONAL FISHERY CREEL SURVEY

### Objectives:

The primary objectives for the project include: (1) estimate total salmon catch and angler effort in the Skokomish River recreational Chinook fishery from August 1 through September 30, 2005, based on creel surveys conducted at two sites along the river; (2) collect coded-wire tag information and biological data on Chinook and coho to determine stock composition and fishery impacts; and (3) summarize fishery monitoring data to evaluate and improve management approaches and communicate project results to co-managers and the public. These objectives all meet the overall goal of maximizing recreational opportunity while improving conservation of wild salmon stocks.

### Description of creel survey:

Two sites were surveyed along the Skokomish River during the recreational fishery from August 1 through September 30, 2005. Site One was located at approximately river mile one, where Highway 106 crosses the Skokomish River. Site Two was located at approximately river mile two, alongside Purdy Creek Road. These two sites were different enough in character (e.g., site accessibility for anglers and level of angler effort) that we implemented separate sampling designs for each in order to accomplish our goals. Site One was a concentrated fishery with easy access; therefore, the fishing information at this site was gathered via a complete census, accounting for every angler exiting the fishery. Site Two experienced angler effort over a larger area and as such, catch per unit of effort (CPUE) information was estimated by documenting effort through car counts and catch rates through a subset of angler interviews.

The creel surveys at both sites were scheduled using a stratified random sampling approach, for weekdays and weekend days, morning and evening time periods, and adjusted to sample areas where most angling effort occurred. Random selection of sampling days and morning or evening sampling shifts was implemented based on the following criteria:

- Each week we randomly selected three days from the Monday through Friday stratum (“weekday” stratum) for sampling.
- Every Saturday and Sunday was sampled (“weekend” stratum).
- Either a morning or an evening shift was randomly chosen for each sampling day. The morning shift began at approximately 6:00 am and ended at 1:30 pm, and the evening shift began at 1:30 pm and ended at 9:00 pm (or when it got dark). We shortened the evening shifts slightly as day length decreased later in the season.
- For each two-week period, two weekend “am” periods (without replacement) were randomly selected. The remaining two weekend days were placed in the “pm” period.

- For each two-week period, three weekday “am” periods (without replacement) were randomly selected. The remaining three weekday days were placed in the “pm” period.
- Labor Day was included in the weekend period.

During the interview at both sites, the sampler asked the angler questions about the amount of time spent fishing and recorded their catch and release information by species. For all Chinook encountered during interviews, the sampler also collected scales, measured the fork length and total length, and determined the sex and mark status (adipose fin-clipped or not clipped). Counts of Chinook adults and jacks were recorded separately, according to the following definitions: jacks measured less than 24 inches (61 cm) in total length, while adults measured greater than or equal to 24 inches (61 cm) in total length.

In addition, samplers electronically sampled all Chinook and coho by scanning the fish with a “wand” detector to determine coded wire tag (CWT) presence or absence. The sampler removed the snout from fish that detected positive for a CWT to enable tag recovery. The sampler also measured the fork length and determined the sex and mark status of each coho and Chinook that detected positive for a CWT.

To estimate total catch and effort in the Skokomish River fishery, the in-sample (observed) harvest and effort in each stratum (AM/PM/Weekend/Weekday) was expanded to all available time periods, for each sampled site. These estimates were summed across strata and then summed for the two sites to generate total estimates of catch and effort in the fishery.

### **Creel survey results:**

We estimated that a total of 25,663 anglers caught 4,940 Chinook (4,842 adults and 98 jacks) in the Skokomish River from August 1 through September 30, 2005 (Table 1). We also estimated that anglers released 10,670 Chinook (10,219 adults, 144 jacks, and 307 of unknown age) during the fishery. In addition, we estimated that 810 coho and 3 pink salmon were captured during the fishery.

Technicians sampled 701 adult Chinook and 13 jack Chinook during the fishery. Sample rates for Chinook were 35.4% for Site One and 6.1% for Site Two, with an overall sample rate of 14.5%. The estimated Chinook catch per unit of effort (CPUE) was 0.27 for Site One and 0.17 for Site Two, with an overall CPUE of 0.19 (Table 4-14). Our estimates showed that a higher number of Chinook and coho were captured during September (3,201 Chinook and 770 coho) compared to August (1,739 Chinook and 41 coho) (Table 4-15).

**Table 4-14. Estimates of total anglers and salmon catch, and the number of Chinook sampled at two sites in the Skokomish River recreational fishery.**

TOTAL ESTIMATED (EXPANDED NUMBERS)													
Site	In-Sample Numbers		Anglers	CHINOOK						Coho Catch	Pink Catch	% Sampled Chinook (jacks+adult)	CPUE: Est Chinook (jacks+adult)/Anglers
	Number Chinook Jacks Sampled	Number Chinook Adults Sampled		Adults Retained	Jacks Retained	Adults Released	Jacks Released	Unknown Released					
Site 1	10	489	5,150	1,385	25	986	30	0	371	3	35.4%	0.274	
Site 2	3	212	20,514	3,457	73	9,233	114	307	440	0	6.1%	0.172	
<b>Total</b>	<b>13</b>	<b>701</b>	<b>25,663</b>	<b>4,842</b>	<b>98</b>	<b>10,219</b>	<b>144</b>	<b>307</b>	<b>810</b>	<b>3</b>	<b>14.5%</b>	<b>0.192</b>	

**Table 4-15. Total estimates of Chinook and coho captured in the Skokomish River recreational fishery by month, for Sites One and Two combined, August 1 through September 30, 2005.**

Month	Stratum		Chinook			Coho
	Start Date	End Date	Jacks	Adults	Total	
August	8/1	8/28	7	1,732	<b>1,739</b>	<b>41</b>
September	8/29	9/30	91	3,109	<b>3,201</b>	<b>770</b>
<b>Total</b>			<b>98</b>	<b>4,842</b>	<b>4,940</b>	<b>810</b>



### 4.3.3 Historical Recreational Chinook Catch

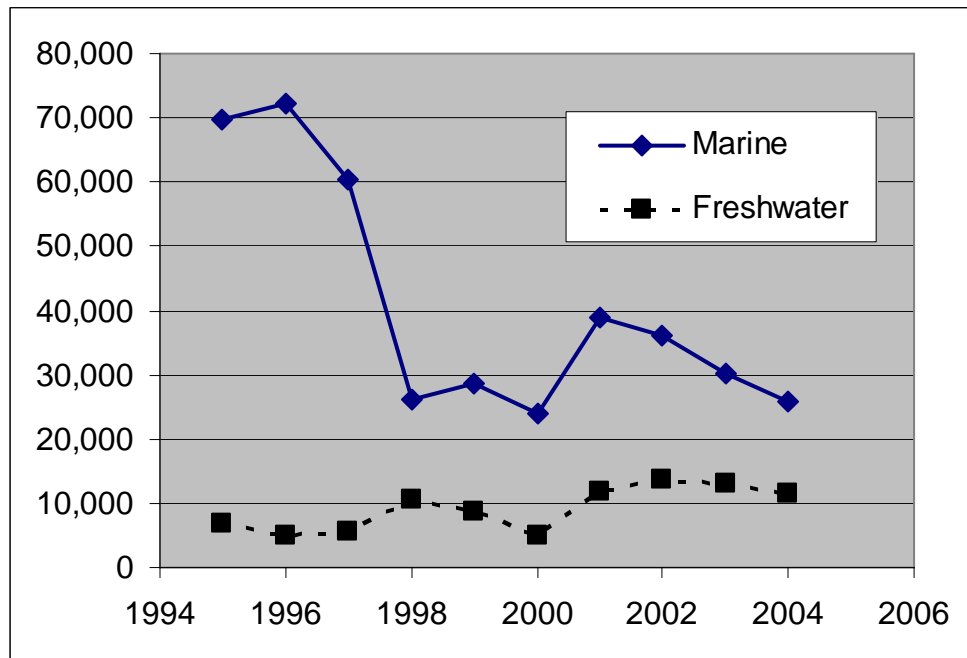
Table 4-14. Historical recreational Chinook catch in Puget Sound, 1995 – 2004

Marine Areas	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
<b>5 &amp; 6</b>	6,349	4,825	12,238	2,159	1,378	1,626	4,050	3,920	5,290	4510
<b>7</b>	7,863	12,674	9,155	3,069	2,747	3,437	6,613	6,544	3,036	1,998
<b>8-1</b>	2,449	1,810	1,225	508	590	615	901	855	447	276
<b>8-2</b>	5,519	4,398	5,894	1,029	1,151	1,796	2,592	3,058	3,058	1970
<b>9</b>	13,351	18,023	10,641	3,118	4,076	3,189	4,004	3,401	1,257	1676
<b>10</b>	13,526	12,244	8,920	3,486	1,569	2,960	3,887	4,817	4,636	12390
<b>11</b>	16,378	15,316	9,602	9,154	12,822	7,625	13,745	10,129	9,383	
<b>12</b>	159	380	592	347	1,346	1,084	446	1,816	1,449	1973
<b>13</b>	4,205	2,399	2,158	3,244	3,060	1,655	2,589	1,518	1,489	1172
<b>Total Marine</b>	<b>69,799</b>	<b>72,069</b>	<b>60,425</b>	<b>26,114</b>	<b>28,739</b>	<b>23,987</b>	<b>38,827</b>	<b>36,058</b>	<b>30,045</b>	<b>25965</b>
<b>Freshwater Areas</b>										
<b>7&amp;7A Ind</b>	14	3	0	19	3	7	0	10	6	0
<b>Straits</b>	0	4	18	0	11	0	0	75	47	19
<b>Nook-Sam</b>	2,338	1,934	3,112	6,924	2,940	1,871	5,083	6,170	3,433	1,061
<b>Skagit</b>	91	17	100	40	46	19	6	70	265	35
<b>Stilly-Sno</b>	51	35	24	44	46	7	54	367	339	182
<b>South Sound</b>	4,402	2,981	2,187	3,470	4,619	2,493	3,530	3,774	3,577	2,529
<b>Hood Canal</b>	6	4	27	13	1,144	600	3,170	3,339	5,283	1,964
<b>Total FW</b>	<b>6,902</b>	<b>4,978</b>	<b>5,468</b>	<b>10,510</b>	<b>8,809</b>	<b>4,997</b>	<b>11,843</b>	<b>13,805</b>	<b>12,950</b>	<b>11,498</b>
<b>Mar + FW</b>	<b>76,701</b>	<b>77,047</b>	<b>65,893</b>	<b>36,624</b>	<b>37,548</b>	<b>28,984</b>	<b>50,670</b>	<b>49,863</b>	<b>42,995</b>	<b>37,463</b>



Having fallen significantly from the levels observed in 1995 – 1997, marine-area recreational Chinook catch, has declined over the last three years. Freshwater recreational catch has increased slightly since the mid-1990s, but has not varied substantially in the last four years (Figure 4-1).

**Figure 4-1 Trends in Puget Sound Marine and Freshwater Sport Chinook Catch**



## 5. Spawning escapement

This section compares the level of natural Chinook spawning escapement projected to occur in 2005 to actual escapement, for each of the Puget Sound management units. This comparison provides a preliminary assessment of abundance, and whether escapement objectives were achieved (Table 5-1) Escapement estimates for 2005 are preliminary for all units, and subject to further revision.

Actual escapement may differ from pre-season projections because of errors in forecasting abundance, projecting harvest volume, or the catch distribution of the many contributing stocks.. Forecasted total abundance may be correct, for a given population, but its age structure (i.e. the relative abundance of age-3, -4, and -5 cohorts) may differ from expected, causing fishery mortality to deviate from model predictions.. Forecasts may be intentionally conservative, (e.g. in assumptions about marine survival conditions) to avoid overharvest. The estimates of actual escapement may also be inaccurate.

### 5.1 2005 Spawning Escapement

Natural spawning escapement in the Stillaguamish, Snohomish, Green, White, Puyallup, Mid-Hood Canal, and Hoko rivers were more than 20% below their projected levels. Escapements of Skagit summer / fall, Skagit spring, Cedar, and Elwha river populations were 10% or less below their projected levels. Escapement estimates for the Green and Puyallup rivers are likely biased low, because pink salmon escapement was high, and their presence in the same areas utilized by Chinook prevented accurate enumeration of Chinook redds. Escapement for both Nooksack populations, and to the Mid-Hood Canal rivers, was below their critical thresholds. This condition was forecasted correctly, so harvest constraints were implemented in accordance with the Chinook Harvest Plan.

Escapements to the Nisqually, Skokomish, and Dungeness rivers were more than 20% higher than forecast. Total natural escapement to the North Fork Nooksack was supplemented substantially by Kendall Creek Hatchery returns, but natural-origin returns remain persistently low in both the North / Middle Fork and South Fork populations in the Nooksack basin.

Abundance forecasts input to the pre-season FRAM model are subject to uncertainty, due to varying freshwater and marine survival. Forecast error certainly contributed to the differences between projected and actual escapement of Puget Sound Chinook in 2005. Of greater concern is the potential for management error, such as when fisheries harvest more, or a greater proportion of Chinook than anticipated, due to higher than expected fishing success or fishing effort. Fishing schedules may be adjusted in-season, when low fishing

success, or results from test fisheries indicate that abundance is lower than forecast. The total abundance of cohorts contributing to the 2005 return for each population cannot be estimated until they are completely matured, so there is insufficient information to check the accuracy of the forecasts that informed 2005 pre-season management. However, the catch data (presented below) and escapement estimates suggest that many populations were less abundant than forecasted.

**Table 5-1. Natural spawning escapement of Puget Sound Chinook in 2005.**

Management Unit	Upper Management Threshold	Low Abundance Threshold	Predicted Escapement	Actual Escapement	Difference
Nooksack <sup>1</sup>	4,000		822	330	-60%
North Fork	2,000	1,000		210	
South Fork	2,000	1,000		120	
Skagit summer / fall	14,500	4,800	22,708	21,246 <sup>2</sup>	-6%
Upper Skagit summer		2,200		16,708	
Sauk summer		400		3,663	
Lower Skagit fall		900		875	
Skagit spring <sup>1</sup>	2,000	576	1,831	1,246	-32%
Suiattle		130		518	
Cascade		170		420	
Upper Sauk		170		308	
Stillaguamish <sup>1</sup>	900	650	1,572	963	-39%
North Fork summer	600	500		885	
South Fork & MS fall	300	Na		78	
Snohomish <sup>1</sup>	4,600	2,000	10,487	4,484	-57%
Skykomish	3,600	1,745		3,203	
Snoqualmie	1,000	521		1,281	
Lake Washington					
Cedar River	1,200	200	594	511	-14%
North Lake Tributaries				215	
Green	5,800	1,800	7,006	3,692	-47%
White River spring	1,000	200	2,318	1,290	-44%
Puyallup fall	0	500	1,902	725	-62%
South Prairie Creek	500				
Nisqually	1,100		1,173	2,159	84%
Skokomish	3,650 aggreg; 1,650 natural	1,300 aggreg; 800 natural	1,204	2,032	69%
Mid-Hood Canal	750	400	185	45	-76%
Dungeness	925	500	675	1,077	60%
Elwha <sup>3</sup>	2,900	1,000	2,522	2,120	-16%
Hoko	850	500	942	283	-70%

<sup>1</sup> Natural-origin spawners

<sup>2</sup> Includes broodstock removals – see text

<sup>3</sup> Includes escapement to both natural spawning grounds and to the hatchery

A description of the methods used to estimate escapement for each population conditions affecting spawning ground surveys follows:

#### Nooksack River (Early Chinook)

*North Fork* : The traditional estimate of the number of volitional (natural- and hatchery-origin) spawners in the North Fork and Middle Forks has been derived by expanding the total number of volitional recruit carcasses from the two watersheds by the 3.48 expansion factor. This factor is a five-year average of the ratio of cumulative redd counts to total carcass counts, in years when good visibility allowed accurate surveys. However, in 2005, an alternative method was developed by the co-managers. The expansion factor was applied only to carcasses in the North Fork. and to use the standard 2.5 redd expansion factor in the Middle Fork. Redd visibility in the Middle Fork was good, and deemed more accurate than the carcass count, so the redd count was expanded by the standard expansion of 2.5 adults/redd. The total natural spawning escapement to the North/Middle Forks was 2047 – 1757 in the North Fork and 290 in the Middle Fork. As observed in the past, the majority of the fish were hatchery-origin, with only 210 (10.3%) estimated to be of natural-origin. This abundance level is low, but not unexpected giving the history of escapements. The NOR estimate of 210 is slightly below the previous 5 year average (2000-2004) of 235.

*South Fork Chinook*: The natural escapement estimate is derived from weekly redd surveys, conducted from the middle of August until the first week of November in all sections of the river and in 2.6 miles of tributary streams. The total redd count is expanded by 2.5 Chinook/redd (i.e. 1 female and 1.5 males per redd) to obtain the estimate. Because of high flows late in the survey season, the confidence in the total estimate deteriorates. Early Chinook escapement is estimated from the numbers of redds detected prior to September 29. The South Fork estimate of spring Chinook was 120 adults. This number of recruits was lower that predicted and much lower than the previous five-year average of 234.

#### Skagit Spring

The terminal run size of 1,305 wild spring Chinook is close to the previous five-year average of 1,297, but only about 70% of the predicted terminal run size of 1,868. However, both the terminal run size and the resulting escapement were well above the low abundance threshold.

Extremely low flows throughout the survey season enabled excellent visibility and survey coverage for all three populations. The total redd count is expanded by

2.5 adults/redd to estimate total escapement. For the Suiattle a total of 207 redds were observed, and expanded to a total 518. For the Upper Cascade population, 168 redds were observed for an estimated 420 spawners. For the Upper Sauk, 123 redds were expanded to estimate 308 spawners. The Suiattle and Upper Cascade estimates were above the 2000-2004 average, while the Sauk estimate was below the recent average.

*Upper Sauk spring:* Total escapement estimate is based on redd counts from the town of Darrington up to the forks (RM 21.2 to 39.7), in the North Fork Sauk from its mouth upstream to the falls, and in the South Fork Sauk from its mouth to about RM 2.5. The redd count-based estimate replaced the former method, which was the peak live plus dead count, beginning in 1994 (Rebecca Bernard, Swinomish Tribe pers comm). Consequently, the time series from 1994 – 2005 is not comparable with previous years' estimates.

Five helicopter surveys and six ground surveys were conducted to count redds and carcasses. Foot surveys consistently yield lower numbers than aerial counts, due to the width and depth of some reaches. Aerial redd counts are plotted to estimate the area under the curve (AUC), between endpoints of Aug 15 and Nov 1. Redd life is assumed to be 30.2 days, (i.e., the mean of the value derived from foot surveys (22.9 days) and the back-calculated value from the aerial AUC (37.5 days). Though the escapement estimate is based on the 2.5 fish/redd expansion (or 1.5 males/female), samples from the test fishery have shown a ratio of 1.65, and carcass surveys indicate a ratio of 1.42 males/female. Of all systems in this study, Suiattle thought to have highest potential for multiple redds per female. However, the present estimate remains based on 1 female per redd. The total estimate assumed no redds in the turbid portion of the mainstem.

Total escapement estimates are based on redd counts in Big, Tenas, Straight, Circle, Buck, Lime, Downey, Sulphur, Milk creeks. Prior to 1994 four index areas (Big, Tenas, Buck, Sulphur) were used, averaging peak live-plus-dead count/mile from these areas. Since 1994 cumulative redd counts have been used. Index areas now include Big, Buck (excluded summer strays – early Oct), Circle, Downey, Lime, Milk, Straight, Sulphur and Tenas creeks along with Whitechuck River.

*Upper Cascade springs:* Total escapement estimate for this stock is based on redd counts from the mainstem Cascade River above RM 7.8, the lower reaches of the north and south forks of the Cascade, and in Marble, Found, Kindy, and Sonny Boy creeks. As with the other early stock, new escapement methodology was developed beginning in 1992. Data for the estimates originated from five surveys conducted on foot and two helicopter flights (RM 7.8 – 18.6). Redds are multiplied by 2.5 fish per redd.

Skagit Summer - Fall

The total Skagit summer/fall Chinook natural escapement was 20,946 – comprised of 16,708 upper river summers (including 100 removed for indicator program broodstock), 875 lower Sauk summers, and 3,663 lower river falls (including 343 removed for indicator program broodstock). This was the second highest escapement recorded in recent years, and was close to (i.e., 8% lower) the preseason projected escapement of 22,708.

Escapement estimates are usually based on aerial redd surveys, with foot surveys conducted for some of the tributaries. Survey conditions were considered good. However, as is the case in many years, counts in the Sauk River were affected by turbidity from the Chocolate Glacier. In at least one area, chum salmon spawning in the same reach hindered counting Chinook redds. The total observed redd count made during the October 26<sup>th</sup> aerial survey, was discounted by 50% to correct for the presence of chum redds.

*Lower Skagit Mainstem (fall):* Total escapement is usually estimated from redd counts in the mainstem Skagit River, between the town of Sedro Wooley and the mouth of the Sauk River, and in Finney and Day creeks. Fixed wing aerial surveys count redds from RM 15.6 to RM 67.1. Turbidity downstream of the mouth of the Sauk River counters the assumption of 100% visibility made by the old survey method. AUC estimates for three reaches use September 15 as start date on lower reach and September 1 for upper two reaches. End dates are December 1 for lower and middle reach and November 15 for upper reach. The old method used Sept 1 - Dec 1 for all reaches. Foot surveys provided a census of redds in Finney, Johnson, and Jackson creeks.

In 2005, due to extreme visibility problems in the mainstem, there was only one partial aerial survey of the mainstem. Consequently, in order to estimate Lower Skagit spawning escapement, we used a variance-weighted average of estimates that were calculated by using two different methods: multiplying the 2005 Upper Skagit summer escapement by the mean ratio between Lower Skagit fall and Upper Skagit summer escapements; and applying a regression of the escapement to two Lower Skagit tributaries (Day Creek and Finney Creek) against the Lower Skagit escapement.

*Upper Skagit Mainstem/Tribs Chinook:* Escapement estimates are based on redd counts in the mainstem Skagit River, from the mouth of the Sauk River to Newhalem, the lower Cascade River (RM 0.0 to 6.5) and in Illabot, Diobsud, Bacon, Falls and Goodell creeks. Three helicopter surveys of upper mainstem, and two helicopter surveys and three ground surveys on the lower Cascade River (RM 0.0 – 0.9), provide redd counts. AUC estimates use August 15 to November 1 as the start- and endpoints; the old method used November 8 as the endpoint.

*Lower Sauk (summer):* Escapement estimates are based on redd counts from the mouth of the Sauk River upstream to the town of Darrington (RM 0.0 to 21.1). Turbidity below the mouth of the Suiattle River precludes aerial surveys in that reach, and is believed to inhibit spawning downstream. Previous estimates assumed that 22% of redds occur below RM 13.2. However, a simulation based



on aerial surveys done in 1996 suggested that the majority of fish spawn below RM 13.2. The current method involves three aerial surveys above confluence (RM 13.2 – 21.1 Darrington Bridge), and foot surveys of Dan Creek slough, which is now part of the mainstem. The total redd count, then, comprises a census above RM 13.2, an assumed number downstream of RM 13.2, and tributary counts.

#### Stillaguamish

Escapement to the North Fork Stillaguamish River was estimated by the AUC method, using aerial surveys to count redds. The accuracy of aerial surveys was validated by concurrent foot and float surveys in previous years (Hahn 2001). There were four aerial surveys conducted in 2005. Assuming redd life of X days, and 2.5 adults per redd, yielded an estimate of 885.

Escapement to the South Fork is based on a peak redd count multiplied by 2.5 fish per redd. Tributaries surveyed include Boulder, Squire and Jim creeks. Assumption include: zero redds below the confluence of the North and South forks, 2.5 fish per redd and 21-day redd life. Hahn et al (2001) found that the precision and accuracy of the South Fork (fall) estimate were uncertain. The primary uncertainty in the AUC method was the inability to measure redd life. Low redd density and poor visibility at times also contribute to uncertainty. The South Fork estimate of 78 fish is considered less accurate than the North Fork due to poor visibility and lower survey effort, and is considered a minimum escapement estimate.

The total estimate for both populations was 963 spawning adults. This level of abundance was less than two-thirds of the predicted escapement of 1572 and about two-thirds that of the 2000-2004 average escapement of 1433.

#### Snohomish

*Skykomish River:* Spawning occurs throughout the mainstem Skykomish and Snohomish rivers, Wallace River, Bridal Vail Creek, Sultan River, Elwell Creek, and in the North and South Forks of the Skykomish River, which include fish passed above Sunset Falls. Natural spawning also occurs in the Wallace River, but many of these spawners originate from the Wallace River Hatchery, located at the confluence of May Creek and Wallace River. Escapement estimates are derived by the AUC method, using redd counts from aerial surveys of index reaches in the Skykomish mainstem (RM 20.5-49.6) and in the South Fork up to Sunset Falls. Additional surveys are conducted on the Wallace River. The calculation assumes 21-day (redd life) intervals, corrects the survey data by 0.95 to account for true redds, and expands the cumulative total redd count by 2.5 fish/redd. *(Estimate is based on mid-Sept visible redds / total escapement ratio in prior year)* Added to this is the number of fish trucked above Sunset Falls. For 2005 the estimated escapement was 3,203, which is below the 2000-2005 average escapement of 4,931.

*Snoqualmie*: Fall Chinook spawn in the Snoqualmie River and its tributaries, including the Tolt and Raging rivers, and Tokul Creek. Spawning also occurs in the Pilchuck and Sultan rivers. Spawn timing extends from mid-September through October. Escapement is estimated by the AUC method from aerial survey of an index reach, comprising 10.1 miles of the 39.6 miles of river below Snoqualmie Falls. As for the Skykomish system, aerial redd counts are corrected by a factor of 0.95, redd life is assumed to be 21 days, and the cumulative total redd count is expanded by 2.5 fish per redd. (*No expansion factor is used*). The 2005 estimate for the Snoqualmie population was 1,281, which is below the 2000-2005 average escapement of 2,574.

The total estimated escapement for the two Snohomish populations was 4,484, which is significantly below the pre-season FRAM projection of 10,487.

## Lake Washington

Cedar River: Escapement is estimated using the AUC method. Live fish are counted by float surveys of entire river below Landsburg Dam. Though the float survey may underestimate live fish, a relatively short redd life of 10 days is assumed. Redds have also been enumerated since 1999, and at some point redd counts may be substituted as the basis for escapement estimates.

The escapement estimated for 2005 on the Cedar was 511, which was close to the FRAM escapement prediction of 594. It is also close to the 2000-2004 escapement average of 489. On the Cedar 259 carcasses were sampled for scales, CWT and adipose clips. The majority of the fish sampled were four-year-olds (46.7%), followed by threes (36.6%) and then fives (12.3%). Ten of the samples were unreadable. Sampling analysis suggests that 29.3% of the spawning fish were hatchery-origin. Taylor creek, a tributary of the Cedar River was also surveyed. Twenty carcasses were sampled, with 60% of them hatchery-origin fish. Two CWT'd Chinook were collected - one from Tulalip Hatchery and one from Grovers Creek.

*North Tributaries:* The escapement estimate is based on the AUC constructed from live-count surveys of index reaches in Bear and Cottage creeks. Since 1998 other portions of the Bear Creek watershed are also surveyed annually, but these counts are not included in the estimate. The index-based estimate is not expanded to account for unsurveyed areas in other tributaries. For 2005 the estimated escapement is 215, which is somewhat comparable to the previous five-year average of 261. There was no FRAM escapement prediction for these watersheds. The HOR/NOR composition for these two watersheds, along with North Creek, was 79% hatchery-origin and 21% natural-origin. Ten CWT'd Chinook were sampled in the north lake tributaries. Three were from the Issaquah Creek Hatchery, four from Grovers Creek Hatchery, two from Portage Bay Hatchery (UW), and one from the Cowlitz River (Lower Columbia).

## Green

Beginning in 2003, a new method for estimating natural escapement was employed in the Green River. Estimates of the number of female spawners in the mainstem Green River and Newaukum Creek were available from mark-recapture studies conducted in 2000 - 2002. The estimate of mainstem females was compared to the "adjusted" peak count of visible redds for that year, with the assumption that each female dug a single redd. In 2003, the mean ratio of mainstem females to mainstem adjusted peak redds (3.109) from the three study years was applied to the 2005 adjusted peak redd count to estimate mainstem female spawners. A sex ratio of 1.5 males per female was used to expand the number of female spawners to total mainstem escapement.

Aerial counts of visible redds were adjusted as follows. In each year of the study, counts of visible mainstem redds were made weekly by helicopter in 33 reaches encompassing all the spawn habitat in the mainstem river. Weekly counts of visible redds were also made by rafts in 12 to 14 of the 33 reaches. Since counts made by raft are assumed to be more accurate than aerial counts, a weekly adjustment factor for aerial redd counts was calculated by dividing the raft counts by the aerial counts from reaches surveyed by both methods, and then calculating the weekly average. This weekly average was only used to adjust counts in reaches surveyed only by air. The weekly redds count, then, is the sum of redds in reaches counted by raft and the adjusted number from reaches counted only by air. The peak redd count is merely the highest weekly count of redds, after the necessary weekly adjustment factor has been applied.

Newaukum Creek natural spawners were estimated by the standard foot-survey method used in past years. Redds completed since the previous survey are counted and marked each week in an index reach from the creek mouth to river mile 1.0. The season cumulative redds are compared to the peak count of visible redds in this index reach, and a multiplier is calculated for converting the peak count of visible redds to an estimate of cumulative redds. The multiplier is applied to the peak visible redd count to estimate total redds upstream of the index reach (RM 1.0 – 2.8). The sum of the cumulative redds for both reaches is the annual estimate of females. A sex ratio of 1.5 males per female was assumed in calculating the total Newaukum Creek escapement.

The total Green River natural spawning escapement for 2005 is estimated at 4,089, which is down considerably from recent year levels and well below the FRAM model escapement prediction was 7006. The 2000-2004 average is over 14,000. For the Green River mainstem, the estimated cumulative number of redds (1,477) was expanded by 2.5 to yield the total escapement estimate of 3,692. The cumulative redd estimate for Newaukum Creek (159) was expanded to an estimate escapement of 397.

Survey conditions were generally good throughout the sampling period, except during the early October survey when high flow during the previous weekend reduced visibility. Pink salmon escapement increased again in 2005. The September 20-22 surveys estimated 250,000 to 500,000 live pink salmon in the middle reach of the Green River. However, they did not have any significant effect on the surveyors' ability to identify Chinook and redds. The only concern was that the smaller size Chinook (3 year-olds) may be underestimated since they were not as obvious as larger Chinook when massed amongst pink salmon carcasses.

Based upon CWT recoveries from carcasses sampled on the spawning grounds, the proportion of hatchery strays has averaged about 60 percent, but has ranged from 25 to over 90 percent. In 2005, of 538 carcasses sampled from the mainstem, 52.6 percent were of hatchery origin. Of 355 carcasses sampled in

Newaukum Creek, 70.1 percent were adipose fin clipped. For the entire Green River system, hatchery-origin fish comprised 59.6 percent of total natural spawners.

#### White River Springs

The estimate of natural escapement to the White River is number of adults trapped at the Army Corps of Engineer's Buckley Diversion Dam and trucked above Mud Mountain Dam. The 2005 estimate was 1,756 adults. Of these 1,290 were natural-origin Chinook, and 466 were hatchery-origin fish that were released into acclimation ponds in the upper watershed. This total was about 75% of the predicted escapement. The Puyallup Tribe also conducted spawning surveys in the lower portion of the river and in Boise Creek. On the mainstem there were two float surveys; the first from RM 24 down to RM 15 and the other from RM 15 down to RM 6. Seven redds were seen along with 17 live and 5 dead (no samples). Boise Creek was surveyed from the mouth up to RM 4.5. The sightings included 440 live, 221 dead and 89 redds. All of the carcasses were sampled, and of the 221 dead, 129 fish were adipose clipped, 11 were coded-wire-tagged and 1 fish (acclimation origin) was right ventral clipped. Survey data collected in the lower river is not included in the natural escapement estimate. Escapement to the hatchery programs included 464 adults the Minter Creek/Hupp Springs facility, and 1597 to the White River Hatchery.

#### Puyallup

Puyallup Tribal Fisheries (PTF) and Washington Department of Fish and Wildlife (WDFW) revised the Puyallup River fall Chinook escapement estimation methodology in 1999. PTF and WDFW agreed that, although the two base years (1975 and 1976) may represent different distribution patterns, the large variation in the estimation statistics between years likely points to deficiencies in the stock assessment data (especially in 1975) and/or the base year's tagging studies themselves. Therefore, the staffs revised the escapement methodology to utilize redd counts that are independent of the tagging studies. The new redd count-based methodology was used to estimate 2005 escapement, based on surveys of South Prairie Creek, the Carbon River, the Puyallup mainstem, and other tributaries of the mainstem.

*South Prairie Creek:* There is consensus that South Prairie Creek is the most productive habitat in the basin, so estimating escapement to that system is critical. In the 1999 review, it was agreed that even-year South Prairie Creek Chinook escapement estimates would be based on cumulative redd counts. In odd-years estimates would be calculated using the live-count AUC method.

Survey coverage was excellent in 2005, but a very large pink salmon escapement, estimated to be 466,000, prevented accurate counts of Chinook. Pink salmon inundated most pools and all available spawning habitats, and the sheer number of pinks screened visibility of Chinook and overwhelmed Chinook redds as they were constructed. It is therefore believed that the Chinook estimate

for South Prairie Creek is grossly underestimated.

For 2005, the South Prairie Creek live count AUC estimate was adjusted by the ratio of redd count-based estimates/AUC live count -based estimates, to correct for the effect of spawning pink salmon on visibility. This ratio has been fair consistent – the historic mean ratio is 2.08, the 2000 ratio was 2.07, and the 2002 ratio was 1.94. That consistency supports use of the mean ratio. The additional data from 2002 reduced the mean ratio to 2.05. The 2005 AUC method yielded an escapement estimate of 185 spawners for South Prairie Creek. Expanding this estimate by the pink salmon correction factor yielded a South Prairie escapement of 379. Wilkeson Creek contributed 10 Chinook to the escapement estimate for a total South Prairie Creek basin estimate of 389.

*Carbon River:* Suitable survey conditions occur seldom in the Carbon River, and never occurred during the 2005 spawning period. However, survey conditions were good in 1999, enabling a valid comparison with South Prairie Creek escapement. The ratio of South Prairie Creek escapements in 2005 and 1999 ( $389/1422 = 0.2765$ ) was applied to the 1999 Carbon River estimate (250), to estimate 2005 escapement to the Carbon River of 68.

*Mainstem Puyallup River Tributaries:* Redd-based escapement estimates were calculated for Puyallup River tributaries except in Clarks Creek. Pink salmon did not inundate these smaller tributaries as much as mainstem streams and did not affect survey ability to count Chinook redds. In Clarks Creek, the peak live/dead count of 25 fish occurred on October 24, 2005; and the total number of Chinook carcasses sampled was 50 fish. However, only 11 redds were counted, which if expanded by 2.5 fish per redd would have estimated escapement of 28. To compensate for potential missed redds and number of fish observed, escapement for Chinook in Clarks Creek was estimated by doubling the peak live/dead count ( $25 * 2 = 50$ ). Escapement to other tributaries were as follows: Fennel Creek 10, Canyon Falls Creek 0, Kapowsin Creek 30, Clear Creek 23. Adding these estimates to the Clark's Creek estimate of 50 yields a subtotal of 113.

*Mainstem Puyallup River:* Similar to the Carbon River, survey conditions in the mainstem Puyallup River were not suitable during the 2005 Chinook spawning period. The PTF and WDFW staff did not believe that the 1999 Carbon River estimation method was appropriate for the Puyallup because the 2005/1999 Chinook escapement ratio was different for the mainstem than for the tributaries. Instead, it was decided to use a ratio of 1999 and 2005 tributaries' escapement ( $90/113 = 0.7965$ ), applied to the 1999 mainstem escapement (195) to estimate 2005 escapement to the mainstem of 155. To be consistency with methods used in 1999, Clear Creek escapement was not included in the tributaries' escapement ratio. However, Clear Creek escapement is included in the total Puyallup River natural fall Chinook escapement estimate.

*Total Escapement:* The total estimated Puyallup River natural fall Chinook escapement was estimated to be 725 fish (i.e., the total of South Prairie Creek (389), Carbon River (68), tributaries (113), and Puyallup mainstem (155)). This estimate is significantly less than the pre-season escapement estimate of 1902. However, it is considered a very conservative estimate as a result of the complications with spawning pink salmon.

### Nisqually

Escapement survey conditions in the Nisqually mainstem are poor in most years due to the glacial origin of the river (i.e., high turbidity). Spawning surveys are conducted on the Nisqually mainstem from RM 21.8 to 26.2 to obtain a peak redd count, and on Mashel from RM 0 to 3.2 to obtain a peak fish count. An expansion factor of 2.5 adults per redd is applied to the mainstem peak redd count. The subtotal of the mainstem and Mashel is expanded by 6.82 to estimate total system escapement. Ohop Creek (RM 4.6-6.3) is surveyed to count redds sample carcasses. Since 2000, all hatchery Chinook have been marked, making it possible to determine the hatchery/wild composition of natural Chinook spawners in the future.

The 2005 escapement estimate for the Nisqually River was 2,159, higher than the FRAM predicted escapement of 1,173, and above the 1,457 average for the previous five years.

### 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 17 (where Cushman Dam blocks further access). Natural escapement estimates are based on counts of Chinook redds in index areas 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). In addition, escapement estimates are also made for Purdy Creek, Vance Creek, Hunter Creek, and McTaggart Creek.

Since 1991, live and dead adults, along with visible redds were counted in Skokomish River index areas using foot and raft surveys. Surveys are conducted every seven to ten days from late August through October. New redds and visible redds are counted each survey in all index sections of the mainstem Skokomish, North Fork and South Fork. A helicopter flight is made most seasons during peak spawning to count redds and adult Chinook in the South Fork upstream of RM 2.2. In addition, foot surveys are made in Hunter and Vance creeks to spot check Chinook abundance and better determine escapement there. Escapements to Hunter Creek and Vance Creek were estimated using the spawners/mile for RM 0.8 to 2.2 in the South Fork and the available habitat in each creek (i.e., 1.7 miles for Hunter Creek and 0.5 miles for

Vance Creek). Escapements to Purdy Creek are based on the counts of live Chinook downstream of George Adams Hatchery (Smith and Castle 1994).

Coded-wire tag (CWT) data and age and sex composition data have been routinely collected for Chinook returning to George Adams Hatchery. More intensive sampling has been done since 1998 on the natural spawning grounds. The proportion of hatchery fish marked has been relatively low in past years – including only the indicator CWT group and double-index tag group. The proportion marked will increase in future, under an agreement reached between the Skokomish Tribe and WDFW. For the 2004 brood year, about 44% of Hood Canal Hatchery fish were marked in some way.

For 2005, the Skokomish River experienced very low flows at the beginning of the season and Chinook were not able to pass upstream of the confluence of Reichert Springs and the North Fork (RM 8) until after October 6. No surveys were done on the South Fork upstream of RM 2 this year due to the extremely low flows. Very few fish were observed in the lower South Fork.

All index areas were surveyed about every 7 to 10 days. Redds were marked with a weighted material and a different colored flagging each week. A cumulative new redd count for each section of the river was tabulated at the end of the season and multiplied by 2.5 fish per redd to estimate total Chinook escapement. However, on the North Fork this year, Area-Under-the-Curve (AUC) methodology was used to estimate the escapement from river mile 9.0 to 13.3 since more live and dead fish were observed during surveys on September 27 or October 4 than the escapement estimated from cumulative new redds. The escapement estimate for Hunter Creek was calculated by multiplying the peak live and dead count from RM 1.6 to RM 1.4 times three to include the spawnable area not surveyed.

The 2005 spawning escapement estimate included 1,445 Chinook in the mainstem Skokomish, 529 Chinook in the North Fork Skokomish, and 58 Chinook in the South Fork Skokomish for a total escapement of 2,032 Chinook in the Skokomish River system during 2005. The FRAM preseason escapement prediction was 1,204.

The surveys included sampling 362 Chinook off the spawning grounds or about 18% of Chinook spawner escapement in the Skokomish system. Four CWTs were recovered; one in the mainstem Skokomish, one in the North Fork Skokomish, and two in Hunter Creek. All CWTs originated from George Adams Hatchery releases in the Skokomish watershed. A preliminary estimate (which accounts for unmarked hatchery Chinook) is 32% HORs in the Skokomish River system during 2005 and. This is comprised of about 40% HORs in the mainstem Skokomish, 19% HORs in the North Fork Skokomish, and 0% HORs in the South Fork Skokomish (pers. comm., T. H. Johnson, WDFW)



Table 5-2. Chinook salmon sampled for CWTs in Hood Canal rivers, 2005

River	Spawner escapement	Number sampled	% sampled	CWTs sampled
Dewatto R.	426	168	39.5%	4
Tahuya R.	11	1	9.1%	0
Union R.	93	9	9.7%	1
Mainstem Skokomish R.	1,445	215	14.9%	
N.F. Skokomish R.	529	142	26.8%	3
S.F. Skokomish R.	<u>58</u>	<u>5</u>	<u>8.7%</u>	1
Skokomish River total	2,032	362	17.8%	<u>0</u>
				4
Lilliwaup R.				
	168	96	57.0%	
Hamma Hamma R.				1
Duckabush R.	33	30	92.0%	
Dosewallips R.	2	1	50.0%	1
Mid-Hood Canal total	<u>10</u>	<u>0</u>	<u>---</u>	0
	45	31	69.5%	<u>0</u>
				1
Hood Canal total	2,775	668	24.1%	11

Escapement estimates and mark sampling were also done in other Hood Canal streams during 2005. Spawner escapement estimates are 426, 11, 93, and 168 Chinook in the Dewatto, Tahuya, Union, and Lilliwaup rivers, respectively. Surveys were also conducted in Anderson, Mission, Eagle, Jorsted, and Quilcene rivers, but no Chinook escapement was observed. A total of 276 Chinook were mark sampled in these streams and six Chinook were coded wire tagged Table 5-2). Five CWT Chinook originated from Hoodport Hatchery (3 in Dewatto, 1 in Union, and 1 in Lilliwaup) and one CWT Chinook sampled in Dewatto River originated from Big Beef Creek Hatchery.

#### Mid-Hood Canal Tributaries

The Mid Hood Canal management unit is comprised of the Hamma Hamma, Duckabush, and Dosewallips rivers. 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. Since 1998, escapement was estimated from counts of live Chinook using the area-under-the curve (AUC) method.

In the Dosewallips and Duckabush rivers, the lower reaches surveyed are spawning and transit areas, but do not include all spawning areas. Upper reaches have been regularly surveyed in the Dosewallips and Duckabush since 1998, but few adults or redds have been observed. It has been possible to count Chinook redds in the upper Dosewallips and Duckabush River reaches (especially in years without pink salmon). However, counts of live Chinook are conducted on in the lower reaches since Chinook redds cannot be identified due to concurrent spawning of summer chum salmon. Current escapement estimates are derived from a combination of counts of live adults and redds.

In 2005, WDFW staff conducted spawner surveys on the Dosewallips, Duckabush, and Hamma Hamma rivers every 7 to 10 days from early September through October. Summer chum and pink salmon 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 the 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.

The total escapement estimate to the three systems was only 45 adults. The FRAM preseason projection was 185. The low abundance threshold for the Mid-Hood Canal management unit in the Harvest Management Plan is 400. It has been assumed that many of the naturally-spawning Chinook in these rivers are due to hatchery strays as well as adult returns from hatchery fry released into these rivers. However, except for hatchery Chinook from the supplementation program on the Hamma Hamma, sampling carcasses for CWTs and scales indicates that few fish were of hatchery origin. A smolt trap has been operating on the Hamma Hamma River since 2002 to assess natural Chinook productivity.

During 2005, it is possible that some Chinook redds were not identifiable on the Dosewallips and Duckabush rivers in areas with pink and summer chum spawning. However, based on the number of Chinook redds and adults observed during surveys, the escapement estimates are probably only slightly lower than the true total.

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. Four Chinook redds were observed in 2005, which, expanded by 2.5 fish per redd, results in an escapement estimate of 10. A total of eight live Chinook were observed and most were actively spawning or in the immediate vicinity of Chinook redds. The Duckabush River was surveyed from RM 0 to RM 2.6 and RM 4.8 to RM 6. No Chinook redds were observed and one live and one dead Chinook were observed. The 2005 escapement estimate for the Duckabush was 2. The Hamma Hamma River was surveyed from RM 0.3 to RM 1.8 and John Creek, a tributary, was also surveyed. A total of 18 live Chinook were observed and the AUC method was used to estimate an

escapement of 13 Chinook spawning in the Hamma Hamma River. In addition, 20 Chinook were collected by Long Live the Kings and WDFW and removed from the river as broodstock for a supplementation program on the Hamma Hamma River during 2005. John Creek was not accessible to Chinook during 2005 due to extremely low flows at the mouth. Total 2005 escapement to the Hamma Hamma River system was estimated to be 33.

During 2005, Mid-Hood Canal Chinook were targeted for enhanced CWT sampling using Pacific Salmon Treaty funds. For mid-Hood Canal Chinook, about 69% of the spawner escapement was sampled for CWTs (Table 5-2). On the Hamma Hamma, 30 fish (91% of escapement) were sampled; one fish had a CWT, which originated from George Adams Hatchery. On the Duckabush River, one Chinook (50% of spawner escapement) was sampled and had no CWT. On the Dosewallips River, no Chinook carcasses were observed.

### Dungeness

Since 1986, foot surveys have counted redds RM 0 to 18.7 in the mainstem Dungeness, from RM 0 to 5.0 in the Gray Wolf River, and RM 0 to 0.3 in Gold Creek. As seen in the past, the majority of fish spawned in the lower reaches of the Dungeness, with about 75% located below RM 9. Visibility was good throughout the survey period. The cumulative total redd count is multiplied by 2.5 adults/redd to estimate total escapement. In 2005 the redd count in the Dungeness was 372, and 10 in the Gray Wolf. This yielded an estimate of 955 Chinook that spawned naturally. In addition, 122 Chinook (68 males and 54 females) were trapped for use as broodstock in the supplementation program at the Hurd Creek Hatchery, so the estimated total escapement was 1,077. This is the highest estimated return for the Dungeness in at least 30 years, though a large proportion were of hatchery origin. An initial estimate of NOR/HOR composition is based on the broodstock. Of the 52 females, 12 fish (23.1%) were of natural-origin; of the 62 males taken, 12 fish (19.4%) were natural-origin, which give a 21% natural-origin composition. Hatchery fish were identified by CWTs, adipose fin clips, otoliths, and scales. The preseason escapement projection of 675 was an average of the previous four years' escapements.

### Elwha

Spawning Chinook can only access the 4.8 river miles below the Elwha Dam; most of the natural spawning taking place between RM 2.8 to 4.4. The preferred method of estimating adult escapement in the mainstem is plotting visible redds versus date and calculating the area under the curve. The resulting number of redd-days is divided by 21-day redd life to estimate the cumulative subtotal number of redds above RM 2.8. This redd subtotal is added to the number of redds counted by the Lower Elwha Tribe in the 1 mile-long Hunt's Road side channel index reach. The total redd count is then multiplied by 2.5 adults/redd. For 2005, the number of naturally spawning Chinook was estimated to be 723. In addition, 1,404 Chinook were collected for hatchery broodstock, including

1,193 which were gaffed, 204 which were seined, and 7 mortalities. The total of natural and hatchery broodstock was 2,127. The preseason estimated escapement was 2,522. Compared to past escapements, the 2005 estimate is close to the 2000-2004 average of 2,169.

### Hoko

Escapement estimates are derived from foot survey redd counts. between RM 1.5 to 21.7, in the mainstem and tributaries. There are ten mainstem reaches surveyed between RM 1.5 – 21. 7, plus 13 reaches in the Little Hoko River, a tributary to the lower mainstem, and Browne's, Herman, N.F. Herman, Ellis, Bear and Cub creeks, which are tributaries to the upper mainstem. The surveyed area represents the entire range where Chinook spawn in the Hoko basin. Redd counts are multiplied by 2.5 adults/redd to estimate total escapement.

Chinook escapement in 2005 was estimated to be 283, which is below the pre-season projection of 942. Survey conditions were generally good, so the estimate is thought to be accurate. Escapement to the Hoko Hatchery, which requires 200 adults for broodstock, was only 80.

## 5.2 Escapement Trends

Inspection of escapements over the last ten years (Table 5-) indicates an increasing trend for Skagit summer / fall, White spring, and Dungeness populations. The increase in abundance for the latter two populations is attributable to the success of supplementation hatchery programs operating in those systems. The increasing trend for Snohomish and Green populations, through 2004, contrasts with significantly lower escapement in 2005. Escapement has been variable but apparently stable for Skagit spring, Stillaguamish, Nisqually, and Skokomish populations.

Total natural escapement to the North and Middle Forks of the Nooksack River has been supplemented by returns from the Kendall Creek supplementation program. However, the low return of natural-origin Chinook for both Nooksack early populations reflect their chronic, critical status. Escapement to the Mid-Hood Canal rivers has also fallen below the critical threshold. Harvest management measures to conserve these critical stocks have been implemented consistently, but their status indicates very low natural productivity due to poor habitat quality. Further constraint of harvest would not materially improve their spawning escapement, and would have no influence on productivity.

**Table 5-3. Puget Sound Chinook Natural Spawning Escapement, 1996 - 2005**

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Nooksack Spring	412	254	194	249	443	532	506	414	444	330
NF Nooksack <sup>/1</sup>	209	74	37	85	160	264	224	210	314	210
SF Nooksack	203	180	157	164	283	268	282	204	130	120
Skagit Spring	1,051	1,041	1,086	471	1,021	1,856	1,065	844	1,575	3502
Cascade sp	208	308	323	83	273	625	340	298	380	420
Upper Sauk sp	408	305	290	180	388	543	460	193	700	308
Suiattle sp	435	428	473	208	360	688	265	353	495	518
Skagit S/F <sup>2</sup>	10,613	4,872	14,609	4,924	16,930	13,793	19,591	9,777	23,891	20803
Lower Sauk	1,103	295	460	295	576	1,103	910	1,493	443	875
Upper Skagit	8,082	4,247	11,852	3,664	13,185	10,159	13,895	7,223	20,145	16,709
Lower Skagit	1,521	409	2,388	1,076	3,383	2,683	4,885	1,394	3,203	3,635
Stillaguamish <sup>1</sup>	1,244	1,156	1,540	1,098	1,622	1,349	1,588	988	1,506	963
North Fork	993	930	1,292	845	1,464	1,066	1,253	883	1,358	885
South Fork	251	226	248	253	158	283	335	105	148	78
Snohomish <sup>1</sup>	4,851	4,295	6,304	4,799	6,092	8,164	7,220	6,214	10,606	4484
Snoqualmie	1,032	1,937	1,892	1,344	1,427	3,589	2,895	1,975	2,990	1281
Skykomish	3,819	2,358	4,412	3,455	4,665	4,575	4,325	4,239	7,616	3203
North L. Wash tribs	33	67	265	537	227	459	268	212	143	215
Cedar	303	227	432	241	120	810	369	562	587	511
Green	6,026	9,967	7,312	11,025	6,170	7,975	13,950	10,042	13,991	4,089
White R. Spring	628	402	320	553	1,523	2,000	803	1,434	1,626	1,756
Puyallup	2,444	1,554	4,995	1,988	1,193	1,915	1,590	1,173	1,065	725
South Prairie Cr	1,268	667	1,028	1,430	695	1,154	840	740	573	379
Nisqually	606	340	834	1,399	1,253	1,079	1,542	627	2,788	2,159
Skokomish	995	452	1,327	1,817	843	1,794	1,479	1,125	2,398	2,032
Mid-Hood Canal	24	6	287	762	438	322	95	194	129	45
Dungeness	183	50	110	75	218	453	663	640	1,014	1,077
Elwha	1,875	2,527	2,409	1,629	1,959	2,208	2,376	2,305	3,443	2,120
Hoko	1,253	868	1,156	1,690	700	946	686	1,100	954	283

<sup>1</sup> Natural-origin spawners <sup>2</sup>Includes broodstock removals for indicator stock programs

## 6. Exploitation Rates

Fishing exploitation rate is calculated, for a population or management unit, as fishing mortality divided by the sum of fishing mortality and escapement. Fishing mortality includes landed non-landed mortality. Total exploitation rates include fisheries-related mortality in all fisheries in Alaska, Canada, and Washington. A southern U.S. (SUS) exploitation rate reflects only fishing mortality that occurs in Washington, and a pre-terminal SUS exploitation rate reflects only mortality that occurs in fisheries in Washington coastal ocean, Strait of Juan de Fuca, and Georgia – Rosario Strait fisheries. The exploitation rates on Puget Sound Chinook that were projected during pre-season fishery planning for the 2005-06 management years were all less than or equal to the objectives stated in the Harvest Management Plan (Table 3-A).

**Table 6-1. Projected harvest exploitation rates, and management objectives, for Puget Sound Chinook management units for the 2005-06 management year.**

Management Unit	RER or ER ceiling	Critical ER Ceiling	2005-06 Management Objective	Preseason Projected ER
Nooksack	under dev.	7% SUS	7% SUS	6% SUS
Skagit summer / fall	50%	15%	50%	40%
Skagit spring	38%	18% SUS	38%	29%
Stillaguamish	25%	15% SUS	25%	26%
Snohomish	21%	15% SUS	15% SUS	15% SUS
Lake Washington	15% PTSUS	12% PTSUS	15% PTSUS	10% PTSUS
Green	15% PTSUS	12% PTSUS	15% PTSUS	10% PTSUS
White River spring	20%	15% PTSUS	20%	20%
Puyallup fall	50%	12% PTSUS	12% PTSUS	49%
Nisqually		NA	NA	76%
Skokomish	15% PTSUS	12% PTSUS	15% PTSUS	12% PTSUS
Mid-Hood Canal	15% PTSUS	12% PTSUS	12% PTSUS	12% PTSUS
Dungeness	<10% SUS	6% SUS	6% SUS	5% SUS
Elwha	<10% SUS	6% SUS	<10% SUS	4% SUS
Western JDF	<10% SUS	6% SUS	<10% SUS	5% SUS

For the purposes of pre-season planning, forecasted Chinook abundance and fishing season structure are input to FRAM in order to estimate exploitation rates for all populations or management units that are associated with the upcoming management year. The model is also run post-season to estimate actual exploitation rates, by inputting actual abundance and catch, for previous management years. These post-season ‘validation’ model runs are compiled every three years, as part of regular re-calibration of the FRAM. The most recent

validation set provides estimates of exploitation rates for management years 1983 – 2003.

Post-season FRAM runs enable the co-managers to examine the actual outcome of a given management year and determine whether the exploitation rates associated with previous years' fisheries were within the constraints imposed by the the Chinook Harvest Management Plan.

Though management objectives for some management units have been subsequently modified, or have varied from year to year due to their abundance status, post-season exploitation rates for management years 2000 – 2003 provide information about the performance of recent fishing regimes developed under the Harvest Plan. The comparison between pre-season projections for past years and the post-season estimates is not exact, because the FRAM has been 'patched' or otherwise modified to improve its accuracy each year. A more detailed analysis than provided here is necessary to determine whether the differences between pre- and post-season estimates are due to model changes, or management imprecision.

The Harvest Plan established total exploitation rate ceilings for six Puget Sound management units For Skagit summer – fall and spring, Stillaguamish summer-fall, and White spring units, the actual exploitation rates in 2000 through 2003 were below the Plan ceilings. The total exploitation rate on the Snohomish summer-fall unit met or exceeded its RER ceiling, and in three previous years the actual SUS ER exceeded the 15% SUS ceiling rate under which this unit is currently managed. The total exploitation rate on the Puyallup unit also consistently exceeded the current objective of 50% (Table 6-2).

Table 6-2. Exploitation rate ceilings imposed by the harvest management plan compared to FRAM pre-season projections and post-season 'validation' models.

	ER Ceiling	2000		2001		2002		2003	
		Proj	Valid	Proj	Valid	Proj	Valid	Proj	Valid
<b>Management units with total ER ceilings</b>									
Skagit S/F	50%	29%	29%	40%	28%	26%	36%	50%	47%
Skagit Spring	38%	22%	26%	21%	34%	23%	28%	24%	15%
Stillaguamish S/F	25%	15%	21%	17%	22%	14%	19%	18%	22%
Snohomish S/F	24%	26%	26%	23%	25%	19%	31%	21%	26%
White R Spring	20%	16%	15%	17%	18%	17%	13%	19%	16%
Puyallup Fall	50%	38%	70%	48%	72%	50%	67%	50%	82%
<b>Management units with southern U.S. ER ceilings</b>									
Nooksack Early	7%	4%	6%	7%	4%	7%	1%	7%	3%
Snohomish S/F	15%	20%	18%	15%	14%	14%	19%	15%	16%
Dungeness	6%	8%	6%	6%	3%	5%	6%	5%	8%
Elwha	10%	8%	6%	6%	3%	5%	6%	5%	8%
<b>Management Units with pre-terminal southern U.S. ER ceilings</b>									
Lake Washington	12%	14%	8%	12%	6%	12%	6%	11%	9%
Green	12%	12%	8%	12%	6%	10%	6%	11%	8%
Skokomish	15%	?	11%	12%	12%	13%	10%	14%	13%
Mid Hood Canal	12%	14%	11%	12%	12%	12%	9%	14%	13%



In 2000 – 2003, the Nooksack and Dungeness units were forecast to return below their current critical threshold level, so preseason planning was attentive to their conservation. In 2002 and 2003 the management objective for Dungeness was to hold the SUS ER at or below 10%. The Mid-Hood Canal unit was forecast to return below the current critical threshold of 400 in 2000 and 2001. The first (2001) version of the Harvest Plan stated that the SUS ER on Mid Hood Canal Chinook would be held at or below 15%.

Actual exploitation rates were consistently below the 7% SUS ER ceiling established for Nooksack early Chinook and the 10% SUS ER established for the Elwha unit. Nooksack early Chinook have been in critical status since the Plan was first developed. The actual SUS ER on the Dungeness unit met the 6% ceiling in 2000 and 2002, and exceeded it in 2003. Actual pre-terminal SUS ERs on the Lake Washington and Green River units were consistently below the 12% ceiling. Actual PT SUS ERs for the Skokomish and Mid-Canal units were consistently below the 15% ceiling, but exceeded the 12% ceiling for the Mid-Hood Canal unit which has been imposed by critical status in more recent years.

For those management units that are managed under total exploitation rate ceilings, post-season FRAM estimates show that, with the exception of the Skagit summer - fall management unit, a majority proportion of the total exploitation occurred in southern U.S. fisheries, in 2000 – 2003. (Table 6-3).

**Table 6-3. Post season estimates of southern U.S. exploitation rate and the proportion of the total exploitation rate associated with southern US fisheries.**

	2000	2001	2002	2003
Skagit S/F	6%	7%	7%	11%
% of total ER	21%	25%	19%	23%
Skagit Spring	19%	23%	19%	8%
% of total ER	74%	68%	67%	55%
Stillaguamish	17%	13%	12%	17%
% of total ER	82%	60%	62%	76%
Snohomish	18%	14%	19%	16%
% of total ER	68%	55%	61%	61%
White	11%	13%	10%	11%
% of total ER	74%	73%	78%	67%
Puyallup	61%	61%	60%	72%
% of total ER	87%	85%	89%	88%

Post-season FRAM estimates suggest, generally, that harvest regimes have been successful in constraining Chinook mortality in accordance with the

objectives of the Harvest Plan. Consistent exceedence of the Plan objectives would be cause to evaluate why harvest regimes have not performed as expected, since pre-season models have predicted full compliance with objectives. In some cases, fisheries have subsequently been further constrained, such as the conservation measures implemented in the Puyallup River terminal fisheries in 2004 and 2005. In other cases, rising impacts in northern fisheries outside of the immediate control of the Washington co-managers have increased the total exploitation rate.

Further post-season evaluation is required by the Harvest Plan. Coded-wire tag data enables an independent estimate of brood-year and annual (calendar year) exploitation rates for PSC indicator stocks, and may provide metrics for assessing the accuracy of the ERs estimated by FRAM. For some management units so managed under the Harvest Plan, ERs estimated from CWT data may also be directly compared with RERs, which are based on the current productivity of component populations.

## 7. Commercial Fisheries Monitoring

### 7.1 Nontreaty Commercial Fishery Bycatch

WDFW annually conducts routine aerial nontreaty vessel counts and focused on-water monitoring as needed. In 2005, on-water surveys were conducted during fisheries in areas 7/7A directed at sockeye, pink and chum, and during chum-directed fisheries in areas 10/11 (South Puget Sound) and 12/12B (Hood Canal). Note that estimates of total bycatch reported below are preliminary and subject to change.

#### Commercial Sockeye & Pink Directed Fisheries (Areas 7 and 7A)

WDFW monitored 2005 nontreaty commercial purse seine catch and bycatch in both the Fraser-Panel-controlled sockeye salmon fisheries. Bycatch for these areas consisted of Chinook and coho salmon, as well as other non-target fish species, benthic invertebrates, and marine birds and mammals. This report focuses primarily on bycatch of Chinook and coho.

Encounters with bycatch species were tallied, and encounter rates (bycatch per target species) estimated using observer data collected during each fishery. Estimates of total bycatch will be based on those tallies, expanded using actual catch numbers reported on fish tickets for each Management Week. The expanded numbers will reflect estimates of total encounters, but do not represent the total bycatch mortality.

**Table 7-1 - Areas 7/7A Nontreaty Commercial Net Fishery Monitoring**

Mgmt Wk	Gear	Observations	SOX	PINK	CHIN	COHO	CHUM	Directed Species	Chin per 1000 Directed Species
36	PS	20	1434	1232	25	1	0	sockeye	17
37	PS	10	2301	5707	301	49	14	sockeye	130
38	PS	17	238	3812	280	34	0	sockeye	1176
42	PS	11	0	0	0	93	855	chum	0
44	PS	6	0	0	0	4	105	chum	0

WDFW staff observed a total of 47 purse seine sets in Areas 7 and 7A during the sockeye season and counted a total of 3,973 sockeye, 14 chum, 84 coho and 606 Chinook. During the fall chum season an additional 17 sets were observed and 960 chum, 97 coho and zero Chinook were counted (Table 7-1)

Area 8A Coho and Chum

This limited-participation opportunity may be continued in 2006. Commercial purse seine fishers maintain an interest in any opportunity to access coho salmon and did not want to give up this limited fishery. Expansion of the fishery was considered, but the history of purse seine effort in Area 8A is episodic; generally only a couple of vessels participate, but occasionally large numbers of vessel participate and take very substantial numbers [100,000 or more per week] of salmon. This level of coho harvest would not be acceptable at this time. The by-catch of other salmon species in the Area 8A fishery was not significant. Very few Chinook were encountered during coho and chum fisheries in area 8A (Table 7-2). During the chum season, 20 sets were observed to catch 216 chum, zero coho and 17 Chinook.

**Table 7-2 -Areas 8/8A Nontreaty Commercial Net Fishery Monitoring**

Mgmt Wk	Gear	Area	Observations	SOX	PINK	CHIN	COHO	CHUM	Directed Species	Chin per 1000 Directed Species
40	PS	8A	6	0	2	1	49	0	coho	20
41	PS	8A	6	0	0	0	57	0	coho	0
47	PS	8A	20	0	0	17	0	216	chum	78

Commercial South Sound and Hood Canal Chum Directed Fisheries

Chum fishing began in Areas 10 and 11 in the week beginning October 9 (Week 42). During the Area 10 and 11 chum directed fishery, purse seines were not allowed to keep Chinook or coho.

WDFW staff observed a total of 115 purse seine sets in Areas 10 and 11 for a total of 10,776 chum, 407 coho and 27 Chinook (Table-7-3). No gillnet observations were made; it is assumed that, since all salmon species can be legally retained, catches of all species will appear on fish tickets. Also, gillnet observations for seabird encounters are not a high priority in South Sound because that area is not heavily utilized by bird species of concern such as marbled murrelets.

**Table 7-3. Areas 10/11 Nontreaty Commercial Chum Net Fishery Monitoring**

Mgmt Wk	Gear	Area	Observations	SOX	PINK	CHIN	COHO	CHUM	Chin per 1000 Chum
42	PS	10/11	15	0	0	1	276	960	1
43	PS	10/11	15	0	0	0	87	2531	0
44	PS	10/11	11	0	0	0	17	841	0
45	PS	10/11	17	0	0	0	10	1555	0
46	PS	10/11	16	0	0	1	17	1913	1
47	PS	10/11	20	0	0	0	0	686	0
48	PS	10/11	21	0	0	25	0	2140	12

WDFW staff observed a total of 64 purse seine sets in Areas 12 and 12B for a total off 5,573 chum, 422 coho and 2 Chinook (Table 7-4).

**Table 7-4. Hood Canal Nontreaty Commercial Chum Net Fishery Monitoring**

Mgmt Wk	Gear	Area	Observations	PINK	CHIN	COHO	CHUM	Chin per 1000 Chum
43	PS	12/12B	12	0	2	47	379	5
44	PS	12/12B	13	0	0	135	1350	0
45	PS	12/12B	16	0	0	67	1182	0
46	PS	12/12B	23	0	0	173	2662	0

Table 7-5 provides estimates of total Chinook encounters for 2005 non-treaty commercial fisheries. A 33% mortality rate was applied in purse seine fisheries in Areas 7 and 7A where brailing is required and a 45% mortality rate was used in all other fisheries where brailing was not required.

**Table 7-5. Estimates of Chinook Bycatch in 2005 Nontreaty Puget Sound Commercial Fisheries**

Area	Estimated Purse Seine Encounters	Estimated Mortality of PS Encounters	Gill Net Landings	Total Mortality
7&7A	4,309	1,422	189	1611
8	81	36	0	36
8A&8D	1289	580	0	580
10&11	116	52	7	59
12,12B-C	11	5	3	8

Encounters of bycatch species were tallied, and encounter rates (bycatch per 1000 target species) estimated using observer data collected during each fishery. Estimates of total “encounters” are based on those tallies, expanded using actual catch numbers reported on fish tickets for each Management Week. The expanded numbers reflect estimates of total encounters. Mortalities are calculated by applying a mortality rate to the estimated encounters (i.e. 45% in areas Puget Sound Areas other than 7&7A and 33% in Area 7&7A). The number reported for gillnet gear represents the number of fish sold to a buyer and recorded on fish tickets. Since it is unlawful to discard dead fish, there is no expectation that gillnet fishers are releasing any fish. Seal damaged fish are legal to release, but there are no data upon which to make an estimate of this type of release.

## 8. Pacific Salmon Treaty Compliance

The terms of the 1999 Chinook Annex to the PST requires that ISBM fisheries be managed to contribute to the achievement of MSY escapement or other agreed, biologically-based escapement objective for indicator Chinook stocks or management units. Furthermore, the general obligation of southern U.S. ISBM fisheries is to achieve an overall 40% reduction in their combined exploitation rate, relative to the base period, on management units for which escapement is projected not to achieve the escapement goal.

Lack of technical agreement on escapement goals for Puget Sound stocks precludes a formal assessment of compliance with the agreement. However, from the Puget Sound co-managers' perspective, most Puget Sound Chinook stocks are depressed, some critically depressed, such that most have not achieved their escapement goals, so they have assumed that the Chinook Agreement obligation for ISBM fisheries is operative.

ISBM fisheries in southern U.S. waters include marine and freshwater commercial and recreational fisheries in Puget Sound, the Strait of Juan de Fuca, and the Washington coast. They also include commercial and recreational fisheries in the Columbia River and on the Oregon coast, though these fisheries have little impact on Puget Sound Chinook stocks.

The Joint Chinook Technical Committee performs a pre-season assessment to inform PST annual fisheries planning. With few exceptions, the pre-season CTC assessment indicates compliance with the obligation (Table 8-1), i.e. exploitation rate indices on the indicator stocks were projected to be less than 0.600.

**Table 8-1. Pre-season annual exploitation rate indices for southern U.S. ISBM fisheries' impacts on Puget Sound Chinook management units (2005 ER Analysis and Model Calibration Report TCChinook (05)-3 Appendix B-2).**

Indicator Stock	ER Indices for U.S. ISBM Fisheries						
	1999	2000	2001	2002	2003	2004	2005
Skagit S/F	0.170	0.210	0.780	0.270	0.406	0.157	0.195
Stillaguamish	0.140	0.140	0.400	0.200	0.184	0.224	0.185
Snohomish	0.040	0.050	0.600	0.150	0.072	0.110	0.889
Lake Washington	0.500	0.480	0.590	1.250	0.768	0.411	0.373
Green	0.500	0.480	0.600	0.350	0.263	0.260	0.202
Nooksack Early	0.150	0.200	0.010	0.000	0.121	0.974	0.222
Skagit Spring			0.070	0.060	0.119	0.663	0.213
Hoko	0.390	0.340	0.560	0.480	0.682	0.966	0.444

These pre-season model projections should be viewed cautiously, because the model output is sensitive at exploitation rates less than 20%. The low abundance of most of the Puget Sound indicator stocks also confounds this assessment. A

CWT-based post-season review may yield different results. The CTC's post-season analysis, summarized through 2003 in 2004 edition of this report, has not been updated for the 2004 management year.



## 9. Sampling

### 9.1 Coded Wire Tag and Biological Sampling

Commercial catch is sampled cooperatively by WDFW and tribal fisheries agencies; WDFW samples the recreational fisheries. An increasing proportion of all hatchery Chinook and coho production in Washington is now mass-marked with an adipose clip, so recovery of coded-wire tags requires electronic sampling of all adipose clipped Chinook to determine whether a coded-wire tag is present. The effectiveness of electronic sampling equipment has been demonstrated, but the large increase in the number of adipose-clipped coho and Chinook has correspondingly increased the effort required to check the desired proportion of the total catch.

When catch and sampling data are acceptably complete, CWT sampling rates are calculated to determine whether the overall sampling objectives have been achieved. Most of these sampling data are summarized by calendar year rather than the management year being reported for catch and escapement.

#### Coded-Wire Tag Sampling

Commercial and recreational catch is sampled to recover coded-wire tagged Chinook and coho. The objective for commercial fisheries is to sample 20% of the catch each week in each catch area. The objective for recreational catch is to sample 10% of the catch each month in each area. These sampling rates have been shown to generate sufficient recoveries of “indicator tag groups” to estimate catch distribution and fishery-specific exploitation or harvest rates.

Coded wire-tagged Chinook are released from hatcheries in each production region in Puget Sound. Recovery of these tagged ‘indicator stocks’ enables estimation of their catch distribution and exploitation rate in fisheries. Selection of indicator stocks, marking, sampling, and analysis of tag recovery data is funded by the Pacific Salmon Commission. The Pacific States Marine Fisheries Commission maintains an electronic database containing all CWT release and recovery data.

With few exceptions, commercial Chinook catch in all Puget Sound catch areas in 2004 was sampled intensively, at rates in excess of the general sampling objective of 20% (Table 9-1). This annual summary does not reveal weekly sampling rates, but it indicates that catch is adequately sampled during periods of high catch volume. CWT sampling has become a more complex task since the advent of mass marking hatchery production with an adipose fin clip, and release of double index tag groups. Since most adipose-clipped Chinook are not CWT’d, and some CWT’d fish are not adipose clipped, all fish must be individually scanned with a magnetic tag detector to determine whether they hold a CWT. High sampling rates, however, suggest that the logistic problems of electronic CWT detection have been solved.

CWT sampling rates for recreational Chinook catch in 2004 generally achieved, and in many areas greatly exceeded, 10% per month (Table 9-2). (Table has not been cross checked for errors, apparently sampling in closed periods, etc).

**Table 9-1. CWT sampling rates for commercial Chinook. 2002 - 2004**

Catch Area	2004			2003			2002		
	Catch	Number Sampled	% Sampled	Catch	Number Sampled	% Sampled	Catch	Number Sampled	% Sampled
4B Neah Bay	54	0	0%	98	0	0%	57	0	0%
Area 5 Clallam Bay	592	169	29%	810	616	76%	1,017	537	53%
Sekiu R.	0	0	0%	2	0	0%	na	na	na
Area 6D Dungeness Bay	0	0	0%	1	0	0%	na	na	na
Area 7 San Juan Islands	2717	2196	81%	1,734	784	45%	562	171	30%
Area 7A Point Roberts	2367	672	28%	3,108	1,387	44%	1,669	820	49%
Area 7B Bellinhan Bay	5379	2985	55%	10,994	2,945	26%	30,550	7,588	25%
Nooksack River	272	47	17%	622	247	39%	447	297	66%
Area 7C Samish Bay	4952	3385	68%	7,366	3,064	41%	7,712	707	9%
Area 7D Lummi Bay	10	4	40%	9	2	22%	3	3	100%
Area 8 Skagit Bay	5	0	0%	69	32	46%	1	0	0%
Skagit River	576	540	94%	340	327	96%	294	255	87%
Area 8A Saratoga Passage	102	26	25%	359	146	40%	5,520	1,758	32%
Area 8D Tulalip Bay	5988	3907	65%	8,931	5,102	57%	With Area 8A		
Area 9 Admiralty Inlet	135	0	0%	na	na		na	na	na
Area 10 Seattle	216	122	56%	217	220	101%	117	115	98%
Area 10A Elliott Bay	4379	3070	70%	1,924	1,681	87%	1,499	1,045	70%
Duwamish River	4935	2795	57%	2,876	1,332	46%	7,976	5,108	64%
Area 10C So Lake Washington	0	0	0%	na	na		na	na	na
Area 10D Lake Sammamish	0	0	0%	204	203	99%	na	na	na
Area 10E East Kitsap	3122	1892	61%	7,616	1,984	26%	4,794	693	14%
Area 10F Ship Canal	640	359	56%	302	178	58%	135	63	47%
Area 10G No Lake Washington	193	10	5%	65	63	96%	na	na	na
Area 11 East & West Passage	0	0	0%	93	1	1%	na	na	na
Puyallup River	3735	1759	47%	2,482	1,534	61%	4,749	3,038	64%
White R.	6	0	0%	117	0	0%	na	na	na
Area 11A Commencement Bay	0	0	0%	na	na		na	na	na
Area 13	3	21	700%	230	165	71%	152	0	0%
Nisqually River	13820	3009	22%	17,833	4,833	27%	11,834	7,198	61%
Area 13A Carr Inlet	1128	386	34%	2,166	497	22%	973	111	11%
Area 13C Chambers Bay	3788	3111	82%	922	187	20%	689	412	60%
Area 13D Dana Passage	253	1	0%	399	203	50%	4	0	0%
Area 13F Budd Inlet	630	103	16%	691	32	4%	28	28	100%
Area 13I Skookum Inlet	0	0	0%	na	na		na	na	na
Area 13K Case Inlet	0	0	0%	56	22	39%	na	na	na
McAllister Creek	0	0	0%	na	na		317	0	0%
Minter Creek	0	0	0%	na	na		40	0	0%
Area 9A Port Gamble Bay	2	1	50%	2	0	0%	3	0	0%
Area 12A Quilcene/Dabob Bays	20	1	5%	na	na		4	0	0%
Area 12B Central Hood Canal	3	2	67%	na	na		90	0	0%
Area 12C South Hood Canal	1561	160	10%	1,327	252	18%	21,110	3,493	17%
Area 12H Hoodspout Hatchery	8692	1400	16%	16,654	2,527	15%	na	na	na
Big Quilcene R.	0	0	0%	91	0	0%	na	na	na
Duckabush R.	0	0	0%	0	5	0%	na	na	na
Skokomish River	4337	432	10%	3,065	520	16%	2,656	242	9%
<b>Total</b>	<b>74612</b>	<b>32565</b>		<b>93,775</b>	<b>31,091</b>		<b>83,199</b>	<b>29,947</b>	

**Table 9-2. Chinook CWT sampling rates in Puget Sound recreational fisheries.**

Area	Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Area 5	2004		28%	13%	33%	0%	1%	23%	26%	19%	8%	22%	
	2003	0%	16%	12%	60%			18%	19%	14%	20%	0%	0%
	2002	0%	34%	11%	25%	0%	0%	22%	12%	42%	0%	1%	0%
Area 6	2004		53%	45%	51%		0%	66%	66%	50%		58%	100%
	2003		47%	70%	23%	0%		41%	42%			33%	0%
	2002		19%	34%	37%		0%	0%		33%	0%	35%	
Area 7	2004	25%	27%	32%	0%	0%	0%	8%	8%	9%	0%	14%	5%
	2003	33%	19%	15%	0%	0%	0%	15%	13%	15%	20%	14%	0%
	2002	0%	10%	31%	9%	0%	0%	4%	15%	14%	0%	18%	0%
Area 8-1	2004	30%	11%	9%		0%		0%	20%			13%	0%
	2003	25%	7%	1%			0%	0%	14%	50%	22%	11%	
	2002		2%	8%	7%				0%		0%	27%	
Area 8-2	2004		34%	28%	29%	0%	46%	23%	30%	29%	33%	26%	14%
	2003	0%	44%	16%	32%	0%	0%	22%	21%	18%	38%	30%	
	2002		25%	27%	22%	0%	24%	16%	27%	20%	1%	38%	0%
Area 9	2004	23%	33%	25%	11%	0%		4%	9%	9%		13%	16%
	2003	40%	17%	6%	0%	0%		9%	5%	12%	21%	17%	0%
	2002	0%	7%	8%	11%	0%	14%	2%	13%	15%	0%	40%	
Area 10	2004	37%	23%	0%				50%	58%	30%	33%	16%	22%
	2003	24%	8%	0%		0%	0%	58%	41%	47%	11%	3%	11%
	2002	0%	1%	14%	13%		0%	22%	46%	45%	6%	16%	17%
Area 11	2004		27%	34%	29%	0%	28%	18%	20%	16%	25%	23%	24%
	2003	18%	29%	37%	13%	36%	26%	19%	17%	21%	25%	18%	26%
	2002	0%	12%	21%	19%	0%	0%	20%	28%	22%	18%	22%	44%
Area 12	2004	0%	20%	21%	52%		0%	4%	16%	4%			
	2003	0%	23%	8%	9%	0%	0%	25%	9%	9%	10%		0%
	2002	0%	0%	36%		22%	0%	0%	22%	5%	4%	12%	14%
Area 13	2004	44%	56%	0%	16%	0%	9%	7%	23%	14%		50%	22%
	2003	0%	0%		11%	18%	0%	8%	16%	17%			12%
	2002	0%	40%	10%	0%	12%	33%	3%	17%	18%			2%

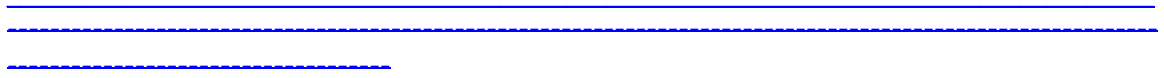
## 9.2 Escapement Sampling

Chinook carcasses on the spawning grounds are systematically sampled to determine their age, sex, size, and hatchery or natural origin. The numbers of samples collected from 2005 escapement is summarized below, in Table 9-3. Samples collected from other rivers have not been compiled yet. Usually, scales are collected to determine age. Hatchery origin is signaled either by an adipose fin clip, the presence of a CWT, or, for some hatcheries, by a thermal mark sequence on the otolith.

**Table 9-3. Chinook scale or otolith samples collected from spawning grounds in 2005.**

Population	No. Samples
No Fork Nooksack	750
So Fork Nooksack	48
Lower Sauk Summer	19
Lower Skagit fall <sup>1</sup>	92
Upper Skagit summer <sup>1</sup>	450
Siuattle spring	52
Upper Cascade spring	33
Upper Sauk spring	50
Cedar	279
Green	897
Skokomish	362
Hamma Hamma	30
Dosewallips	0
Duckabush	1
<sup>1</sup> Includes adults removed for broodstock	

Differentiating the origin of spawners is essential to estimating and monitoring natural abundance and productivity. Determining the age composition of spawners enables cohort reconstruction (i.e. estimating the abundance of all adults that survive from a given brood-year). In many systems, scales collected from terminal fisheries can augment spawning ground samples, but the latter provide the most accurate population-specific information in river systems that support multiple Chinook populations. Estimates of the proportions of hatchery-origin adults among natural spawners in 2005, and previous years' estimates, are summarized in Table 9-4. Estimates for several rivers are not available, pending requisite de-coding of recovered CWTs, or otolith analysis. The methods and accuracy for estimating the contribution of hatchery-origin Chinook vary. Collecting samples from carcasses in a manner that is truly representative of all spawning areas



**Table 9-4. The proportion of hatchery-origin adults on spawning grounds in 2005 and previous years.**

Population	Previous year % Hatchery Origin	2005 % Hatchery Origin
<b>Dungeness</b>	2004 -81% 2001 - 2004 average 85%	79%
<b>Nooksack NF</b>	2004 – 85%; 2000 - 2004 average 89%	90%
<b>Nooksack SF</b>	2004--24.5% 1999 - 2004 average 41%	
<b>Skagit</b>	2004 – Up Cascade & Sauk - 0% Suiattle - 4%; Up Skagit - 9%; L Skagit 5% L. Sauk - 0%	N/A
<b>Snohomish</b>	Snoqualmie 1987– 2003 average 15% Skykomish 1997- 2002 average 53%	N/A
<b>Stillaguamish</b>	2004 - 30% 1996 - 2004 average 37%	N/A
<b>Cedar</b>	2004 - Mainstem 30% System 43% 2003 - System 39%	Mainstem 29% Taylor Cr 60%
<b>North L Wash Tributaries,</b>	2004 – 62% 2003—66%	79% .
<b>Green</b>	2004 – 66%; 1989 - 2004 average 52%	Mainstem 53% Newaukum Cr 70%.
<b>White</b>	2004 – Buckley 49% Transported - 15%	Transported 29% Boise Cr 58%.
<b>Puyallup</b>	2003: 53% 2004: 26%	N/A
<b>Nisqually</b>	2004 – Mashel River 48%	N/A
<b>Skokomish</b>	N/A	Mainstem 40% North Fork 19% South Fork 0% System 32%

## 10. Fisheries Enforcement

### 10.1 Recreational Fisheries Enforcement and Compliance

The following report is a summary of enforcement activities by Officers of the Washington Department of Fish and Wildlife (WDFW) for the 2005 recreational marine salmon fisheries. Originally designed as a program to monitor adherence to wild coho salmon release rules, increased patrols in marine areas have had a positive impact on overall compliance issues. With the expansion of selective fishing to other species, like Chinook, along with concerns raised during the North of Falcon (NOF) season setting process, Officers are tracking enforcement efforts in thirteen marine Salmon Management Catch Areas (SMCA). Enforcement presence was accomplished by vessel, dock patrols, undercover patrols, and joint operations with other enforcement agencies such as the US Coast Guard and the Oregon State Patrol. Joint patrols with Tribal enforcement entities also occurred.

Due to a request by Co-Managers, compliance on the Big Quilcene River was also monitored and the results of patrols reported here. Numerous arrests for snagging salmon were effected as a result of our focus.

Estimating compliance rate with fishing regulations is difficult. Uniformed presence on the water or at the dock provides visible deterrence to violations, thereby altering the behavior of those who may violate natural resource laws. In some instances, the contact to violation ratio may be merely a reflection of the effectiveness of the individual Officer at discovering a violation. Therefore, estimated compliance rates compiled from uniformed enforcement activity may not be an accurate measure of actual compliance, but rather, serves best as an index when comparing one area to another, or one season to the next. In the summary tables below, percent compliance with overall salmon regulations is calculated as total rule violations associated with salmon only (license, gear, possession, season and area) divided by the total number of contacts of enforcement officers with anglers. Percent compliance for possession of unmarked coho is calculated as the total unmarked fish violations divided by the total number of contacts. Percent compliance for possession of unmarked Chinook is calculated as the total unmarked fish violations divided by the total number of contacts.

Although a variety of violations detected during these patrols have been reported, only those violations related to salmon fishing were used in the compliance calculations. The average estimated compliance with overall salmon rules for the all of the marine areas was 90.1%.

### **SMCA AREA ONE, TWO AND THREE SUMMARY**

The Columbia River/Coastal Marine Detachment is directly responsible for planning patrols for Salmon Management Catch Areas one, two, and three. In 2005, Officer contact with anglers was down due to low angler participation, however, officer enforcement patrol hours increased. Catches were moderate.



Table 10-1. WDFW Fisheries Enforcement Summary for Salmon Catch Area 1 (Ilwaco, WA), in 2005.

**Enforcement Hours:**

Docks	102
Vessel	147
Investigative	0
Interagency	0
<b>Total</b>	<b>249 hours</b>
<b><u>Total Contacts:</u></b>	<b>836</b>

LIC VIOLATION	Arrest	6	Warnings	38	Total	44
GEAR VIOLATION	Arrest	49	Warnings	33	Total	82
OVERLIMIT	Arrest	1	Warnings	0	Total	1
BARBED HOOK-SALMON	Arrest	0	Warnings	0	Total	0
WILD COHO	Arrest	6	Warnings	0	Total	6
CHINOOK	Arrest	0	Warnings	0	Total	0
AREA /SEASON	Arrest	8	Warnings	10	Total	18
GROUND FISH / HALIBUT	Arrest	4	Warnings	2	Total	6
BOAT SAFE	Arrest	0	Warnings	2	Total	2
WARRANT	Arrest	0	Warnings	0	Total	0
OTHER	Arrest	5	Warnings	6	Total	11
FAIL TO SUBMIT	Arrest	0	Warnings	0	Total	0
UNDERSIZED	Arrest	1	Warnings	1	Total	2
DRUGS	Arrest	2	Warnings	0	Total	2
ILLEGAL CHARTER	Arrest	0	Warnings	0	Total	0

Total Citations: 82    Total Warnings: 92

Estimated compliance regarding overall salmon rules was 81.7%\*  
 Estimated compliance regarding the possession of wild coho was 99.2%\*\*  
 2003 / 2004 / 2005 overall salmon rules compliance rate comparison: 93.2% / 90.5% / 81.7%  
 2003 / 2004 / 2005 comparison of compliance with wild coho release rules: 98.7% / 99.5% / 99.2%  
 2003 / 2004 / 2005 comparison of enforcement hours: 479 / 395 / 249 hours.  
 2003 / 2004 / 2005 comparison of anglers contacted: 1801 / 1806 / 836 contacts.

**Figure 10-1. Fishing regulation compliance in Salmon Catch Area 1, 1999 – 2005.**

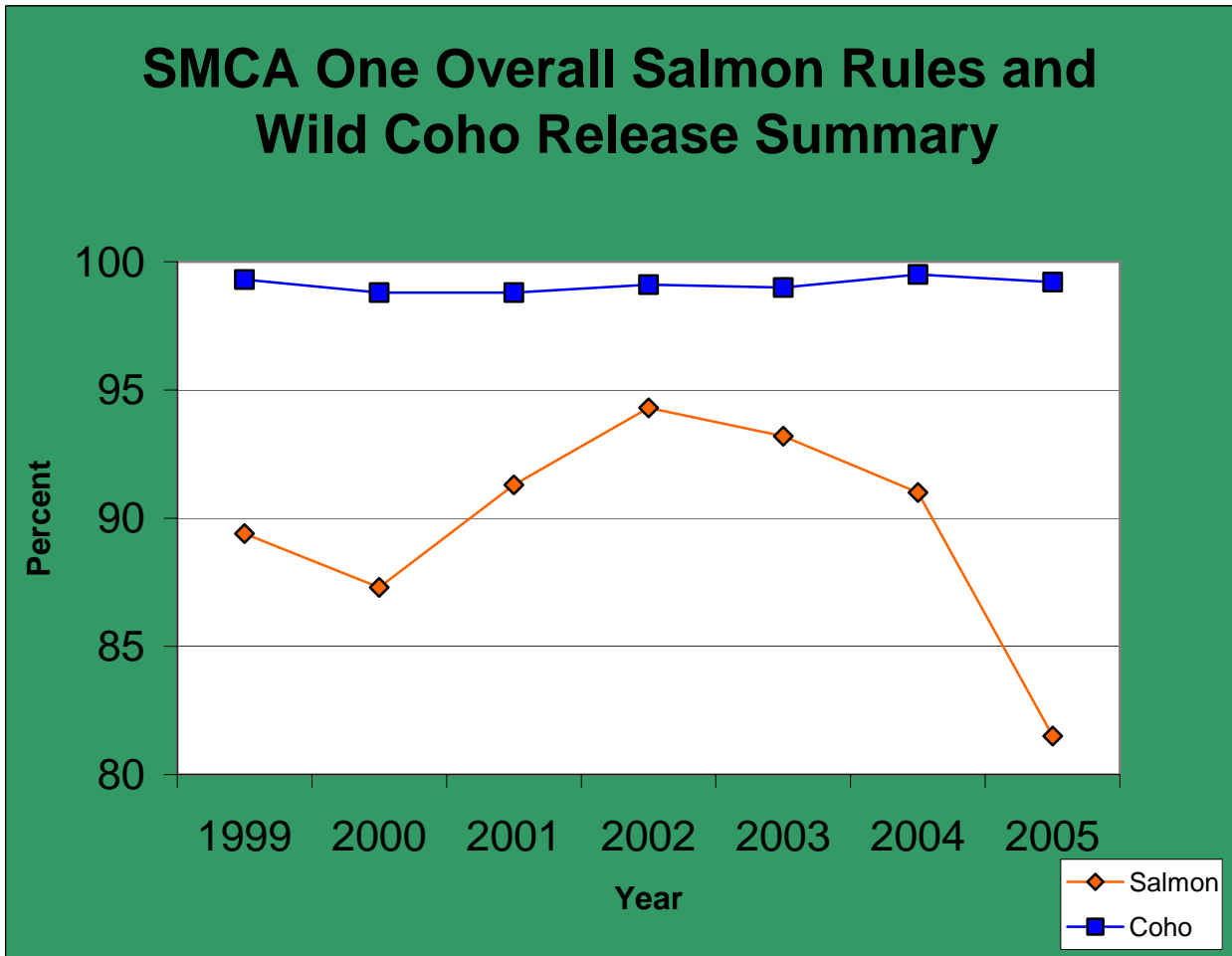


Table 10-2. WDFW Fisheries Enforcement Summary for Salmon Catch Area 2 (Westport, WA), in 2005.

**Enforcement Hours:**

Docks	99.5
Vessel	389
Investigative	6
Interagency	0
<b>Total</b>	<b>494.5 hours</b>
<b><u>Total Contacts:</u></b>	<b>1845</b>

LIC VIOLATION	Arrest	19	Warnings	108	Total	127
GEAR VIOLATION	Arrest	32	Warnings	54	Total	86
OVERLIMIT	Arrest	1	Warnings	0	Total	1
WILD COHO	Arrest	15	Warnings	0	Total	15
UNDERSIZED	Arrest	4	Warnings	0	Total	4
AREA /SEASON	Arrest	5	Warnings	9	Total	14
GROUND FISH / HALIBUT	Arrest	4	Warnings	5	Total	9
BOAT SAFE	Arrest	5	Warnings	4	Total	9
OTHER						
FAIL TO SUBMIT	Arrest	27	Warnings	35	Total	62

**Total Citations: 112**  
**Total Warnings: 215**

Estimated compliance regarding overall salmon rules was 86.4%\*  
 Estimated compliance regarding the possession of wild coho was 99%\*\*

2003 / 2004 / 2005 overall salmon rules compliance rate comparison: 97% / 95.2% / 86.4%

2003 / 2004 / 2005 comparison of compliance with wild coho release rules: 98% / 99.5% / 97%

2003 / 2004 / 2005 comparison of enforcement hours: 438 / 349 / 495 hours.

2003 / 2004 / 2005 comparison of anglers contacted: 2164 / 2069 / 1845 contacts.

**Figure 10-2. Fishing regulation compliance in Salmon Catch Area 2, 1999 – 2005.**

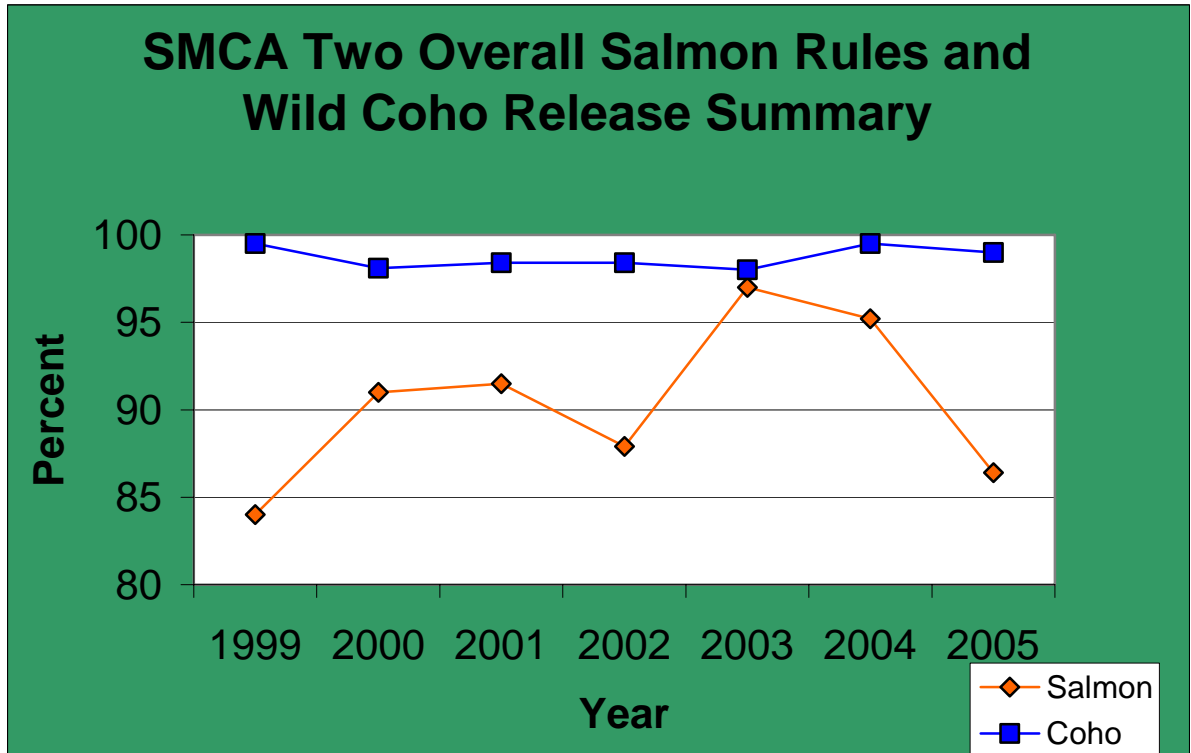


Table 10-3. WDFW Fisheries Enforcement Summary for Salmon Catch Area 3 (LaPush, WA), in 2005.

**Enforcement Hours:**

Docks	20
Vessel	44 Officer hours / 11 vessel hours
Investigative	0.5
Interagency	0
<b>Total</b>	<b>64.5 hours</b>
<b><u>Total Contacts:</u></b>	<b>265</b>

LIC VIOLATION	Arrest	4	Warnings	0	Total	4
GEAR VIOLATION	Arrest	2	Warnings	2	Total	4
OVERLIMIT	Arrest	3	Warnings	0	Total	3
WILD COHO	Arrest	3	Warnings	0	Total	3
CHINOOK	Arrest	1	Warnings	0	Total	1
AREA /SEASON	Arrest	0	Warnings	0	Total	0
GROUND FISH / HALIBUT	Arrest	4	Warnings	0	Total	4
BOAT SAFE	Arrest	0	Warnings	0	Total	0
WARRANT	Arrest	0	Warnings	0	Total	0
OTHER	Arrest	0	Warnings	0	Total	0
FAIL TO SUBMIT	Arrest	2	Warnings	0	Total	2
ILLEGAL CHARTER	Arrest	0	Warnings	0	Total	0

**Total Citations: 19**  
**Total Warnings: 2**

Estimated compliance regarding overall salmon rules was 93.5%\*  
 The estimated compliance regarding the possession of wild coho was 98.8%\*\*

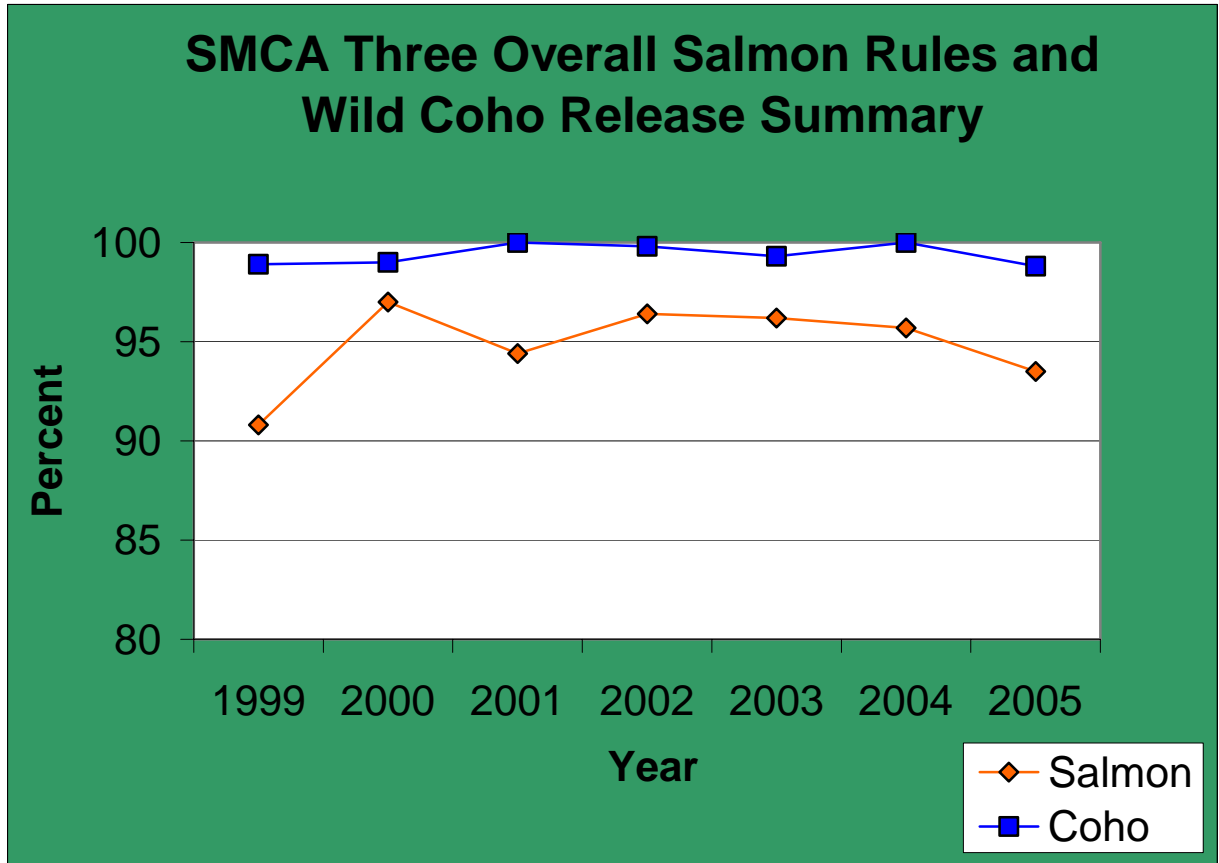
2003 / 2004 / 2005 overall salmon rules compliance rate comparison: 96.2% / 95.7% / 93.5%

2003 / 2004 / 2005 comparison of compliance with wild coho release rules: 99.3% / 100% / 98.8%

2003 / 2004 / 2005 comparison of enforcement hours: 22 / 69.5 / 64.5 hours.

2003 / 2004 / 2005 comparison of anglers contacted: 129 / 349 / 265 contacts.

**Figure 10-3. Fishing regulation compliance in Salmon Catch Area 3, 1999 – 2005.**



**SMCA AREA FOUR, FIVE, SIX and TWELVE SUMMARY**

The Strait /Hood Canal Marine Detachment has primary responsibility for patrolling these Salmon Management Catch Areas. The Coastal Detachment assisted with patrolling SMCA four. The North Sound Detachment assisted in patrolling part of SMCA six.

Following fish from marine waters in SMCA 12 to the spawning grounds, the Strait marine Detachment and Region 6 Land Officers also concentrated patrol efforts to address the illegal take of listed summer chum from the Big Quilcene River. As you will see from the results, numerous arrests were made for snagging and fish handling violations.

Angler effort appeared to be down from previous years in SMCAs four, six, and twelve. Area twelve, Triton Cove, is the responsibility of the Region 6 Land Detachment. Those efforts have been reported here as supplemental to Marine

Division activity.

Table 10-4. WDFW Fisheries Enforcement Summary for Salmon Catch Area 4 (Neah Bay, WA), in 2005.

**Enforcement Hours:**

Docks	43
Vessel	140
Investigative	7
Interagency	0
<b>Total</b>	<b>190 Hours</b>
<b><u>Total Contacts:</u></b>	<b>861</b>

LIC VIOLATION	Arrest	18	Warnings	15	Total	33
GEAR VIOLATION	Arrest	25	Warnings	9	Total	34
OVERLIMIT	Arrest	1	Warnings	0	Total	1
WILD COHO	Arrest	4	Warnings	0	Total	4
CHINOOK	Arrest	0	Warnings	1	Total	1
AREA /SEASON	Arrest	4	Warnings	0	Total	4
GROUND FISH/HALIBUT	Arrest	0	Warnings	0	Total	0
BOAT SAFE	Arrest	3	Warnings	0	Total	3
WARRANT	Arrest	0	Warnings	0	Total	0
OTHER	Arrest	0	Warnings	0	Total	0
DRUGS	Arrest	0	Warnings	0	Total	0
POSSESS UNLAWFUL	Arrest	0	Warnings	0	Total	0

**Total Citations: 55**  
**Total Warnings: 25**

Estimated compliance regarding overall salmon rules was 91%\*  
 The estimated compliance regarding the possession of wild coho was 99.5%\*\*

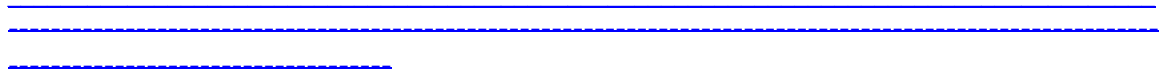
2003 / 2004 / 2005 overall salmon rules compliance rate comparison: 91.5% / 85.4% / 91%

2003 / 2004 / 2005 comparison of compliance with wild coho release rules: 98.8% / 98.5% / 99.5%

2003 / 2004 / 2005 comparison of enforcement hours: 161 / 73 / 190 hours.

2003 / 2004 / 2005 comparison of anglers contacted: 518 / 1069 / 861 contacts.





**Figure 10-4. Fishing regulation compliance in Salmon Catch Area 4, 1999 – 2005.**

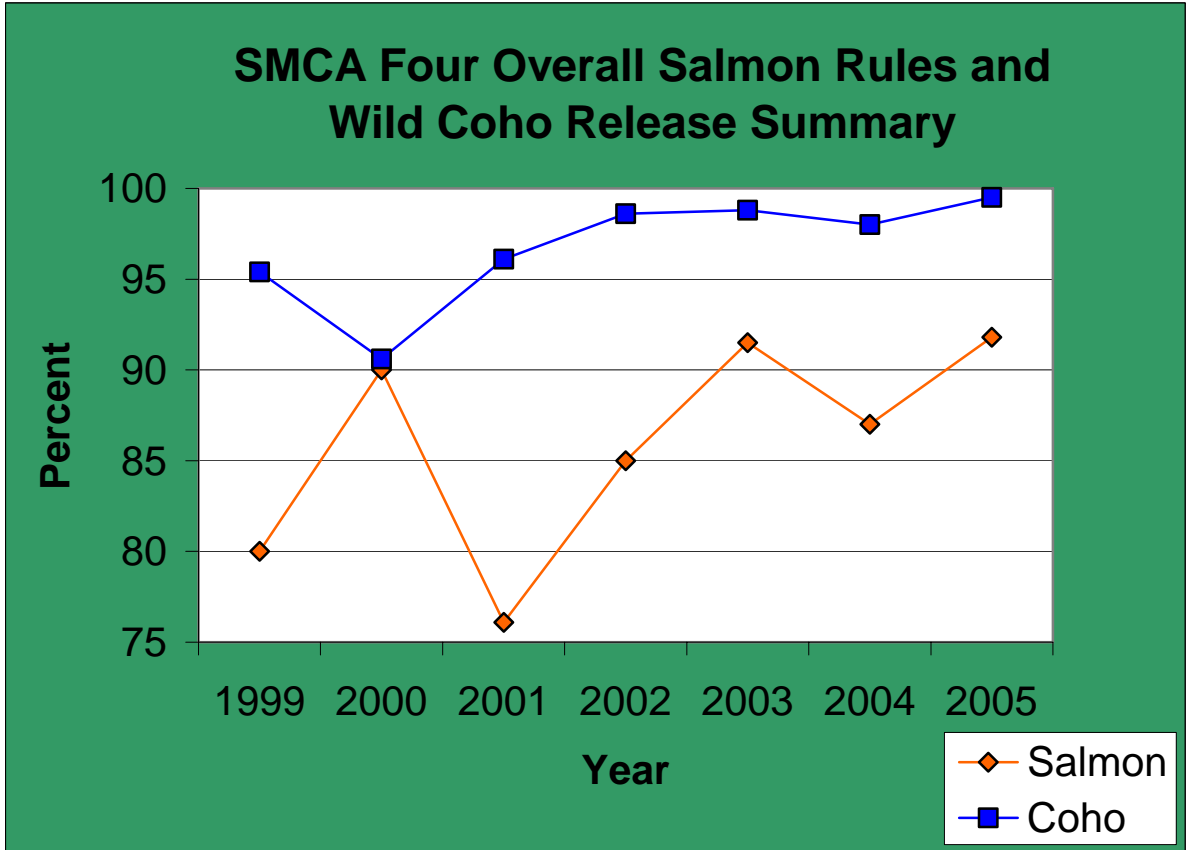


Table 10-5. WDFW Fisheries Enforcement Summary for Salmon Catch Area 5 (Sekiu, WA), in 2005.

**Enforcement Hours:**

Docks	91
Vessel	147
Investigative	0
Interagency	9
<b>Total</b>	<b>247 hours</b>
<b><u>Total Contacts:</u></b>	<b>1168</b>

LIC VIOLATION	Arrest	<b>31</b>	Warnings	<b>14</b>	Total	45
GEAR VIOLATION	Arrest	<b>23</b>	Warnings	<b>7</b>	Total	30
OVERLIMIT	Arrest	<b>4</b>	Warnings	<b>0</b>	Total	4
WILD COHO	Arrest	<b>8</b>	Warnings	<b>0</b>	Total	8
CHINOOK	Arrest	<b>7</b>	Warnings	<b>0</b>	Total	7
AREA /SEASON	Arrest	<b>5</b>	Warnings	<b>0</b>	Total	5
GROUND FISH/HALIBUT	Arrest	<b>1</b>	Warnings	<b>0</b>	Total	1
BOAT SAFE	Arrest	<b>0</b>	Warnings	<b>5</b>	Total	5
FAIL TO SUBMIT	Arrest	<b>0</b>	Warnings	<b>0</b>	Total	0
UNDERSIZED	Arrest	<b>0</b>	Warnings	<b>2</b>	Total	2
ILLEGAL CHARTER	Arrest	<b>0</b>	Warnings	<b>0</b>	Total	0
CRAB	Arrest	<b>0</b>	Warnings	<b>1</b>	Total	1

**Total Citations: 79**

**Total Warnings: 29**

Estimated compliance rate for overall salmon rules was 93.2%\*

Estimated compliance for wild coho possession was 99.3%\*\*

Estimated compliance for closed season Chinook was 99.6%\*\*\*

2003 / 2004 / 2005 overall salmon rules compliance rate comparison: 90.2% / 83.3% / 93.2%

2003 / 2004 / 2005 comparison of compliance with wild coho release rules: 98.7% / 99.2% / 99.3%

2003 / 2004 / 2005 comparison of compliance with closed season for Chinook: 99.2% / 99.4% / 99.6%

2003 / 2004 / 2005 comparison of enforcement hours: 334 / 154 / 247 hours.

2003 / 2004 / 2005 comparison of anglers contacted: 1662 / 795 / 1168 contacts.

**Figure 10-5. Fishing regulation compliance in Salmon Catch Area 5, 1999 – 2005.**

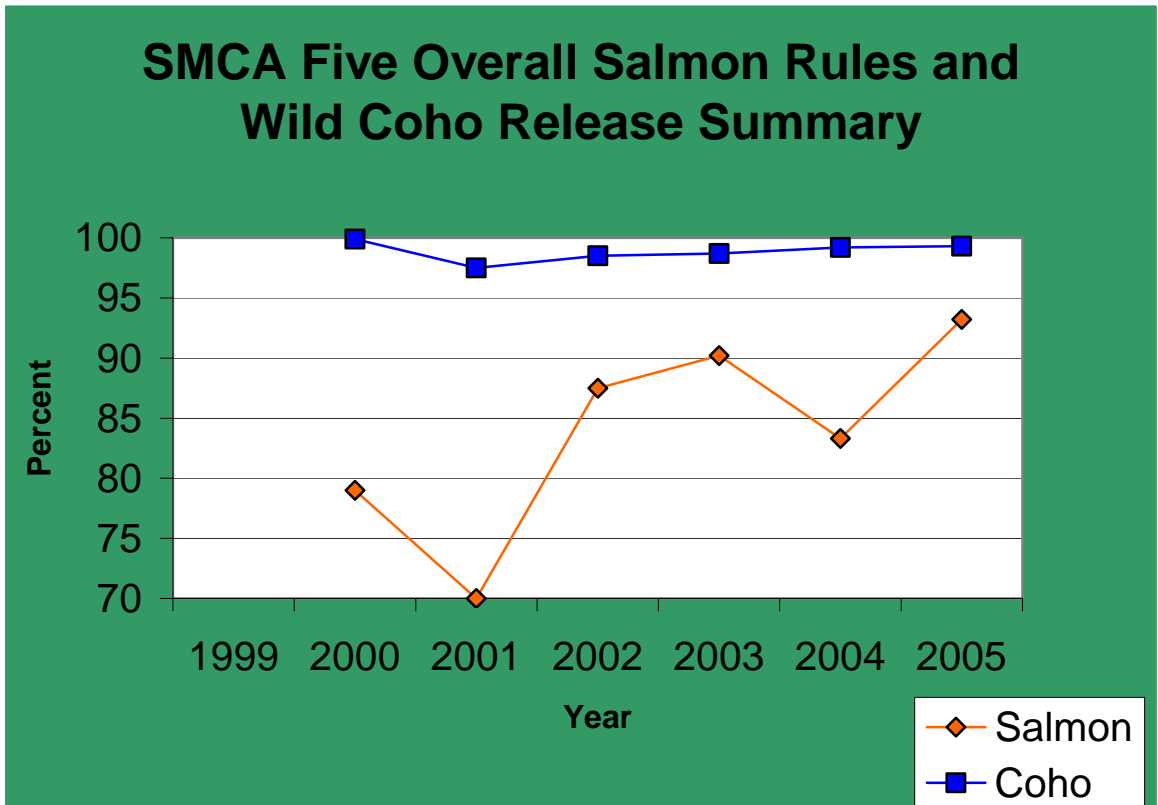


Table 10-6. WDFW Fisheries Enforcement Summary for Salmon Catch Area 6 (Port Angeles, WA), in 2005.

**Enforcement Hours:**

Dock	17
Vessel	202
Investigative	0
Interagency	26
<b>Total</b>	<b>245 hours</b>
<b><u>Total Contacts:</u></b>	<b>228</b>

LIC VIOLATION	Arrest	0	Warnings	0	Total	0
GEAR VIOLATION	Arrest	0	Warnings	0	Total	0
OVERLIMIT	Arrest	0	Warnings	0	Total	0
WILD COHO	Arrest	0	Warnings	0	Total	0
CHINOOK	Arrest	0	Warnings	0	Total	0
AREA /SEASON	Arrest	2	Warnings	0	Total	2
GROUND FISH / HALIBUT	Arrest	0	Warnings	0	Total	0
BOAT SAFE	Arrest	0	Warnings	3	Total	3
WARRANT	Arrest	0	Warnings	0	Total	0
OTHER	Arrest	0	Warnings	0	Total	0
CRAB	Arrest	7	Warnings	0	Total	7
FISH HANDLE RULE	Arrest	2	Warnings	1	Total	3

**Total Citations: 11**  
**Total Warnings: 4**

Estimated compliance rate regarding overall salmon rules was 98%\*  
 Estimated compliance rate regarding overall wild coho was 100%\*

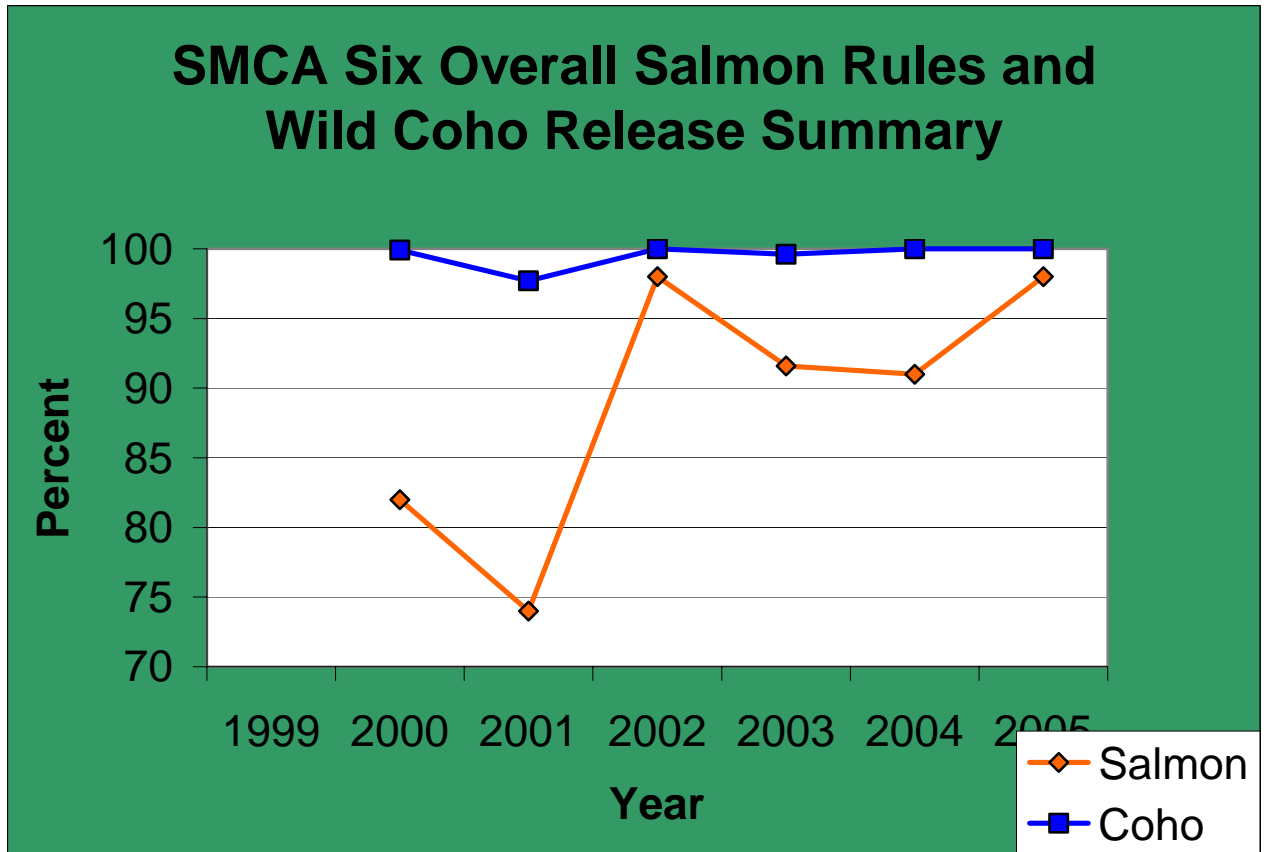
2003 / 2004 / 2005 overall salmon rules compliance rate comparison: 91.6% / 91% / 98%

2003 / 2004 / 2005 comparison of compliance with wild coho release rules: 99.6% / 100% / 100%

2003 / 2004 / 2005 comparison of enforcement hours: 440 / 136 / 245 hours.

2003 / 2004 / 2005 comparison of anglers contacted: 1013 / 422 / 228 contacts.

**Figure 10-6. Fishing regulation compliance in Salmon Catch Area 6, 1999 – 2005.**



**SMCA AREA SEVEN AND EIGHT-ONE SUMMARY**

Salmon Management Catch Area seven and eight-one, and are the responsibility of the North Sound Marine Detachment. A focus in area SMCAs 8-1 was on the Chinook salmon closure that was in affect. Additional hours were expended while commercial fisheries were in progress.

Table 10-7. WDFW Fisheries Enforcement Summary for Salmon Catch Area 7 (San Juan Islands), in 2005.

**Enforcement Hours:**

Docks	30
Vessel	613
Investigative	0
Interagency	21
<b>Total</b>	<b>664 hours</b>
<b><u>Total Contacts:</u></b>	<b>1956</b>

LIC VIOLATION	Arrest	81	Warnings	7	Total	88
GEAR VIOLATION	Arrest	87	Warnings	47	Total	134
OVERLIMIT	Arrest	0	Warnings	1	Total	1
WILD COHO	Arrest	2	Warnings	0	Total	2
CHINOOK	Arrest	0	Warnings	0	Total	0
AREA /SEASON	Arrest	2	Warnings	2	Total	4
GROUND FISH / HALIBUT	Arrest	12	Warnings	24	Total	36
BOAT SAFE	Arrest	14	Warnings	14	Total	28
OTHER						
FAIL TO SUBMIT	Arrest	1	Warnings	0	Total	1
POSSESS UNLAWFUL	Arrest	0	Warnings	0	Total	0

**Total Citations: 199      Total Warnings: 95**

Estimated compliance regarding overall salmon rules was 88.3%\*  
 Estimated compliance regarding the possession of wild coho was 99.84%\*\*  
 Estimated compliance regarding closed season Chinook was 99.8%

2003 / 2004 / 2005 overall salmon rules compliance rate comparison: 84.2% / 86.2% / 88.3%  
 2003 / 2004 / 2005 comparison of compliance with wild coho release rules: 99.8% / 99.5% / 99.84%  
 2003 / 2004 / 2005 comparison of enforcement hours: 669 / 400 / 664 hours.  
 2003 / 2004 / 2005 comparison of anglers contacted: 1331 / 1076 / 1956 contacts.



**Figure 8-7. Fishing regulation compliance in Salmon Catch Area 7, 1999 – 2005.**

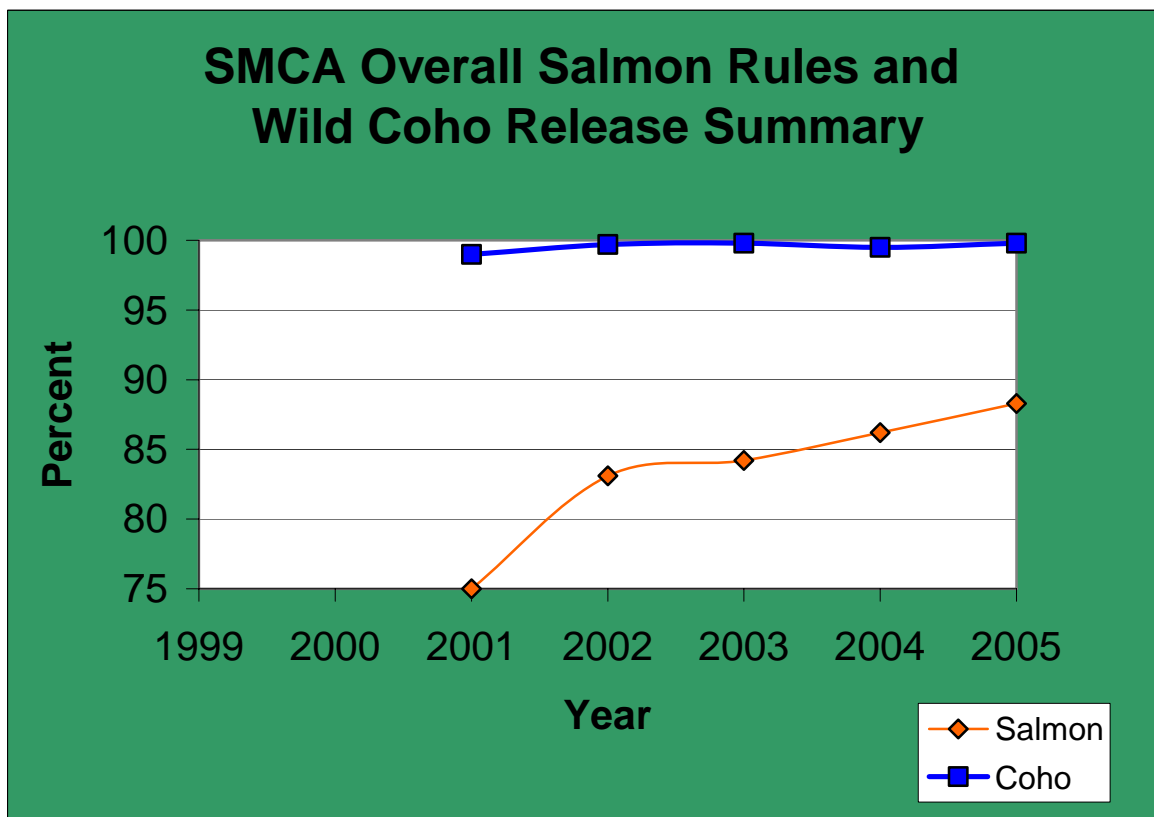


Table 10-8. WDFW Fisheries Enforcement Summary for Salmon Catch Area 8-1 (Saratoga Passage and Skagit Bay), in 2005.

**Enforcement Hours:**

Docks	6
Vessel	147
Investigative	0
Interagency	0
Total	153 hours

**Total Contacts:** 649

LIC VIOLATION	Arrest	7	Warnings	0	Total	7
GEAR VIOLATION	Arrest	20	Warnings	12	Total	32
OVERLIMIT	Arrest	0	Warnings	0	Total	0
WILD COHO	Arrest	0	Warnings	0	Total	0
UNDERSIZED	Arrest	0	Warnings	0	Total	0
AREA /SEASON	Arrest	1	Warnings	3	Total	4
BOAT SAFE	Arrest	13	Warnings	14	Total	27
GROUND FISH	Arrest	0	Warnings	0	Total	0
OTHER						
FAIL TO SUBMIT	Arrest	0	Warnings	0	Total	0
POSSESS FISH UNLAWFUL	Arrest	0	Warnings	0	Total	0

**Total Citations: 41**  
**Total Warnings: 29**

Estimated compliance regarding overall salmon rules was 93.4%.  
 Estimated compliance regarding closed season Chinook was 100%.  
 Estimated compliance regarding closed season Chinook was 100%

2003 / 2004 / 2005 overall salmon rules compliance rate comparison: 95.5% / 92.9% / 95.7%

2003 / 2004 / 2005 comparison of enforcement hours: 74 / 78 / 153 hours.

2003 / 2004 / 2005 comparison of anglers contacted: 132 / 182 / 649 contacts.

## **SMCA AREA EIGHT- TWO, NINE, TEN, THIRTEEN SUMMARY**

The Central Sound Marine Detachment is responsible for patrol efforts in Salmon Management Catch Areas 8-2 and 9. Region 6 land Officers were responsible for patrols in SMCA 10 and 13 in 2005. Efforts in SMCA 13 were not tracked in the kind of detail as in previous years so they are reported more generally than in other marine areas. That report has been attached.

Officer contacts increased in SMCA 8-2 from previous years. Angler attraction was attributed toward this season being a Pink Salmon run year, although the fish were not present in then numbers expected. Wild Chinook were not allowed to be retained and this regulation was monitored heavily.

Table 10-9. WDFW Fisheries Enforcement Summary for Salmon Catch Area 8-2 (Everett, Mukilteo, and Tulalip Bay), in 2005.

**Enforcement Hours:**

Docks	<b>54</b>
Vessel	<b>167.5</b>
Investigative	<b>0</b>
Interagency	<b>16</b>
<b>Total</b>	<b>237.5 hours</b>
<b><u>Total Contacts:</u></b>	<b>1556</b>

LIC VIOLATION	Arrest	<b>25</b>	Warnings	<b>4</b>	Total	<b>29</b>
GEAR VIOLATION	Arrest	<b>38</b>	Warnings	<b>60</b>	Total	<b>98</b>
OVERLIMIT	Arrest	<b>0</b>	Warnings	<b>0</b>	Total	<b>0</b>
WILD COHO	Arrest	<b>0</b>	Warnings	<b>0</b>	Total	<b>0</b>
AREA /SEASON	Arrest	<b>3</b>	Warnings	<b>0</b>	Total	<b>3</b>
GROUND FISH	Arrest	<b>12</b>	Warnings	<b>0</b>	Total	<b>12</b>
BOAT SAFE	Arrest	<b>5</b>	Warnings	<b>62</b>	Total	<b>67</b>
UNDERSIZED	Arrest	<b>0</b>	Warnings	<b>0</b>	Total	<b>0</b>
ILLEGAL CHARTER	Arrest	<b>0</b>	Warnings	<b>0</b>	Total	<b>0</b>
OTHER						
FAIL TO SUBMIT	Arrest	<b>0</b>	Warnings	<b>0</b>	Total	<b>0</b>
POSSESS FISH UNLAWFUL	Arrest	<b>0</b>	Warnings	<b>0</b>	Total	<b>0</b>

Total Citations: 83

Total Warnings: 126

Estimated compliance regarding overall salmon rules was 91.7%\*

Estimated compliance regarding wild coho possession was 100%\*\*

Estimated compliance regarding closed season Chinook was 99.9%\*\*\*

2003 / 2004 / 2005 coverall salmon rules compliance rate comparison: 67% / 76.2% / 91.7%

2003 / 2004 / 2005 comparison of enforcement hours: 183 / 137 / 237.5 hours.

2003 / 2004 / 2005 comparison of anglers contacted: 430 / 356 / 1556 contacts.

Table 10-10. WDFW Fisheries Enforcement Summary for Salmon Catch Area 9 (Edmonds, Southwest Whidbey Island), in 2005.

**Enforcement Hours:**  
 Docks 24  
 Vessel 29  
 Investigative 0  
**Interagency 9**  
**Total 62 hours**  
**Total Contacts: 254**

LIC VIOLATION	Arrest	4	Warnings	0	Total	4
GEAR VIOLATION	Arrest	8	Warnings	11	Total	19
OVERLIMIT	Arrest	0	Warnings	0	Total	0
CHINOOK	Arrest	0	Warnings	0	Total	0
AREA /SEASON	Arrest	0	Warnings	4	Total	4
BOAT SAFE	Arrest	0	Warnings	0	Total	0
OTHER	Arrest	0	Warnings	0	Total	0

**Total Citations: 12**  
**Total Warnings: 15**

Estimated compliance regarding overall salmon rules was 89.4 %\*  
 Estimated compliance regarding wild coho was 100%\*  
 Estimated compliance for closed season Chinook was 100%\*\*\*

2003 / 2004 / 2005 overall salmon rules compliance rate comparison: 75.1% / 86.5% / 89.4%

2003 / 2004 / 2005 comparison of enforcement hours: 203 / 79 / 63 hours.

2003 / 2004 / 2005 comparison of anglers contacted: 590 / 377 / 254 contacts.

**Table 10-11. WDFW Fisheries Enforcement Summary for Salmon Catch Area 10 (Bremerton, WA), in 2005.**

<b><u>Enforcement Hours:</u></b>	
Docks	<b>80.5</b>
Vessel	<b>82.5</b>
Investigative	<b>0</b>
Interagency	<b>2</b>
<b>Total</b>	<b>165 hours</b>
<b><u>Total Contacts:</u></b>	
	<b>678</b>

LIC VIOLATION	Arrest	12	Warnings	6	Total	18
GEAR VIOLATION	Arrest	10	Warnings	9	Total	19
OVERLIMIT	Arrest	0	Warnings	0	Total	0
WILD COHO	Arrest	0	Warnings	0	Total	0
AREA /SEASON	Arrest	0	Warnings	0	Total	0
GROUND FISH / HALIBUT	Arrest	7	Warnings	3	Total	10
BOAT SAFE	Arrest	9	Warnings	0	Total	9
UNDERSIZED	Arrest	0	Warnings	0	Total	0
<b>OTHER</b>						
FAIL TO SUBMIT	Arrest	1	Warnings	0	Total	1
POSSESS FISH UNLAWFUL	Arrest	0	Warnings	0	Total	0

Total Citations: 39

Total Warnings: 18

Estimated compliance regarding overall salmon rules was 94.4 %\*

Estimated compliance regarding wild coho possession was 100%\*\*

Estimated compliance regarding closed season Chinook was 100%\*\*\*

2003 / 2004 / 2005 overall salmon rules compliance rate comparison: 69.3% / 82.2 % / 91.9%

2004 / 2005 comparison of compliance with wild coho release rules: 95.4% / 100%

2004 / 2005 comparison of enforcement hours: 400 / 165 hours.

2004 / 2005 comparison of anglers contacted: 1076 / 678 contacts.



Table 10-12. WDFW Fisheries Enforcement Summary for Salmon Catch Area 12 (Hood Canal), in 2005.

**Enforcement Hours:**

Docks	13
Vessel	177
Investigative	0
Interagency	0
<b>Total</b>	<b>190 hours</b>
<b><u>Total Contacts:</u></b>	<b>337</b>

LIC VIOLATION	Arrest	10	Warnings	0	Total	10
GEAR VIOLATION	Arrest	22	Warnings	1	Total	23
OVERLIMIT	Arrest	2	Warnings	0	Total	2
WILD COHO	Arrest	0	Warnings	0	Total	0
CHINOOK	Arrest	0	Warnings	0	Total	0
AREA/SEASON	Arrest	3	Warnings	0	Total	3
UNDERSIZED	Arrest	0	Warnings	0	Total	0
BOAT SAFE	Arrest	2	Warnings	2	Total	4
WARRANTS	Arrest	1	Warnings	0	Total	
OTHER						
FAIL TO SUBMIT	Arrest	0	Warning	0	Total	0
CRAB	Arrest	46	Warning	7	Total	53
GROUND FISH	Arrest	8	Warning	2	Total	10
FAILURE TO RECORD	Arrest	3	Warning	1	Total	4
OYSTER VIOLATION	Arrest	1	Warning	0	Total	1

Total Citations: 98    Total Warnings: 13

Estimated compliance regarding overall salmon rules was 87.6%\*

2003 / 2004 comparison of compliance with overall salmon rules: 86.1% / 84.1% / 87.6%

**SUPPLEMENTAL REGION 6 LAND OFFICER ACTIVITY IN AREA TWELVE**

Hours:	364
Contacts:	792
Arrests:	72    (26 salmon related violations)
Written Warnings:	1
Verbal Warnings:	176    (8 salmon related violations)

Compliance rate to salmon rules: 95% (based on land officer contacts only).

Table 10-13. WDFW Fisheries Enforcement Summary for the Quilcene River in 2005.

**Enforcement Hours:**

Docks	381.5
Vessel	0
Investigative	0
Interagency	51.5
<b>Total</b>	<b>433 hours</b>

**Total Contacts: 523**

LIC VIOLATION	Arrest	13	Warnings	0	Total	13
GEAR VIOLATION	Arrest	0	Warnings	0	Total	0
OVERLIMIT	Arrest	4	Warnings	0	Total	4
WILD COHO	Arrest	0	Warnings	0	Total	0
CHINOOK	Arrest	0	Warnings	0	Total	0
AREA/SEASON	Arrest	15	Warnings	0	Total	15
UNDERSIZED	Arrest	0	Warnings	0	Total	0
BOAT SAFE	Arrest	0	Warnings	0	Total	0
WARRANTS	Arrest	0	Warnings	0	Total	0
OTHER						
FAIL TO SUBMIT	Arrest	0	Warning	0	Total	0
CRAB	Arrest	0	Warning	0	Total	0
GROUND FISH	Arrest	0	Warning	0	Total	0
DRUGS	Arrest	0	Warning	0	Total	0
FISH HANDLING	Arrest	14	Warning	3	Total	17
SNAGGING	Arrest	89	Warning	2	Total	91

**Total Citations: 135**  
**Total Warnings: 5**

Estimated compliance regarding overall salmon rules was 74.2%\*

2004 / 2005 comparison of compliance with overall salmon rules: 89.3% / 74.2%

2004 / 2005 comparison of enforcement hours: 172 / 433 hours.

2004 / 2005 comparison of anglers contacted: 773 / 523 contacts.

Table 10-14. WDFW Fisheries Enforcement Summary for Salmon Catch Area 13 (Olympia, WA), in 2005.

**REGION 6 LAND ACTIVITY**

Hours: 423

Contacts: 1391

Arrests: 103 (47 salmon related violations)

Written Warnings: 3

Verbal Warnings: 201 (48 salmon related violations)

Estimated compliance rate for overall salmon rules was 93%

2003 / 2004 / 2005 overall salmon rules compliance rate comparison: 64% / 67.8% / 93%

2003 / 2004 / 2005 comparison of enforcement hours: 324 / 400 / 423 hours.

2003 / 2004 / 2005 comparison of anglers contacted: 522 / 1076 / 1391 contacts.

## Appendices

Appendix A. 2005-2006 State/Tribal Agreed-to Fisheries

Appendix B. Ocean troll fishery encounter rate study.