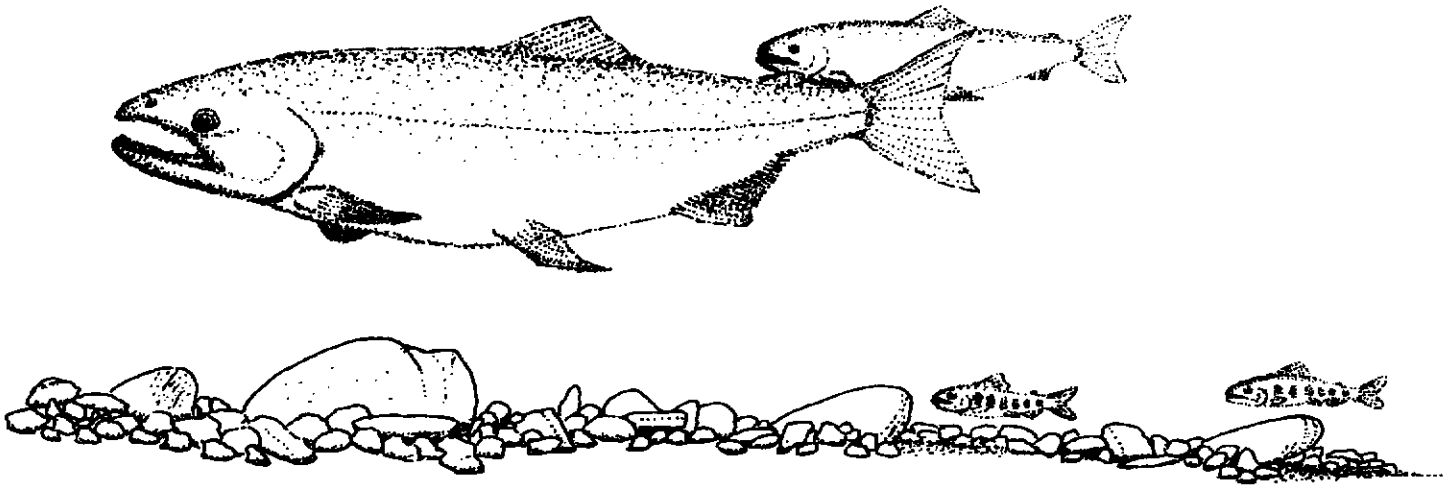
U.S. FISH AND WILDLIFE SERVICE

PROGRESS REPORT OF NATIONAL FISH HATCHERY PROGRAMMING AND EVALUATION ACTIVITIES, PUGET SOUND AND COASTAL WASHINGTON, 1993-1994



WESTERN WASHINGTON FISHERY RESOURCE OFFICE

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PROGRESS REPORT OF NATIONAL FISH HATCHERY PROGRAMMING AND EVALUATION ACTIVITIES, PUGET SOUND AND COASTAL WASHINGTON, 1993-1994

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PREFACE

The purpose of this report is to document annual hatchery programming and evaluation activities at U.S. Fish and Wildlife Service fish hatcheries on the Olympic Peninsula of Washington. Although this report contains some analysis of existing data and may recommend changes to programming activities, the intent is to provide annual updates and not to provide comprehensive analysis of the various programs. Individual broodyear reports will also be generated to describe what is known about the production and performance of different hatchery stocks by brood. Comprehensive analytical reports that encompass multiple broodyears will be produced intermittently to describe trends in survival and production of the hatchery stocks. While one person may be listed as the author of an individual report, all reports result from the collaborative efforts of the staffs of the National Fish Hatcheries, Fishery Resource Office, and Fish Health Center.

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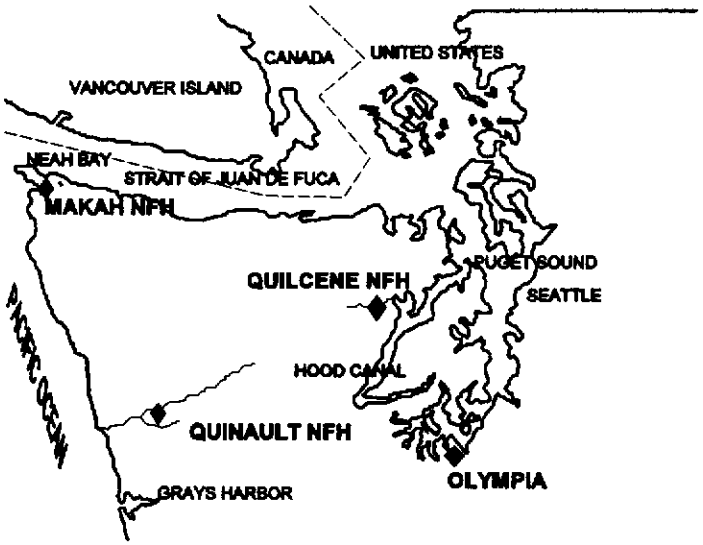
INTRODUCTION

This report contains information regarding hatchery programming and evaluation activities at Quinault, Makah, and Quilcene National Fish Hatcheries (NFH) conducted from August 1, 1993 to July 31, 1994. The information is compiled using the Fisheries Resource Evaluation Database (FRED) (USFWS, 1991), designed and maintained by the Western Washington Fisheries Resource Office (WWFRO). This database provides administratively required information, biological data used to describe biological characteristics of hatchery stocks, and data to correlate fish rearing variables with survival characteristics of hatchery stocks. A general summary of the types of data routinely collected at each facility is presented in Table 1. Summarized data for this reporting period are contained in Tables 2 through 6. Specific details about the data or the database are available from WWFRO.

Fish production levels for all three hatcheries are determined in cooperation with representatives of the U.S. Fish and Wildlife Service (USFWS), tribal staffs, and the Washington Department of Fish and Wildlife. Harvest levels, stock survival rates, wild stock interactions, and hatchery production capabilities are all considered when establishing production numbers. Programmed production goals for the broods reported in this document are presented in Table 2.

This year we established formal hatchery evaluation teams for each hatchery, as specified by the USFWS Region 1 Vision Action Plan. The teams function as a focal point for involved Fish and Wildlife Service employees to participate in the programming and evaluation of the hatchery products. Membership includes hatchery staff, Olympia Fish Health Center staff, and WWFRO staff.



Western Washington locale map.

QUILCENE NATIONAL FISH HATCHERY

The Quilcene NFH production program operates under the guidance of the Hood Canal Management Plan and the Hood Canal Production Evaluation Program (broodyears 1988-1993). Fish production levels are determined cooperatively with representatives from the Fish and Wildlife Service, Point No Point Treaty Council, and the Washington Department of Fish and Wildlife. Future fish production may be limited by water rights issues in the Quilcene drainage. The hatchery's withdrawal right is insufficient for current production levels but attempts to increase the withdrawal right have not been successful in providing more water when fish loads require it. The issue is still under negotiation. Summer chum continue as a high priority program at the hatchery. Hood Canal summer chum are named as a stock of concern in a petition for listing under the Endangered Species Act.

Coho

Releases and Transfers: Coho production at Quilcene NFH included 400,699 Quilcene stock yearlings released to the Big Quilcene River. We transferred 68,123 Dungeness stock and 89,495 Quilcene stock pre-smolt coho to the Point No Point Treaty Council for rearing at their Port Gamble Bay net-pen facility.

Tags and Marks Applied: We coded-wire tagged 29,416 coho for the on-station release and 52,837 coho for the Port Gamble net-pens. The tagged fish for Port Gamble and an additional 117,000 untagged coho received a left ventral fin clip to determine straying patterns within Hood Canal.

Terminal Area Returns, 1993: Adult returns provided sufficient spawners to meet program needs for 1993. Escapement to the hatchery was 7,866. Estimated harvest of Quilcene coho in area 12A beach seine and net fisheries was only 81 fish due to emergency closures to protect summer chum.

Coded-Wire Tag Recoveries: All returning coho to the hatchery were sampled for coded-wire tags. One thousand fifty-one tags were recovered, representing nine different codes. Eighty-one of these tag recoveries were from coho that originated from releases from net-pen programs in Port Gamble and Quilcene Bays. Besides hatchery recoveries, Canadian and Washington sport and commercial fisheries also catch Quilcene coho.

Discussion/Recommendations: The coho program at Quilcene continues to support a major fishery in Quilcene Bay. Due to the early run timing of Quilcene stock coho, there is concern about the interception harvest of summer chum, which enter the Quilcene River simultaneously. Fishery

managers have modified the terminal fishery to emphasize beach seine methods, which allow fishers to return summer chum to the water alive.

Spring Chinook

Releases and Transfers: The hatchery released 116,980 Soleduck stock spring chinook yearlings into the Big Quilcene River. We transferred 32,188 Quilcene stock spring chinook to the Washington Department of Fish and Wildlife. They were later released from the Hood Canal Hatchery in Hoodsport.

Tags Applied: We applied coded-wire tags to all of the spring chinook transferred to the Hood Canal Hatchery.

Terminal Area Returns, 1993: A total of 36 spring chinook returned to the hatchery rack. The run fell far short of the required escapement of 500 adults. We biosampled 86% of the return to find age composition. Age five fish were most common.

Coded-Wire Tag Recoveries: All spring chinook returning to the hatchery were sampled for coded-wire tags. We recovered twenty-five tags representing 13 different codes. Besides hatchery recoveries, Canadian and Washington sport and commercial fisheries catch Quilcene spring chinook. One coded-wire tagged spring chinook from the Hood Canal state fish hatchery and one coded-wire tagged fall chinook from the Pleasant Harbor (Hood Canal) net pen program also returned to the Quilcene NFH rack.

Discussion/Recommendations: This program is being phased out at Quilcene due to poor return rates. The returning adults are now discretely spawned according to stock of origin as determined from coded-wire tags. Eggs and milt are transferred to the Washington Department of Fish and Wildlife hatchery at Hoodsport when necessary for their production needs.

Fall Chum

Releases and Transfers: The hatchery released 1,859,143 feeding chum fry into the Big Quilcene River.

Terminal Area Returns, 1993: A total of 3,464 adult fall chum returned to the hatchery rack. In addition, many fish remained in the river and spawned naturally. We biosampled 14% of the return to determine age composition. Most of the fish were three years old. Run reconstruction by

WDFW shows that over 12,000 normal chum (7,000 natural origin, 5,000 hatchery origin) from the Quilcene River system were caught in 1993 net fisheries, primarily in northern Hood Canal.

Discussion/Recommendations: This program continues as a composite of hatchery and natural production.

Summer Chum

Releases and Transfers: The hatchery released a total of 24,784 feeding summer chum fry in 1994. No summer chum were marked or tagged.

Terminal Area Returns, 1993: Thirty-six adult summer chum were handled at the hatchery. These fish came from interagency broodstocking efforts conducted in the river and from the coho fishery conducted in Quilcene Bay. We biosampled 92% of the summer chum to determine age composition. Five-year-old fish predominated in the run taken to the hatchery. The Washington Department of Fish and Wildlife sampled summer chum carcasses from the hatchery spawning population to develop a genetic profile of summer chum.

Discussion/Recommendations: The number of fish used for broodstocking this year is a reflection of run size rather than broodstocking technique. In both 1992 and 1993, about half of the terminal run was taken to the hatchery for incubation and rearing. The other half of the population spawned in the river. During December 1993 a flood event breached a dike in the lower river, threatening the property of a landowner. The landowner was allowed to do limited repair work to the dike. Due to some miscommunication by state and county authorities, the landowner channelized a large portion of the lower river, destroying some summer chum redds.

MAKAH NATIONAL FISH HATCHERY

Guidance for fish production at Makah NFH is provided through a steering committee with representation from the Fish and Wildlife Service, the Makah tribe, and the Washington Department of Fish and Wildlife. The parties met once during the year and agreed to discontinue all programmed off-station fry releases due to potential impacts on wild stocks. Also discussed was the possibility of increasing yearling steelhead production by 200,000 fish when re-use pumps are installed. The coho, steelhead, and chinook programs are successfully building.

Coho

Releases and Transfers: Coho production at Makah NFH included 300,380 yearlings and 136,000 subyearlings released into the Sooes River. We transferred 59,500 subyearling coho to the Makah tribe for further rearing and imprinting at their Educket Creek facility.

Tags Applied: In December 1993 we applied coded-wire tags to 46,515 yearling coho for the Sooes River release and 31,061 coho for the transfer to Educket Creek.

Terminal Area Returns, 1993: Coho returns provided sufficient spawners to meet program needs for 1993. Escapement to the hatchery was 1,786. Of these, we passed 1,109 fish upstream above the weir to contribute to natural production. The Sooes River net fishery harvested 2,213 coho in the river below the hatchery.

Coded-Wire Tag Recoveries: Thirty-seven percent of the coho returning to the hatchery were sampled for coded-wire tags. One hundred thirty-two tags were recovered, representing six different codes. Expansion of tags to account for subsampling of fish passed upstream yields an estimate of 359 tagged fish recovered. Besides hatchery recoveries, Canadian and Washington sport and commercial fisheries also catch Makah coho.

Discussion/Recommendations: We continue our efforts to separate the timing of the coho run and the chinook run. Early run coho are excessed and not spawned in the hatchery or allowed above the hatchery in the Sooes River. This exception to our standard method of random spawning across the run is being done to allow for more effective fishery management, allowing harvest of coho when chinook numbers preclude fishing, and vice-versa. The early run coho are likely the progeny of Quilcene stock released in the 1970s.

Fall Chinook

Releases and Transfers: The hatchery released 3,391,596 fall chinook fingerlings. We are continuing a strategy of releasing chinook as late as possible (depending on water availability) to improve survival. This year four distinct releases were made, each with an associated coded-wire tag group. The majority of the unmarked fish were released with the last group, between June 1 and June 9.

Tags Applied: A total of 278,427 fall chinook was coded-wire tagged in late April 1994. These fish are an indicator group for the Pacific Salmon Treaty chinook stock re-building program.

Terminal Area Returns, 1993: A total of 2,310 fall chinook returned to the hatchery rack. We biosampled 27% of the return to determine age composition. Age four fish were most common. We passed 509 chinook above the hatchery to spawn in the Sooes River. Five chinook were incidentally harvested in the Sooes River coho fishery.

Coded-Wire Tag Recoveries: All fall chinook kept at the hatchery were sampled for coded-wire tags. One hundred twenty-five tags were recovered, representing eight different codes. Besides hatchery recoveries, Canadian, Alaskan, and Washington sport and commercial fisheries catch Makah fall chinook.

Discussion/Recommendations: The chinook program continues to build at Makah. Adults from the 1989 brood are returning at a higher than average rate, suggesting a large return of five-year-old fish for 1994. These five-year-old fish are predominately female. One recurring problem is the lack of water in the Sooes River when adult chinook return. The hatchery is unable to operate the fish ladder until fall flows increase and adults must hold in the river below the weir. No directed fishery has been held yet, but we project that surplus fish will be available in 1996.

Fall Chum

Releases and Transfers: The hatchery released a total of 10,690 feeding chum fry in 1993.

Terminal Area Returns, 1993: A total of 12 adult fall chum returned to the hatchery rack.

Discussion/Recommendations: The chum program at Makah will continue to be small as there is limited estuarine area for juvenile growth. The program will rely only on returns to the rack and

will probably never achieve the programmed release target.

Winter Steelhead

Releases and Transfers: The hatchery released a total 91,441 steelhead yearlings and 138,907 subyearling fish into the Sooes River. Nineteen thousand steelhead subyearlings were transferred to the Makah tribe for rearing at their Educket Creek facility.

Marks Applied: We clipped the adipose fin on 112,753 of the Sooes River and Educket Creek steelhead yearlings to identify them as hatchery origin.

Terminal Area Returns, 1993: A total of 294 adult steelhead returned to the hatchery rack. All of these were adipose-clipped, signifying hatchery origin. Steelhead entered the hatchery from October 28 to February 10. After that time the ladder was closed and fish were allowed to pass upstream uncounted. Based on this and previous mark recoveries, we know that fish returning in the fall and winter are of hatchery origin and that fish returning in the early spring are of wild origin. We biosampled 97% of the hatchery steelhead to find age composition. Most of the fish were three-year-olds.

QUINAULT NATIONAL FISH HATCHERY

Production levels for Quinault NFH are set through joint agreement between the Fish and Wildlife Service and the Quinault Tribe in a steering committee. This year the Service conducted weekly spawning surveys for fall chinook on the two miles of Cook Creek below the hatchery. Coded-wire tags from the surveys, numbers of live and dead fish observed, and redd counts were provided to Quinault tribal fisheries for expansion and reporting. The chinook technical committee of the Pacific Salmon Commission has requested the escapement information to complete survival information for the Quinault River stock as an indicator group.

Fall Chinook

Releases and Transfers: The hatchery released 201,547 fall chinook fingerlings.

Tags Applied: In early June 1994 we coded-wire tagged 197,054 fall chinook for release into Cook Creek. Tagging of this stock is done to provide an indicator group for the Pacific Salmon Commission chinook stock re-building program.

Terminal Area Returns, 1993: One hundred fifty-four fall chinook were processed at spawning. These fish result from voluntary swim-ins to the hatchery rack and from broodstocking activities conducted by the Quinault tribe in the mainstem Quinault River. This year 77 adult chinook were transported to the hatchery. We scale sampled 58% of the fish at the hatchery to determine age composition. Most of the fish were five years old. Spawning escapement to Cook Creek was estimated at 305 adults, 278 of which were estimated to be of hatchery origin. Another 310 Quinault NFH origin chinook were estimated to have spawned in the mainstem Quinault River. An estimated 983 chinook of Quinault NFH origin were caught in Quinault River fisheries. In summary, of the NFH origin chinook returning to the Quinault River, 58 returned to the hatchery, 983 were caught by fishermen, and 588 spawned in the Quinault system.

Coded-Wire Tag Recoveries: All fall chinook handled at the hatchery were sampled for coded-wire tags. We recovered19 tags, representing seven different codes. Besides hatchery recoveries, Canadian, Alaskan, and Washington sport and commercial fisheries catch Quinault fall chinook.

Discussion/Recommendations: Insufficient broodstock were obtained to meet the programmed production of 600,000 chinook.

Coho

Releases and Transfers: Coho production at Quinault NFH included 582,133 yearlings released on-station.

Tags Applied: We applied coded-wire tags to 79,740 coho yearlings for the on-station release to Cook Creek.

Terminal Area Returns, 1993: Coho returns provided sufficient spawners to meet program needs for 1993. Escapement to the hatchery was 1,628. The Quinault River net fishery harvested an estimated 1,505 fish of Quinault NFH origin. Tribal fisheries staff estimate that 392 hatchery origin coho spawned naturally in the Quinault system.

Coded-Wire Tag Recoveries: We sampled all coho returning to the hatchery for coded-wire tags. One hundred fifty-five tags were recovered, representing four different codes. Besides hatchery recoveries, Canadian and Washington sport and commercial fisheries also catch Quinault coho.

Discussion/Recommendations: Coho density levels are being held low to try to produce smolts with a lower incidence of bacterial kidney disease. It is thought that kidney disease may be a factor in the low coho survival rates (~2.0%) seen at Quinault NFH.

Fall Chum

Releases and Transfers: The hatchery released a total 636,223 feeding chum fry in 1993.

Terminal Area Returns, 1993: A total of 811 adult fall chum returned to the hatchery rack. We biosampled 27% of the rack return to determine age composition. Age four fish were most common. Considerable spawning has recently been documented in Cook Creek below the hatchery rack.

Discussion/Recommendations: The large spawning population of chum in Cook Creek supports the notion that this stock should be considered a wild/hatchery composite. While the hatchery release is below the programmed goal, the Cook Creek system produces enough chum to maintain the fishery.

Winter Steelhead

Releases and Transfers: The hatchery released 170,210 yearling steelhead at the hatchery and 57,808 at Allen's Bar on the Hoh River. The Raft River received 50,000 subyearling steelhead from the 1993 brood and 35,000 subyearlings from the 1994 brood during the period covered by this report. Transfers to Quinault tribal facilities included 50,524 fish to the Hoh Tribal facility at Chalaat Creek, 149,510 from the 1993 brood to Salmon River, and 163,800 from the 1994 brood to Salmon River.

Tags and Marks Applied: Coded-wire tags were applied to 31,518 steelhead for the on-station release to Cook Creek and to 21,145 steelhead for the release at Allen's Bar on the Hoh River. An additional 29,916 fish for the Hoh River release were adipose clipped to identify them as hatchery fish. Of the fish transferred to Salmon River 30,995 were tagged. A total of 21,400 steelhead for transfer to the Chalaat Creek facility were coded-wire tagged and 29,505 were adipose clipped.

Terminal Area Returns, 1993: A total of 587 adult steelhead returned to the hatchery rack. We biosampled 41% of the returning steelhead to determine age composition. Most of the fish were four-year-olds.

Coded-Wire Tag Recoveries: All returning steelhead were sampled for coded-wire tags. Ninety-seven tags were recovered, representing 13 different codes. Twenty-three of these tag recoveries were from Quinault NFH origin steelhead transferred to other facilities or released off-station, at Salmon River, Chalaat Creek, or Hoh River. One tag recovery was from a fish released in the Wishkah River which originated from the Humptulips state fish hatchery.

Discussion/Recommendations: The steelhead program continues to support a vigorous net fishery in the Quinault River and a sport fishery in both the Quinault River and Cook Creek. Over 1,100 steelhead were caught in terminal fisheries in the 1993-94 catch year.

ACKNOWLEDGMENTS

Much of the data required for hatchery evaluation, programming, and coordination is collected solely by hatchery staff. That which is not is collected cooperatively with WWFRO staff. Many suggested program changes and evaluation ideas originate from hatchery personnel. Makah, Quinault, and Quilcene hatchery staff have contributed significantly to the current success and future direction of the hatcheries through their innovative ideas and cooperative natures.

LITERATURE CITED

USFWS. 1991. Fisheries Resource Evaluation Database Users Manual. Western Washington Fishery Resource Office. Olympia, Washington. June 1991. 131pp.

Table 1. Fisheries Resource Evaluation Database (FRED) data collected from Olympic Peninsula hatcheries, 8/1/93 - 7/31/94.

	Quilcene NFH				Quinault NFH				Makah NFH			
	Spring chinook	Coho	Summer chum	Fall chum	Fall chinook	Coho	Fall chum	Winter steelhead	Fall chinook	Coho	Fall chum	Winter steelhead
Adult entry	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
Fish removal	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
Group spawning	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
Mark sampling	✔	✔			✔	✔		✔	✔	✔		✔
Mark recovery	✔	✔			✔	✔		✔	✔	✔		✔
Scale sample	✔		✔	✔	✔		✔	✔	✔		✔	✔
Environmental	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
Marking	✔	✔			✔	✔		✔	✔	✔		✔
Fish transfer	✔	✔						✔		✔		✔
General release	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
Specific release	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔

Table 2. Programmed production for broods released from Olympic Peninsula hatcheries, 8/1/93 - 7/31/94.

Hatchery	Species	Broodyear	Life stage	Number to release	Number to transfer
Quilcene NFH	Coho	1992	smolt	250,000	0
	Spring chinook	1992	smolt	0	90,000
	Fall chum	1993	fed-fry	2,200,000	0
	Summer chum	1993	fed-fry	400,000	0
Quinault NFH	Coho	1992	smolt	600,000	0
	Fall chinook	1993	smolt	600,000	250,000
	Fall chum	1993	fed-fry	1,500,000	0
	Winter steelhead	1993	smolt	160,000	
	Winter steelhead	1994	fingerling	0	160,000
Makah NFH	Coho	1993	sub-yearling	0	0
	Coho	1992	smolt	250,000	50,000
	Fall chinook	1993	smolt	4,000,000	0
	Fall chum	1993	fed-fry	3,000,000	0
	Winter steelhead	1994	sub-yearling	0	0
	Winter steelhead	1993	smolt	82,000	18,000

Table 3. Release and tagging information for Olympic Peninsula hatcheries, August 1, 1993 to July 31, 1994.

Hatchery	Species	Brood	Stock	Release Site	Release Date(s)	size at release (g)	Tagcode	Tags released	Ad-only released	Untagged released	Percent of release tagged	Month tagged	Size at tagging (g)	Tag retention rate (%)
Makah	Chum	93	Sooes River	Sooes River	04/29/94	1.4				10,690				
	Coho	92	"	"	04/08/94-04/13/94	33.2	053421	13,176	2,399	85,253	13.5	Dec 93	17.4	84.6
	"	"	"	"	04/08/94-04/13/94	33.1	053422	13,657	1,653	83,802	13.5	Dec 93	17.4	89.2
	"	"	"	"	04/08/94-04/13/94	33.2	053423	13,622	1,893	84,925	13.5	Dec 93	17.4	87.8
	"	93	"	"	03/11/94-03/30/94	0.5				136,000				
	Fall Chinook	93	"	"	05/13/94	4.9	053133	70,544	4,503	732,319	11.5	Apr 94	3.2	94
	"	"	"	"	05/20/94	4.9	053134	68,674	1,566	331,193	11.5	May 94	3.2	97.8
	"	"	"	"	05/22/94-05/24/94	4.9	053519	61,208	4,758	520,400	5.6	May 94	3.2	92.8
	"	"	"	"	06/01/94-06/09/94	4.9	053520	61,364	4,048	1,531,019	5.6	May 94	4.5	93.8
	Winter Steelhead	93	"	"	04/20/94-04/25/94	58.7				91,441				
	"	94	"	"	05/02/94-05/26/94	0.9				138,907				
Quilcene	Chum	93	Big Quilcene River	Big Quilcene River	05/02/94-05/16/94	1.0				1,859,143				
	Summer Chum	"	"	"	03/30/94	1.5				24,784				
	Coho	92	"	"	05/09/94	22.6	053418	7,791	1,919	123,286	6.2	Oct 93	10.1	80.2
	"	"	"	"	05/09/94	22.6	053419	8,040	1,930	126,587	6.2	Oct 93	10.1	80.6
	"	"	"	"	05/09/94	22.6	053420	8,942	633	121,572	6.2	Oct 93	10.1	93.4
	Spring Chinook	92	Soleduck River	"	05/09/94	28.4				116,980				
Quinault	Chum	93	Cook Creek	Cook Creek	04/08/94	0.7				636,223				
	Coho	92	"	"	04/12/94	23.2	053137	22,322	3,013	168,218	11.8	Nov 93	18.1	88.1
	"	"	"	"	04/12/94	23.2	053138	22,850	1,987	164,911	11.8	Nov 93	17.4	92
	"	"	"	"	04/12/94	23.2	053139	23,630	2,396	172,806	11.8	Nov 93	16.8	90.8
	Fall Chinook	93	"	"	07/27/94	9.9	051956	87,748	8,190	2,417	89.2	Jun 94	4.0	91.5
	"	"	"	"	07/27/94	9.9	053521	93,027	7,630	2,535	90.1	Jun 94	4.0	92.4
	Winter Steelhead	93	"	"	05/03/94	90.8	212412	30,056	1,122	139,032	17.7	Nov 93	30.2	96.4
	"	93	"	Hoh River	05/05/94-05/06/94	73.2	212407	18,693	2,263	31,911	35.4	Nov 93	19.7	89.2
	"	93	"	Raft River	08/11/93	5.8				50,000				
	"	94	"	"	07/27/94	6.9				35,000				

Table 4. Rack return of salmon and steelhead to Olympic Peninsula hatcheries.

Hatchery	Species	Number returned
Makah NFH	Fall chum	12
	Coho	1,786
	Fall chinook	2,310
	Winter steelhead	294
Quilcene NFH	Fall chum	3,464
	Coho	7,866
	Fall chinook	1
	Spring chinook	36
	Summer chum[1]	36
Quinault NFH	Fall chum	811
	Coho	1,628
	Fall chinook[1]	154
	Winter steelhead	587

[1] - from broodstocking efforts and rack return.

Table 5. Age composition of salmon and steelhead returning to Olympic Peninsula hatcheries, 1993-94, in percent.

Species	Hatchery	age 2	age 3	age 4	age 5	age 6	percent of run aged
Chum	Makah NFH	0	0	89	11	0	75
	Quilcene NFH	0	77	22	1	0	14
	Quinault NFH	0	16	82	3	0	27
Summer Chum	Quilcene NFH	6	6	18	70	0	92
Fall Chinook	Makah NFH	0	7	93	0	0	27
	Quinault NFH	3	3	33	59	1	58
Spring Chinook	Quilcene NFH	3	3	10	77	6	86
Winter Steelhead	Makah NFH	1	66	32	1	0	97
	Quinault NFH	0	16	84	0	0	41

Table 6. Summary of coded-wire tag recoveries from Olympic Peninsula hatcheries, 8/1/93 - 7/31/94.

Hatchery	Species	Number of codes	Number of tags	Expansion factor
Quilcene NFH	Spring chinook	13	25	1.00
	Fall chinook	1	1	1.00
	Coho	9	1,051	1.00
Quinault NFH	Fall chinook	7	19	1.00
	Coho	4	155	1.00
	Winter steelhead	13	97	1.00
Makah NFH	Fall chinook	8	125	1.21
	Coho	6	132	2.72
			1,605	