HATCHERY AND GENETIC MANAGEMENT PLAN (HGMP)

Hatchery Program:	**Nehalem Hatchery Coho Salmon Program**
Species or Hatchery Stock:	**Coho Salmon (Stocks 32 & 99)** **Coho Salmon (proposed wild brood)-Stock No. TBD**
Agency/Operator:	**Oregon Department of Fish and Wildlife**
Watershed and Region:	**North Coast Watershed District** **NW Region**
Date Submitted: **First Update submitted:** **Second Update Submitted:**	**March 27, 2001** **December 9, 2008** **July 18, 2016**
Date Last Updated:	**July 18, 2016**

SECTION 1. GENERAL PROGRAM DESCRIPTION

1.1) Name of hatchery or program.

Nehalem Hatchery Coho Salmon program, stocks 32 and 99. Program production is targeted for release in the NF Nehalem River.

Nehalem Hatchery Coho Salmon- wild broodstock. Stock identification number to be determined (if approved)

1.2) Species and population (or stock) under propagation, and ESA status.

Coho Salmon *Oncorhynchus kisutch,* hatchery stocks 32 & 99

Nehalem Basin wild Coho Salmon are part of the Oregon Coast Coho ESU, which was listed as a threatened species under the federal ESA on February 11, 2008 (Federal Register Notice 2008). The hatchery stocks are not part of the ESU and therefore not listed under the ESA. The Oregon Native Fish Status Report 2005 lists the interim assessment of Oregon Coastal Coho Species Management Unit (SMU) as Not at Risk.

1.3) Responsible organization and individuals

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On-site Lead Contact:

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Hatchery Contact:

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1.4) Funding source, staffing level, and annual hatchery program operational costs.

- Funding for this program is 100% funded by the State of Oregon (Other Fund).
- Nehalem Hatchery has a staffing level of 3.5 full time employees (FTE).
- The annual budget for the Coho Salmon program is a s follows:

Table 1-1. Annual budget for Nehalem Hatchery coho program (includes Trask stock 34 reared at Nehalem).

Year	Total Budget	Coho Budget	Stock 32 & 99 % of Total	Stock 32 / 99 Coho Smolts	Stock 34 % of Total	Stock 34 Coho Smolts
2005	$ 318,291	$31,829	10%	102,722	8.2	$ 26,100
2006	$314,158	$29,217	9.3%	102,144	8.1	$29,217
2007	$349,601	$32,164	9.2%	102,761	8.8	$30,765
Source: ODFW (2008)						

1.5) Location(s) of hatchery and associated facilities.

Nehalem Hatchery is located about 12 miles northeast of the town of Nehalem, adjacent to the North Fork Nehalem River at about river mile (RM) 10.3, The hatchery site is 26.2 acres in size, located at an elevation of 141 feet above sea level, at latitude 45o 39' 41'' N (45.8130) and longitude 123o 50' 20" W (123.7745). All fish propagation activities for this hatchery coho program including adult collection, spawning, egg incubation, juvenile rearing and release etc. occur at Nehalem Hatchery. The LLID number for North Fork Nehalem River is 1238777457315. The ODFW waterbody code for NF Nehalem River is 0100310000. The regional mark processing code for Nehalem Hatchery is 5F22218 H18 21.

1.6) Type of program.

Isolated Harvest – The intent of this propagation program is for harvest augmentation and is not intended to produce fish to spawn in the wild or interbreed with natural populations. This program is currently operated as a segregated hatchery program.

As described within this HGMP, ODFW proposes to establish a new Nehalem basin Coho Salmon broodstock from wild coho once approved by NOAA. *And it is proposed that the new broodstock would be derived from wild coho by using 100% wild brood in three consecutive years (details described in Section 6.2.3).* Future production would include some level of integration of wild adults into the broodstock (described in Section 6.2.3, item #3).

1.7) Purpose (Goal) of program.

The purpose of this program is to provide adult hatchery coho for harvest in ocean fisheries and in Nehalem Basin freshwater fisheries.

1.8) Justification for the program.

The two goals currently identified for this program and their justifications are summarized below.

***Goal 1**: A hatchery fish harvest fishery will occur for coho on the Nehalem River. This goal is not intended to directly benefit listed fish.*

A hatchery fish harvest will be allowed on Nehalem Hatchery coho as long as incidental harvest and associated hatchery risks are held within acceptable limits established in Amendment 13 of the PFMC Salmon Fishery Management Plan (PFMC 1997) and in the Fishery Management and Evaluation Plans (FMEP's) . Harvest will occur in ocean fisheries as well as freshwater/estuary fisheries in Nehalem Bay and in the North Fork Nehalem River. However, in recent years wild coho harvest fisheries have been allowed under an FMEP approved by NOAA within certain limitations.

***Goal 2:** Coho hatchery stocks 32 & 99 will be used to provide monitoring opportunities for north coast coho related to ocean distribution and marine survival.*

Nehalem Hatchery coho were marked with coded wire tags (CWT) since the 1977 brood year, however, beginning with BY 2008 smolts will not have CWT's due to marking budget reductions and restructuring of stock assessment needs. Since these current broodstocks originated from the Nehalem River it was assumed that the ocean distribution of the hatchery fish would be similar to that of wild fish, and that the marine survival trends in hatchery fish would be informative about the trends in marine survival of wild fish. The survival and catch distribution (both time and area) information obtained in the past from the CWT hatchery coho was used in fishery management models, and in documenting fishery impacts. These models estimated the harvest impacts of various fishery management options, to specific salmon stock aggregates. Therefore, the CWT data obtained in the past on Nehalem Hatchery coho were useful in the management and recovery of the Oregon Coast coho ESU.

The North Fork Nehalem trap (located approximately 2 miles above Nehalem Hatchery) is a salmonid life-cycle monitoring site. The life-cycle monitoring site estimates population parameters for naturally spawning coho above the North Fork Nehalem trap (Solazzi et al. 2000). Both juvenile and adult information obtained from wild coho at North Fork trap can be compared to similar data from Nehalem Hatchery coho. This will provide information on the differences between hatchery and wild coho and the appropriateness of using information obtained from hatchery coho in management of wild coho. Evaluation of the assumption that trends in marine survival of hatchery fish reflect trends in marine survival of wild fish will be useful in the management and recovery of the Oregon Coast coho ESU. This will be especially important for these hatchery coho broodstocks given their age, lack of recent incorporation of wild fish, and historic stock transfers (see Section 6).

1.9) and 1.10 List of program "Performance Standards' and "Performance Indicators" designated by "benefits" and "risks".

Indicator 1 - Harvest

Standard 1.1 – Harvest of Nehalem Hatchery coho will be managed to comply with Amendment 13 of the PFMC Salmon Fishery Management Plan, and/or FMEPs developed for these fisheries. **(Benefit)**

Indicator: Number of Nehalem Hatchery coho harvested. **(Benefit)**

Indicator: Estimate of incidental mortality rate on wild coho. **(Risk)**

Standard 1.2 – All Nehalem Hatchery coho will be externally marked. **(Benefit)**

Indicator: Pre-release mark quality checks indicate at least 95% of fish released have retained identifiable marks and/or tags. **(Benefit)**

Indicator: Mark rate by mark type for each release group. **(Benefit)**

Indicator 2 - Life History Characteristics

Standard 2.1 – Coho for broodstock are collected in a manner that approximates the distribution in run timing, age, and size of the fish returning to the Nehalem basin. However, jacks typically make up no more than 5% of the males spawned. **(Benefit)**

Indicator: Temporal distribution of Nehalem Hatchery adult coho returns and broodstock collected. **(Risk – unknown)**

Indicator: Age distribution of Nehalem Hatchery adult coho returns and broodstock spawned. **(Benefit)**

Standard 2.2 – Releases of Nehalem Hatchery coho will minimize impacts to naturally produced salmonids through control of hatchery release numbers, and by minimizing spatial and temporal overlap with natural populations. **(Risk)**

Indicator: Number of Nehalem Hatchery coho released. **(Risk)**

Indicator: Dates of Nehalem Hatchery coho releases. **(Risk)**

Indicator: Location of Nehalem Hatchery coho releases. **(Risk)**

Indicator: Temporal distribution of wild coho smolt migration from North Fork Nehalem smolt trap. **(Risk)**

Standard 2.3 – Nehalem Hatchery coho smolts will be volitionally released as yearlings, any fish remaining after a volitional period, will be crowded out. **(Risk – unknown)**

Indicator: Beginning and ending dates of Nehalem Hatchery coho releases. **(Risk – unknown)**

Indicator: Estimated proportion of Nehalem Hatchery coho leaving volitionally. **(Risk – unknown)**

Standard 2.4 – All Nehalem Hatchery coho smolts will be reared and released on station. Any fry or fingerlings in excess of needs for the smolt program may be released into

standing water bodies without natural coho production, or may be destroyed. **(Risk – unknown)**

Indicator: Location of Nehalem Hatchery coho rearing and release. **(Risk – unknown)**

Indicator 3 - Genetic Characteristics

Standard 3.1 – Hatchery coho will not exceed the stray rate identified in the Coastal Coho Conservation Plan (2007) for the Nehalem Basin naturally spawning coho population abundance. **(Benefit)**

Indicator: Estimated abundance of naturally spawning coho in Nehalem Basin. **(Benefit)**

Indicator: Estimated abundance of naturally spawning coho in the Nehalem Basin that are of hatchery origin, based on marks and/or tags. **(Benefit)**

Standard 3.2: Stock 99 or 32 hatchery coho adults, or wild adult coho adults collected form the Nehalem basin, will be used as broodstock. **(Risk - unknown)**

Indicator: Location of broodstock collection. **(Risk - unknown)**

Indicator: Fin clips on hatchery fish collected for brood, or unmarked adults. **(Benefit)**

Standard 3.3: Coho broodstock will be spawned following appropriate mating and spawning protocols to maintain genetic diversity of the population. **(Benefit)**

Indicator: Number and ratio of males and females spawned. **(Benefit)**

Indicator: Matings will follow procedures as outlined and appropriate for the stock size, in the Hatchery Management Policy, Fish Health Management Policy, IHOT fish health document, or as directed by the ODFW staff geneticist. **(Benefit)**

Indicator 4 - Operation of Artificial Production Facilities

Standard 4.1 – The Nehalem Hatchery coho program will be operated in compliance with ODFW Hatchery Management Policy, Fish Health Management Policy, and the IHOT fish health guidelines. See attachment A. **(Benefit)**

Indicator: Number of broodstock sampled and pathogens observed. **(Benefit)**

Indicator: Rearing survival rates from egg to fry and fry to smolt stages. Results of regular fish health examinations and appropriate measures. **(Benefit)**

Indicator: Determine fish health status of juveniles prior to release, and release only certified fish. **(Benefit)**

Indicator: Release of full term smolts at the target size of 15 fish per pound. **(Benefit)**

Standard 4.2 – Nehalem Hatchery water discharges will comply with the conditions and water quality limitations identified in the current NPDES permit as required by the Oregon Department of Environmental Quality (DEQ). **(Benefit)**

Indicator: Water samples collected and result reported. **(Benefit)**

Indicator: Results within accepted criteria. **(Benefit)**

Standard 4.3 – Nehalem Hatchery water withdrawals will comply with NMFS juvenile screening criteria. **(Benefit)**

Indicator: Screens inspected and are either in or are brought in to compliance. **(Benefit)**

Standard 4.4 – Nehalem Hatchery coho carcass placements for stream enrichment comply with MOU between ODFW and DEQ. **(Benefit)**

Indicator: Number and location of coho carcasses distributed. **(Benefit)**

Indicator: Examine carcass health and use only pathogen free carcasses. **(Benefit).**

Standard 4.5 - Naturally produced steelhead, Chinook, coho, chum, and cutthroat that enter the Nehalem Hatchery adult trap are handled and released (except fish retained for brood) in a manner that minimizes stress, injury, mortality, and delay in migration. **(Risk)**.

Indicator: Number of unmarked adult steelhead, Chinook, coho, chum, and cutthroat collected and released alive (or retained for brood) from the Nehalem Hatchery trap. **(Risk - unknown).**

Indicator: Number of unmarked adult steelhead, Chinook, coho, chum, and cutthroat mortalities at Nehalem Hatchery during operation of the hatchery adult trap. **(Risk).**

Indicator: Dates of trap operation and frequency of handling steelhead, Chinook, coho, chum, and cutthroat. **(Benefit)**

Standard 4.6 - Releases of hatchery coho smolts will limit predation impacts to naturally produced salmonids through control of hatchery release numbers and by minimizing spatial and temporal overlap with naturally produced salmonid juveniles. **(Risk - unknown).**

Indicator: Dates, location and sizes of Nehalem Hatchery coho releases. **(Risk - unknown).**

Indicator: Temporal and size distribution of wild coho smolt migration from North Fork Nehalem smolt trap. **(Risk - unknown).**

Indicator 5 - Socio-Economic Effectiveness

Standard 5.1 – Estimated harvest benefits will equal or exceed hatchery production costs for Nehalem Hatchery coho, based on the benefit-cost model (ODFW 1999), or an updated version of that model. **(Benefit)**

Indicator: Annual budget expenditures. **(Benefit)**

Indicator: Estimated harvest benefits. **(Benefit)**

1.11) Expected size of program.

The Nehalem Hatchery coho program currently has a smolt release goal of 100,000. All smolts are for release in the NF Nehalem River.

1.11.1) Proposed annual broodstock collection level (maximum number of adult fish).

Existing hatchery program requires a minimum of 70 females and 70 males for broodstock purposes and to increase genetic diversity. Additional adults may be collected as necessary to cover shortages resulting from, but not limited to, fecundity variation, early egg mortality, positive disease test, etc.

ODFW proposes to establish a new program using wild coho adults. A maximum of 110 adults (55 females and 55 males) would be needed for broodstock to meet full production goals.

1.11.2) Proposed annual Coho Salmon release levels by life stage and location.

Table 1-2. Proposed Annual Release Levels.

Life Stage	Release Location	Annual Release Level
Eyed Eggs	N.A.	N.A.
Unfed Fry [1]	Standing Water	Excess to production, varies
Fry [1]	Standing Water	Excess to production, varies
Fingerling [1]	Standing Water	Excess to production, varies
Yearling	N Fork Nehalem R. @ hatchery	100,000

Data source: District files

1 - This program does not produce fry or fingerlings for release as a program goal for Stock 99 or 32 coho. In any given year there may be surplus fry or fingerlings (typically from above average fry and fingerling survival). These will be released to standing water bodies or destroyed.

1.12) Current program performance, including estimated smolt-to-adult survival rates, adult production levels, and escapement levels. Indicate the source of these data.

Table 1-3 provides estimates of adult coho production from the Nehalem Hatchery coho program, for the years 1985 - 1996. The estimated total number of adult hatchery coho produced was derived from a variety of data sources.

The “Ocean Commercial” and “Ocean Sport” columns were estimated by expansion of coded-wire tag (CWT) recoveries to reflect total production as follows: {(Estimated CWT recoveries / number of CWT smolts released) * total fish released}. This calculation was made for each group of CWT smolts released, and then summed across all CWT groups released for each brood year. This estimate represents landed catch and does not include an estimate of non-landed coho mortality in Chinook only fisheries. Included in the “Ocean Sport” column are any recoveries in the “Buoy 10” or other estuary fisheries outside of Nehalem Basin. The “Freshwater Sport” column was obtained from a statistical creel survey in Nehalem Bay and the North Fork Nehalem River, begun in 1998. The “Hatchery Return” column is the actual count of adult coho returns at Nehalem Hatchery. In 1998 and 1999 the returning hatchery fish were essentially 100% marked, and the hatchery return numbers do not include unmarked coho

collected and released alive at Nehalem Hatchery.

Two estimates of the number of hatchery coho that strayed to natural spawning areas in the Nehalem Basin are available, and these are reported in Table 1-3 in the two columns under "Spawning Areas". The first is based on a Stratified Random Sampling (SRS) approach and is an "extensive" monitoring effort that provides a basin wide estimate of hatchery coho strays (Jacobs et al. 2000). The "SRS" column is estimated as: {(Hatchery strays = Total SRS population estimate – SRS wild coho population estimate)}, see Jacobs et al. (2000) for 1998-99 run year data. The total SRS coho population estimate is adjusted based on the hatchery to wild ratio, from scale samples and/or marks on coho salmon carcasses. A second "intensive" monitoring effort provides an estimate of hatchery coho strays in 35 miles of habitat in the North Fork Nehalem River immediately above Nehalem Hatchery. As part of the OPSW, a life-cycle monitoring program was initiated in 1998 for the North Fork Nehalem River above the North Fork Falls, located about 2 miles above Nehalem Hatchery. This program estimates total coho spawning abundance above North Fork Nehalem Falls based on a mark-recapture method, and then estimates the proportion of hatchery fish based on the hatchery to wild ratio observed at the adult trap. This estimate of hatchery coho is reported under the "N Fk" column. The "SGS" column should account for fish in the "N Fk" column, but clearly did not in 1999-2000. Adult hatchery coho collected during operation of the life-cycle monitoring program are killed and returned to Nehalem Hatchery, these fish are reported below in the column "Removed @ N Fk Traps". Smolt to adult survival is calculated as the sum of the prior 7 columns divided by the "Smolt Release" column.

Table 1-3. Estimated adult coho produced by the Nehalem Hatchery coho program, 1985-2004.

Brood Year	Smolt Release	Adult Return Year	Estimated Total Adult Hatchery Coho Produced							Smolt to Adult Survival
			Ocean Comm.	Ocean Sport	Freshwater Sport	Hatchery Return	Removed @ N Fk Traps	Spawning Areas		
								SRS	N Fk	
1985	583,023	1988-89	13,032	5,944	n.a.	7,831	n.a.	n.a.	n.a.	4.60%
1986	741,204	1989-90	3,617	3,358	n.a.	6,730	n.a.	n.a.	n.a.	1.85%
1987	804,901	1990-91	6,414	9,393	n.a.	1,553	n.a.	2,933	n.a.	2.52%
1988	830,852	1991-92	9,309	10,760	n.a.	14,732	n.a.	1,113	n.a.	4.32%
1989	735,845	1992-93	1,265	3,565	n.a.	3,353	n.a.	958	n.a.	1.24%
1990	832,351	1993-94	1,544	5,584	n.a.	5,191	n.a.	9,427	n.a.	2.61%
1991	760,261	1994-95	84	147	n.a.	5,464	n.a.	1,503	n.a.	0.95%
1992	839,514	1995-96	24	490	n.a.	4,514	n.a.	1,407	n.a.	0.77%
1993	789,984	1996-97	154	411	n.a.	4,526	n.a.	3,063	n.a.	1.03%
1994	636,519	1997-98	0	125	n.a.	2,645	n.a.	963	n.a.	0.59%
1995	629,007	1998-99	2	109	206	2,576	162	350	299	0.59%
1996	192,645	1999-00	11	78	465	1,197	675	0	392	1.46%
1997	214,556	2000-01	10	18	101	697	57	50	109	0.49%
1998	209,900	2001-02	32	286	2087	6,728	632	468	2071	5.86%
1999	204,648	2002-03	0	343	941	2,638	n.a.	1474	3332	4.26%
2000	204,534	2003-04	39	696	1351	1,653	n.a.	377	649	2.33%
2001	101,704	2004-05	42	348	260	1,445	n.a.	100	647	2.79%
2002	100,652	2005-06	21	36	45	1,689	n.a.	0	872	2.65%
2003	102,722	2006-07	0	81		846	n.a.	1202	384	na
2004	102,144	2007-08	0	47		163	n.a.	n.a.	49	na
2005	102,761	2008-09	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	na
2006	102,849	2009-10	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	na

Data Source: ODFW HMS database, District files, EMAP, OASIS, and CWT database.

1.13) Date program started (years in operation), or is expected to start.

Hatchery coho production, at the current site began in 1966 for stock 32 (N. Fk. Nehalem) and in 1978 for stock 99 (Fishhawk Lake). The current hatchery replaced a prior hatchery located at Foley Creek (tributary of the Lower Nehalem River) which was operated from 1926 to 1965.

Use of wild coho broodstock would be implemented as soon as possible, provided conditions outlined in this HGMP, and approved by NOAA, are met.

1.14) Expected duration of program.

The Nehalem Hatchery coho program is ongoing and expected to continue into the future.

1.15) Watersheds targeted by program.

North Fork Nehalem River, a tributary of the lower Nehalem River.

1.16) Indicate alternative actions considered for attaining program goals, and reasons why those actions are not being proposed.

1.16.1) Brief Overview of Key Issues

Stock Composition - The Nehalem Hatchery coho program is currently a combination of stock 32 and stock 99. Alternatives to this program are being considered. See section 1.16.2.

1.16.2) Potential Alternatives to the Current Program

Alternative 1 - Increase stock 99 and / or stock 32 coho program size

Description and Implications - This alternative would increase the number of smolts released for one or both stocks. The coho sport fishery in the ocean, Nehalem Bay and North Fork Nehalem River may be enhanced if the increase resulted in more adults available to anglers. Any impacts from stock 99 or 32 hatchery coho on naturally rearing species would potentially increase also. Hatchery operating costs would increase. Increased adult returns would increase the workload of hatchery personnel to handle the additional fish.

Alternative 2 - Eliminate the stock 99 or stock 32 coho program

Description and Implications - This alternative would eliminate one of the programs. The consumptive coho recreational fishery in the Nehalem Bay and North Fork Nehalem would be eliminated in corresponding return years for the stock eliminated. Any impacts of stock 99 or stock 32 hatchery coho on naturally rearing species would be eliminated for that stock's return years. Hatchery operating costs associated with the program would be eliminated.

Alternative 3 - Eliminate both stock 99 and stock 32 programs

Description and Implications - This alternative would eliminate this program. The consumptive coho sport fishery in the Nehalem River basin would be eliminated and would decrease economic activities related to sport fisheries. Any interactions of hatchery coho with naturally produced fish would be eliminated.

Alternative 4 - Incorporate unmarked fish into brood

Description and Implications – Use of unmarked, wild adults would replace the current broodstock. Alternatively, a wild brood program could be phased in during years of sufficient abundance while maintaining a portion of the releases from the existing programs. Use of naturally produced adults from the main-stem Nehalem basin may increase potential straying of returning adults to the upper Nehalem River. This alternative is proposed for implementation in this HGMP.

Alternative 5 – Eliminate stock 99 coho program and replace with stock 32 production

Description and Implications - This option would increase the number of stock 32 smolts produced to replace the stock 99 smolts eliminated. Overall release numbers would remain the same. This option would require developing a new stock 32 broodstock as replacement for stock 99 (every third year). It is unknown if sufficient numbers of naturally produced fish would be available to meet genetic needs without excessive impacts to natural populations.

Alternative 6 – Eliminate stock 32 coho program and replace with stock 99 production

Description and Implications - This option would increase the number of stock 99 smolts produced to replace the stock 32 smolts eliminated. Overall release numbers would remain the same. This option would require developing a new stock 99 brood for the replacement of stock 32 (two of every three years). It is unknown if sufficient numbers of naturally produced fish would be available to meet genetic needs without excessive impact to natural populations.

Alternative 7 – Install a barrier (i.e. weir) at Nehalem Hatchery to allow removal of hatchery coho and limit their presence in the upper North Fork Nehalem River basin

Description and Implications – This option would allow for the separation of hatchery and wild fish at the hatchery. Only naturally produced adults would be passed upstream of the hatchery. Operating would necessitate handling of all fish migrating upstream past the hatchery. Workload associated with sorting hatchery coho from naturally produced fish would increase. Impacts to naturally produced fish from handling would increase. Any impacts to naturally produced salmonid populations from passing hatchery coho to the upper North Fork Nehalem River would be reduced or eliminated. Substantial cost would be associated with construction and maintenance of the barrier.

Note: The alternatives listed are draft. They are presented here as a forum for further discussion. This list is not exhaustive, other ideas are welcome. The alternatives listed may not represent final decisions by ODFW.

1.16.3) Potential Reforms and Investments.

Modify intake screening – Nehalem Hatchery intake screening does not currently meet NOAA Fisheries standards. Modification of the intake will require increasing the size of the screen area and purchase of additional screens and framing. No cost estimate is currently available.

Note: The reforms and investments listed are draft. They are presented here as a forum for further discussion. This list is not exhaustive, other ideas are welcome. The reforms and investments listed may not represent final decisions by ODFW.

SECTION 2. PROGRAM EFFECTS ON ESA-LISTED SALMONID POPULATIONS

2.1) List all ESA permits or authorizations in hand for the hatchery program.

The HGMP for this program was submitted to NOAA Fisheries in 2001 which served as a take authorization for any ESA-listed fish. This current document is an updated version of HGMP for Nehalem Hatchery coho propagation program that has been developed after re-listing of Oregon Coast coho under the federal Endangered Species Act (ESA).

2.2) Provide descriptions, status, and projected take actions and levels for ESA-listed natural populations in the target area.

2.2.1) Description of ESA-listed salmonid population(s) affected by the program.

Oregon Coastal Coho Salmon inhabit the Nehalem River basin and may be directly affected by the Nehalem Hatchery coho program. The Oregon Coastal Coho ESU is currently ESA listed (February 11, 2008), and it is assumed that the coastal coho population may be affected by this program.

Nehalem Complex

The Nehalem Complex consists of Coho Salmon inhabiting the Nehalem Basin, one small direct ocean tributary to the north and a few to the south (Nickelson 2001). There is an estimated 470 miles of spawning habitat available to the Coho Salmon of this complex.

Coho Salmon Life History

Adult coho salmon migrate into fresh water in the fall to spawn. Spawning of wild Coho Salmon usually occurs from mid-November through February. Adult spawning Coho Salmon are typically 3 years old and are often accompanied by 2-year-old jacks (precocious males) from the next brood. Spawning occurs primarily in small tributaries located throughout coastal basins. The parents normally exhibit strong homing to their natal stream. The female digs a nest (redd) in the gravel and lays her eggs, which are immediately fertilized by accompanying adult males or jacks. The eggs are covered by digging and displacing gravel from the upstream edge of the nest. Each female lays about 2,500 eggs. The adults die soon after spawning. Sex ratios of spawning adults tend to average around 50:50 at most locations (Table 2-1). However, Moring and Lantz (1975) observed 77 percent males in three small Alsea River tributaries over a period of 14 years. They concluded that males tend to move around a lot and visit multiple streams.

The eggs hatch in about 35 to 50 days, depending upon water temperature (warm temperature speeds hatching). The alevins remain in the gravel for 2 or 3 weeks until the yolk is absorbed and emerge as fry to actively feed in the spring. Most juvenile coho salmon spend 1 summer and 1 winter in fresh water. The following spring, approximately 1 year after emergence, they undergo physiological changes that allow them to survive in seawater. They then migrate to the ocean as silvery smolts about 10 to

12 centimeters (cm) in length.

Table 2-1. Sex ratio of Coho Salmon observed in adult traps.

Population Complex	Percent Males	Percent Females	Location	Run Years	Data Source
Nehalem	52%	48%	North Fork trap	1998-1999	Life Cycle Monitoring
Siletz	50%	50%	Mill Creek trap	1997-1999	Life Cycle Monitoring
Yaquina	51%	49%	Mill Creek trap	1997-1999	Life Cycle Monitoring
Alsea	77%	23%	Drift Creek tributaries	1959-1972	Moring & Lantz (1975)
	50%	50%	Cascade Creek trap	1997-1999	Life Cycle Monitoring
Umpqua	55%	45%	Smith River trap	1999	Life Cycle Monitoring
Coos	63%	37%	S. Coos River, Winchester Creek, and Fall Creek	1999	Oregon Plan Monitoring

The smolts undergo rapid growth in the ocean, reaching about 40 to 50 cm by fall. Little is known of the ocean migrations of coho salmon from Oregon coastal streams; however, based on what is that migrations are mostly limited to coastal waters. Initial ocean migration appears to be to the north of their natal stream (Fisher and Pearcy 1985; Hartt and Dell 1986). After the first summer in the ocean, a small proportion of the males attain sexual maturity and return to spawn as jacks. Migration patterns during the fall and winter are unknown. Those fish remaining at sea grow little during winter but feed voraciously during the next spring and summer, growing to about 60 to 80 cm in length. During this second summer in the ocean, a substantial percentage of these maturing adults are caught in ocean troll and sport fisheries, usually to the south of their natal stream (Lewis 2000). The survivors return to their home streams or neighboring streams where they spawn and die to complete the life cycle.

Habitat Use and Freshwater Distribution

Spawning and rearing of juvenile Coho Salmon generally take place in small, low-gradient (generally less than 3 percent) tributary streams, although rearing may also take place in lakes where available. Coho Salmon require clean gravel for spawning and cool water temperatures (53º to 58°F preferred, 68°F maximum) for rearing (Reiser and Bjornn 1979). Fry emerge from February to early June (Moring and Lantz 1975) and occupy backwater pools and the stream margins (Mundie 1969; Lister and Genoe 1970; Nickelson et al. 1992a). During the summer, Coho Salmon prefer pools in small streams, whereas during winter, they prefer off-channel alcoves, beaver ponds, and dam pools with complex cover (Nickelson et al. 1992a, 1992b). Complexity, primarily in the form of large and small wood is an important element of productive Coho Salmon streams

(Nickelson et al. 1992b; Rodgers et al. 1993). Little is known about residence time or habitat use of estuaries during seaward migration. It is usually assumed that Coho Salmon spend only a short time in the estuary before entering the ocean. However, recent research is finding that rearing in the upper ends of tidal reaches can be extensive.

The distribution of Coho Salmon within a basin is primarily determined by two factors: marine survival and the distribution of freshwater habitat of different levels of quality. When marine survival has been very poor, coho will be found in only the highest quality habitats. Coast-wide, these habitats comprise about 22 percent of the habitat (Nickelson 1998). When marine survival increases, as could occur with a changing climate regime, coho may redistribute into freshwater habitats of even lower quality. Thus, Coho Salmon population dynamics function with a classic "source-sink" relationship among stream reaches.

- Identify the ESA-listed population(s) that will be <u>directly</u> affected by the program.

The Oregon Coastal Coho Salmon, which has been listed as Threatened, may be directly affected by this hatchery coho program once the incorporation of proposed listed natural Coho Salmon into broodstock is authorized by NMFS.

- Identify the ESA-listed population(s) that may be <u>incidentally</u> affected by the program.

The Nehalem River Coho Salmon may be incidentally affected by this program. Although not ESA-listed, the Oregon Coast winter steelhead populations are considered a species of concern, and may also be incidentally affected by this program.

2.2.2) Status of ESA-listed salmonid population(s) affected by the program.

- Describe the status of the listed natural populations(s) relative to "critical" and "viable" population thresholds.

Nehalem Complex

The Nehalem Complex consists of Coho Salmon inhabiting the Nehalem Basin, and small direct ocean tributaries to the north and south. There is an estimated 470 miles of spawning habitat available to the Coho Salmon of this complex. The critical population level for the Nehalem complex is 1,900 adult spawners. The habitat of this complex has the potential to support a viable population because high quality habitat is estimated to be present in 110 miles of stream, well above the 15-mile threshold (Nickelson 2001).

The population of wild Coho Salmon spawners of the Nehalem Complex has ranged from about 3,000 to about 32,500 and has averaged about 16,539 since 2003 (Figure 2-1 and Table 2-2). In none of those years did spawner abundance fall below the critical threshold of 1,900 fish.

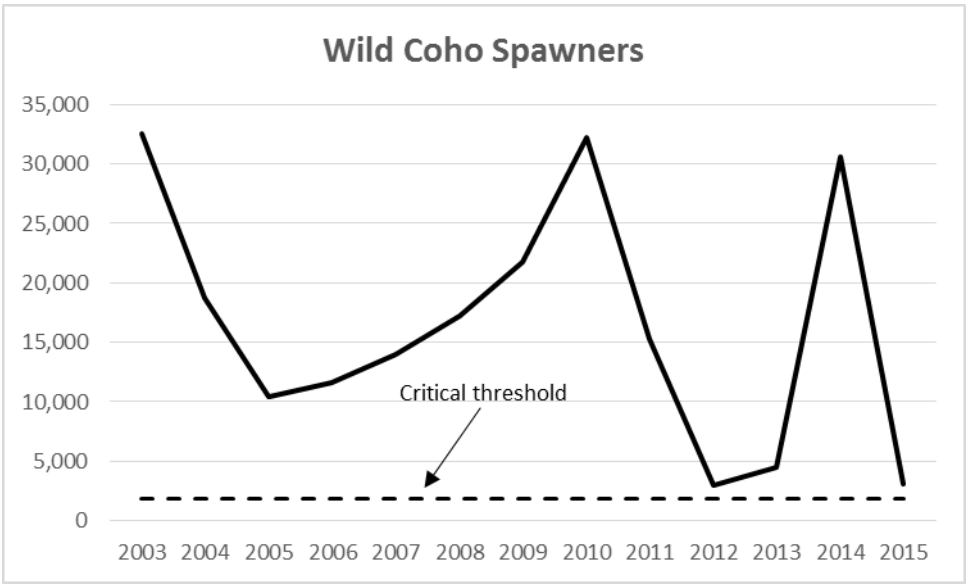

Figure 2-1. Trend in adult wild coho spawner abundance relative to the critical population level for the Nehalem Complex.

- Provide the most 12 year progeny-to-parent ratios, survival data by life stge, or other measures of productivity for the listed population. Indicate the source of data.

Recruits per wild spawner have been highly variable, with seven of the last thirteen broods falling below one (Table 2-2 and Figure 2-3).

Table 2-2. Population Parameters showing recruit per spawner for the Nehalem Complex Coho Salmon, 2003-2015.

Year	Wild Spawners	Hatchery Spawners	Percent Hatchery Spawners	Pre-harvest Wild Population	Recruits Per Spawner
2003	32,517	284	1%	35,345	2.4
2004	18,736	89	0%	20,299	0.9
2005	10,451	0	0%	10,932	0.6
2006	11,614	1202	9%	12,569	0.4
2007	14,033	425	3%	15,910	0.8
2008	17,205	0	0%	17,538	1.7
2009	21,753	1740	7%	23,315	2.0
2010	32,215	837	3%	33,733	2.4
2011	15,322	64	0%	16,283	0.9
2012	2,963	0	0%	3,627	0.2
2013	4,539	0	0%	5,296	0.2
2014	30,577	764	2%	35,721	2.3
2015	3,079	0	0%	3,844	1.3
Avg.	**16,539**	**416**	**2%**	**18,032**	**1.2**

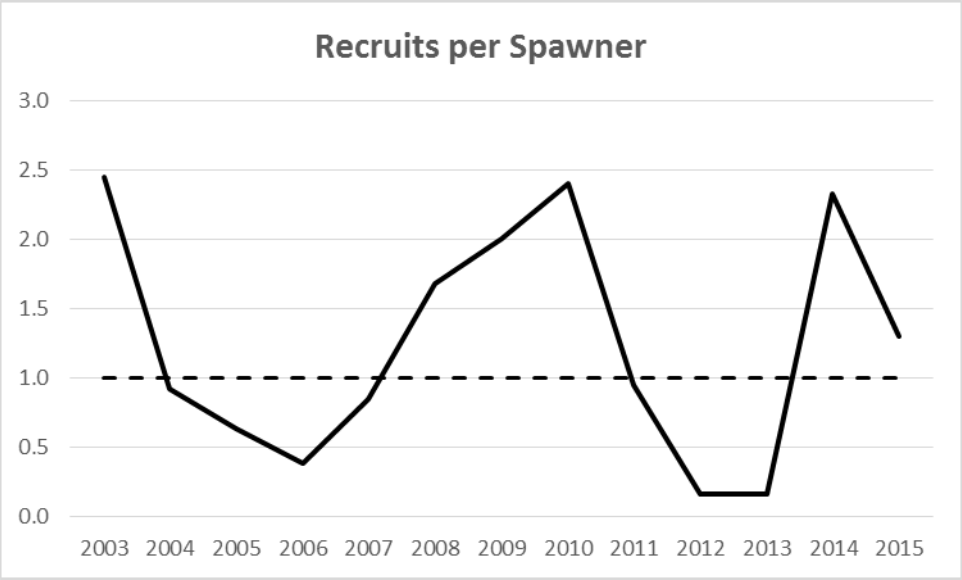

Figure 2-2. Trends in Recruits per Spawner for Nehalem Complex Wild Coho Salmon, 2003-2015.

- Provide the most recent 12 year annual spawning abundance estimates, or any other abundance information. Indicate the source of data.

Results of past surveys in the North Fork Nehalem suggested little natural production of coho salmon was taking place in that subbasin, which was heavily influenced by hatchery fish. However, since the North Fork above Waterhouse Falls became a Life-Cycle Monitoring Site in 1998 (Solazzi et al. 2000) and all of the hatchery fish are now marked, we have found that significant natural production is occurring. Wild adult spawning population estimates are presented in (Table 2-3).

Table 2-3. **Summary of Life-Cycle Monitoring for the North Fork Nehalem River.**

Brood Year	Estimated Egg Deposition	Smolts Produced	Returning Adults			Freshwater Survival	Marine Survival
			Males	Females	Total		
2007	1,459,170	29,044	2,431	2,595	5,026	2.0%	17.9%
2008	4,176,504	27,106	1,437	1,269	2,706	0.6%	9.4%
2009	2,898,252	20,553	205	184	389	0.7%	1.8%
2010	9,083,940	37,852	686	596	1,282	0.4%	3.2%
2011	3,797,696	30,035	3,527	3,163	6,690	0.8%	21.1%
2012	492,536	19,228	466	317	783	3.9%	3.3%
2013	1,895,418	30,778	N/A	N/A	N/A	1.6%	N/A
2014	11,878,440	N/A	N/A	N/A	N/A	N/A	N/A
2015	953,418	N/A	N/A	N/A	N/A	N/A	N/A

Source: ODFW Life Cycle Monitoring files.

From 2002-2007, most hatchery fish captured in the Waterhouse Falls trap were removed from the system, except for a small percentage that were passed for research purposes (*i.e.* Life Cycle Monitoring Project). Since 2007, all hatchery coho trapped have been removed from the system. As a result, the proportion of hatchery fish in the spawning population above the falls, based on the ratio of hatchery to wild fish trapped, has been substantially reduced (from an average of 31% down to an average of 14%). Another factor in the reduction of hatchery fish on the spawning grounds is the reduction in smolt releases from Nehalem Hatchery from 800,000 to 100,000.

Estimated wild smolt production in the North Fork has been 19,000-37,000 during the 2007-2013 brood years (Table 2-4). Estimates of smolt production for the entire Nehalem Complex for the 1997-1999 broods range from about 200,000 to about 400,000 (Table 2-4).

Table 2-4. **Estimates of Abundance of Juvenile Life Stages Based on Spawner Abundance.**

Population Complex	1997 Brood (millions)				1998 Brood (millions)				1999 Brood (millions)			
	Eggs	Fry	Parr	Smolts	Eggs	Fry	Parr	Smolts	Eggs	Fry	Parr	Smolts
Nehalem	1.466	0.953	0.587	0.198	1.488	0.967	0.595	0.201	4.350	2.828	1.151	0.389
Source: Nickelson (2001).												

- Provide the most recent 12 year estimates of annual proportions of direct hatchery-origin fish and listed natural-origin fish on natural spawning grounds, if available.

Hatchery strays have not comprised a significant portion of the spawning population in recent years. Less than 10% of the Coho Salmon sampled on spawning ground surveys have been of hatchery origin, with an average of 2% since 2003 (see above Table 2-2) . The majority of hatchery spawners tend to be in the North Fork Nehalem. No data is available for progeny of naturally spawning hatchery Coho Salmon rearing in the wild.

2.2.3) Describe hatchery activities, including associated monitoring and evaluation and research programs, that may lead to the take of listed fish in the target area, and provide estimated annual levels of take.

- Describe hatchery activities that may lead to the take of listed salmonid populations in the target area, including how, where, and when the takes may occur, the risk potential for their occurrence, and the likely effects of the take.

Hatchery adult trapping - Adult salmonids are trapped at Nehalem Hatchery from November through February/early March annually. The hatchery trap is usually shut down at the end of February (sometimes early March), at the end of the hatchery steelhead return. Naturally produced Coho Salmon may be handled if they enter the trapping facility. Unmarked wild Coho Salmon are not currently retained for brood (and

unmarked steelhead, Chinook Salmon, Chum Salmon, and Cutthroat Trout) that are trapped are passed above the hatchery facility. But if authorized by the NMFS the proposed integration of listed natural Coho Salmon into broodstock then wild Coho Salmon will be retained for spawning. Handling mortality may occur during this process. Trapping and handling devices and methods may lead to injury to listed fish through descaling, delayed migration and spawning, or delayed mortality as a result of injury or increased susceptibility to predation, although no mortalities have been observed. Any such take would be incidental take.

Release of hatchery coho smolts has an unknown potential to take listed Coho Salmon through ecological interactions.

- Provide information regarding past takes associated with the hatchery program, (if known) including numbers taken, and observed injury or mortality levels for listed fish.

Data on past take is shown for return years 1996-97 to 2007-08 and is provided in Table 2-5: the 1996-97 run-year was the first year that returning hatchery adults were mass marked and could be differentiated from naturally produced coho. The unmarked coho trap figures presented (Table 2-6) are not cumulative take but are total take for the trapping season (all stocks combined). No mortalities have been observed.

Table 2-5. Number of unmarked Coho Salmon collected at Nehalem Hatchery.

Return Year	Unmarked Coho[1]
1996-97	1
1997-98	0
1998-99	119
1999-00	44
2000-01	147
2001-02	194
2002-03	6
2003-04	228
2004-05	68
2005-06	173
2006-07	191
2007-08	27

Data Source: ODFW HMS database; hatchery files

[1] Includes jacks

Note: The unmarked coho trap figures are not cumulative take but are total take for the trapping season. Collection occurs during trapping of coho and winter steelhead. The number of unmarked coho handled represents a season total, and is not additive to numbers presented in other HGMP's.

- Provide projected annual take levels for listed fish by life stage (juvenile and adult) quantified (to the extent feasible) by the type of take resulting from the hatchery program (e.g. capture, handling, tagging, injury, or lethal take).

See below the "Take Table" (Table 2-6) for the projected annual take levels of natural fish by life stages.

- Indicate contingency plans for addressing situations where take levels within a given year have exceeded, or are projected to exceed, take levels described in this plan for the program.

The Nehalem Hatchery trap facility and handling procedures will be modified immediately if take, or incidental mortality, of naturally produced coho exceeding, or projected to exceed, levels specified in this HGMP can be identified, appears in or near the trap, and appears to be related to operation of the facility. This may include, but is not limited to, additional staff training or review of procedures, trap modifications, cessation of trapping, modified operation by hatchery personnel, etc.

Table 2-6. Estimated Listed Salmonid Take Levels by Hatchery Activities.

Listed Species Affected:	**Coho Salmon**	**ESU/Population: Oregon Coast Coho ESU**		**Activity:**	**Co & StW Trapping**
Location of Hatchery Activity:	**Nehalem Hatchery**	**Dates of Activity:**	**Nov. 15 – March 15**	**Hatchery Program Operator:**	**ODFW**

	Annual Take of Listed Fish By Life Stage *(Number of Fish)*			
Type of Take	**Egg/Fry**	**Juvenile/Smolt**	**Adult**	**Carcass**
Observe or harass a)				
Collect for transport b)				
Capture, handle, and release c)		75-100 (est.)	0-500*	
Capture, handle, tag/mark/tissue sample, and release d)				
Removal (e.g. broodstock) e)			0-110	
Intentional lethal take f)				
Unintentional lethal take g)		<10	<10**	
Other Take (specify) h)				

a) Contact with listed fish through stream surveys, carcass and mark recovery projects, or migrational delay at weirs.

b) Take associated with weir or trapping operations where listed fish are captured and transported for release.

c) Take associated with weir or trapping operations where listed fish are captured, handled and released upstream or downstream.

d) Take occurring due to tagging and/or bio-sampling of fish collected through trapping operations prior to upstream or downstream release, or through carcass recovery programs.

e) Listed fish removed from the wild and collected for use as broodstock.

f) Intentional mortality of listed fish, usually as a result of spawning as broodstock.

g) Unintentional mortality of listed fish, including loss of fish during transport or holding prior to spawning or prior to release into the wild, or, for integrated programs, mortalities during incubation and rearing.

h) Other takes not identified above as a category.

*** All unmarked, naturally produced coho trapped are passed upstream of the hatchery facility.**
**** No direct mortalities have been observed during trap and pass operations.**

Note: The take figures are not cumulative take but are total take for the trapping season. Collection occurs during trapping of coho and winter steelhead. The number of unmarked coho handled represents a season total, and is not additive to numbers presented in other HGMP's.

SECTION 3. RELATIONSHIP OF PROGRAM TO OTHER MANAGEMENT OBJECTIVES

3.1) Describe alignment of the hatchery program with any ESU-wide hatchery plan (e.g. *Hood Canal Summer Chum Conservation Initiative*) or other regionally accepted policies (e.g. the NPPC *Annual Production Review* Report and Recommendations - NPPC document 99-15). Explain any proposed deviations from the plan or policies.

Native Fish Conservation Policy - The Oregon Fish and Wildlife Commission has approved the Native Fish Conservation Policy (NFCP). The NFCP requires the development of a conservation plan for each native stock within the species management unit (SMU). The ODFW has completed the Oregon Coast Coho Conservation Plan (Coast Coho Plan), fulfilling the NFCP requirement for Coho Salmon along the Oregon Coast. The Coast Coho Plan provides the management direction for coho populations along the coast from Sixes River in the south to the Necanicum River in the north, including the Nehalem River population. The plan also provides guidance on the use of coho hatchery programs.

Fish Hatchery Management Policy (FHMP) – This policy provides guidance for the responsible use of hatchery-produced fish. It outlines the best management practices for hatchery programs to ensure conservation and management of both naturally produced native fish and hatchery produced fish in Oregon. The FHMP calls for the development of Hatchery Program Management Plans (HPMPs) to outline the hatchery practices that will be followed for each hatchery program. A HPMP may be a Hatchery and Genetic Management Plan (HGMP) or an aspect of conservation plan developed under the Native NFCP. For the Oregon Coast Coho SMU, the conservation plan has been developed and adopted by the Commission.

Coastal Multi-Species Conservation and Management Plan – This plan addresses conservation and management of anadromous salmonids (salmon, steelhead and trout) on the Oregon coast from Cape Blanco to Seaside. The CMP is unique from other conservation plans in that it addresses both conservation and utilization of six distinct groups of fish species, none of which are listed under the ESA. In addition to meeting requirements of the Native Fish Conservation Policy, the CMP provides long-term management direction for species which are relatively healthy, with the intent to help ensure the continued existence of wild fish and the fisheries which wild and hatchery fish support.

3.2) List all existing cooperative agreements, memoranda of understanding, memoranda of agreement, or other management plans or court orders under which program operates.

Oregon Plan for Salmon and Watersheds, Governors Executive Order EO 99-01:
The Oregon Plan for Salmon and Watersheds is a prescriptive set of measures for recovering threatened and endangered salmon and steelhead, and meeting federal water quality standards, established by Executive Order of the Governor. The Oregon Plan includes measures linked to the hatchery production of coho in the Nehalem watershed, including nutrient enrichment, separations of hatchery and natural production, and

monitoring of hatchery and naturally produced runs.

NPDES Permit:

The Nehalem Hatchery is operated under the NPDES 300-J general permit to maintain the environmental quality of hatchery effluents.

3.3) Relationship to harvest objectives.

Nehalem Hatchery coho are mass marked as a means of integration of hatchery and harvest management. Mass marking will allow for selective harvest of hatchery fish while requiring release of all wild coho. Mass marking will also allow for better monitoring and control of impacts of the hatchery program to wild coho populations. Incidental take of wild Nehalem River coho in harvests is limited by the ESA section 4(d) rule. The 4(d) rule requires development of Fishery Management and Evaluation Plans (FMEP). Such plans are under development and will be guided by the Pacific Coast Salmon Plan, specifically Amendment 13 (PFMC 1997). Under current conditions of marine survival and abundance, the take is limited to <10% of the total, pre-harvest Oregon Coast ESU wild coho abundance. Take could increase to 35% if conditions improve (PFMC 1997). This standard is adopted as adequate for controlling incidental harvest impacts in this plan, pending completion of FMEPs. All further address of harvest impacts will occur under the FMEPs. Estimated harvest impacts (ocean and freshwater combined) on wild coho for the period 1994 through 1999 averaged 9.2% and ranged from 6.8% to 12.4%. Current year (2000) harvest impacts are estimated to be about 8%.

The hatchery program evaluation presented in Section 1.12 (Tables 1-3) was as part of an ODFW hatchery review (ODFW 1999).

The coho artificial production program is designed to have minimal biological impacts to naturally produced species. Likewise, fish culture practices are designed and carried out to rear full-term smolts to limit impacts to naturally rearing fish species.

3.3.1) Describe fisheries benefiting from the program, and indicate harvest levels and rates for program-origin fish for the last twelve years (1988-99), if available.

Nehalem Hatchery coho are intended to contribute to ocean fisheries in the Oregon Production Index area, to freshwater fisheries in Nehalem Bay and the North Fork Nehalem River. The estimated number of Nehalem Hatchery adult coho harvested in run years 1988 to 1999 is reported in Section 1.12 (Table 1-3).

3.4) Relationship to habitat protection and recovery strategies.

This program is not directly related to habitat protection or recovery strategies. The intent of this program is to provide hatchery coho for harvest, while maintaining impacts to wild fish within acceptable limits.
Major factors affecting natural production in the Nehalem River basin are unknown; however, it is suspected that ocean survival may be the largest contributing factor. In general, habitat condition in the basin is slowly improving. A significant portion of the upper Nehalem Basin was severely impacted from a series of forest fires in the mid-1930s, collectively known as the “Tillamook Burn”, which impacted habitat with loss of

shade, increased sedimentation, and loss of stream complexity. The basin is recovering to a forested condition with shade and sedimentation impacts greatly reduced. Dominant land use in the basins in which this program operates is industrial forestland and agriculture. Recent changes to regulations governing these activities should improve water quality and reduce sedimentation in streams. Unfavorable natural events (flooding) are common in the basin and can have detrimental effects on egg depositions and juvenile rearing.

Habitat restoration projects over the past seventeen years (on state and private timberlands, which make up the majority of the basin ownership) have addressed instream complexity concerns. Fish passage structures believed to impede migrations (primarily culverts) are being evaluated on most county, state, and privately owned timberlands. Culverts on major highways and county road systems have been inventoried and priority ranked. Some sites have been addressed and others are in various planning stages; however, all are subject to funding availability. Oregon fish passage laws require fish passage to be addressed at all impediments to passage when a passage trigger situation is reached. As such, fish passage in these basins is likely to continue to improve over time.

3.5) Ecological interactions.

1. *Negatively impact program;*
Competition for food between Nehalem Hatchery coho smolts and other hatchery and wild smolts in the Nehalem Estuary and near shore ocean environment may negatively impact this program. Avian and marine mammal predation may also negatively impact this program.

2. *Be negatively impacted by program;*
Competition for food between Nehalem Hatchery coho smolts and wild salmon and steelhead juveniles in the Nehalem Estuary and near shore ocean environment may negatively impact the wild juveniles. Straying of Nehalem Hatchery coho to natural spawning areas can negatively impact wild coho populations through interbreeding and reduced genetic fitness. Large concentrations of hatchery fish may attract predators causing increased predation on hatchery and wild salmon and steelhead juveniles.

3. *Positively impact program;*
Increased abundance of wild coho may allow for higher harvest rates on hatchery coho from this program. Increased abundance of wild coho may also positively impact this program by allowing for inclusion of wild coho in the hatchery broodstock.

4. *Be positively impacted by program*
Nehalem Hatchery coho carcasses are used in stream enrichment programs. The nutrients provided by these carcasses should benefit salmonid and non-salmonid fishes in the streams where the carcasses are placed. This may be an especially important source of stream nutrients given the current low levels of naturally spawning salmon. Therefore, this use of hatchery coho carcasses takes precedence over other means of carcass disposal (sale, rendering or burial) during periods of low wild coho abundance.

General Information

Several factors indicate current ecological impacts from Nehalem Hatchery coho should be substantially reduced from historic levels. Unfed fry and fingerlings from hatchery production are released into habitat locations (standing water) that are unlikely to overlap with rearing fry/fingerling of listed species, and the current number of smolts released is about12% of the historic level (Table 10-1 and 10-2 and Figure 2). Nehalem Hatchery is located fairly low in the Nehalem Basin and hatchery coho are currently only released on site, therefore spatial overlap is limited to the freshwater and estuarine migration corridor (approximately 18 river miles) and in the ocean. There does not appear to be much overlap in smolt migration timing between Nehalem Hatchery coho and wild North Fork Nehalem coho (Lewis et.al. 2000). Also, preliminary studies using radio tagging indicate Nehalem Hatchery coho smolts appear to leave the Nehalem basin, either enter saltwater or taken by predators, in less than 10 days (Stahl et.al. 2000). Fork length of wild coho smolts is measured at the lower North Fork Nehalem trap, located about 2 miles upstream from Nehalem Hatchery (Solazzi et.al. 2000). Average fork length of wild coho smolts was smaller than that of hatchery smolts, 103mm vs 147mm in 1998 and 112mm vs 145mm in 1999. The substantially larger size of hatchery smolts creates a potential for negative impacts to wild coho smolts through competition. However, this larger size is important for promoting vigorous smolting so that the hatchery fish will promptly leave the river. Finally, the fish health monitoring and treatment plan (Attachment A) for this program should document and minimize potential disease ecological interactions.

Habitat Above Trapping Facilities

North Fork Nehalem River

The North Fork Nehalem River and some tributaries met several of the benchmarks for general quality salmonid habitat when ODFW Aquatic Habitat Inventory surveys were conducted in the mid 1990s (Johnson and Maser, 1999). There are approximately 40 miles of anadromous (primarily Chinook, coho, steelhead, and cutthroat) fish habitat available upstream of Nehalem Hatchery (Dalton, ODFW Research, personal communication). Although relative pool area and frequency met the benchmark goals, habitat complexity was lacking in many areas. In-stream large wood volume was at or above benchmark values in many reaches; however the number of key pieces was low.

Spawning gravel abundance is generally sufficient, but the presence of fine sediments in surveyed reaches generally exceeded benchmark values.

The majority of the North Fork Nehalem basin above the hatchery is located in industrial forestland. Younger age forest habitat dominates the landscape. Riparian areas generally did not meet the desired benchmark values.

ODFW has worked cooperatively with the major landowner(s) in the basin on habitat enhancement projects and will continue to conduct habitat enhancement projects in conjunction with timber management operations. It is expected that habitat conditions will generally improve over time under current forest management practices.

SECTION 4. WATER SOURCE

4.1) Provide a quantitative and narrative description of the water source (spring, well, surface), water quality profile, and natural limitations to production attributable to the water source.

Nehalem Hatchery has a water right for 0.22 cfs of pathogen free spring water for incubation and early rearing. The spring is located approximately 900 feet from the incubation facility and water is delivered by gravity flow through an underground pipeline. There are no fish living within the spring water system. Availability of spring water is limited by winter and spring rainfall. North Fork Nehalem River water can be pumped for incubation and early rearing during times of insufficient spring water supply.

Rearing ponds are supplied with North Fork Nehalem River water by pumping, with a hatchery water right of 23.3 cfs. Water temperatures, in degrees F, usually range in the 40's and 50's during winter and 50's and 60's in summer. River water contains a variety of pathogens and becomes turbid several times annually making it less suited for incubation and early rearing. River water availability can be limited by low flows, usually from July through September, and listed coho are present in this water source. The facility is in compliance with the water rights, water withdrawals, and annual water uses reporting to Oregon Water Resource Department.

4.2) Indicate risk aversion measures that will be applied to minimize the likelihood for the take of listed natural fish as a result of hatchery water withdrawal, screening, or effluent discharge.

Nehalem Hatchery currently operates and discharges effluents as per NPDES 300-J permit as required by the DEQ. The hatchery is in compliance with the requirements of the permit. The hatchery takes quarterly samples during the months of heaviest production of settleable solids (SS) and total suspended solids (TSS), both during normal operations and during cleaning operations. Individual samples evenly spread over the day are taken and combined to form a composite. Contents from the composite are used to measure SS and TSS. Nehalem Hatchery does not have the pollution abatement/settling pond, however, the hatchery is able to meet the effluent qualities as required by the NPDES permit. The facility is in compliance with the NPDES permit's monitoring and reporting requirements.

Intake screening for the main hatchery water supply from the North Fork Nehalem River at Nehalem Hatchery currently does not comply with NOAA criteria. This problem has been identified through the ODFW Fish Screening and Passage Program. To date, no funding is available to modify the facilities to meet NOAA standards. Long term plans include upgrading the screens when funding has been secured. Intake screening on the spring water source used for incubation does not meet NOAA criteria either, however, there are no fish present in the spring system.

SECTION 5. FACILITIES

All adult collection, spawning, egg incubation, juvenile rearing and release facilities, associated with the Nehalem Hatchery coho program are located at Nehalem Hatchery. Returning adult hatchery coho are also collected at 2 trapping sites on the North Fork Nehalem River as part of an Oregon Plan for Salmon and Watersheds (OPSW) life-cycle monitoring program. These adult hatchery coho are collected at the trap site and returned to the hatchery for disposal or used for broodstock if needed. Since these traps are not part of the hatchery program they are not included in the details below, see Solazzi et al. (2000) for further information on these adult traps.

5.1) Broodstock collection facilities (or methods).

The Nehalem Hatchery trap is located in the North Fork Nehalem River watershed approximately 12 miles east of Nehalem, off Highway 53 (RM 10.3). The adult trap is located at the hatchery, and is supplied with outflow water from the raceways as an attractant. The hatchery relies on fish voluntarily swimming up a fish ladder, through a v- notched weir, and in to the adult trap. Wild fish are able to migrate past the hatchery unrestricted. An old weir footing spans the North Fork Nehalem River above the entrance to the fish ladder, however the weir is no longer in place. The footing is not a barrier to upstream migration. Hatchery coho may also be collected at the Life Cycle Monitoring Project trap site at Waterhouse Falls. This is trap built into one step of a fish ladder that allows fish to migrate over the falls.

Wild coho collected for broodstock may be collected in the hatchery trap, from the Life Cycle Monitoring Project trap at Waterhouse Falls (approximately two miles upstream from Nehalem Hatchery), or other remote trap sites with the Nehalem basin yet to be determined. Broodstock may also be collected by hook and line (angling) or via nets (seine, tangle, or dip nets as determined by site conditions).

5.2) Fish transportation equipment (description of pen, tank truck, or container used).

Broodstock are collected and held in the Nehalem Hatchery trapping/holding facility. All off-station transfers are done with the use of a large liberation truck or a portable liberation tank (see description below). Broodstock collected by angling would be held in an aerated live box or large cooler and transported to the hatchery (or other collection site to be determined), or transferred to a portable tank.

The on-station transfer of juvenile fish (from one pond to another) is usually done with a liberation truck. Juvenile fish are dip-netted, weighed, and counted to determine the average number of fish per pound. Juveniles are then weighed, via water displacement, and counted as they are loaded on a lib truck. The fish are then released from the truck into another raceway through liberation hoses. Occasionally, fish may be transferred from one pond to another through an irrigation pipe when being moved to an adjacent pond.

Carcasses for stream enrichment are transported in plastic totes in the back of full size pickup trucks, or on a trailer. Haul time varies depending on the location, but is usually less than 2 hours.

Fish are transported in liberation trucks, or in a portable liberation tank carried in a full-size pickup truck. Liberation trucks are typically 1,000-2,500 gallon capacity units, either mounted on a large flatbed truck, or a tanker style truck. The lib trucks are equipped with oxygen diffusing systems, water re-circulation pumps, and may have dissolved oxygen meters. The portable liberation tank is carried in the back of a pickup truck, has a capacity of 200-400 gallons of water, and is equipped with an oxygen diffusion system and circulation pump.

Larger numbers of trapped adult fish to be passed upstream of the hatchery are transported in a portable liberation tank to a release pipe about 200 feet upstream of the hatchery weir. Smaller numbers of fish are hand carried in a soft net and released above the pump intake structure near the trap.

5.3) Broodstock holding and spawning facilities.

The adult holding area consists of a large in-ground concrete pond measuring 26-feet wide, 50-feet long, and 5-feet deep with a water depth of 3 feet. Metal railings above the pond prevent fish from jumping out. The adult holding area is segregated with vertical metal bar dividers into 6 enclosed pens. Each pen has the capacity to hold approximately 100 fish. Spawning is conducted under a covered area immediately adjacent to the trap/holding pond.

5.4) Incubation facilities.

Egg incubation is conducted in the main hatchery building. There are 19 stacks of vertical incubator trays (16 trays per stack), with a total capacity of approximately 1.7 million eggs to hatching. Typically three stacks (5 gpm) are utilized for the coho program

5.5) Rearing facilities.

The hatchery has 6 Canadian troughs, four 6 ft circular fiberglass tanks, and four 5 ft circular fiberglass tanks that can be used for staring tanks. The hatchery uses Canadian troughs as starting tanks. The hatchery also has four 6-foot circular fiberglass tanks, and four 5-foot circular fiberglass tanks that can also be used for starting tanks, although these are not currently used.

At ponding, juvenile coho are transferred from hatch house to concrete raceways. There are 20 concrete raceways (3,825 ft^3), each with a capacity of 5,000 pounds of fish. All raceways are in-ground and measure 75 ft long, 17 ft wide, and 4 ft deep, with a typical water depth of 3 ft. The raceways are modified Burrows ponds. As such they have a solid center wall down the length of the pond, except for 8 ft at the head and tail ends of the pond. Thus, each pond can essentially be divided lengthwise into 2 raceways by blocking the openings at the head and tail ends of the pond. Nehalem Hatchery Stock 99 / 32 coho production is contained in 2 raceways (51,000 fish per raceway). At the target size of 15 fish per pound, there are about 3,400 pounds of fish in each raceway (about 70% of maximum capacity). Trask Hatchery coho, which are reared at Nehalem, also occupy 2 raceways at the same loading densities.

5.6) Acclimation/release facilities.

Not Applicable. Releases into the North Fork Nehalem River are volitional at the hatchery

5.7) Describe operational difficulties or disasters that led to significant fish mortality.

There have been no operational difficulties or disasters that have led to significant fish mortality.

Major flood events occur every few years effecting Nehalem Hatchery. Flood waters entered some of the hatchery ponds and caused other damage to the hatchery, however, the impacts to juvenile coho rearing at the hatchery were minimal. There were no large escapes, losses, or premature releases of coho at Nehalem Hatchery.

Potential operational difficulties that could result in significant fish mortality include loss of power to run the pumps which supply water to the hatchery; or high flows that deliver large amounts of debris, which may plug intake screens or deposit silt on eggs; or disease outbreaks. Thus far, hatchery staff and fish health staff have been able minimize the effects of these events and substantial fish mortality has been avoided.

Nehalem Hatchery coho have experienced occasional high losses due to disease, mostly to coho anemia disease (CAD). When the smolt production was reduced to 200,000 (1996 brood) rearing densities were reduced and then further reduced when production was reduced to 100,000 (2004). No high coho losses, due to disease, have occurred since the rearing densities were reduced.

5.8) Indicate available back-up systems, and risk aversion measures that will be applied, that minimize the likelihood for the take of listed natural fish that may result from equipment failure, water loss, flooding, disease transmission, or other events that could lead to injury or mortality.

Because no listed fish are being reared at the facility any operational failures are anticipated to have minimal effects. The following risk aversion measures are in place to reduce the potential for adverse impacts to salmonids in the wild in the event of equipment failure or natural event affecting the hatchery. Procedures and equipment are used to address events and allow fish to remain on station and avoid emergency releases except in extreme situations.

To minimize the risk to propagated fish, the hatchery is staffed full-time, 24 hours per day. Alarm systems are in place to warn employees of low water, plugged intakes, and other problems. Employees work schedules are adjusted as conditions warrant (i.e. during large storm events) to maintain hatchery operations. A backup generator is available to supply power for the pumps that supply water to the hatchery in the event of a power outage.

SECTION 6. BROODSTOCK ORIGIN AND IDENTITY

6.1) Source.

This program currently uses two broodstocks in alternate years over the three year generation cycle (two years of stock 32 and one year of stock 99). Broodstock is collected at Nehalem Hatchery. Hatchery adults collected at upstream research facilities may be used if needed to make production goals.

A new Nehalem broodstock is proposed to be developed in this HGMP to replace the long-term domesticated broodstocks currently used. If approved by NOAA, wild coho adults used for broodstock would be collected from the Nehalem River basin.

6.2) Supporting information.

6.2.1) History.

North Fork Nehalem stock (32) is a long-term hatchery stock that was reared at Foley Creek Hatchery (Nehalem River tributary) from 1926 to 1965 while that facility was in operation. This stock was begun with releases of Foley Creek Hatchery smolts reared at the Foley Creek site and released at the new hatchery site (1964 and 1965 brood years). Since 1966, when the Nehalem Hatchery opened, the broodstock has been composed entirely of fish collected at the current hatchery site. Returns through 1995 probably included both hatchery adults (from smolts released at this site) and some wild coho from the North Fork Nehalem River. Since that time all broodstock used have been marked coho returning to Nehalem Hatchery. Stock 32 originally included a mix of local wild and out of basin stocks while at Foley Creek. However, it is felt the stock was substantially re-founded with local wild coho subsequent to the last release of out of basin stocks (1952 brood year).

The third brood cycle was begun at the new hatchery site with a mix of Trask and Alsea stock coho (1966 brood year). This continued through the 1981 brood year, after which poor survival resulted in its replacement with Fishhawk Lake stock. The current Fishhawk Lake stock (stock 99) was begun with 1978 brood year wild coho salmon collected from Fishhawk Creek. Fishhawk Creek is located within the range of the Upper Nehalem wild coho population. For the 1981 and 1984 brood years, the broodstock was a mixture of returns from the earlier releases, identified by a unique fin clip, and wild fish collected from Fishhawk Creek. Beginning with the 1987 brood year the hatchery has relied on returns of stock 99 to the hatchery for broodstock.

The proposed use of wild Coho Salmon in the broodstock would be a new component of this program. No wild fish have been incorporated in the broodstock since mass marked hatchery adults began returning.

6.2.2) Annual size.

The existing Coho Salmon program (stocks 99 and 32) requires a minimum of 70 females and 70 males of each stock for broodstock needs and for genetic diversity. Additional

adults may be collected as necessary to cover shortages resulting from, but not limited to, fecundity variation, early egg mortality, positive disease test, etc.

Use of wild coho adults for broodstock, if approved by NOAA, would require a maximum of 110 adults (55 males and 55 females). See section 6.2.3 for further discussion.

6.2.3) Past and proposed level of natural fish in broodstock.

Wild coho have not been intentionally included in hatchery coho stocks 32 and 99 since 1986. Prior to mass marking any wild coho that entered the hatchery could not have been distinguished from hatchery fish and could have been included in the broodstock. Wild coho have been released alive immediately above the hatchery.

ODFW is proposing to utilize wild Coho Salmon as broodstock for this program as part of this HGMP. The intent of using wild brood is to replace the current long term hatchery stocks, which appear to not be contributing to harvest fisheries at a satisfactory rate.

ODFW proposes to establish a new broodstock derived from wild coho by using 100% wild brood in three consecutive years. A maximum of 110 fish (55 males and 55 females) would be taken for broodstock. Wild brood would be collected from the natural population in any given year under the following conditions:

(1) No wild adults will be used for brood if the pre-season run forecast (a 3 year average basin proportion applied to the total OCN ocean forecast) to the Nehalem basin is less than 5,500 fish.
(2) Wild adults removed from the population for brood will not exceed 2% of the pre-season escapement forecast to the basin, up to the proposed maximum of 110 fish. Based on pre-season run forecasts of ≥ 5,500 wild coho, the maximum brood collection would represent 2% or less of the predicted escapement.
(3) Once a new broodstock is established for each brood year cycle, wild coho adults will be integrated into the hatchery broodstock (subject to 1 and 2 above) at a rate consistent with Hatchery Scientific Review Group guidelines, ODFW staff recommendations, or other available information. This could include periodically using 100% wild coho for broodstock.

In the event that insufficient adults are captured during the initial years of establishing the new wild broodstock, the hatchery program will operate in one of the following ways:

(a) The program will utilize only the wild brood collected, which may result in releases less than the 100,000 smolt target; or
(b) Stock 32 or 99 hatchery adults will be utilized to make up the difference such that the 100,000 smolt target is reached. If this approach is taken, smolts will be differentially marked for stock identification. Maintaining a full production release is the preferred alternative in the event of a wild brood shortage.

The new wild broodstock would be considered established once each of the three brood year cycles have used 100% wild fish. As stated above, the goal is to establish the new brood over three consecutive years. If not completed in consecutive years due to low abundance, low brood collection, or other factors, ODFW would continue to attempt to achieve this goal until a wild broodstock is established in each of the three brood year cycles.

6.2.4) Genetic or ecological differences.

The broodstock currently used in this program are essentially locally founded. However, the two current hatchery coho stocks are assumed to have diverged, to some unknown extent, from Nehalem Basin wild coho populations, based on probable historical incorporation of non-local stocks (stock 32) and lack of recent incorporation of wild fish into the broodstock (both stocks 32 & 99). Because of the assumed differences between the hatchery and wild coho stocks, risks to wild coho may occur if the hatchery fish stray extensively. Therefore, the intent of this program is to keep the hatchery and wild populations isolated by making on station releases of both stocks and limiting hatchery coho strays in wild coho spawning areas.

Wild coho used for broodstock, if approved, would be assumed to represent the natural population, and thus should not have any ecological or genetic differences. Hatchery rearing and subsequent use of returning hatchery fish may result in some divergence from the natural population over time. Hatchery fish from wild broodstock would be managed as described for the current Stock 32/99. The intent of the program is to produce fish for harvest, and minimize straying to natural spawning areas.

6.2.5) Reasons for choosing.

North Nehalem stock (32) was not chosen for any special traits or characteristics other than being a local native stock. Fishhawk stock (99) was chosen because it is a local native stock with a more typical, later, wild coho adult run timing.

A wild coho broodstock would be expected to produce a better return to the fishery than the current long term hatchery stocks. Wild brood hatchery adults spawning naturally may pose less risk to the natural population.

6.3) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic or ecological effects to listed natural fish that may occur as a result of broodstock selection practices.

The following measures will be used to minimize adverse genetic or ecological effects to Nehalem Basin coho.

Broodstock selection for stocks 99 and 32 coho programs should have minimal impact to naturally produced coho salmon. No naturally produced coho from either stock are used in the hatchery program. Naturally produced coho may be trapped during broodstock collection, however, any unmarked coho trapped are passed upstream of the hatchery facility to spawn naturally.

Broodstock selection for the stocks 99 and 32 hatchery program(s) entails using ripe adults from throughout the run period. Collection and use is random. Excess hatchery adults are killed and are donated to the food bank program, used in stream enrichment, buried, or taken to a landfill.

Wild broodstock will be collected randomly from the population once approved by NOAA. Brood collection will occur under certain circumstance (see section 6.2.3) that will reduce impacts to the wild population.

SECTION 7. BROODSTOCK COLLECTION

7.1) Life-history stage to be collected (adults, eggs, or juveniles).

Adult stock 32 and 99 coho are collected for broodstock to meet the objective of 100,000 smolts and to meet genetic guidelines.

Wild coho adults will be collected as outlined in section 6.2.3 if approved by NOAA.

7.2) Collection or sampling design.

Hatchery broodstock will be collected from fish that voluntarily swim into the Nehalem Hatchery adult trap, or if necessary from fish collected at the upstream Life Cycle Monitoring site. The hatchery trap will operate throughout the time period coho are expected to arrive at the site, and is known to catch all sizes of fish that encompass the entire coho size and age distribution. Therefore, the trap is not considered to be selective for coho run-timing, adult size, or age. Fish for broodstock will be selected at random from fish collected, will be collected from throughout the run, and will neither favor nor discard potential broodstock according to any characteristic observed.

Wild adults collected for brood will be captured at the hatchery trap, from the Life Cycle Monitoring Project trap, at other remote trap sites (to be determined), via hook and line (angling), and/or by net (seine, tangle, or dip net as determined by site conditions)

7.3) Identity.

Hatchery fish will be identified based on the presence of marks and/or tags. Unmarked (non-finclipped) adults will be considered wild.

7.4) Proposed number to be collected:

7.4.1) Program goal (assuming 1:1 sex ratio for adults):

The current program utilizes a minimum of 70 males and 70 females for broodstock to meet production goals and genetic guidelines. Additional adults may be collected as necessary to cover shortages resulting from, but not limited to, fecundity variation, early egg mortality, positive disease test, etc. Adults are matrix spawned throughout the entire run to maintain genetic diversity within the population. However, sufficient numbers of fish may be spawned during the early portion of the run to ensure that production goals will be met and for genetic purposes. Once spawning is complete, surplus eggs are culled randomly (except that a higher proportion of eggs may be culled from early groups if

additional eggs were taken to ensure meeting production goals) across egg take groups and destroyed (see section 9.1.2).

Wild coho broodstock, if approved, would utilize up to 110 fish (55 males and 55 females). See section 6.2.3 for further description of brood collection conditions.

7.4.2) Broodstock collection levels for the last twelve years (e.g. 1988-99), or for most recent years available:

Table 7-1. Broodstock collection levels for Stock 99 and 32 coho (1988-2007). Data represent the number of fish spawned and eggs collected form thoase spawned females.

Year [1]	Adults			Eggs	Juveniles
	Females	Males [2]	Jacks		
1988	530			1,650,577	915,099
1989	509			1,391,128	914,214
1990	521			1,330,932	878,916
1991	357			1,001,196	915,871
1992	379			1,013,444	923,253
1993	398	398	0	1,052,106	927,615
1994	320	320	0	912,524	782,131
1995	298	298	0	943,006	828,011
1996	199	199	0	562,128	261,958
1997	194	194	0	535,904	302,516
1998	173	173	0	478,071	314,148
1999	170	171	0	528,367	316,939
2000	180	173	0	552,000	311,407
2001	190	192	0	641,000	296,223
2002	100	100	0	356,000	144,222
2003	107	107	0	296,000	148,739
2004	80	80	0	266,000	154,269
2005	102	102	0	284,000	153,954
2006	80	80	0	264,000	152,750

Year [1]	Adults			Eggs	Juveniles
	Females	Males [2]	Jacks		
2007	69	69	0	235,000	144,678

Data source: ODFW Hatchery Information Management System (HIMS) Database Salem Oregon.
1. Shaded rows are years with stock 99
2. Number of males spawned is only available since 1991

7.5) Disposition of hatchery-origin fish collected in surplus of broodstock needs.

Between 1984 and 1990 large numbers of excess hatchery coho jacks and adults were released into natural spawning areas in the North Fork Nehalem River above the hatchery (Lewis et.al. 2000). In addition, 75 jack and 226 adult Fishhawk Lake stock coho were released at the Fishhawk Lake adult trap in 1984. These releases were discontinued after the 1992-93 run year. Currently all marked hatchery coho trapped are killed and used either for donation to food banks, used in stream enrichment, buried, or taken to a landfill.

Any wild coho collected that are surplus to broodstock needs would be released alive back to the river basin.

7.6) Fish transportation and holding methods.

Adult coho are held in the adult holding pond described in Section 5.3. Transportation equipment is described in Section 5.2. The only fish transported for this program are wild adults. Wild adults released from the hatchery are hauled from the hatchery trap approximately 200 feet upstream for release. The transport time is a matter of minutes, and is done without use of any anesthetics, salves or antibiotics.

Wild broodstock would be transported and held as described in sections 5.2 and 5.3.

7.7) Describe fish health maintenance and sanitation procedures applied.

Adult coho are not currently treated. Treatment may be applied if necessary and as directed by ODFW fish health staff. See Attachment A.

7.8) Disposition of carcasses.

Hatchery fish in excess of what is needed for broodstock are donated to charity food banks if in good condition. Those fish not in good enough condition for donation to food banks, are used for stream nutrient enrichment, or otherwise discarded. Stream enrichment takes precedence over other means of carcass disposal, such as sale, rendering or burial. All hatchery coho carcasses used for stream enrichment are marked to prevent confusion with carcasses from naturally spawned fish. ODFW has developed specific criteria and guidelines for operation of the stream enrichment program.

Wild coho broodstock used for this program would be kill-spawned. Carcasses would be

used for stream enrichment, taken to a landfill, or buried. Any wild broodstock surplus to production needs would be released alive back to the river basin.

7.9) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic or ecological effects to listed natural fish resulting from the broodstock collection program.

The following measures will be used to minimize adverse genetic or ecological effects to Nehalem Basin wild coho.

- Coho stocks 32 & 99 will be managed as hatchery broodstocks isolated from wild coho populations in the Nehalem Basin. Only returning hatchery fish will be included in the broodstock.
- Wild fish that enter the Nehalem Hatchery trap will be released alive (if not retained for brood) upstream from the hatchery. The hatchery trap will be visually checked at least daily, and fish sorted at least weekly, or more often as needed, to minimize delay and potential harm to wild fish.
- No transfers from any other hatchery coho broodstock into stocks 32 or 99 are permitted.
- Only hatchery coho stocks 32 & 99, or any new broodstock derived from Nehalem basin wild coho populations will be released in the Nehalem Basin.
- Wild broodstock will be collected as outlined in section 6.2.3.
- A disease monitoring plan will be implemented (Attachment A).
- To safeguard against catastrophic loss of broodstock additional adults are retained (up to the proposed maximum collection number for wild coho)

SECTION 8. MATING

8.1) Selection method.

Collection of coho for use as broodstock occurs throughout the run. Fish are typically spawned randomly during the collection period, and depends on the number of fish available and ripe at time of spawning. Spawning usually occurs from late October to late November. All brood selection is done on a random basis from throughout the run, with an attempt to balance the number of fish collected from the beginning, middle, and end of the run. Excess eggs may be collected from the early portion of the run to assure meeting the production goal. Excess eggs are culled randomly across egg take groups after spawning is completed if necessary (see section 9.1.2).

8.2) Males.

Males are generally only used once during spawning. If necessary, in the case of a shortage of males, individual fish may be spawned more than once, or additional males may be used. Jacks may be included in spawning operations, up to 5% of the males spawned.

8.3) Fertilization.

Sex ratio during spawning will be 1:1 (male : female) ratio. Spawning is typically conducted using a matrix format (5x5, 10x10, etc.). Eggs from multiple females are spawned into a single plastic bucket. The eggs are then divided into separate buckets equaling the number of females spawned. Individual males are spawned, one into each of the buckets of eggs. These groups are held separate for at least 3 minutes, then combined into larger groups and transferred to the incubation facility. Once the incubation facility receives the eggs, they are trayed down into stack incubator trays containing a solution of iodophore and disinfected for 10 minutes before being introduced to the pathogen-free incubation water. This matrix-spawning regime provides for the possibility of multiple family groups for each females spawned.

Ovarian samples are taken from up to 60 females and visceral (kidney, spleen) samples are collected from up to 60 fish (either sex) for viral analysis. Fertilized eggs are water-hardened in an iodine solution prior to placement in incubators. Eggs that test positive for disease may be kept or destroyed, at the direction of ODFW fish health staff. Fish health and sanitation procedures are described in Attachment A.

8.4) Cryopreserved gametes.

Cryopreservation of gametes is not used in this program.

8.5) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic or ecological effects to listed natural fish resulting from the mating scheme.

Listed fish are not under propagation; however the following measures will be used to minimize adverse genetic or ecological effects to Nehalem Basin wild coho.

- Hatchery or wild adults are spawned as outlinedd in this HGMP.
- When possible there will be a minimum of three egg takes to include early-run, mid-run, and late-run fish in the broodstock.
- An equal number of females and males will be spawned each year (50:50 sex ratio) unless an emergency situation arises where backup males are required.
- Each fish will be paired with a single other individual. Or the hatchery may choose to use a matrix spawning scenario (2 x 2, 3 x 3, etc.).
- Each fish will be spawned only once unless an emergency situation arises where backup males are required.

SECTION 9. INCUBATION AND REARING

9.1) Incubation:

9.1.1) Number of eggs taken and survival rates to eye-up and/or ponding.

Table 9-1. Number of egg take and survival rates, 1995-2006.

Brood Year [1]	Egg Take	Eyed Eggs	Percent Survival to Eye-up
1995	943,006	892,750	94.7
1996	562,128	529,000	94.1
1997	535,904	497,419	92.8
1998	478,071	442,628	92.6
1999	528,367	490,500	92.8
2000	552,281	527,059	95.4
2001	641,372	565,197	88.1
2002	356,381	296,448	83.2
2003	323,568	295,900	91.4
2004	266,380	248,200	93.2
2005	583,818	266,037	93.7
2006	263,529	243,750	92.5

Data source: HIMS, Nehalem Hatchery files.

1. Shaded years are Stock 99 figures, unshaded are stock 32 years

9.1.2) Cause for, and disposition of surplus egg takes.

Extra eggs are collected to meet genetic guidelines for broodstock size, to account for typical losses during rearing, and/or to safeguard against catastrophic loss. Culling of excess production will occur at either the eyed egg or pre-smolt stage. Culling of eggs will be done across family groups (except that a higher proportion of eggs may be culled from early groups if additional eggs were taken to ensure meeting production goals). All other culling will be done at random with an equal probability of affecting any family. Excess eggs will be destroyed. Any excess fingerlings may be released into areas where they will have low potential for contact with wild coho, (standing water bodies). Excess fingerlings may also be destroyed.

9.1.3) Loading densities applied during incubation.

Average egg size at spawning is 118 eggs per ounce. The vertical stack egg incubators have a water flow of 5 gpm. The standard loading density per tray from green to eyed is 8,300 eggs per unit. When eggs eye-up they are shocked, picked, inventoried, and densities are reduced to 7,000 eggs per unit. The number of trays utilized per stack will

vary from 1-15 depending on the isolation of family groups, heated vs ambient water, etc.

9.1.4) Incubation conditions.

The water supply to the egg incubators is from a spring. The water is monitored for flow and temperature daily. The incubating eggs are held in water that is 40º to 51ºF. Dissolved oxygen (DO) levels are not monitored during incubation. Temperature regimes will vary according to what is necessary to bring egg groups together for common ponding dates. The incubation facility is not equipped to chill water. All of the temperature manipulation is achieved by using up to three, in-line, single-pass, spa heaters. The incubation facility typically will not have a silting problem, as the spring water normally remains clear. Eggs are treated with formalin, or other approved chemicals, to control fungus and soft-shell.

If necessary, North Fork Nehalem River water can be used to supply water to the incubation facility. If this occurs, incubating eggs would be subject to rearing conditions similar to those described in Section 9.2.3.

9.1.5) Ponding.

Fry are physically relocated from the incubator trays to a raceway when at least 50% of the fry are estimated to be buttoned up. This occurs with approximately 1,300 temperature units. Coho fry average approximately 900 fish per pound at this point.

9.1.6) Fish health maintenance and monitoring.

See Attachment A regarding state approved fish health protocols.

9.1.7) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish during incubation.

Listed fish are not under propagation; however the following measures will be used to minimize adverse genetic or ecological effects to Nehalem Basin wild coho.

- A disease monitoring plan will be implemented (Attachment A).
- Incubation units are supplied with spring water to control disease and siltation.
- The number of eggs retained for production will be based on meeting the smolt release goal, assuming average egg to smolt survival.
- No intentional selective activities will be allowed, and unintentional selection will be avoided as much as possible.
- To safe guard against catastrophic egg or juvenile mortality excess egg takes will occur; the excesses will be culled across family groups at either the eyed egg or fry stage.

9.2) Rearing:

Rearing of Coho Salmon (both stocks 32 and 99) takes place at Nehalem Hatchery, until release into North Fork Nehalem River.

9.2.1) Provide survival rate data (*average program performance*) by hatchery life stage (fry to fingerling; fingerling to smolt) for the most recent twelve years (1988-99), or for years dependable data are available..

Average survival for Stock 99 coho at Nehalem Hatchery from fry to the time of marking was 84.4% for the 1992-2005 brood years. The survival to time of marking ranged from 74% to 98%.

Average survival for Stock 32 coho at Nehalem Hatchery from fry to the time of marking was 90.6% for the 1992-2005 brood years. The survival to time of marking ranged from 73%-97%.

Overall average survival from fry to release for Stock 99 coho was 84.4% for 1992-2005 brood years. The survival to release ranged from 72%-98%.

Overall average survival from fry to release for Stock 32 coho was 88.2% for 1992-2005 brood years. The survival to release ranged from 73%-93%

Data of survival rates for both stocks are presented below in Table 9-2.

Table *9-2.* Stock 99 and 32 Coho Salmon survival rates at Nehalem Hatchery.

Brood Year [1]	Fry Ponded	Juveniles at Marking	Fish Released	Percent Survival to Marking	Percent Survival to Release
1995	828,011	631,370	629,007	88	88
1996	261,958	194,400	192,650	74	74
1997	302,516	236,965	214,556	97	90
1998	32,559	215,559	209,900	93	91
1999	315,819	206,098	204,648	98	98
2000	297,407	204,879	204,534	90	90
2001	296,223	106,701	101,704	93	91
2002	144,222	103,300	100,652	74	72
2003	148,739	109,693	102,722	92	87
2004	154,269	102,675	102,144	73	73
2005	153,954	103,164	102,851	85	85

Data Source: HIMS; Nehalem Hatchery files

1. Shaded years are stock 99, unshaded years are stock 32

9.2.2) Density and loading criteria (goals and actual levels).

Fry are transferred into a raceway at approximately 900 fish/lb after fry button up. After marking in September at approximately 30 fish/lb, the juveniles are split into two ponds with approximately 51,000 fish per pond. Excess fingerlings are released to standing water bodies after marking is completed.

The raceways at Nehalem Hatchery are managed for a maximum of 5000 pounds of fish per raceway (approximately 1.31 lb/ft^3).

Maximum density occurs at release when the fish are at their largest size (target size is 15 fish/lb).

Density targets from fry to smolt reared in ponds at Nehalem Hatchery are not to exceed 1.7 pounds fish per cubic feet water (rearing space). Actual density levels are at approximately 1.3 pounds of fish per cubic feet water at release. Maximum loading level criteria for rearing is 10.0 pounds of fish per gpm. Actual target pond loading level at smolt release time is approximately 8.0 pounds of fish per gpm.

9.2.3) Fish rearing conditions.

Coho Salmon reared at Nehalem Hatchery grow on river water; hence, rearing water temperatures vary with seasons and with natural fluctuations. Water temperatures range approximately from 45º to 65ºF during spring and summer and from 36º to 45ºF during the fall and winter. Dissolved oxygen (DO) levels coming into the facility are typically between 10.0 ppm and 11.0 ppm in the fall and winter. However, in the summer, DO levels can be as low as 7.0 ppm. Re-circulation of effluent water through the ponds is possible in extreme drought conditions.

Monitoring of the pond conditions is done daily at feeding time. While feeding fish, personnel are observing for signs of stress, disease, water clarity, and general fish behavior. Pond mortality is picked and recorded daily. During late summer and early fall, the fish are closely monitored by ODFW fish health staff for external parasites. Water quality is monitored under the prescribed 300J general NPDES permit as required by the DEQ (see Section 4).

9.2.4) Indicate biweekly or monthly fish growth information (*average program performance*), including length, weight, and condition factor data collected during rearing, if available.

Weight samples are collected bi-monthly and reported on ponded fish reports in the ODFW Hatchery Management System (HMS). Length frequency data are taken at the time of liberation (see section 9.2.8); mark quality observations are also made at this time. Table 9-3 shows average monthly weights for the program from ponding to release.

Table 9-3. Average Monthly Fish Size for Nehalem Stock 99 and 32 Coho at Nehalem Hatchery.

Month	Stock 99 Size in fish/pound [1]	Stock 32 Size in fish/pound [1]
February	736	594
March	334	265
April	167	156
May	91	91.5
June	65	67.9
July	50	47.3
August	34	33.1
September	24.9	27.8
October	20.5	22.3
November	19.1	21.1
December	18	19.7
January	16.9	18.1
February	15.4	15.8
March	14.4	14.4

Data Source: ODFW HMS database; Nehalem Hatchery files

1. Numbers represent end-of-month averages

9.2.5) Indicate monthly fish growth rate and energy reserve data (*average program performance*), if available.

Once the fry have been ponded, their weight increases substantially each month (see Table 9-3) until the time of marking (September/October) when their feed is programmed to ensure that the fish do not exceed pond density limitations and are on target to meet production size goals.

Length frequency information is only collected at the time of release, energy reserve and individual fish condition factor data is not collected. Average fork length of wild coho smolts is smaller than that of hatchery smolts, 103mm vs 147mm in 1998 and 112mm vs 145mm in 1999, wild coho data from Solazzi et.al. (2000).

9.2.6) Indicate food type used, daily application schedule, feeding rate range (e.g. % B.W./day and lbs/gpm inflow), and estimates of total food conversion efficiency during rearing (*average program performance*).

Fish are fed a dry food which may be supplied by various vendors and may change throughout rearing depending on feed supply contracts, availability, or conversion performance.

The fish are started by feeding once per hour, 8 times per day. The amount fed is determined on a demand basis. When the fish reach the size of about 200 fish/lb the diet is changed to a more bulky diet based on fish size and performance. The diet is fed daily during the summer, and then intermittently as needed to maintain the fish growth through

the winter. Feeding rates are programmed, and adjusted monthly, to achieve the desired target size at release and may vary with brand and type of feed used. Current target release size is 15 fish/lb (30 gm/fish). Historic feeding level, projected growth rates, anticipated food conversions, and feed manufactures recommendations, along with experience, are all used as tools to program and adjust feeding rates. Food conversion rate for the 1997 through 1999 (incomplete) brood years averaged 1.10 (range 1.08 to 1.12).

9.2.7) Fish health monitoring, disease treatment, and sanitation procedures.

Fish health of rearing juvenile coho is monitored regularly by Nehalem Hatchery staff and ODFW fish health staff. ODFW fish health staff diagnose disease problems and prescribe the appropriate treatments to eliminate or control disease. See Attachment A for description of treatments.

Tools and equipment used for coho rearing are not routinely disinfected (other than allowing to air dry). During the coho spawning season, no other adults are held on station, however, fall chinook do enter the trap at times and are immediately released back into the river. The spawning facilities are not routinely disinfected during the spawning season.

If it becomes necessary, iodine antiseptic is used to sanitize hatchery equipment and prevent the incidence or spread of disease. For further description, see Attachment A.

9.2.8) Smolt development indices (e.g. gill ATPase activity), if applicable.

Weight samples of the fish are taken monthly to ensure proper growth rate (Table 9-3). Prior to release, length frequencies are taken (Table 9-4). A visual mark quality check is completed on a representative sample of the fish targeted for release.

Table 9-4. Average fork length frequency percentages of Nehalem coho at release.

Fork Length Size Range	Stock 99 Average Percentages at Release BY 05	Stock 32 Average Percentages at Release BY 06
< 13 cm.	8	12
13 –15 cm.	86	81
> 15 cm.	6	7
Data Source: HIMS; Nehalem Hatchery files		

9.2.9) Indicate the use of "natural" rearing methods as applied in the program.

No “natural” rearing methods are applied in this program, however smolts are allowed to volitionally leave ponds for 2 to 4 weeks, the remainder are then forced out.

9.2.10) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish under propagation.

Listed fish are not under propagation, however the following measures will be used to minimize adverse genetic or ecological effects to Nehalem Basin wild coho.

- A disease monitoring plan will be implemented (Attachment A).
- Any excess fingerlings may be released into areas where they will have low potential for contact with wild coho, (standing water bodies). Excess fingerlings may also be destroyed.
- No intentional selective activities will be allowed, and unintentional selection will be avoided as much as possible.
- To safe guard against catastrophic egg or juvenile mortality excess egg takes will occur; the excesses will be culled across all families done in such a way as to reduce each family to an equal size, at either the eyed egg or fry stage.

SECTION 10. RELEASE

10.1) Proposed fish release levels

Table 10-1. Nehalem Hatchery proposed coho release levels.

Age Class	Maximum Number	Size (fpp)	Release Date [2]	Location
Eggs	None			
Unfed Fry [1]	Surplus, varies	2,000		Standing waters
Fry [1]	Surplus, varies			Standing waters
Fingerling [1]	Surplus, varies	100 to 140	May to June	Standing waters
Yearling	100,000	15.0	March/April	N Fk Nehalem R.

Data Source: Production schedules and District files

1. This program does not produce fingerlings for release as a program goal for either Stock 99 or 32. In any given year there may be surplus fingerlings (typically from above average fry and fingerling survival). These will be released to standing water bodies.

2. Period listed will occur annually for releases.

10.2) Specific location(s) of proposed release(s).

Stream, river, or watercourse: North Fork Nehalem River (LLID 1238777457315)
Release point: At Nehalem Hatchery, river mile 10.3
Major watershed: Nehalem River
Basin or Region: Northern Oregon Coast

10.3) Actual numbers and sizes of fish released by age class through the program.

Table 10-2. Nehalem Hatchery actual numbers and sizes of coho released by age class through the program.

Release year	Eggs/ Unfed Fry [1]	Avg size	Fry [1]	Avg size	Fingerling [1]	Avg size	Yearling	Avg size
1995	175	N.A.	0		0		789,984	*15.5*
1996	0		0		0		636,519	*14.3*
1997	0		0		0		629,007	*13.9*
1998	0		0		49,450	115.0	192,650	14.4
1999	0		0		74,563	101.1	214,556	13.6
2000					103,371	70.8	209,652	14.4
2001					103,371	70.8	204,648	14.4
2002					63,736	52.8	204,534	15.0
2003					168,490	65.9	101,704	14.6
2004					19,485	86	100,652	15.9
2005					27,211	61.8	102,722	13.7
2006					10,046	53	102,144	14.9
2007					27,871	69.5	102,761	15.1
2008							102,849	14.19
2009							99,250	14.14
2010							103,324	16.24
2011							102,744	14.33
2012							102,924	14.60
2013							102,772	14.3
2014							102,653	14.0
2015							103,292	14.95
Average					64,759	75	210,064	14.59

Data source: ODFW Hatchery Management System (HMS) Database, Salem Oregon.

NOTE: Shaded rows denotes Stock 99

1. This program does not produce fingerlings for release as a program goal for either Stock 99 or 32 In any given year there may be surplus fingerlings (typically from above average fry and fingerling survival). These are released to standing water bodies.

10.4) Actual dates of release and description of release protocols.

Any excess fingerlings for this program may be transported and directly released into areas where they will have low potential for contact with wild coho (typically standing waterbodies). Coho smolts are volitionally released at Nehalem Hatchery, usually in March or April. Volitional release will occur until the majority of the fish have left, with any remaining fish crowded out (Table 10-3), these dates appear to precede the majority of the wild coho migration (Lewis et. al. 2000).

Table 10-3. North Fork Nehalem River Stock 99 & 32 Coho Smolt Release Dates.

Year	Stock 99		Stock 32	
	Release start date	Release end date	Release start date	Release end date
2001	3/1 and 4/1	3/15 and 4/15		
2002			3/1 and 4/1	3/15 and 4/15
2003			3/1 and 4/1	3/15 and 4/15
2004	3/1 and 4/1	3/15 and 4/15		
2005			3/1 and 4/1	3/15 and 4/15
2006			3/1 and 4/1	3/15 and 4/15
2007	3/15	4/1		
2008			3/1	4/15
2009			4/1	4/1
2010	4/1	4/1		
2011			4/1	4/1
2012			4/1	4/1
2013	4/1	4/1		
2014			4/1	4/11
2015			4/15	4/15

Data Source: ODFW HMS database; hatchery files

[1] These dates represent the final date of release. Fish released in the North Fork Nehalem from the hatchery are allowed to leave volitionally for a period of time (up to approximately two weeks) prior to the remaining fish being pushed out. Unless directed otherwise by fish health or Department staff, date(s) of release is determined annually based on the ODFW production schedule and the size of the fish.

10.5) Fish transportation procedures, if applicable.

Not applicable to smolt releases. Any releases of excess fingerlings are transported in an ODFW fish liberation truck (see Section 5.2), using standard procedures. Transport time to local standing waters is approximately 1 hour.

10.6) Acclimation procedures (*methods applied and length of time*).

Not applicable, all Coho Salmon smolts are reared and released at Nehalem Hatchery. Any releases of excess fingerlings are direct, un-acclimated releases in lakes.

10.7) Marks applied, and proportions of the total hatchery population marked, to identify hatchery adults.

Nehalem Hatchery coho smolt releases are 100% fin marked. Beginning with the 2009 releases smolts are adipose fin clipped only (no CWT groups). Excess fingerlings are released unmarked into standing waters or destroyed. Mark quality is checked prior to release, at least 1 month after marking. Sample size is at least 200 fish. Other external marks may be applied if necessary for identification.

10.8) Disposition plans for fish identified at the time of release as surplus to programmed or approved levels.

There are no surplus fish at the time of release. Surplus eggs are destroyed at the eyed egg stage. Surplus fingerlings are released or destroyed in the Spring/Summer as determined by production inventory. Finally, at the time of mass marking, usually November, an actual hand count is obtained and any fish surplus to the release goal (plus anticipated mortality) are released, unmarked, in standing water bodies or destroyed. Smolt releases have generally been within programmed and approved levels.

10.9) Fish health certification procedures applied pre-release.

See Attachment A.

10.10) Emergency release procedures in response to flooding or water system failure.

The goal is that juvenile coho juveniles will not be released as a response to emergency conditions. However, an emergency release may be necessary, but may only occur after:

- The hatchery crew has exhausted all possibilities for retaining the fish.
- The hatchery crew has consulted with the ODFW District Fish Biologist.
- The release will be into the N Fk Nehalem River or into a closed water body.

10.11) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish resulting from fish releases.

The following measures will be used to minimize adverse genetic or ecological effects to Nehalem Basin wild coho.

- All rearing and release activities will occur at Nehalem Hatchery.
- All hatchery coho smolts released in the Nehalem basin will be 100% fin marked.
- All hatchery smolts will be released at the hatchery, which is also the collection location for returning adult hatchery fish that are used in the broodstock.
- The only release strategy for coho stocks 32 & 99 will be as direct release smolts at the hatchery location (North Fork Nehalem River, about river mile 10.3).

- Any excess fingerlings for this program may be released into standing water where they will have low potential for contact with wild coho. Excess fingerlings may also be destroyed.
- There will be a single release. Currently this means:
    - Releases will occur at an average size of approximately 15 fish per pound, about 14 cm fork length.
    - Releases will begin in March or April.
    - Releases will be volitional, with any remaining fish crowded out once the majority have left the pond.

The hatchery-produced smolts are expected to migrate upon, or shortly after release, which should reduce freshwater residence time and minimize interactions with naturally produced salmonid juveniles.

This release strategy should minimize potential interactions and adverse ecological effects that may occur between hatchery coho and juvenile salmonids rearing or migrating through these systems.

SECTION 11. MONITORING AND EVALUATION OF PERFORMANCE INDICATORS

11.1) Monitoring and evaluation of "Performance Indicators" presented in Section 1.10.

11.1.1) Describe plans and methods proposed to collect data necessary to respond to each "Performance Indicator" identified for the program.

Information for Nehalem Basin wild coho, spawner abundance, proportion of hatchery strays, smolt size and timing, will be obtained from OPSW monitoring projects: Salmonid Life-Cycle Monitoring project (Solazzi et al. 2000); and Coastal Salmonid Inventory project (Jacobs et al. 2000). Information on the ocean catch of Nehalem Hatchery coho and incidental harvest impacts to wild coho is obtained from the coast wide ocean salmon fishery sampling program and is compiled and analyzed by the Pacific Fishery Management Council (PFMC 2000). For more information about these aspects of the monitoring program see the above references or Lewis et al. (2000).

Existing staff, funds, and resources are available to conduct the following monitoring and evaluation activities. These activities will directly measure performance standards and indicators previously described in Sections 1.9 and 1.10. Information on the catch of hatchery coho is compiled from returned salmon/steelhead tags, and is available from Fish Division in the Salem office of ODFW. Specific economic data for sport caught fish is not routinely developed for all stocks. Economic data that is compiled is available in the Salem Headquarters Office. New performance standards (and subsequent M&E) may be prescribed in the future as implementation of the Coastal Coho Conservation Plan progresses. Monitoring of naturally spawning salmon and steelhead has increased coast-wide in recent years. Additional information regarding the number of naturally spawning coho of hatchery origin may become available in the future.

Monitoring of in-hatchery performance and adult returns at Nehalem Hatchery will be conducted by the hatchery crew. This information is stored on the ODFW mainframe computer in the Hatchery Information Management System (HIMS) database. This will include at least the following information:

Adults

- The number of females, males, and jacks collected at Nehalem Hatchery, (Standard 2.1, 3.3).
- Number of unmarked winter steelhead, unmarked coho, fall chinook, chum, and cutthroat handled and released (or retained for brood) from Nehalem Hatchery, (Standard 4.5).
- Any observed mortalities of unmarked winter steelhead, unmarked coho, fall chinook, chum, and cutthroat handled at Nehalem Hatchery (Standard 4.5).
- Date of entry into the Nehalem Hatchery trap, specified by hatchery and naturally produced fish (Standard 2.1).
- Date of entry into the Nehalem Hatchery trap for fish retained for broodstock (Standard 2.1).

- Dates of spawning at Nehalem Hatchery (Standard 2.1).
- The number of males, jacks, and females spawned (Standard 3.3).
- Fecundity of females spawned (Standard 2.1).
- Disposition (spawned, sold, stream enrichment, etc.) of all hatchery coho collected (Standard 4.4).

Juvenile Rearing

- Monthly number of eggs/fish on hand, mortality, feeding rate, and growth (Standard 4.1).
- Results of fish health checks and any incidence of disease occurrence (Standard 4.1).
- Results of water quality sampling (Standard 4.2).

Release

- Number of fish released, by mark type (Standard 1.2, 2.2).
- Fish age and size at release; average weight, and length frequency distribution (Standard 2.3).
- Location of releases (Standard 2.2, 2.3).
- Date releases started and ended (Standard 2.2).

11.1.2) Indicate whether funding, staffing, and other support logistics are available or committed to allow implementation of the monitoring and evaluation program.

Funding and staffing are available as part of normal hatchery operation for those activities associated with hatchery operations. However, as with all state and federal programs, budgets are approved by the Legislature, and no commitment of funds can be made past the approved budget period. Funds for various projects associated with this HGMP come from (or could come from) a variety of sources, possibly including license dollars, state general funds, and federal funding sources. Funds are committed for certain activities, but can change with relatively short notice. This could result in elimination or reduction in the hatchery program and associated monitoring and evaluation activities.

11.2) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish resulting from monitoring and evaluation activities.

Risk aversion measures for the salmonid life-cycle monitoring project, and the coastal salmonid inventory project are included under the NMFS 4(d) rule as part of the OPSW Research and Monitoring Program. The in-hatchery monitoring program is not expected to increase risks to listed coho above those imposed by operation of the program. Thus, risk aversion measures for the monitoring program are the same as those discussed under prior sections of this document.

SECTION 12. RESEARCH

There are no research programs conducted in direct association with the Nehalem Hatchery coho program described in this HGMP. There is an OPSW life-cycle monitoring program that operates in the area above the North Fork Nehalem Falls, located about 2 miles above Nehalem Hatchery. See Solazzi et.al (2000) for specific information about this research/monitoring program. Therefore, the answer to all questions in Section 12 is "Not Applicable".

SECTION 13. ATTACHMENTS AND CITATIONS

Citations:

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Lister, D. B., and H. S. Genoe. 1970. Stream habitat utilization by cohabiting underyearlings of chinook (*Oncorhynchus tshawytscha*) and coho (*O. kisutch*) salmon in the Big Qualicum River, British Columbia. Journal of the Fisheries Research Board of Canada 27:1215-1224.

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Stahl, T.P., C.B. Schreck, and D.D. Roby. 2000. Avian predation in Oregon estuaries and juvenile salmonid migration. Annual Report. Oregon Cooperative Fish and Wildlife Research Unit, Department of Fish and Wildlife, Oregon State University, Corvallis, Oregon.

SECTION 14. CERTIFICATION LANGUAGE AND SIGNATURE OF RESPONSIBLE PARTY

"I hereby certify that the foregoing information is complete, true and correct to the best of my knowledge and belief. I understand that the information provided in this HGMP is submitted for the purpose of receiving limits from take prohibitions specified under the Endangered Species Act of 1973 (16 U.S.C.1531-1543) and regulations promulgated thereafter for the proposed hatchery program, and that any false statement may subject me to the criminal penalties of 18 U.S.C. 1001, or penalties provided under the Endangered Species Act of 1973."

Name and Title of Applicant: Chris Knutsen, North Coast Watershed District Manger

Signature:_____Date:_____

Certified by: Scott Patterson, Fish Propagation Program Manager

Signature: _____Date:_____

Attachment A

Table A1. This fish health monitoring plan is identical to that developed by the Integrated Hatchery Operations Team for the Columbia Basin anadromous salmonid hatcheries (see Policies and Procedures for the Columbia Basin Anadromous Salmonid Hatcheries, Annual Report 1994. Bonneville Power Administration).

- All fish health monitoring will be conducted by a qualified fish health specialist.
- Annually examine brood stock for the presence of viral reportable pathogens. Number of individuals examined, usually 60 fish, will be great enough to assure a 95% chance of detection of a pathogen present in the population at the 5% level. American Fisheries Society "Fish Health Blue Book" procedures will be followed.
- Annually screen each salmon brood stock for the presence of *R. salmoninarum* (R.s). Methodology and effort will be at the discretion of the fish health specialist.
- Conduct examinations of juvenile fish at least monthly and more often as necessary. A representative sample of healthy and moribund fish from each lot of fish will be examined. The number of fish examined will be at the discretion of the fish health specialist.
- Investigate abnormal levels of fish loss when they occur.
- Determine fish health status prior to release or transfer to another facility. The exam may occur during the regular monthly monitoring visit, i.e. within 1 month of release.
- Appropriate actions including drug or chemical treatments will be recommended as necessary. If a bacterial pathogen requires treatment with antibiotics a drug sensitivity profile will be generated when possible.
- Findings and results of fish health monitoring will be recorded on a standard fish health reporting form and maintained in a fish health database.
- Fish culture practices will be reviewed as necessary with facility personnel. Where and when pertinent, nutrition, water flow and chemistry, loading and density indices, handling, disinfecting procedures, and treatments will be discussed.

Disease Treatment

Treatments for disease at Nehalem Hatchery include: green eggs are routinely water hardened in diluted buffered iodophor; formalin flush treatments of 1:600 formalin for 15 minutes given three to five times per week for fungi prevention on eggs; and juvenile fish are treated with either formalin or hydrogen peroxide to control external fungi and parasites. Hydrogen peroxide is used at 50-100 ppm for one hour on three consecutive days. Depending on species of fish, parasite treating and water temperature, formalin is used at 1:15,000 to 1:6,000 for one hour for three consecutive days and occasionally at 1:20,000 to 1:15,000 for 4 to 6 hours daily until

Ichthyophthirius is controlled. Juvenile fish are treated for bacterial infections with oxytetracycline or Romet medicated feed according to label. Each spring a 28 day feeding of Aquamycin (erythromycin) medicated feed is administered to the coho juveniles under an investigational new animal drug permit to prevent bacterial kidney disease. If bacterial gill disease is detected, potassium permanganate is given as an one hour bath at 1.0 ppm treatment on the first day and 1.25 ppm treatment on days 2 and 3.

Table A2. Disease history* (1995 to present) by fish stock at Nehalem Hatchery. CHF = Fall Chinook Salmon, STW = Winter Steelhead, Rb = Resident Rainbow Trout. Stock codes are 32 = North Nehalem River Stock, 99= Fish Hawk Lake Stock, 34 = Trask River Stock.

	Hatchery Programs (stock code and species)					
Disease or Organism	32 STW	99 STW	72 Rb	32 Coho	99 Coho	34 CHF
IHN Virus	No	No	No	No	No	No
EIBS Virus	No	No	No	Yes	No	No
Coho Anemia Disease	No	No	No	Yes	Yes	No
Aeromonas salmonicida	Yes	Yes	Yes	Yes	Yes	Yes
Aeromonas/Pseudomonas	Yes	Yes	Yes	Yes	Yes	Yes
Flavobacterium psychrophilum	Yes	Yes	Yes	Yes	Yes	No
Fl. columnare	Yes	No	Yes	No	No	No
Fl. branchiophilum	No	No	Yes	No	No	No
Fusiform gill disease bacterium	No	No	Yes	No	No	No
Renibacterium. salmoninarum	Yes	Yes	Yes	Yes	Yes	No
Yersinia ruckeri	No	Yes	No	No	No	No
Carnobacterium sp.	Yes	No	Yes	Yes	No	No
Ichthyobodo	Yes	Yes	Yes	No	Yes	No
Gyrodactylus	Yes	Yes	Yes	No	No	No
Ichthyophthirius multifilis	Yes	Yes	Yes	No	No	No
Gill Ameba	Yes	No	Yes	Yes	Yes	Yes
Trichodinids	Yes	Yes	Yes	Yes	Yes	No
Loma sp	No	Yes	No	Yes	Yes	No
Nanophyetus salmincola	Yes	Yes	Yes	No	Yes	Yes
Glochidia	Yes	Yes	Yes	No	No	No
Sanquinicola sp.	Yes	Yes	Yes	No	No	No

* Yes indicates detection of the pathogen but in many cases no disease or fish loss was associated with presence of the pathogen. No indicates the pathogen has not been detected in that stock.