HATCHERY AND GENETIC MANAGEMENT PLAN (HGMP)

Hatchery Program:	**Coos River Fall Chinook Program**
Species or Hatchery Stock:	**Fall Chinook Salmon (Stock 37)**
Agency/Operator:	**Oregon Department of Fish and Wildlife**
Watershed and Region:	**Coos Watershed – ODFW West Region**
Date Submitted: **First Update Submitted:** **Second Update Submitted:** **Third Update Submitted:** **Fourth Update Submitted:**	**October 19, 2005** **December 8, 2008** **November 12, 2014** **June 6, 2016** **September 20, 2017**
Date Last Updated:	**September 20, 2017**

SECTION 1. GENERAL PROGRAM DESCRIPTION

1.1) Name of hatchery or program.

Coos River Fall Chinook Program

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

Oregon coastal fall Chinook salmon (*Oncorhynchus tshawytscha*) –Stock 37
ESA status: The wild and hatchery-produced fall Chinook of the Coos River and Oregon coast are not ESA-listed (Federal Register Notice 1998).

1.3) Responsible organization and individuals.

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Hatchery Contact:

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Other agencies, Tribes, co-operators, or organizations involved, including contractors, and extent of involvement in the program.

Salmon and Trout Enhancement Program (STEP) volunteers and numerous unassociated students and volunteers assist with broodstock collection and spawning. Volunteers also assist in other aspects of the operation of the STEP facilities at Morgan Creek, Millicoma Interpretive Center, Noble Creek, Blossom Creek, and Charleston Creek. Volunteer

efforts are under the supervision of an ODFW STEP biologist or other ODFW fish district and hatchery personnel. The Coquille Indian Tribe operates the acclimation and release of Chinook pre-smolts from Fourth Creek Reservoir.

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

Funding source: Sportfish Restoration, grants such as Restoration and Enhancement, private foundations, donations, and general state funds.

Bandon Hatchery staffing level: One Hatchery Manager-1; one Hatchery Technician-2; one Hatchery Technician-1.

Cole Rivers Hatchery Staffing level: One hatchery Manager, nine Hatchery Tech-1, one Hatchery Tech-2, one Hatchery Tech-3, two Trades Maintenance, and one Office Coordinator.

Operational Cost information:
Bandon Hatchery: 2006 - $77,589; 2007 - $77,583; 2008 - $77,416
Cole Rivers Hatchery: 2006 - $8,561; 2007 - $8,108; 2008 - $8,428

In addition to ODFW facility and staff costs, there is a substantial value to the volunteer labor, materials, and other aspects of the production of Coos River hatchery Chinook. District staff also has a substantial investment in these programs on an annual basis in terms of time, service, and supplies. The Chinook production from the Bandon Hatchery is divided among several station/acclimation site releases, so Bandon's expenses should be applied to those stations.

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

Bandon Hatchery is located in the Coos watershed one mile east of the city of Bandon. The site is at an elevation of approximately 98 feet above sea level, at latitude 43º 06' 54" N and longitude 124º 23' 03" W. The hatchery is situated at the confluence of Geiger and Ferry Creeks. Ferry Creek enters the Coquille estuary at river mile (RM 1.0). The watershed code is 1700301000. The regional mark processing code for Bandon Hatchery is 5F22237 H37 21.

Cole Rivers Hatchery is located in the Rogue watershed approximately 30 miles NE of Medford. The site is at an elevation of 1,545 feet above sea level, at latitude 42º 39' 49" N and longitude 122º 41' 01" W. This hatchery is located at the base of Lost Creek Dam at river mile 157. The watershed code is 1500000000. The regional mark processing code for Cole Rivers Hatchery is 5F22208 H8 21.

Morgan Creek Hatchery is located 11 miles east of Coos Bay on a tributary of the South Fork Coos River. The location is 43º 20' 37'' N and 124º 25' W. Morgan Creek flows into Daniels Creek, which enters the South Coos River at RM 2.5.

Noble Creek Hatchery is located seven miles south of Coos Bay and is sited on a tributary of Isthmus Slough called Noble Creek. The location is 43º 15' 30'' N and 124º 18' W.

Blossom Gulch rearing site is located one half mile from Coos Bay on an un-named stream that flows through a long culvert under the City of Coos Bay. The location is 43º 22' N and 124º 17' W. This rearing site is situated near the campus of Blossom Gulch Elementary School in a stream before it runs through the long culvert under Tenth Street.

The Millicoma Interpretive Center is located 25 miles northwest of the City of Coos Bay at RM 11.5 on the West Fork Millicoma River. The location is 43º 29' N and 124º 29' 15" W. The West Fork Millicoma enters the Millicoma River at RM 9. The East Fork and the West Fork form the Millicoma River.

Associated incubation facilities are listed below:

Glasgow (Coos Bay Tributary)	T 25 S, R 13 W, Section 2
Noble Creek (Isthmus Slough Tributary)	T 27 S, R 13W, Section 1
Allegany (East Fork Millicoma)	T 25 S, R 11 W, Section 5
Marlow Creek (East Fork Millicoma)	T 24 S, R 11 W, Section 32
Allegany upper (East Fork Millicoma)	T 25 S, R 10 W, Section 6
Hughes (West Fork Millicoma)	T 24 S, R 11 W, Section 16
Hampton (Ferry Creek, trib. To Noble Creek)	T 27 S, R 13W, Section 1
School aquaria (Millicoma Middle School, Madison Elementary, Hillcrest Elementary, Sunset Middle School, North Bay Elementary, Blossom Gulch Elementary, Marshfield High School, North Bend Middle School, Christ Lutheran, Kingsview School, and Lighthouse School, Coquille Indian Tribe community center)	All in Coos Bay/ North Bend Area

Broodstock collection facilities

Broodstock are collected through swim-ins to Morgan Creek, Millicoma Interpretive Center, and Noble Creek. Tangle-net collections are also conducted by ODFW staff and STEP volunteers. Common netting sites include the head of tidewater on the Millicoma River, several locations on the East Fork Millicoma, and near the Millicoma Interpretive Center on the West Fork. Two main river traps are the primary source for native broodstock. One trap is located near the head of tidewater at RM 10 on the South Fork Coos River (Dellwood) and the other trap is at RM 3.5 on the West Fork Millicoma River.

Spawning and egg incubation facilities

Eggs are taken at Morgan, Noble, and the Millicoma stations. All gametes are taken to Bandon Hatchery where fertilization of the eggs is conducted and the eggs are incubated to the eyed egg stage. Bandon Hatchery receives 2,600,000 green eggs for the Coos River fall Chinook hatchery program.

Egg incubation and rearing facilities

Approximately 550,000 eggs are retained at Bandon Hatchery to be reared to presmolts for release into the Coos River Basin at Morgan Creek and Blossom Gulch acclimations. The balance of eyed eggs are distributed to the Millicoma Interpretive Center and Noble Creek for presmolt production and to multiple hatchbox sites and classroom aquaria that are sited throughout the basin. Approximately 2,000 Chinook eyed eggs are distributed in small groups (200 eggs per school) to elementary schools, to be displayed in classroom incubators.

Release sites (See Appendix C for map of sites.)

Bandon Hatchery rears 547,500 presmolts that are transferred to three sites to be acclimated. Morgan Creek receives 247,500; Blossom Gulch receives 200,000; and Fourth Creek Reservoir receives 100,000 presmolts. These groups are acclimated about two weeks prior to release.

An additional 5,000 presmolts are programmed to be reared at Bandon Hatchery and transferred to the Charleston Pond (Oregon Institute of Marine Biology—OIMB) to be acclimated and released at that site. Charleston Pond formerly reared and released hatchery Coho that had a potential to impact wild Coho in Winchester Creek at the head of South Slough. That Coho release was discontinued to prevent those potential impacts and replaced with a small Chinook program. The program at OIMB is primarily an education and interpretation project, but adult fish can contribute to harvest in ocean and lower bay fisheries.

Volunteer facilities also rear presmolts for direct release or transfer. Morgan Creek has a production goal of 645,000 presmolts that are reared and released on station.
At the Noble Creek facility, the production goal is to rear and release 600,000 presmolts.

The Millicoma Interpretive Center rears 100,000 presmolts that were formerly released on-site. As a measure of the ODFW's Coastal Multi-Species Conservation and Management Plan (2014)(aka "CMP"), this presmolt release was moved to Pony Slough in the lower Coos Estuary, beginning with the 2015 release, in order to focus returning adults on an area of high angling effort and harvest, and in an attempt to reduce the incidence of hatchery adults on natural spawning grounds higher in the basin.

A group of 200,000 presmolts are reared at Cole Rivers Hatchery and transferred to Morgan Creek for acclimation and release, following the release of the on-site reared fish at Morgan Creek facility.

Finally, unfed fry from classroom incubators are released into streams near elementary schools. Again, these releases are typically 200 fish or less, per school class. Release sites and logistics are under the guidance of ODFW STEP Biologists.

1.6) Type of program.

Isolated Harvest Program.

1.7) Purpose (Goal) of program.

The main purpose of this program is harvest augmentation. The ultimate goal is to provide fish that are genetically and ecologically similar to wild populations, primarily for harvest, while minimizing any potential adverse impacts to the wild population of this species and other listed species. Another important goal of this program (STEP component) is to educate school students and public to increase awareness of salmonid biology, life history, and their habitat requirements.

1.8) Justification for the program.

This program provides fish for both the ocean commercial and recreational fisheries as well as the in-river recreational fishery on the Coos River. Maintaining these and other fisheries directed at unlisted species maintains the economic and cultural values associated with historic salmon fisheries while reducing social pressures to increase fisheries directed at listed species. To minimize interaction with listed Coho, the hatchery-produced fall Chinook are released at presmolt stage (75 fish/lb) into tidewater tributaries during the late spring and summer when Coho rearing in the estuary is minimal. Also, the wild Coho smolts in the estuary will be larger in size and more aggressive than the presmolt fall Chinook released into tidewater areas. An ODFW staff technical report on coastal salmonid stocking guidelines (McGie, undated) suggested the potential for significant expansion of the hatchery fall Chinook program in the Coos River Basin, to take advantage of the large, productive estuary.

STEP Fish Propagation Project Review

In accordance with STEP program rules, a five-year review was conducted for all STEP-related fish propagation projects in the Coos-Coquille-Tenmile Fish District in the latter half of 2005, culminating with conditional approval by ODFW's Fish Division Administrator in March of 2006. The overall Coos fall Chinook hatchery program is a combination of incubation, rearing ("propagation" under the STEP rules), and acclimations conducted prior to release. These actions are carried out at multiple STEP volunteer-operated facilities as well as ODFW hatcheries, by volunteers, students, tribal staff, and ODFW staff. The Review process began with a required Oregon Fish and Wildlife Commission ("Commission") approval for individual projects to release anything greater than 100,000 fish. Those approvals were granted by the Commission in December of 2005.

Following intensive review and public comment, conditions for individual projects were established and incorporated into letters of approval that were sent to each project's sponsor. Four of the six projects reviewed were a part of the overall Coos River fall Chinook hatchery program. Although only those STEP projects that rear (propagate) fish

prior to release were under the five-year review (as opposed to short-term acclimations), it was decided that ODFW staff should conduct an overall Coos fall Chinook hatchery program review to provide cohesiveness and compliance with policy.

Changes that were made to this HGMP since the September 2005 version include:

- the elimination of the release of unfed fry (except classroom incubators) and smolts;
- continuing the program as presmolts, released only at target size of 75 fish/lb;
- from the 2005 STEP Review, an increased mark rate of released presmolts from the previous 7-8% to up to a minimum of 30%, to facilitate evaluation under the five-year "Coos Fall Chinook Monitoring and Evaluation Project" (conducted 2009-'13);
- accomplishment of 100% hatchery Chinook fin marking, beginning in 2014; and
- shifting the release of 100,000 presmolts reared at Millicoma Interpretive Center to acclimation/release at Pony Slough (a CMP measure).

The Coos Fall Chinook Monitoring and Evaluation Plan developed during this process is attached to this document as Appendix E. The increased marking of released hatchery Chinook facilitated the study from 2009 through 2013. Preliminary results were utilized to make changes to the Coos hatchery Chinook program indicated in this HGMP, primarily moving the release site of presmolts reared at Millicoma Interpretive Center to an acclimation further down in the estuarine part of the watershed.

1.9) List of program "Performance Standards" and 1.10) Performance Indicators, addressing benefits (1.10.1) and addressing risks (1.10.2).

BENEFITS **Performance Standards**	**BENEFITS** **Performance Indicators**	**BENEFITS** **Monitoring & Evaluation**
A representative sample of the Chinook run will be collected in the Coos Basin, in order to maintain a hatchery broodstock similar to naturally produced Chinook.	• For each effort, record the date, location, sex, and total number of Chinook captured and used for broodstock. • Chinook broodstock will be collected across the fall Chinook run timing.	• Tracking of broodstock collection records by District staff, in-season.

Marking and tagging will provide for an estimate of the success of the artificially produced Chinook salmon.	• Attempt to achieve 100 percent of the Chinook juveniles (pre-smolts) fin-clipped prior to release, and a portion of those will be coded-wire tagged. (Reference Coos M&E Plan)	• Quality control sampling post-marking, but pre-release. • Evaluation of success through hatchery returns and creel from ocean and in-basin fisheries, when feasible.
Carcasses or other products will be placed in spawning streams for nutrient enrichment. This is identified as an Oregon Plan salmon restoration measure.	• Distribution of carcasses and other products for nutrient enrichment is in compliance with DEQ guidelines for number, date and location of carcasses placed in streams for nutrient enrichment. • Number and location of carcass placements comply with Oregon Plan monitoring designated treatment (nutrient loading) and control streams.	• Monitor carcass placement to verify compliance with DEQ agreement. • Oregon Plan monitoring will attempt to determine effectiveness of carcass placements for nutrient enrichment.
RISKS **Performance Standards**	**RISKS** **Performance Indicators**	**RISKS** **Monitoring & Evaluation**
Adverse effects on wild Coho and Chinook will be minimized through numbers, timing, and location of juvenile releases.	• Releases of juveniles into the upper portions of watersheds will be minimized. Releases of Chinook presmolts will occur into tidewater areas of the estuary. • Releases of juveniles into the estuary will be timed to minimize competition with	• Releases made when and where scheduled.

	out-migrating wild Coho. These releases will primarily occur after Coho have migrated through the upper tidal areas.	
While collecting Chinook broodstock, avoid adverse impacts to the wild Coho run.	• Maintain numbers of wild Coho captured or otherwise impaired below 5% of estimated wild Coho three-year average annual escapement, based on SRS data.	• For each effort, record the date, location, sex, total number of Coho encounters, number of Coho captured, and the number visibly harmed or otherwise impaired, if released.
ODFW Hatchery water discharges will comply with the prescribed 300J general NPDES permit as required by the Oregon Department of Environmental Quality (DEQ).	• Results within accepted criteria.	• Water samples collected and result reported.
ODFW Hatchery operations comply with the Fish Hatchery Management Policy and other state and federal guidelines and permits.	• Hatchery operations conform to applicable fish health, sanitation, and operational guidelines. • Hatchery operations conform to STEP poundage and/or DEQ/NPDES guidelines for water quality. • Facility intakes are appropriately screened or above anadromous salmon distribution.	• Fish health is regularly monitored to avoid the introduction of new pathogens or significant levels of existing pathogens. • Fish health is certified prior to release. • Appropriate reports are filed to document fish mortality and growth. • Sanitation and maintenance activities are conducted regularly. • Appropriate protocols will be followed for monitoring water quality standards.
Hatchery water withdrawals will be screened to prevent	• Screens inspected and in working order.	• Periodic inspection of screen condition.

entrainment of native fish.		

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

At the current program size, the number of broodstock needed for this program is 1,600 fish (800 pairs) of hatchery and wild origin. A maximum of 3,000 adults may be used annually to fulfill broodstock needs if program size is increased, or for purposes of increasing genetic diversity. In years of projected low Chinook spawner escapement, fewer wild adults may be used, with a heavier reliance on hatchery fish for broodstock.

1.11.2) Proposed annual fish release levels (maximum number) by life stage and location.

Table 1-1. Proposed annual releases of fall Chinook in the Coos River Basin.

Life Stage	Annual Release Level	Release Location
Eyed Eggs	0	
Unfed Fry	2,000	Near schools, from classroom incubators.
Fry	0	
Fingerling **(Presmolts at 75 fish per pound)**	Up to 2,200,000	645,000 Morgan Creek--rearing 247,500 Morgan Creek—acclimation (from BH) 200,000 Morgan Creek—acclimation (from CRH) 600,000 Noble Creek--rearing 200,000 Blossom Gulch Creek—acclimation (BH) 100,000 Coquille Tribe project (Fourth Cr. Res.-BHr) 100,000 Pony Slough--acclimation (from W. Fk. Millicoma rearing) 5,000 Oregon Inst. of Marine Biology/Chstn. Cr.
Smolt	0	
*** Not current program; proposed only**		

See Appendix B for Fish Production Flow Chart.

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

Estimates of adult fall Chinook production from Morgan and Noble Hatchery fall Chinook program for 11 brood years are presented in Table 1-2. Returns to other stations

are estimates; counts are not available for stations that do not trap or enumerate returning Chinook. The estimated number of total adult hatchery fall Chinook 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 only. Estimated "Freshwater Sport" catch is not available, as punch card estimates of catch in the Coos Basin cannot be separated into hatchery and wild fish, or into brood years. The "Hatchery Return" column depicts the actual count of adult fall Chinook returns at Morgan and Noble Creek hatcheries. The adult fall Chinook returns for each run year were allocated to a brood year based on the average age composition of hatchery recoveries of CWT fall Chinook. In most years, we do not have an estimate of the number of hatchery fall Chinook that strayed to natural spawning areas. Therefore, the "Spawning Areas" column is not available. Smolt to adult survival is calculated as the sum of the prior 5 columns divided by the "Smolt Release" column. This is a minimum survival estimate, as we do not have estimates of the number of hatchery fall Chinook caught in freshwater fisheries (by brood year) or straying to spawning areas.

Table 1-2. Estimated total adult hatchery Coos fall Chinook produced per brood year (results are combined for fingerling and smolt releases, derived from CWT expansions). N/A= data not available.)

		Estimated Total Adult Hatchery Fall Chinook Produced						
Brood Year	Fingerling Release	Smolt Release	Ocean Comm.	Ocean Sport	Freshwater Sport	Hatchery Return	Spawning Areas	Smolt to Adult
1989	1,833,511	63,490	1,794	187	N/A	684	N/A	0.14%
1990	741,663	115,466	885	30	N/A	580	N/A	0.17%
1991	881,872	100,538	2,043	0	N/A	2,389	N/A	0.45%
1992	1,151,518	130,044	1,045	212	N/A	3,475	N/A	0.37%
1993	1,306,736	92,850	1,588	18	N/A	2,056	N/A	0.26%
1994	1,260,731	103,534	924	0	N/A	829	N/A	0.13%
1995	708,875	94,405	410	13	N/A	1,557	N/A	0.25%
1996	1,524,128	98,963	427	101	N/A	1,404	N/A	0.12%
1997	1,120,683	103,618	1,511	79	N/A	3,871	N/A	0.45%
1998	1,719,480	91,496	4,039	873	N/A	8,100	N/A	0.72%
1999	1,850,676	95,480	12,902	1,669	N/A	18,471	N/A	1.70%

Freshwater sport data are not available by brood year contribution (i.e. derived from 3-yr.-olds, 4-yr.-olds, etc. contributing to harvest in a given run year). However, overall punchcard harvest estimates are available for total basin catch and divided amongst subbasin fishery areas. Figure 1-1 shows total basin harvest for Coos fall Chinook salmon for the run years 1978 through 2003. The ten-year average harvest estimate (1994-2003) was 3,102 adult fish, with a range from 1,559 to 5,396. Hatchery fish to wild fish ratios are not available from this data.

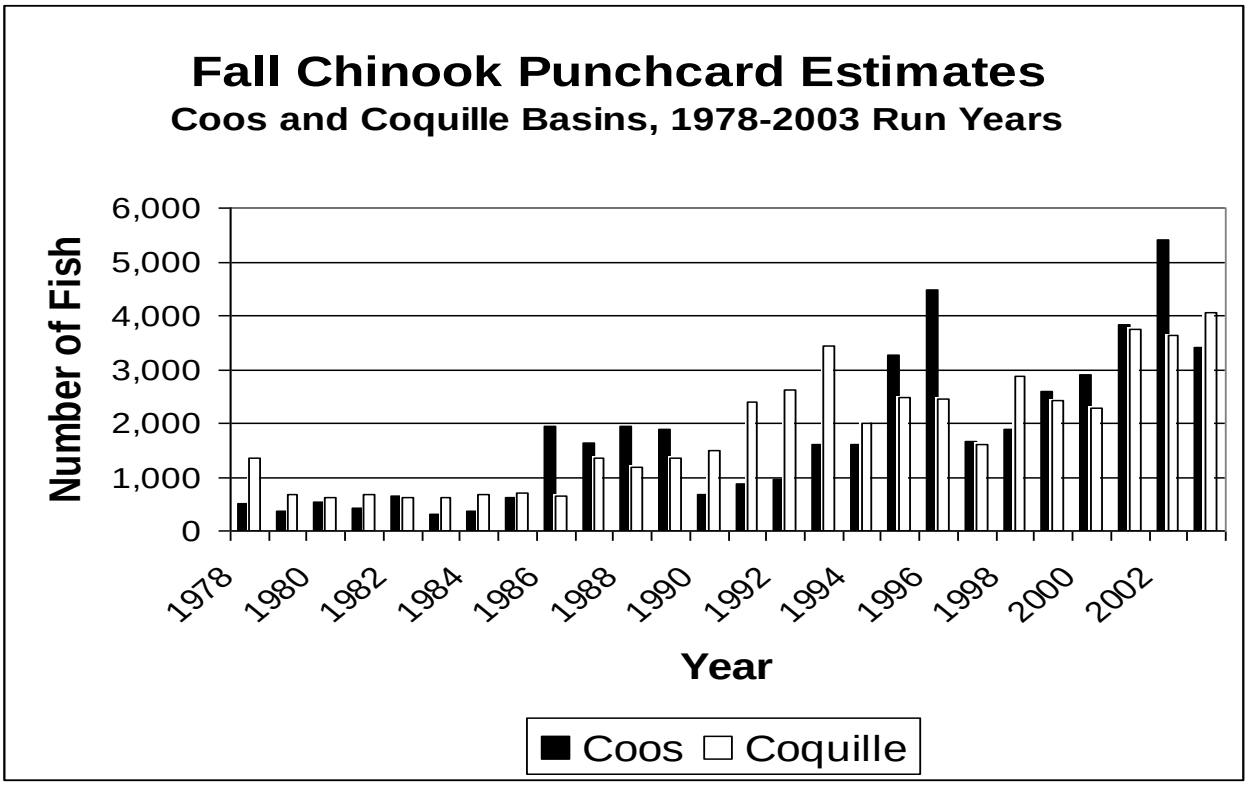


Figure 1-1. Total basin harvest for Coos and Coquille fall Chinook salmon for the run years 1978 through 2003.

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

The presmolt release program began in 1982, and the smolt program began in 1983 and discontinued in 2006. The presmolt program has been primarily composed of fish that were unmarked (formerly 7 to 8% marked), subsequently the ability to document ocean and in-river contributions was not possible with most of the release groups.

1.14) Expected duration of program.

This is an ongoing program with no planned termination.

1.15) Watersheds targeted by program.

Coos River watershed.

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.***

Issues, problems, controversies in connection with the program. (size of facilities, program efficiency, straying, broodstock problems, etc.) A sentence or two for each issue, in simple paragraph form.

Issue 1: Size of Facilities
Ocean survival of presmolt and smolt Chinook increased during the years 2000-2004, and subsequently increased the number of returning adult and jacks. During those years, large returns of hatchery Chinook to the trapping and holding facilities required almost daily sorting of broodstock during rain events to keep numbers of fish below carrying capacity in the ponds. Returns from 2005 through 2007 declined from those peak years.

Issue 2: Program Efficiency
Prior to the 2005-'06 STEP Propagation Project Review, most of the fish were released at unfed fry and presmolt (fingerling) stages. The ability to evaluate program efficiency with respect to ocean survival of these released fish was an issue of concern. Presmolts appear to survive well and also contribute well to fisheries. Presmolts are less expensive to produce and are capable of utilizing the estuary to complete their rearing to become effective ocean migrants. The Monitoring and Evaluation (M&E) Plan developed as a result of the STEP review was completed to allow for program evaluation and modification for conservation and effectiveness.

Issue 3: Straying
Straying of hatchery-produced fish is always a concern. Early assessment based on trapping data from Dellwood and the West Fork Millicoma and ODFW spawning ground surveys indicated that hatchery fall Chinook strayed at a minimal level (about 5%) to locations in which wild Coho and Chinook populations spawn, however it is also recognized that the hatchery mark rate was relatively low in the past. Also, Chinook spawn earlier than Coho and spawning locations are spatially different, for the most part. It is thus believed that stray hatchery Chinook may have minimal impact on wild Coho on the spawning grounds. Results of the Monitoring and Evaluation (M&E) Plan and actions developed through the CMP will inform and facilitate modifications to the program to reduce straying.

Issue 4: Broodstock Collection
ESA-listed wild Coho may enter the traps during fall Chinook broodstock collections. As a result, trapping may need to be suspended when significant numbers of Coho are moving upriver at the trapping locations. Coho and Chinook usually move at different times up the West Fork Millicoma and the South Coos River, and typically handling of Coho is limited to a few fish on a given adult sorting day. Coho are no longer collected for broodstock and are released immediately above the trap, with minimized handling.

Issue 5: Finmark types
Concern was raised over the former use of ventral fin marks on presmolts. This mark is known to have a relatively high mortality rate associated with it, estimated at up to 30%. Also, recognition of a ventral mark can be difficult, as this fin tends to regenerate significantly. Anglers can have difficulty recognizing a regenerated ventral fin as a marked fish. Also due to regeneration to a fin nearly as complete as the unmarked ventral fin, once decomposition begins to take place in Chinook carcasses, the mark can also be difficult to recognize. For this reason, the Coos hatchery fall Chinook program was changed to adipose-only mass-marking of presmolts. Evaluation groups continue to be coded-wire tagged to allow for monitoring of individual rearing/acclimation sites. The current mark rate for Coos program hatchery fall Chinook is 100%, which facilitates better management between wild and hatchery fish.

1.16.2) POTENTIAL ALTERNATIVES TO THE CURRENT PROGRAM

Alternatives should be labeled as "draft" and not necessarily endorsed by the mgmt. entity. List intent and implications of the alternative. Paragraph or two on each alternative. Mgmt. entity and proponent should collaborate on a fair rendering of the proposition.

DRAFT ALTERNATIVE 1—Program expansion.

DESCRIPTION AND IMPLICATIONS:
Expand the current fall Chinook hatchery program to the estuarine carrying capacity for juvenile fall Chinook salmon rearing. Current size-at-ocean-entrance data collected in the late summer/early fall suggests that the Coos Estuary has additional potential to rear fall Chinook juveniles. Spawning ground counts for fall Chinook have observed low occurrence of marked hatchery fish on the spawning grounds, however it is also recognized that the former mark rate was low. The M&E Plan for Coos fall Chinook included a 30% mark rate that allowed for evaluation of the program, and the current target is now for a 100% adipose fin-clip mark rate.

PROS AND CONS:
Pros— Seeding the Coos Bay Estuary to its full capacity may generate an expansion in angling opportunities. Expanded angling opportunities are good for anglers and provide economic benefits for the local community and the state of Oregon.
Cons—Expansion of the hatchery fall Chinook program in the Coos Basin could have unanticipated impacts on listed Coho or other non-listed native fish populations. An expanded program would require additional broodstock collection that could potentially have impacts to listed Coho. This could come in the form of delays of Coho in traps or handling stress during netting operations. Additional hatchery facilities/capacity would be required, which currently limits expansion of the program.

DRAFT ALTERNATIVE 2—Current program size, with improvements.

DESCRIPTION AND IMPLICATIONS:
The current hatchery fall Chinook program in the basin could be kept at status quo.
Pros— This would continue the economic benefits that are currently being realized as an outcome of the program. Changes could also continue to be made to the current hatchery fall Chinook program to improve survival of releases and contribution to fisheries. Investigations need to continue as to the best time and location to release Chinook juveniles to maximize their production and subsequent benefits to the community.
Cons— Status quo in release numbers, combined with minor program changes in release strategies is anticipated to have very little potential impact on Coho. Some of the changes may require additional funding and/or staff time. There is estimated to be underutilized carrying capacity in the Coos Estuary that could accept additional fall Chinook rearing.

DRAFT ALTERNATIVE 3—Program reduction.

DESCRIPTION AND IMPLICATIONS:
Reduce the number of fall Chinook juveniles that are produced in the hatchery program to some unidentified lower level.

PROS AND CONS:
Pros— Minor reductions in impacts to Coho would be expected, from reduced Chinook broodstock collection. However, some level of Chinook broodstock collection would still occur, and Coho would still be handled during this capture.
Cons— This program reduction would result in reduced benefits to commercial and recreational fisheries, and have a negative effect on the local and State economies. Reduced community support for conservation programs might also result (see Alternative 4, below).

DRAFT ALTERNATIVE 4—Eliminate hatchery fall Chinook program.

DESCRIPTION AND IMPLICATIONS:
Eliminate the hatchery program for fall Chinook in the Coos Basin.

PROS AND CONS:
Pros—Elimination of the program would eliminate some annual costs to ODFW. Some reduction of impacts to Coho would be expected, by eliminating handling of Coho during Chinook broodstock collection.

Cons— This would reduce the contribution of Coos hatchery fall Chinook to commercial and recreational fisheries and have an unknown effect on the production of Coho. Fisheries would be dependent strictly on fall Chinook from natural production, and some estuarine rearing capacity might go unused. Harvest of Chinook would be expected to be only a fraction of current levels. The local and State economy could be negatively impacted by this program elimination. ODFW might expect to experience a loss of volunteer effort, a loss of support for conservation efforts, and a loss of community "ownership" in the salmon resources of the basin.

1.16.3) POTENTIAL REFORMS AND INVESTMENTS

These are draft, for further discussion, not final decisions. Discuss operating changes or facility modifications that require additional funds, if implemented. Include rough cost estimates, if available. Modifications could include: facility rehabilitation, additional acclimation capacity or sites, alternative rearing practices, changed or new holding and segregation facilities, additional transportation equipment, etc. Include the importance of the reform. Section could be one to five pages in length.

Reform / Investment 1: Construct additional adult fall Chinook holding ponds to accommodate the returns of hatchery broodstock in a safer and more efficient manner. These facilities could be constructed at existing facilities where the land is publicly owned or where long term agreements for the use of the facilities exist. A better job of mimicking the natural spawning timing could be achieved if these facilities were constructed. Additional broodstock holding ponds would also be needed if expansion of the hatchery fall Chinook program in the Coos River basin were merited. The cost of such expanded holding ponds would be an estimated total of $100,000.

Update since 2005 version: Beginning in the summer of 2005 and completed in summer 2007, STEP volunteers acquired property and donations and relocated/improved the STEP facility at Morgan Creek. While there was no increase in production at Morgan Creek, the new facility is designed to address issues listed above. As an out-of-stream raceway (as opposed to the former in-stream raceway), the new facility allows for improved passage and reduced handling of non-target fish, reduced capture of bedload material, greater capacity for trapping and holding adult Chinook, and greater capacity for rearing/acclimating presmolts.

The staff paper on "Guidelines for stocking salmonids in streams", by Alan McGie (ODFW) is used as a reference and supporting evidence for the expansion of the hatchery fall Chinook program in the Coos River Basin.

Reform / Investment 2: Construct net pens or additional release and recapture facilities in the Coos Estuary, in order to focus returning adult fish on primary fishery areas.

The cost of the constructing net-pens or additional release and recapture facilities is estimated at $55,000.

Update since 2005 version: Shifting the presmolt production from the Millicoma Interpretive Center (100,000 fish) to the acclimation site net-pen at Pony Slough was a reform measure in response to straying results from the Coos M&E study.

Reform / Investment 3: Obtain the equipment/resources necessary to use adipose-only mass-marking of juvenile fall Chinook, and attain 100% mark rate. Replace ventral finmarking with adipose marking. Maintain ad-CWT marking of small groups, in order

to provide a unique identifier for project evaluation, while using the mass-mark to make the simpler evaluation of hatchery/non-hatchery fish.

Update since 2005 version: 100% adipose fin marking was accomplished in 2014. Ventral marking was eliminated. CWT groups are ongoing.

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 hatchery program was submitted to NMFS on 10/19/2005 for approval and ESA coverage. This is an updated version of the previously submitted HGMP and consistent with the ODFW's Coastal Multi-Species Conservation and Management Plan 2014.

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

The following descriptive and status information for Coos Complex Coho salmon was prepared in 2000 and 2001 for the direct-take of Coho salmon and that has been described in the Coho HGMP submitted at that time. Since that time, the Oregon Plan for Salmon and Watersheds Coastal Coho Assessment was finalized. Also, ODFW completed an Oregon Native Fish Status Report (ODFW 2005), under the Native Fish Conservation Policy. These documents include updated Coho salmon stock status information for the Coos population, and are available through links on the ODFW website (www.dfw.state.or.us).

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

Coos Complex
The Coos Complex consists of Coho salmon inhabiting the Coos Basin. There are an estimated 220 miles of spawning habitat available to the Coho salmon of this complex (Nickelson 2001).

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 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 in 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 known, it appears 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 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 as in recent years, Coho will be found in only the highest quality habitats. Coast-wide, these habitats comprise about 22 percent of the total habitat (Nickelson 1998). When marine survival increases, as could occur with a changing climate regime, Coho will redistribute into freshwater habitats of lower quality. Thus, Coho salmon population dynamics function with a classic "source-sink" relationship among stream reaches.

a) Identify the NMFS ESA-listed population (s) that will be <u>directly</u> affected by the program.
The program has no intent to directly take any ESA-listed Coho salmon of the Oregon Coast.

b) Identify the NMFS ESA-listed population (s) that will be <u>indirectly</u> affected by the program.
Oregon Coast ESU Coho salmon may be indirectly affected by the Coos fall Chinook hatchery program through competitive interactions for food and space between listed Coho juveniles and hatchery-produced Chinook salmon juveniles. Incidental take of listed wild Coho may occur during fall Chinook brood collection. Wild Coho that are captured during Chinook brood collection are released immediately.

2.2.2) <u>Status of ESA-listed salmonid population affected by the program.</u>

The Coos Complex consists of Coho salmon inhabiting the Coos Basin. There are an

estimated 220 miles of spawning habitat available to the Coho salmon of this complex. The critical population level for the Coos Complex is 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 56 miles of stream, more than the 15-mile threshold (Nickelson 2001).

The abundance of Coho salmon spawners of the Coos Complex ranged from about 1,100 to about 16,500 and averaged about 8,100 between 1990 and 2000 (Figure 1). The abundance from 2001 through 2012 ranged from 1,329 to 33,595 and averaged 19,565 fish (Figure 2.). Abundance since 1990 has never fallen below the critical threshold of 900 fish, and in only two years fell below 2,000 fish. The updated abundance estimates for the Coos population are:

2013—6,884
2014—38,880 (highest return from 1990-2015)
2015—3,030 (sixth lowest since 1990) (ODFW 2016)

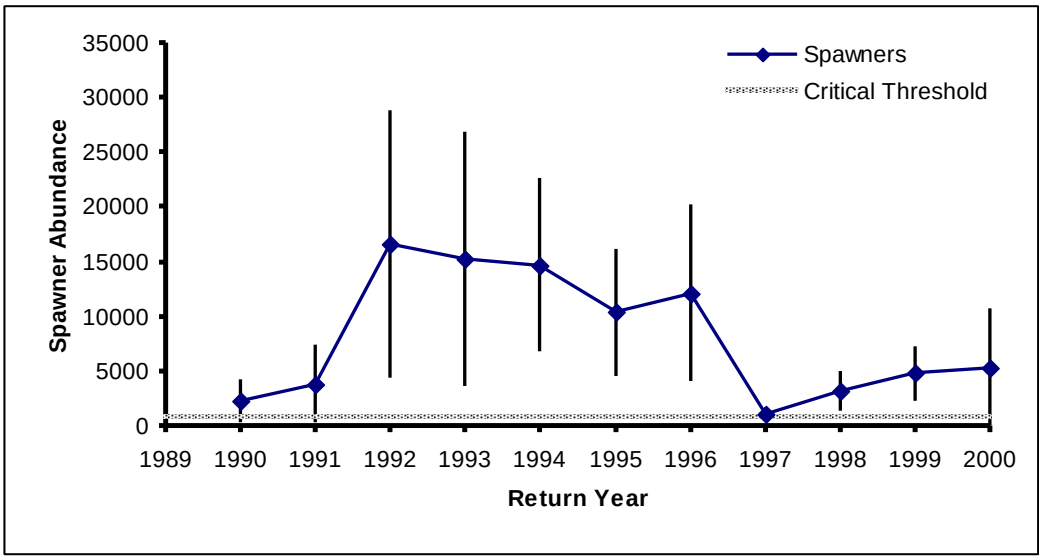


Figure 1. Trend in adult Coho salmon abundance relative to the critical population level for the Coos Complex. (Base years 1990-2000, from 2001 HGMP). Error bars are 95% confidence limits.

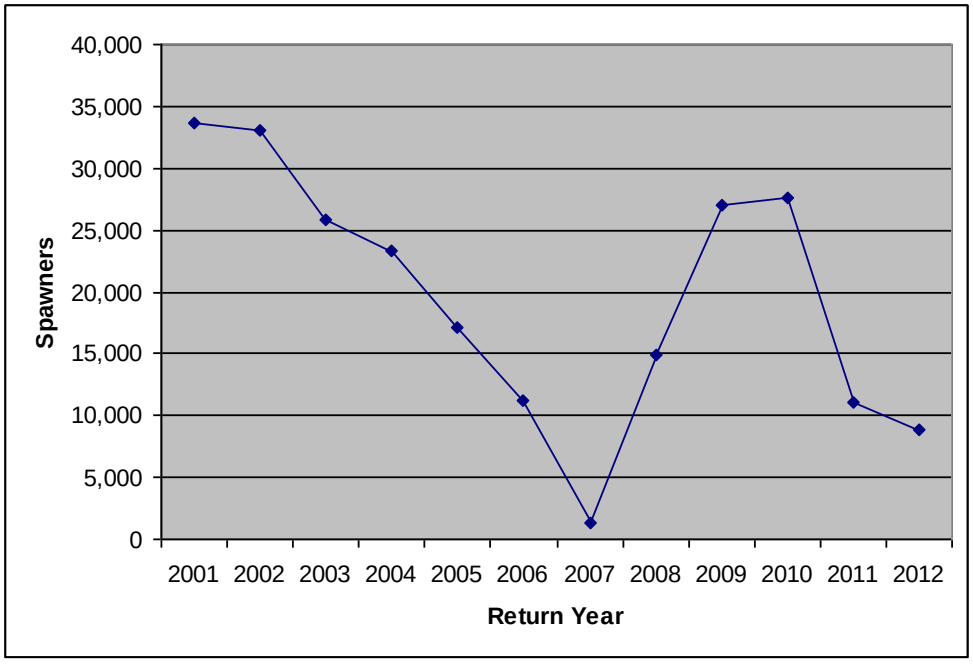


Figure 2. Trend in adult Coho salmon abundance (spawners) for the Coos Complex, 2001-2012.

Recruits per wild spawner exhibited a downward trend from 1993 to 1999, with 1995 to 1999 falling to below one (Figure 3). This was the result of a series of five consecutive extremely strong broods not replacing themselves. During the mid 1990s, marine survival of Coho salmon of this complex was much higher than most of the complexes to the north. At the end of the 1990s, survival came down to the level that the other complexes had been experiencing. The downward trend in recruits per spawner reversed in 2000, when the 1997 brood produced about 5,800 adults and 5,400 spawners from about 1,100 parent spawners.

Recruits per wild spawner for the period 2001 through 2012 is shown in Figure 4. Again, low recruit per spawner levels were generally the result of large spawning escapements not fully matched three years later.

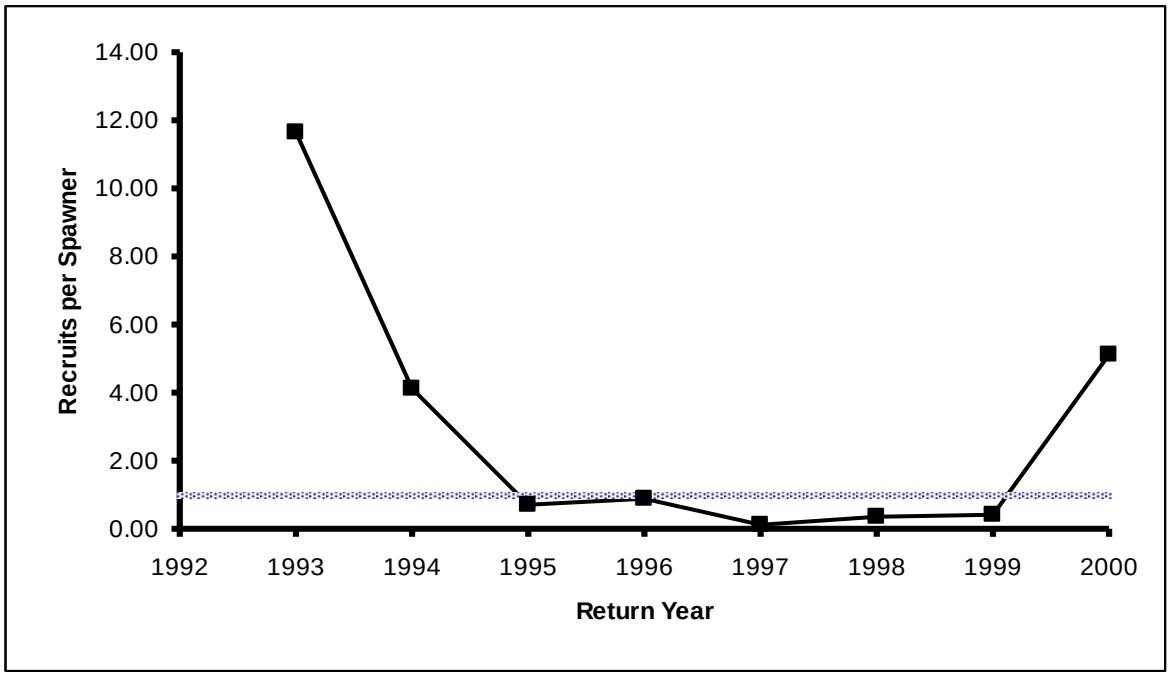


Figure 3. Trend in recruits per spawner for Coos Complex wild Coho, 1992-2000.

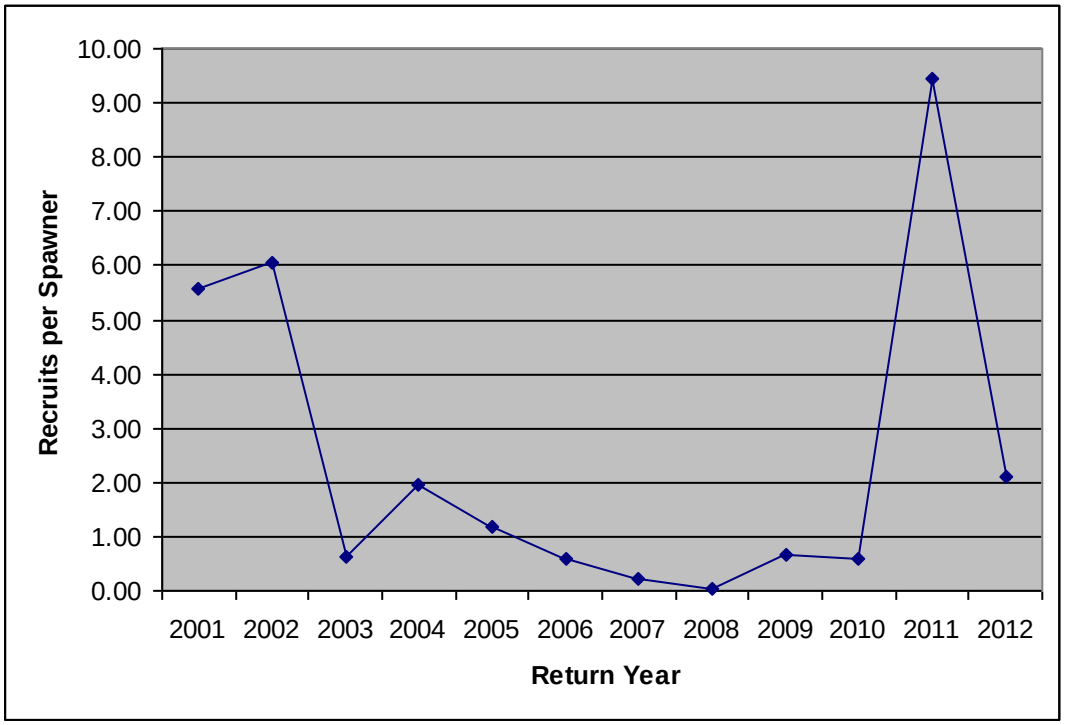


Figure 4. Trend in recruits per spawner for Coos Basin wild Coho, 2001-2012.

Hatchery fish were found on the spawning grounds in some years of the period 1990-99, and averaged only 5.1% of the population (53 of 1,032 scale samples having hatchery patterns). That percentage has declined with the major reduction of coastal hatchery Coho smolt releases.

Table 2.2.2 shows the estimated percentage of hatchery Coho Salmon on spawning grounds in the Coos, Coquille, and Tenmile basins. The 1998-2007 return years represent years when marked adult hatchery fish from smolt releases in the Coos and Coquille basins were still returning. The 2008-2015 return years are beyond the returns of marked adults, with discontinuation of the smolt release program occurring after the 2006 release (2004 BY). In the Coos, pHOS was below 2% in all years, averaging 0.6% with smolt releases and 0.2% post-smolt releases.

Table 2.2.2. Estimated Percentage of Hatchery Coho Salmon on Spawning Grounds (pHOS [1])--Coos, Coquille, and Tenmile Basins

		Coos				Coquille				Tenmile			
	Return Year[2]	Wild	Hatchery	Total	pHOS[1]	Wild	Hatchery	Total	pHOS[1]	Wild	Hatchery	Total	pHOS[1]
With Smolt Releases (Coos and Coquille)	1998	2,985	0	2,985	0.00	2,412	0	2,412	0.00	5,169	0	5,169	0.00
	1999	4,818	0	4,818	0.00	2,667	0	2,667	0.00	6,123	0	6,123	0.00
	2000	4,704	0	4,704	0.00	6,253	0	6,253	0.00	8,278	0	8,278	0.00
	2001	33,595	664	34,259	1.94	13,833	1,832	15,665	11.69	10,990	49	11,039	0.44
	2002	33,120	145	33,265	0.44	7,676	190	7,866	2.42	13,861	0	13,861	0.00
	2003	25,761	189	25,950	0.73	22,403	162	22,565	0.72	6,260	0	6,260	0.00
	2004	23337	113	23,450	0.48	22,138	44	22,182	0.20	7,148	18	7,166	0.25
	2005	17,048	257	17,305	1.49	11,806	0	11,806	0.00	8,464	0	8,464	0.00
	2006	11,266	0	11,266	0.00	28,577	0	28,577	0.00	15,064	123	15,187	0.81
	2007	1,329	13	1,342	0.97	13,968	0	13,968	0.00	3,957	0	3,957	0.00
	Avg's.--	15,796	138	15,934	0.60	13,173	223	13,396	1.50	8,531	19	8,550	0.15
Post-Smolt Releases	2008	14,881	0	14,881	0.00	8,791	0	8,791	0.00	17,131	0	17,131	0.00
	2009	26,979	237	27,216	0.87	22,286	227	22,513	1.01	9,175	0	9,175	0.00
	2010	27,658	230	27,888	0.82	23,564	0	23,564	0.00	20,385	0	20,385	0.00
	2011	10,999	0	10,999	0.00	55,667	442	56,109	0.79	7,284	84	7,368	1.14
	2012	9,414	0	9,414	0.00	5,911	0	5,911	0.00	9,302	0	9,302	0.00
	2013	6,884	0	6,884	0.00	23,637	148	23,785	0.62	6,449	0	6,449	0.00
	2014	38,880	0	38,880	0.00	41,660	0	41,660	0.00	11,141	0	11,141	0.00
	2015	3,030	0	3,030	0.00	3,357	0	3,357	0.00	2,086	0	2,086	0.00
	Avg's.--	17,341	58	17,399	0.21	23,109	102	23,211	0.30	10,369	11	10,380	0.14

[1] pHOS = [Estimated Hatchery Adults on Spawning Grounds/Total (W+H) Adults on Spawning Grounds] x 100.

[2] Data Sources:
Through 2003--NMFS Technical Memorandum NMFS-NWFSC-91 and Oregon Coast Coho Conservation Plan.
2004-2015--GRTS estimates from ODFW OASIS Project. (Ore. Adult Salmonid Inventory and Sampling Project).

[3] Hatchery Coho releases have not been made in the Tenmile Basin since the 1990's.

The proportion of hatchery-origin Chinook spawners (pHOS) in the Oregon Coast Coho ESU is not available (personal communication, Ben Clemens and Shannon Richardson, ODFW, June 2016). The sampling protocol for Chinook spawning surveys does not provide the data necessary to estimate Chinook pHOS with any precision. ODFW has recognized "hotspots" of hatchery-origin spawners observed in streams near acclimation/release sites. The new Coastal Multi-Species Conservation and Management Plan considers these hotspots and allows for higher pHOS adjacent to release sites. ODFW is developing new criteria for evaluating pHOS that might stratify areas based on adjacency to release sites.

The Coos-Coquille-Tenmile Fish District implemented the Coos Fall Chinook M&E study from 2009 to 2013, which shed some light on Chinook pHOS in the basin. The final report of the M&E study is not yet published, however preliminary results led to a change in the release site for presmolts reared at Millicoma Interpretive Center. This change was implemented in order to increase homing of the returning adults back to the lower estuary (Pony Slough), away from natural spawning grounds further upstream.

Intraspecific pHOS has potential genetic and environmental impacts to naturally-produced fish. Interspecific pHOS, in this case hatchery Chinook found on natural Coho spawning grounds, have only environmental impacts. Because they spawn earlier in the fall prior to Coho spawning, hatchery Chinook adults don't superimpose redds on existing Coho redds. Chinook also tend to spawn in larger, main rivers whereas Coho tend to spawn in smaller order tributaries. Progeny of hatchery Chinook may compete with Coho juveniles for rearing space and food, however fall Chinook produce 0-age smolts that move from spawning grounds to tidewater and the ocean within a few months of hatching. This minimizes overlap of Chinook presmolts/smolts with rearing juvenile Coho Salmon.

Due to spatial, temporal, and life cycle differences between Chinook and Coho salmon, the pHOS of hatchery Chinook should have minimal impact on wild Coho Salmon.

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

a) 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.

Adult Chinook are collected by three primary methods. Netting and trapping at a variety of sites within the Coos Basin. Traps are located at South Coos River (RM 10.0), West Fork Millicoma River (RM 3.5), Millicoma Interpretive Center (RM 12.0), Tioga Creek (RM 7.0), Morgan Creek (RM 0.5), and at Noble Creek (RM.5) on Isthmus Slough. Netting occurs at the Millicoma Interpretive Center using seines and entanglement nets. Angler donations of brood Chinook throughout the open angling area are taken from a core group of trained and permitted anglers. These anglers (by way of permit or authorization letter) are allowed to keep and deliver Chinook to holding tanks at key locations in the Coos Basin. ODFW employees and key volunteers transport the Chinook to hatchery facilities where they are held until ripe, and spawned.

Chinook broodstock collection usually begins around mid-October and continues through mid-December. The onset of fall collection usually depends on significant rain events to get fish moving upriver and into traps.

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

Coho captured in the process of collecting Chinook for broodstock may also be retained for Coho propagation program (described in Coho HGMP) or released unharmed. So, it is not expected that direct take or mortalities of adult Coho shall occur associated with Chinook broodstock collection activities.

b) 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).

Wild Coho may be captured, handled, and released, or captured and retained for Coho propagation program that has been outlined above and in the Coos Coho HGMP.

c) 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.

Options include:

1. Discontinue trapping/netting of fall Chinook as maximum take limits of Coho are reached.
2. Open trap facilities to prevent capture of additional wild Coho, allowing them for free passage.

SECTION 3. RELATIONSHIP OF PROGRAM TO OTHER MANAGEMENT OBJECTIVES

3.1) Describe alignment of the hatchery program with any ESU-wide hatchery or other regionally accepted policies. Explain any proposed deviations from the plan or policies.

Pacific Fishery Management Council (PFMC) Harvest Program Section 7 consultation:

The Coos River hatchery Chinook program will operate consistently with **PFMC Harvest Program Section 7 consultation** and with Regional harvest management programs. Specifically, a percentage of the Chinook hatchery presmolts will be marked with a fin clip and/or tag prior to release to allow for the monitoring of harvest rates and escapement as adults.

The Oregon Plan for Salmon and Watersheds (Oregon Plan): This is a prescriptive set of measures for recovering salmon and steelhead populations and habitats, 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 salmon in the Coos River Basin including: nutrient enrichment, acclimations that target the separation of hatchery and wild fish, terminal fisheries that reduce harvest impacts on wild Coho, and monitoring of hatchery and wild runs. While many of the particular measures in the Oregon Plan make reference to a particular species, the measures are broadly applicable to all salmonids.

Native Fish Conservation Policy (NFCP): The Oregon Fish and Wildlife Commission approved the Native Fish Conservation Policy (NFCP). The NFCP requires the development of a conservation plan for each species management unit (SMU). The ODFW completed an Oregon Native Fish Stock Status Report in 2005. In 2014, the Coastal Multi-Species Conservation and Management Plan (CMP) was adopted by the Oregon Fish and Wildlife Commission, and included coastal fall Chinook strategies and actions (ODFW 2014). The conservation plan illustrates options for the responsible use of hatchery-produced fish within the SMU.

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.

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

1) Oregon Plan for Salmon and Watersheds (OPSW).
2) Coastal Multi-Species Conservation and Management Plan (ODFW 2014).
3) Pacific Fishery Management Council (PFMC) Harvest Management Agreement.
4) DEQ Memorandum of Agreement regarding fish carcass distribution in Oregon streams.
5) NPDES permits for hatchery operations.
6) Integrated Hatchery Operations Team (IHOT).
7) ODFW Hatchery Management Policy.
8) ESA Section 7 consultation, biological opinion with Roseburg and Coos BLM districts, interagency fish population and monitoring program – approved NMFS April 10, 1997.
9) U. S. Army Corps of Engineers Regional General Permit for Stream Restoration in Oregon.
10) US-Canada Salmon Treaty.

11) STEP Fish Propagation Project approvals.

3.3) Relationship to harvest objectives.

Chinook juveniles are reared and released at multiple locations in the basin, focused on the estuary. The rearing sites are Morgan Creek, Noble Creek, and the Millicoma Interpretive Center. Acclimation occurs at Morgan Creek, Blossom Gulch Creek, Pony Slough, Charleston Creek/OIMB, and the Coquille Indian Tribe's project at Fourth Creek Reservoir. As a measure of the Coastal Multi-Species Conservation and Management Plan (ODFW 2014) the presmolts reared at the Millicoma Interpretive Center were moved to the Pony Slough acclimation site in the lower estuary, in order to separate them from natural spawning areas and focusing their return to areas of intense fisheries. Rearing and acclimation sites are selected to maximize homing and contribution to fisheries and at the same time minimize the potential impacts to wild Chinook and listed Coho.

3.4) Relationship to habitat protection and recovery strategies.

Major factors affecting natural production include spawning habitat, rearing habitat, ocean conditions, predation, water flows, water quality, and climatic conditions. The Oregon Plan for Salmon and Watersheds lays out measures to be followed by all state agencies including habitat protection, restoration, harvest, and hatchery refinement measures by Oregon Department of Fish and Wildlife; forest practices revisions by Oregon Department of Forestry; water quality protection by Department of Environment Quality; diversion monitoring by Water Resources Division; and Senate Bill 1010 implementation by Department of Agriculture; all of which are designed to protect and improve salmonid habitat. The Coos River fall Chinook program is consistent with these habitat protection and recovery strategies.

3.5) Ecological interactions.

a) *Species that could negatively impact program.*
Predatory fish that could negatively impact outmigrating Chinook smolts in fresh water include primarily one native fish (coastal cutthroat trout). Non-native striped bass, once plentiful in Coos Estuary, are now virtually non-existent. A long list of marine fish species such as lingcod or rockfish may prey on Chinook smolts in the Coos Estuary and the Pacific Ocean. The level of impact on Chinook fry and smolts by predators is unknown. Information is limited on levels of predation to specific species. Predation by aquatic mammals like otters, seals, sea lions, etc. could negatively impact the program. Also, birds like blue herons, Caspian terns, cormorants, gulls, etc. may impact the program.

b) *Species that could be negatively impacted by program.*
Competition and/or predation by Chinook releases on Federal ESA-listed salmonids (OR Coast Coho—Threatened) may be expected to be minimal due to competitive exclusion

by juvenile Coho of juvenile Chinook, and due to spatial and temporal differences in habitat utilization and relative size at the time of habitat utilization between Chinook and Coho.

The Chinook hatchery program that may have had the largest potential impacts to Coho is the release of Chinook into the West Fork Millicoma River, where Coho are also present. Juvenile Chinook have been released into the West Fork as presmolts. These presmolt Chinook average 9 cm and are not large enough to prey on juvenile Coho that are also in the river during the time that the Chinook are released. The Chinook that are released into the West Fork are usually 100% marked. This provides the opportunity to monitor their movement in the river. In most years, the juvenile hatchery Chinook leave the river and enter the estuary very quickly. This quick out-migration from the river is a function of size, as these juveniles are ready to enter tidewater to feed and rear. This rapid migration also means that the potential impacts to juvenile Coho are minimized because competition is negligible. The river downstream from the release site on the Millicoma is not one of the core areas for Coho rearing in the watershed. As previously stated, a Conservation Plan/Coos ChF M&E action has moved the West Fork-reared presmolts down to the lower Coos Estuary for acclimation and release.

Other releases of Chinook in the basin are conducted in close proximity to tidewater; thus, the potential impacts on Coho are also minimized. The release location in Morgan Creek is in the lower reaches of the stream. Morgan Creek enters Daniels Creek less than one mile above tidewater. Only the lower reaches of Morgan and Daniels Creeks are influenced by the releases of presmolt Chinook. The lower reaches of these streams have low to moderate numbers of residing Coho juveniles due to the "pasture trench" character of the stream habitat.

Acclimation sites for Chinook have also been selected towards downstream in the watershed, in an attempt to minimize the potential risk of interactions between program fish and wild Chinook as well as Coho which usually reside in the upstream. Few wild Chinook and Coho are present downstream from the release sites, except during outmigration.

Chinook in the hatcheries are routinely checked for diseases to reduce the risk of infection to not only the fish in the hatchery, but to wild fish as well.

a) Species that could positively impact program.
Any hatchery or wild fish (Coho, Chinook, steelhead) that dies naturally or is spawned and recycled for nutrient enrichment in the basin may positively impact the program. The eggs and larvae of American shad and striped bass have been found to be a food source utilized by juvenile Chinook salmon in the upper tidewater areas. Populations of both American shad and striped bass have been very low in recent years.

b) Species that could be positively impacted by the program.
The freshwater and marine species that depend directly or indirectly on salmonids for

their food and nutrient supply could be positively impacted by the program. These include larger salmonids, other fish species, aquatic mammals, birds, etc. Thus, the hatchery production has the potential for playing a significant role in the predator-prey relationships and community ecology during periods of low natural productivity.

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.

Bandon Hatchery

All gametes from the Chinook egg taking stations in the Coos River Basin are taken to Bandon Hatchery where the eggs are fertilized and subsequently incubated. The water sources for incubating eggs are Ferry and Geiger creeks. The Ferry Creek system feeds into the Coquille River estuary at river mile 1, near the Port of Bandon. This source is all surface water. Average summer flows are approximately 1.25 cfs each. Winter flows vary greatly with storm activity, but average about 5 cfs from each stream.

Bandon Hatchery has water rights for a total of 3.0 cfs. These water rights are senior to all other active water rights in Ferry and Geiger creeks.

Intakes are fully screened with perforated aluminum plates with 1/8" x ¾" slots, installed approximately eight years ago. A request of funds for 3/32" mesh screen has been submitted to ODFW Headquarters. Anadromous salmonids are currently unable to reach the area above the hatchery weir where the intakes are located; however resident cutthroat are present.

The hatchery is operated under the NPDES general permit 300J to maintain the environmental standards of the discharges.

Annual water temperatures range from about 38ºF in the winter to a maximum of 64ºF in the summer. The 14-year average is 51ºF. The water quality meets or exceeds the recommended IHOT standards for temperature, ammonia, carbon dioxide, chlorine, pH, copper, dissolved oxygen, hydrogen sulfide, dissolved nitrogen, iron, and zinc. Fish production at Bandon Hatchery is limited by available water.

Cole Rivers Hatchery

Eyed eggs from Bandon hatchery are shipped to Cole Rivers Hatchery where they are hatched and reared to presmolts. Cole Rivers Hatchery's main water supply is the Rogue River. Ambient water is gravity fed to the hatchery from an impoundment formed by a diversion dam. The intake structure is screened with #4 mesh having 0.178 inch square holes. This supply system will provide up to 300 cubic feet of water per second. Annual

ambient water temperatures range from 41.2ºF to 56.7ºF. The hatchery's warm water supply is piped from the surface of Lost Creek Reservoir. Warmer water is gravity fed to the hatchery from a floating intake on the Powerhouse Intake Tower. The supply system will provide up to 60 cubic feet of water per second. Annual warm water temperatures range from 42.8ºF to 72.8ºF. When the warm water temperature rises above 55ºF it is mixed with ambient water to achieve an upper limit goal of 55ºF. At Cole Rivers Hatchery, the water quality parameters meets or exceeds the recommended IHOT standards for temperature, ammonia, carbon dioxide, chlorine, pH, copper, dissolved oxygen, hydrogen sulfide, dissolved nitrogen, iron, and zinc.

Incubation water is pumped from the ambient water supply line and ultra violet light sterilized. Incubation water is all single pass. Cole Rivers Hatchery has the ability to filter some incubation water with pressure sand filters. The Coos fall Chinook are generally incubated on sand filtered, UV sterilized ambient water. The hatchery is equipped with facilities to heat or chill water to speed up and slow down egg or fry development; and the temperature regime is regulated to "catch up" development of all egg takes to achieve a common ponding date. The overall quality of the water is very good. Fish production at Cole M. Rivers has not been limited by available water or water temperature. The hatchery is operated under the NPDES general permit 300J to maintain the environmental standards of the discharges. The water right is for 224 cfs and the permit number is (S 44910).

Coos Basin Volunteer-operated facilities

The four volunteer-operated rearing stations and the acclimation ponds in the Coos River basin utilize surface water from a variety of streams. The ambient water temperature ranges from 48º to 63º F. Since the fish production in these stations is less than 20,000 lb/yr, the facilities are exempt from the NPDES permit. Most of these stations have incubation facilities associated with them as well as rearing ponds. Incubation facilities receive eyed eggs from Bandon Hatchery and incubate these eggs utilizing surface water. Incubation water sources are usually very small springs that are associated with these rearing stations.

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.

Bandon Hatchery water intake is screened to minimize the risk of entrapment of juvenile listed fish or any other native fish species, but the intake structure doesn't comply with the NOAA screening criteria. Anadromous salmonids are blocked at the hatchery weir and by a pair of dams upstream on Ferry and Geiger creeks, and thus cannot reach the water intakes above the facility. Water diversion for fish culture purposes is non-consumptive, and is returned to Ferry Creek at the fish weir. The water flow, settleable solids, suspended solids, pH etc. are monitored and reported to DEQ as per NPDES permit requirements to comply with the federal Clean Water Act and Oregon Water Quality Standards.

There are no listed natural fish above Cole Rivers Hatchery intake structures, and barriers prevent anadromous fish from reaching intake structures. The water diversion for fish culture purposes is non-consumptive and is returned to the Rogue River below the hatchery. All wastewater from pond cleaning operations is pumped to a 150' x 100' x 6' asphalt lined pollution abatement pond. Like Bandon, the effluents of Cole Rivers Hatchery are monitored and data are reported quarterly to DEQ as per NPDES 300J permit requirements.

Volunteer rearing and acclimation facilities in the Coos basin are screened to minimize the entry of listed species into the rearing or incubation ponds. Water is only diverted in to the volunteer facilities and is rarely pumped. Subsequently, listed natural fish are not impacted by screens or pumps. If a listed species does enter a rearing container through a screen, the size of the fish being reared at the volunteer stations does not pose a predation risk. The listed species, if in the container with the hatchery fish, is soon released with the other fish.

SECTION 5. FACILITIES

5.1) Broodstock collection facilities (or methods).

Adults Chinook are collected using the following four different techniques:

A. Fall Chinook Trapping (off-facility)

a) South Coos River Trap

The major trap in the main river is located at the head of tidewater on the South Fork Coos River at river-mile 10.0 (known as Dellwood). This trap has been operated since 1987 and has been an important tool in collecting wild salmonids to incorporate into hatchery programs. It was originally constructed in 1900 and operated up until 1958. It is composed of a leading weir that guides upstream migrating fish into a concrete and wood trap. The leading weir is three feet wide, three feet tall, and 157 feet in length. The concrete box trap is six feet wide, four feet tall and 16 feet long. The concrete box opens into a wood trap pen that is five feet tall, ten feet wide, and 20 feet long. A PVC incline weir is seasonally installed on top of the guiding weir. The Dellwood Trap has been operated for research and monitoring purposes in recent times, but is presently used only for broodstock collection.

b) West Fork Millicoma Trap

Another main river trap is located at river mile 2.2 on the West Fork Millicoma River. This trap has been operated since 1987 and has also been an important tool in collecting wild salmonid adults to incorporate into hatchery programs. This trap is composed of a leading weir that guides upstream migrating fish into a concrete box trap. The leading

weir is three feet wide, three feet tall, and 130 feet in length. The box trap is eight feet wide, four feet tall and 16 feet long. A second concrete box is adjacent to the trap box. This box provides water control for attraction of fish and is similar in size to the box trap. A PVC incline weir is seasonally installed on top of the guiding weir.

c) Tioga Creek

Chinook can be trapped at Tioga Creek fishway. This fishway was constructed around a waterfall to improve fish passage. The trap is in a rock cut with concrete weirs and walls. The trap is eight feet wide, six feet long, and four feet tall. Fish enter the trap through a fyke and are prevented from leaving the fishway by a blocking weir. This fish trap has not been used for many years.

d) Daniels Creek

A temporary/removable trap has been installed in the tidewater section of Daniels Creek, to capture early returning Chinook headed for Morgan Creek STEP facility. These fish are often held up in tidewater, awaiting enough rainfall to ascend the creeks. This trap is generally fished early enough in the fall to avoid capturing Coho, but is not used every year, depending on broodstock needs and rainfall/streamflows that facilitate movement of adult fish up to the Morgan Creek Facility Trap.

B. <u>Trapping hatchery returns</u>

a) Morgan Creek Hatchery

Many hatchery Chinook are trapped which return to the Morgan Creek STEP facility, located at river-mile 0.5 on Morgan Creek. Morgan Creek is a tributary to Daniels Creek which enters the South Fork Coos River in tidewater. The new raceway (constructed summer 2007) at this station is 120 feet long and 20 feet wide. Fish are trapped at this station after ascending a fishway and jumping over a finger weir. The lower end of the raceway is partitioned for trapping adult fish, and the upper portion is then used to hold sorted fish until ready to spawn.

b) Noble Creek Hatchery

Chinook are also trapped returning to the Noble Creek STEP facility, which is located at river-mile 0.5 on Noble Creek. This facility is located at the head end of Isthmus Slough on Coos Bay. The trap is 120 feet long, six feet wide, and five feet tall. Fish enter the trap by swimming over a finger weir.

c) Millicoma Interpretive Center

Chinook are also trapped at the Millicoma Interpretive Center, located at river-mile 12.0 on the West Fork Millicoma. Fish first ascend a small stream with jump pools made of log weirs or gabions for a distance of approximately 60 feet. The last 20 feet of the fishway is a concrete structure that is three feet wide and four feet tall. Once through the fishway, the Chinook move over a finger weir where they are trapped in a concrete box that is 20 feet wide, 20 feet long, and four feet high.

C. <u>Netting Fall Chinook for Broodstock Collection</u>

Chinook are netted usually in close proximity to the Millicoma Interpretive Center. Two types of gears are used to capture Chinook in netting operations: (1) A 250-foot beach seine, and/or (2) entanglement nets. The seine is made of two-inch mesh and is eight feet deep. The entanglement nets are three inch mesh and are also eight feet deep. The entanglement nets are actively moved through the resting pool near the facility. The entanglement nets are pulled-in immediately upon sensing that a fish has been captured. This minimizes the time a fish is entangled, and fish typically recover well, to survive to spawning.

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

Broodstock collected via trapping, netting, or angler donation are transported in plastic water storage tanks that have been modified to fit in the back of pickup trucks. These tanks are four feet in diameter and about four feet tall. They hold about 250 gallons of water. A 12-volt aerator circulates the water to keep the water oxygenated and the fish alive.

5.3) Broodstock holding and spawning facilities.

Chinook broodstock are held for spawning at three separate locations in the basin. The holding ponds are made out of concrete. The holding pond at Morgan Creek is up to 120 feet long and 20 feet wide and five feet deep. The pond at Noble Creek is 120 feet long, 14 feet wide, and five feet deep. The pond at the Millicoma Interpretive Center is 60 feet long, 20 feet wide, and four feet deep. All sorting and handling of the fish is done by hand and no power equipment is used for sorting or spawning at any of these facilities.

5.4) Incubation facilities.

Bandon Hatchery has a total of 28 vertical double stack incubators. These are supplied by two aluminum headboxes. Five gallons of water per minute are normally run through each stack.

Eggs are incubated at Bandon Hatchery from fertilization to eye-up. Water supply headboxes and incubator stacks are equipped with alarms that sound when water depth drops below critical level. During the period of Chinook egg incubation, the facility has operated at up to an estimated 99% of tray capacity (multiple species/stocks at a time). Bandon Hatchery transfers eyed eggs to the Coos River Basin for incubation, and to Cole Rivers Hatchery for presmolt production. Bandon Hatchery also incubates Chinook from the Coos to the swim-up stage and then begins feeding this group of fish. This group is then transferred to acclimation ponds in the Coos River basin to be released as presmolts.

At Cole Rivers Hatchery, incubation takes place in 66 stacks of vertical incubators. Each stack has 15 usable trays for a total of 990 trays. The water is generally ambient, sand filtered and UV sterilized. The water supply is the ambient water line. Eggs are trayed at approximately 5,000 per tray upon receipt from Bandon Hatchery. Water supply lines, pumps, and the aeration tower (used as a reservoir for gravity feed) are equipped with

pressure and temperature alarms. The wet well used to feed the aeration tower is also equipped with an alarm.

Eggs are incubated at multiple STEP volunteer facilities in the Coos River watershed. Some of these facilities are rearing sites, and the others are hatchboxes. Hatchboxes are volunteer operated incubation sites that transfer the Chinook to other rearing sites at the swim-up stage. Chinook eggs are also incubated in numerous classroom aquaria. School classroom aquaria are operated as educational projects that have fewer than 300 eggs per unit.

5.5) Rearing facilities.

Cole Rivers Hatchery

At Cole Rivers Hatchery there are 26 circular ponds in two groups of 13 each. Each circular pond is 25 feet in diameter and 4 feet deep. Each group of circulars is supplied with ambient or warm water from separate valves connected to each group. Cole Rivers is equipped with 87 concrete ponds 100 feet long, 20 feet wide and 5.5 feet deep. All ponds are supplied with ambient water and 21 ponds have warm water facility. The Coos Chinook require use of ambient water in 2 raceway ponds during rearing. Flows are adjustable in all containers and all containers are single pass.

Bandon Hatchery

At Bandon Hatchery, the Chinook are reared in a concrete pond that is 100 feet long, 20 feet wide, and 4 feet deep. For a short time the ADCWT Chinook are held separately in a pond that is 40 feet long, 15 feet wide and 3 feet deep. All ponds are supplied with ambient water from two reservoirs. Flows are adjustable in all containers and all containers are single pass.

Morgan Creek Hatchery

Chinook are reared in a new (built 2007) concrete raceway that is 120 feet long, 20 feet wide and 5 feet deep. They will be reared to release in late May or early June at a target size of 75 per pound. All ponds are supplied with water that is ambient and diverted from surface water sources. Flows are adjustable in all containers and all containers are single pass.

Noble Creek STEP Facility

The Chinook that are reared at Noble Creek begin in fiberglass British Columbia troughs and a rectangular concrete pond of 5 feet deep, 40 feet long, and 8 feet wide. In early spring, they are moved to the main raceway at the facility. The main raceway is 120 feet long, 14 feet wide, and five feet deep. All ponds are supplied with water that is ambient and diverted from surface water sources. Flows are adjustable in all containers and all containers are single pass.

Millicoma Interpretive Center

The Chinook are ponded into a series of two fiberglass circular ponds and four British Columbia troughs. The Chinook are reared in these containers while the adult winter

steelhead are being held and spawned at the station and while the winter steelhead smolts are in acclimation. Once the winter steelhead adults and smolts are gone, then the Chinook are transferred to a concrete raceway that is 80 feet long, 20 feet wide and four feet deep. All ponds are supplied with water that is ambient and diverted from surface water sources. Flows are adjustable in all containers and all containers are single pass.

5.6) Acclimation/release facilities.

Chinook are acclimated at four sites in the Coos River Basin. During the acclimation period the Chinook are fed 1% of their body weight per day. The acclimation period is two weeks in length, after which the screens are pulled and the Chinook are allowed to leave volitionally. Acclimations in the basin include Blossom Gulch Creek, Morgan Creek, Pony Slough, Fourth Creek Reservoir, and "Charleston Creek" on the campus of the Oregon Institute of Marine Biology, tributary to South Slough. Similar to the rearing stations, acclimation sites have been selected to be in tidewater areas where the potential impact on listed species and naturally spawning fish is minimized.

As a measure of the ODFW's Coastal Multi-Species Conservation and Management Plan (2014), the presmolts that were formerly released on-site from Millicoma Interpretive Center have been moved toacclimation and release at Pony Slough.

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

Mortality of adult fall Chinook has occurred periodically at Noble Creek. The largest loss occurred in the fall of 2000, when fish were "stacked up" in the estuary awaiting rain to move upriver. When a rainstorm occurred, the Noble Creek hatchery trap filled up with adult Chinook, but streamflows dropped again and dissolved oxygen levels were too low for the holding adults. Approximately 1,300 adult and jack Chinook were lost in a single evening. Most of these Chinook were still successfully spawned.

The problem of rapid attraction and subsequent low water would only occur early in the fall, and procedural guidelines have been established to prevent its occurrence again. The hatchery trap can be closed when a given density of adults have been trapped, or if measured D.O. gets too low for the number of fish already trapped, the fish can be allowed to pass downstream by removing the weir. Pond aerators can also be operated to raise D.O. in the trap and holding pond. This high fish density/low D.O. condition does not occur later in the fall and winter, when streamflows are generally higher and water temperatures are lower.

Prior to re-locating/re-building Morgan Creek STEP facility, a major mortality event occurred in juvenile Chinook, when pond divider screens plugged with debris and water flow was restricted. This type of event is precluded now by the design of the new facility, an on-site host, and alarm systems to alert staff/host of water flow/level deficiencies.

At Cole Rivers Hatchery, disease outbreaks pose the greatest operational difficulty. Coos stock fall Chinook have experienced some levels of disease as shown in Appendix A.

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.

Not applicable to Coos fall Chinook program, as this is not an ESA-listed population. However, when listed Coho are propagated, all risk aversion measures are applied that are critical to the operations and are described in Coos River Coho HGMP.

SECTION 6. BROODSTOCK ORIGIN AND IDENTITY

Describe the origin and identity of broodstock used in the program, its ESA-listing status, annual collection goals, and relationship to wild fish of the same species/population.

6.1) Source.

The original broodstock for this program was obtained from the following locations:

South Coos River Trap : River mile 10.0 of the mainstem of South Coos River
West Fork Millicoma Trap : River mile 2.2 of the mainstem of West Fork Millicoma
Tioga Creek Trap : River mile 8.1 of the Tioga Creek
East Fork Millicoma Netting : River mile 0.5 –8.0 of the East Fork Millicoma
West Fork Millicoma Netting: River mile 0.5 –13.0 of the West Fork Millicoma
Millicoma Netting : River mile 8.0 – 10.0 of the Millicoma River
South Coos Netting : River mile 8.0 – 14.0 of the South Coos River

Currently fish from these sources are combined with fish that swim into Morgan, Noble, and Millicoma volunteer facilities to meet broodstock objectives. The minimum annual collection goal is 1,600 fish (800 pair). The current federal ESA listing status of Oregon coastal Chinook is "not warranted."

6.2) Supporting information.

6.2.1) History.

The initial Coos hatchery Chinook program began in 1900 and was operated up until 1958. During that period, native stocks were mostly utilized early on, but later out of basin stocks were used. Another era in the Coos Chinook hatchery program began with the 1982 brood year and the release of presmolts and unfed fry in the spring of 1983. A hatchery smolt program using Coos basin broodstock began in brood year 1983. Approximately 92,000 smolts were released each year from 1984 to 2005. Morgan Creek and Noble Creek facilities were the only two places where smolts were released. Presmolt Chinook have been released from multiple locations in the basin. Nearly all of these releases have been in or near tidewater. During the 1980's private aquaculture

facilities released both fall and spring fall Chinook from primarily out of basin stocks.

Following the STEP Propagation Project Review in 2005-06, the Coos Fall Chinook program was shifted to strictly presmolt releases, with elimination of the smolt and unfed fry releases.

6.2.2) Annual size.

Annual collection goal is 1,600 adult fish (800 pairs). Both wild/unmarked and hatchery/marked adults are used for broodstock.

6.2.3) Past and proposed level of natural fish in broodstock

The target minimum proportion of wild fish has been 30%, but historically the proportion of unmarked fish has been as high as 80%. (Unmarked fish may be of hatchery origin.) With a higher mark rate (100%) beginning with 2014 spring presmolt releases, there will be a much greater ability to evaluate adult returns and proportion of naturally-produced adults in the broodstock. ODFW has developed guidelines for broodstock collection in years of low predicted fall Chinook spawning escapement, placing more emphasis on hatchery adult fish for broodstock.

6.2.4) Genetic or ecological differences.

There are no known genotypic differences between hatchery stocks and wild stocks. Due to the objectives of the program, certain behavioral/physical differences may exist between hatchery and wild juveniles. Fish size and timing at migration for hatchery juveniles is more uniform than that observed for wild juveniles. Other behaviors, such as surface feeding and aggression may be different between hatchery and wild juveniles.

Since the inception of the broodstock development program for Chinook in the basin, every effort possible has been made to mimic the naturally produced Chinook in the basin, at least genetically. This has been accomplished through incorporation of wild brood fish each generation. Every effort has been made to make the collections and the matings as random as possible. With newly-emerging research on decreasing size and age at return in salmon, efforts are underway to conduct spawning protocols that more closely match the size (length) of male and female broodstock (see Appendix F). Wild and hatchery Chinook are spawned throughout the entire run to maintain genetic diversity of the population. Hatchery Chinook are released at the time when peak outmigration is occurring in the natural population. No known differences have been observed between wild and hatchery populations in the basin.

6.2.5) Reasons for choosing.

There are no special traits or characteristics for which the broodstock is selected, except to represent the local wild population. Development of the broodstock in the mid-1980's was designed to improve compliance with ODFW's Wild Fish Management Policy, and

reduced the potential for genetic impacts to wild fish.

Beginning with a pilot trial in 2015, spawning of hatchery Chinook in the Coos Basin has transitioned from a random selection of broodstock to a more size-based selection of broodstock, based on an investigation by Hankin et al. (2009). The findings by Hankin indicated that (1) a random choice of spawners leads to substantial long-term selection for younger age at maturity, (2) a random choice of spawners, but excluding jacks, also leads to substantial (but less so) long-term selection for younger age at maturity, and (3) a spawner choice of male length ≥ female length is similar to the natural outcome of Chinook salmon mating under natural conditions. As a result of these findings, they recommended, to prevent the unintentional selection for younger age at maturity, hatchery programs for Chinook salmon spawn larger males with smaller females.

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 Oregon Coast fall Chinook is not an ESA-listed unit. It is unlikely that broodstock selection practices for fall Chinook will have adverse genetic or ecological effects on listed Coho populations.

SECTION 7. BROODSTOCK COLLECTION

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

Adults.

7.2) Collection or sampling design. (see also Section 5.1)

Chinook are actively collected for broodstock using traps, seines, and entanglement nets at the following locations:

South Coos River Trap- River mile 10.0 of the mainstem of South Coos River
West Fork Millicoma Trap- River mile 2.2 of the mainstem of West Fork Millicoma
Tioga Creek Trap- River mile 8.1 of the Tioga Creek
East Fork Millicoma Netting- River mile 0.5 –8.0 of the East Fork Millicoma
West Fork Millicoma Netting- River mile 0.5 –13.0 of the West Fork Millicoma
Millicoma Netting- River mile 8.0 – 10.0 of the Millicoma River
South Coos Netting- River mile 8.0 – 14.0 of the South Coos River
Daniels Creek Trap- River mile 1.0 in Daniels Creek tidewater

Netting of Chinook usually begins around 15 October and continues through 15 December. The intent of the broodstock collection program is to collect fish that

represent the run as a whole with respect to run timing and age/size representation.

7.3) Identity.

A single population of wild fall Chinook is present in the Coos River Basin. The WFMP status review (ODFW 1995) placed Coos Chinook into the Mid-South Coast Gene Conservation Group. Under the Coos Fall Chinook Monitoring and Evaluation Plan, a minimum of 30% of hatchery fish released were fin-clipped and/or coded-wire-tagged prior to release, to determine the stray rates and percentage of survival. The coded-wire tags also provide for release lot identification and fishery evaluation. Over the five years of the M&E project, the mark rate increased from the minimum 30% to 70%, and since the 2014 presmolt release, has achieved 100% mark rate.

7.4) Proposed number to be collected:

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

The proposed number of fish to be collected is 1,600 fish (800 pair). The target minimum proportion for wild fish is 30%. In years of low forecast spawning escapement, fewer wild fish may be collected in order to allow for increased escapement.

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

Table 7-1. Coos fall Chinook broodstock collection, 1991 – 2002.

Year	Males	Females	Jacks
1991	573	480	857
1992	591	360	495
1993	546	343	161
1994	674	739	1366
1995	2563	1455	1030
1996	1438	1795	362
1997	455	728	659
1998	1299	755	189
1999	760	1299	828
2000	1158	698	1014
2001	1754	1498	1801
2002	3606	2380	2723
2003	4113	3764	2449

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

Most carcasses, spawned or unspawned, are used for stream enrichment. Small numbers of food quality fish are donated to local food banks or for tribal purposes.

7.6) Fish transportation and holding methods.

Fish are transported in portable tanks (see section 5.2). Usually the fish are held in these tanks three hours or less. Fresh flow aerators provide for adequate oxygen levels. No chemical treatments of any kind are administered during any phases of capture, transfer, or holding. At Coos Basin facilities they are then transferred to divided holding pens (see section 5.3).

7.7) Describe fish health maintenance and sanitation procedures applied.

On spawning days, fish are sorted by hand without the use of anesthetic. Buckets, spawning chutes, knives, and other equipment are disinfected with an iodine solution between fish. Fertilized eggs are disinfected for 15 minutes at 1:500 with a buffered iodine solution.

7.8) Disposition of carcasses.

Most carcasses, spawned or unspawned, are used for stream enrichment, in compliance with the conditions of the MOU with the Oregon DEQ.

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 Coos fall Chinook is not an ESA-listed population. The brood collection for fall Chinook should have no genetic effects on listed Coho in the basin. To avoid any adverse ecological effects, any adult Coho that are captured during fall Chinook brood collection are carefully handled and released.

SECTION 8. MATING

Describe fish mating procedures that will be used, including those applied to meet performance indicators identified previously.

8.1) Selection method.

Fish are chosen from throughout the whole run timing. Matings to produce presmolts may be from crosses that are WxW, HxH, or WxH. If there are excess gametes, the wild fish gametes will be utilized fully with priority. The importance of utilizing all segments of the run is recognized, and hatchery x hatchery gametes may be destroyed accordingly, if surplus to production needs. Destroying of excess eggs does not occur until the eyed stage and is done equally or randomly across all family groups in order to provide all family groups an equal opportunity to contribute to the next generation. In the years of

high adult escapement/return to facilities, only a portion of each hatchery female's eggs may be used, in order to maximize the family numbers and genetic diversity of the population.

8.2) Males.

Adult males are selected that are ready to spawn on the scheduled spawning date. Beginning at Noble Creek STEP Facility in 2015, a size-matched (length) protocol has been established for pairing hatchery males with females in order to address an apparent trend toward younger/shorter returning adult fish. This protocol is based on newly-emerged research into this common trend on the Pacific Coast. Jacks are still used as a portion of broodstock (Hankin, 2009). (See Appendix F.)

8.3) Fertilization.

The spawning protocol is that one female is mated with one male (1:1). This mating strategy is an attempt to minimize inbreeding and maximize genetic variability within the hatchery population. Gametes are collected into plastic bags. Fertilization is carried out in these same plastic bags to ensure that fertilization of multiple females does not occur from a single male. Differential sperm motility is not a consideration by the use of this fertilization technique. Gametes are never pooled.

The plastic bags that are used to hold gametes and to carry out fertilization are used only once and then discarded. This technique provides a good aseptic environment so that gametes can be handled and subsequently fertilized without the threat of horizontal pathogen transmission. When the eggs are placed into a common incubator the water is treated with iodophor that further reduces the potential for the horizontal pathogen transmission. During the actual egg taking operation, the equipment used is also treated with an iodophor solution to prevent the spread of diseases.

8.4) Cryopreserved gametes.

Cryopreserved gametes are not utilized 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.

Not Applicable (see Sections 6.3 and 7.9).

SECTION 9. INCUBATION AND REARING

Specify any management *goals* (e.g. "egg to smolt survival") that the hatchery is currently operating under for the hatchery stock in the appropriate sections below. Provide data on the success of meeting the desired hatchery goals.

9.1) Incubation:

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

Table 9-1. Coos fall Chinook annual egg take and survival rates (%) to eyed stage.

Year	Eggs Taken	Eyed % Survival
1992	1,608,379	89.7
1993	1,622,450	92.4
1994	2,323,402	95.3
1995	2,656,096	91.6
1996	3,961,983	91.8
1997	1,661,438	92.3
1998	2,380,012	91.4
1999	2,532,073	88.6
2000	2,565,903	95.3
2001	4,087,485	90.5
2002	4,235,688	87.8
2003	4,190,720	91.6
2004	4,070,689	93.3
2005	3,310,249	93.7
2006	2,463,267	91.9
2007	2,665,525	94.9

Note: Smolt and unfed fry release programs were eliminated toward a presmolt-only program, which reduced the program size and numbers of egg take.

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

Lower than expected levels in egg mortality may result in surplus eggs. Surplus unfertilized eggs are placed into streams with carcasses, for nutrient enrichment. Surplus fertilized eggs may be frozen and discarded by placing them in the trash or buried.

9.1.3) Loading densities applied during incubation.

At Bandon Hatchery, eggs are loaded into vertical incubators at a density of approximately 10,000 eggs per tray, usually equivalent to the eggs from two females. The standard flow rate is 5 gpm. The 12-year average for eyed egg size is 59 eggs per ounce, with a range of 54 to 62 annually.

At Cole Rivers Hatchery, eyed eggs are loaded into shallow trough basket at 90 ounces of eggs per basket. The standard flow rate is 10 gpm. The average eyed egg size is 59

eggs/oz.

9.1.4) Incubation conditions.

At Bandon hatchery, water temperatures are checked twice daily and recorded, then averaged. Temperature units are tracked daily to monitor egg development. Dissolved oxygen levels are not monitored, as suffocation has not been a problem with eggs in flow-through systems. Tray screens are brushed and bottoms are "rodded out" as needed depending on the number and severity of storms. Eyed eggs are transferred to Cole Rivers Hatchery in styrofoam containers. Ice in the top tray insures a cool, moist shipping environment.

At Cole Rivers Hatchery, water temperatures are checked twice daily and averaged. Temperature units are tracked and recorded daily. Dissolved oxygen levels are not monitored as inflowing waters always carry sufficient dissolved oxygen content. Heated water is used to "catch up" the later groups of egg take, to achieve a common ponding date.

9.1.5) Ponding.

At Cole Rivers Hatchery the fry are forced ponded when they are 99% buttoned up, normally around 1,650 temperature units. Fry size at ponding is between 850 and 1,100 fish/lb. Ponding dates range from March 20th to April 10th.

9.1.6) Fish health maintenance and monitoring.

A summary of fish health monitoring and fish disease history is presented in Appendix A.

Bandon Hatchery
Eggs are treated with formalin every other day at 1:600 for 15 minutes to prevent fungal growth. During the eyeing stage, eggs are not handled. The only disease monitoring that is done is virus samples, which are taken from brood at the time of spawning. These samples include ovarian fluid, gill, kidney, and spleen tissues. Eyed eggs are addled at 575 or more temperature units, then run through a Van Gaalen brand egg picking machine to separate the dead (white) eggs. Additional hand picking may be necessary for blank and/or weak eyed eggs.

Cole Rivers Hatchery
Eyed eggs are received from Bandon, disinfected with an iodophore, and hand--picked for mortality and fungus. Hatch house water comes from the main supply.

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.

This program is not on ESA-listed fish. However, to minimize any adverse effects to

incubating fall Chinook, eggs at Bandon Hatchery are incubated at low density levels that have proven to be safe. Headboxes are equipped with low water level monitoring alarms to reduce risk of interrupted flows. Bandon Hatchery's water supply has a history of being an extremely reliable gravity feed system. All supply lines and valves including main pipeline from intake, hatchery building supply line, headbox feed, and valve were replaced in 1998-99. The Ferry Creek Reservoir was dredged in 1998, which significantly reduced silt levels in incubators, thus increasing safety factors for all eggs. These risk aversion measures apply to all stocks of eggs incubated.

At Cole Rivers Hatchery, eggs are incubated at density levels that have proven safe and effective. All troughs are equipped with low-level water alarms. Due to the water supply being gravity fed, it has been very reliable with minor siltation.

9.2) Rearing:

9.2.1) Survival rate data.

Table 9-2. Eyed egg to presmolt survival rate of Coos River fall Chinook, 1990 – 2007.

Brood Year	Eyed Egg to Presmolt Survival Rate (percent)
1990	98.4*
1991	95.1*
1992	98.4*
1993	95.1*
1994	97.6
1995	97.7
1996	96.9
1997	97.7
1998	97.9
1999	97.9
2000	98.6
2001	92.0
2002	98.3
2003	99.8
2004	97.6
2005	94.4
2006	99.2
2007	98.2

* No fry loss data available for these years

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

The goal for rearing density as it pertains to flow rate is a range of 4 to 7.5 pounds of

fish/gal/min. The goal for rearing space density is less than 1 pound of fish/cubic foot. These goals are met or exceeded.

9.2.3) Fish rearing conditions.

Temperature is monitored and recorded daily. Dissolved oxygen is monitored on an as needed basis. Mortality is collected daily. Ponds are flushed or swept weekly and effluents are monitored. Fish densities are monitored monthly.

Cole Rivers Hatchery receives stock 37 ChF eggs in December and January. Eggs are incubated at 41-54^{o}F. Fish are ponded into circular ponds in March and reared on "warm" water at 41-56^{o} F. Then they are moved to raceways, and reared from April thru mid-September at similar temperatures.

Rearing temperatures for stock 37 ChF at Bandon Hatchery range from 45-56^{o} F, with an average of 51^{o} F.

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.

Table 9-3. Data of feed type, feeding rate, fish growth (fish/lb, and feed conversion.

	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	AVG
F/LB	1750	400	120	70	32	15	10	9	8.5	7.5	6.4	5.9	436.31
FEED	Skretting fed through #3 dry ~90 f/lb						Grow-out diet is BioMoist Grower						NA
%BW/DAY	2.6	2.7	2.6	2.8	2.7	3.1	2.5	2.7	2.3	1.6	1.9	2.2	2.48
CONV.	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.40
LBS/GPM	1.03	1.3	1.57	1.97	2.38	2.86	3.6	4.32	5.15	5.98	6.71	7.67	3.71

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

See Table 9-3 above in Section 9.2.4. Energy reserve data are not available.

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*).

Food type used is:
Skretting Biovita Mash Plus Starter between 2,500 and 2,000 f/lb.
#0 BioVita Starter between 2,000 f/lb and 570 f/lb.
#1 BioVita Starter between 570 f/lb and 300 f/lb.
#2 BioVita Starter between 300 f/lb and 150 f/lb.
#1.2 BioVita Fry between 150 f/lb and 90 f/lb
1.5 BioVita Fry between 90 f/lb and 60 f/lb
2.0 BioClark's Fry Between 60 f/lb and 25

2.5 BioClark's Fry Between 25 f/lb and 11
3.0 BioClark's Fry between 11 f/lb and 6 f/lb
4.0 BioClark's Fry between 6 f/lb and >

Some of the release site acclimation ponds, especially those that are instream, are not designed for the sampling of Chinook during the acclimation period, making it difficult to obtain an accurate sampling of the Chinook to determine growth and conversion rates. The Chinook during the acclimation period are fed only 1% of their body weight to maintain size. No significant change in size should occur at this rate of feeding.

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

See Table 9-3 for monthly growth (fish/lb). Energy reserve data are not available.

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

See Table 9-3.

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

At Cole Rivers Hatchery, fish health and behavior are monitored daily. Dead fish are collected immediately and data on mortality are collected and analyzed daily. Pathology examinations are scheduled at random, as needed, and as prophylactic. Parasitic and bacterial infections are treated as needed under prescription of a department pathologist. Viral samples are monitored by fish health section staff. Disinfection is the primary prevention of lateral transfer of viral infection. For further information, see Appendix A.

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

N/A

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

The fall Chinook which is under propagation is not a listed fish. However, Chinook egg incubation and fry rearing in the hatchery environment is not anticipated to have any adverse genetic or ecological impacts on listed Coho. As a result of the 2005-06 STEP Review, actions were identified for multiple sites to improve fish passage and water quality, and to reduce handling of non-target fish.

SECTION 10. RELEASE

Describe fish release levels, and release practices applied through the hatchery program.

10.1) Proposed fish release levels.

Table 10-1. Proposed release levels of Coos River fall Chinook.

Age Class	Release Date	Size (fpp)	Release Levels	Location
Eggs			0	
Unfed Fry	Feb.-Mar.	1,400	2,000 0 0 0	Classroom incubators—released into streams near elementary schools, at the guidance of ODFW STEP Biologists. Typically, less than 200 eggs/fry per school.
Fry			0	
Fingerling (presmolts)	Late May - Early June	75	645,000 247,500 200,000 600,000 200,000 100,000 100,000 5,000	Morgan Creek (on site) Morgan Creek (acclimated, from Bandon H.) Morgan Creek (acclimated, from Cole Rivers H.) Noble Creek (on site) Blossom Gulch Creek (acclimated) Coquille Tribal project Pony Slough (Formerly West Fork Millicoma) OIMB/Charleston Cr. (acclimation)
Smolts			0	

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

Table 10-2. Coos River fall Chinook release locations.

Release Location	Legal Description	Waterbody Code	Release Point
Morgan Creek	43 20'37" N and 124 25' W	1700211020	River Mile 2.0
Noble Creek	43 15'30" N and 124 18' W	1700203080	River Mile 1.5
Blossom Gulch Creek	43 22' N and 124 17' W	1700203000	River Mile 0.5
Millicoma Interpretive Center	43 29' N and 124 29'15" W	1700221000	River Mile 11.5
Coquille Tribe—Fourth Creek Res.	43 22’ N and 124 18 W		River Mile 1.0
Oregon Institute of Marine Biology	43 20'30" N and 124 19'30" W	1700201000	River Mile 0
Pony Slough (former West Fork Millicoma release)	T25S, R13W, section 15, adjacent to N. Bend H.S.	???	River Mile 0.5

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

Table 10-3. Coos River fall Chinook releases, 1991 – 2008.

Release year	Unfed Fry	Avg size (Fish/lb.)	Fed Fry	Avg size (Fish/lb.)	Presmolt	Avg size (Fish/lb.)	Smolt	Avg size (Fish/lb.)
1991	9,326	950	20,720	280	720,943	89.2	144,343	9.9
1992	0	950	112,541	143	769,331	83	100,518	11.9
1993	286,563	950	447,913	131	703,605	85.7	130,044	11.3
1994	0	950	0	N/A	1,286,654	99.6	111,401	10.2
1995	949,695	950	0	N/A	1,053,678	93.2	103,534	11.5
1996	2,402,621	950	0	N/A	983,845	71.8	94,405	10.1
1997	1,396,790	950	0	N/A	1,074,427	71.3	98,963	9.0
1998	29,115	950	0	N/A	1,041,903	61.7	103,607	10.0
1999	71,639	950	644,776	272	1,004,608	62.6	91,496	9.8
2000	0	N/A	644,800	260	1,205,876	73.4	95,540	10.1
2001	0	N/A	490,147	343	1,766,049	72.2	89,505	10.0
2002	706,178	950	355,555	381	1,595,864	55	132,020	9.6
2003	732,205	950	634,865	385	1,782,114	65.3	94,611	9.9
2004	967,023	950	645,000	400	1,915,750	59.8	98,515	9.3
2005	947,038	950	620,672	373	1,922,775	61.6	54,075	13.0
2006	330,853	950	638,250	345	1,486,376	69	0	N/A
2007	0	N/A	0	N/A	2,180,377	68.9	0	N/A
2008	0	N/A	0	N/A	2,131,704	75	0	N/A

Source: Hatchery management information system (HMIS), ODFW.

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

Release times are intended to coincide with the peak presence of naturally produced fish of the given life stage in the location of release in order to mimic the natural population’s migration timing. The fry release program was eliminated in 2007 and smolt release ended in 2006 (see Table 10-3). Only the presmolt release has continued.

Table 10-4. Coos River fall Chinook release dates, 1991 – 2008.

Release Year	Release Date(s)			
	Unfed Fry	Fed Fry	Presmolt	Smolt
1991	Feb 1991	Apr 1991	Apr-Jun 1991	Sep 1991
1992	N/A	Apr 1992	May 1992	Sep 1992
1993	Mar 1993	May-Jun 1992	May-Jun 1993	Sep-Oct 1993
1994	N/A	N/A	May-Jun 1994	Sep 1994
1995	Feb-Mar 1995	N/A	May-Jun 1995	Sep 1995
1996	Jan-Mar & Dec 1996	N/A	May-Jun 1996	Sep 1996
1997	Jan 1997	N/A	May-Jun 1997	Sep 1997
1998	Feb 1998	N/A	May-July 1998	Sep 1998
1999	Feb 1999	Apr 1999	May-July 1999	Sep 1999
2000	N/A	Apr 2000	May-Jun 2000	Sep 2000
2001	N/A	Apr 2001	May-Jun 2001	Sep 2001
2002	Feb-Apr 2002	Apr 2002	May-Jun 2002	Sep 2002
2003	Jan-Mar 2003	Apr 2003	May-Jun 2003	Sep 2003
2004	Jan-Feb & Dec 2004	Apr 2004	May-Jun 2004	Sep-Oct 2004
2005	Jan-Mar 2005	Apr 2005	May-Jun 2005	Sep 2005
2006	Feb-Mar 2006	Apr 2006	May-Jun 2006	N/A
2007	N/A	N/A	May-Jun 2007	N/A
2008	N/A	N/A	May-Jun 2008	N/A

Source: HMIS, ODFW.

These fish are released as they approach target size and complete two-week acclimations (for those not reared on-site). This release will be from mid-May to early June.

10.5) Fish transportation procedures, if applicable.

Fish are transported from Cole Rivers Hatchery in fish trucks ranging in size from 1,000 to 2,500 gallons capacity. Loading density approximates one pound of fish per cubic foot. Trucks have bottled oxygen systems, fresh flow aerators, and backup recirculation systems. Fish stay on board for a period of about four hours. Some trucks have refrigeration capabilities, but refrigeration is normally not necessary, as variation in water temperature between tank and release location is minimal. Tempering is typically not required, unless transporting and receiving water differ in temperature by several degrees.

10.6) Acclimation procedures.

The Chinook presmolts are transferred to the acclimation sites and contained with screens for a period of about two weeks. During the acclimation period, the smolts are fed 1% of their body weight per day. At the end of the acclimation period the screens are removed and the Chinook are allowed to leave the ponds on their own volition.

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

As described earlier, under the M&E Plan for Coos fall Chinook hatchery program, there has been a greatly expanded marking program since 2007 (see attached—Appendix E—

Section 13 of this HGMP). The target mark rate is now 100%.
In addition to adipose fin mass marking the following release group shall have CWT:

a) Morgan Creek STEP (200,000 releases into Morgan Creek in June): 30,000 will have CWT.
b) Noble Creek STEP (600,000 releases into Noble Creek in May): 30,000 will have CWT.
c) Morgan Creek STEP (645,000 releases into Morgan Creek in May): 30,000 will be CWT.
d) Morgan Creek STEP from Bandon Hatchery (247,500 releases into Morgan Creek in May): 30,000 will have CWT.
e) Millicoma STEP (100,000 releases into Coos estuary in May): 30,000 will have CWT.

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

Every effort to avoid producing surplus fish is made prior to transportation and liberation. Eyed eggs are carefully inventoried to insure adequate but not excessive numbers of fish will be reared. If rearing mortalities are less than expected, overages can occur. If the projected overage is minimal, the excess fish have been included into releases. Other options include releasing excess Chinook into standing water bodies for "trout" fisheries, killing humanely and burying, or using for wildlife projects. Surplus fish have been donated to Oregon Coast Aquarium or wildlife rehabilitation centers to feed other animals.

10.9) Fish health certification procedures applied pre-release.

Fish are examined and certified by an ODFW Fish Pathologist prior to transportation and liberation. Only certified fish are released into State waters. See Appendix A for further information of fish health monitoring at Bandon and Cole Rivers hatcheries.

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

During rearing, emergency release procedures at Cole Rivers Hatchery would start with contact of the District Fish Biologists in the Upper Rogue and Coos Basins. Options for water system failure include: (1) truck and release in the Coos Basin, (2) truck and release in an approved standing water body, or (3) truck to another hatchery facility. Coos River fall Chinook would not be released into the Rogue River Basin.

Flooding of the Coos Basin acclimation facilities could cause the early release of part, if not all of the presmolts. At worst, this might minimally reduce survival or homing and could change the percentage of fish marked in a given year.

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.

Due to competitive exclusion by smolt Coho on Chinook, and due to temporal differences between the species in freshwater and estuarine habitat utilization, Chinook releases are likely to have minimal adverse effects on Coho. There is a strong tendency of juvenile Chinook to migrate downstream toward the estuary. All hatchery presmolt Chinook will be released in tributaries to the estuary in the late spring when Coho rearing in the estuary is minimal. This strategy will minimize the likelihood for interaction with and adverse ecological effects to Coho juveniles, which rear in upriver and freshwater areas and migrate to the sea as smolts in May.

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.

- Staff will record the date, location, total number of Coho encounters, and the number of Coho visibly harmed or otherwise impaired upon release.
- ODFW Fish Health Services will sample the hatchery Cohorts prior to releases.
- Staff will conduct quality control monitoring during fin clipping.
- District staff will coordinate with research staff in order to stay abreast of current research documenting patterns of Coho and Chinook rearing in estuaries.
- District staff will document number and location of carcasses placed for nutrient enhancement and an annual statewide report will document compliance with DEQ requirements. ODFW Research will report any project effectiveness results.
- At ODFW hatcheries, staff will conduct mandatory discharge sampling, and ensure water withdrawals are within permit requirements.

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

As with all state programs, budgets are approved by the Legislature for a two-year period. No commitment of funds can be made past the approved budget period. Funds for various projects associated with this HGMP come from a variety of sources including license dollars, state general funds, Federal Sport Fish Restoration funds, and volunteer

effort. ODFW Restoration and Enhancement (R&E) Program funded the majority of the Coos M&E Plan actions from 2009 through 2013.

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.

ODFW staff has not identified any potential genetic or ecological risks to listed Coho salmon from our current or proposed monitoring program. ESA 4(d) authorizations are applied for each year, in order to conduct monitoring activities associated with the Coos fall Chinook monitoring.

SECTION 12. RESEARCH

No formal research is being proposed for any activities described in this HGMP.

12.1) Objective or purpose. N/A

12.2) Cooperating and funding agencies. N/A

12.3) Principal investigator or project supervisor and staff. N/A

12.4) Status of stock, particularly the group affected by project, if different than the stock(s) described in Section 2. N/A

12.5) Techniques: include capture methods, drugs, samples collected, tags applied. N/A

12.6) Dates or time period in which research activity occurs. N/A

12.7) Care and maintenance of live fish or eggs, holding duration, transport methods. N/A

12.8) Expected type and effects of take and potential for injury or mortality. N/A

12.9) Level of take of listed fish: number or range of fish handled, injured, or killed by sex, age, or size, if not already indicated in Section 2 and the attached "take table" (Table 1). See Take Table 1 below.

12.10) Alternative methods to achieve project objectives. N/A

12.11) List species similar or related to the threatened species; provide number and causes of mortality related to this research project. N/A

12.12) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse ecological effects, injury, or mortality to listed fish as a result of the proposed research activities. N/A

SECTION 13. ATTACHMENTS AND CITATIONS

APPENDIX A.--FISH HEALTH MONITORING

The fish health monitoring plan is implemented as per ODFW's Fish Health Management Policy and 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 ODFW's fish health specialists.
- 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. With wild adult steelhead stocks, generally all fish are sampled for viruses at spawning.
- Annually screen each salmon brood stock for the presence of *R. salmoninarum* (R.s.), agent of bacterial kidney disease. Beginning in 2001, 100% of the Coos and Coquille Coho female adults were sampled for Rs antigen and culling or segregation of the progeny will be implemented. Methodology and effort will be at the discretion of the fish health specialist. The hatchery programs for the production of Coho smolts has been discontinued in both the Coos and Coquille Watersheds.
- 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 History and Treatment

Treatments for disease at Bandon Hatchery include treatment of juvenile fish for external parasites using either hydrogen peroxide (75-100 ppm for 1 hour exposure) or formalin 1:6,000 to 1:40,000 depending on species treated and water temperature. *Ichthyophthirius* may be treated with a prolonged formalin drip (1:25,000 for 8 hours). On rare occasions it is necessary to treat a group of fish for bacterial pathogens, in which case medicated food containing oxytetracycline is used. A five-year disease history of Bandon Hatchery is summarized in Table 13-1.

Table 13-1. Five-year disease history by fish stock at Bandon Hatchery, 1996-2000.

Disease/Organism	**Stock/Species**						
	72 Rb	**44 Co**	**44 ChF**	**44 StW**	**144 StW**	**37 ChF**	**88 StW**
IHNV	no	no	no	no	no	no	no
CAD	no	no	no	no	no	no	no
Fl. psychrophilum	no	no	no	yes	yes	yes	yes
Fl. columnare	no	no	no	no	no	no	no
Aeromonas salmonicida	no	No	no	no	no	no	no
Aeromonas/Pseudomonas	yes	yes	yes	yes	yes	yes	yes
Yersinia ruckeri	no	No	no	no	no	yes	no
R. salmoninarum	no	yes	yes	yes	yes	yes	no
Internal mycosis	no	No	no	no	no	yes	no
External mycosis	yes	yes	yes	yes	yes	yes	yes
Ichthyobodo	no	No	no	yes	yes	yes	yes
Gyrodactylus	yes	No	no	yes	yes	no	yes
Ichthyophthirius	no	No	no	yes	yes	no	no
Gill Amoeba	no	No	no	no	no	no	no
Trichodinids	yes	No	no	yes	yes	no	no

Treatments for disease at Cole Rivers Hatchery include treating juvenile fish for fungus and external parasites using either hydrogen peroxide (50 ppm for 1 hour exposure) or formalin (1:4,000 to 1:7,000 depending on species treated and water temperature.) *Ichthyophthirius* may be treated with a prolonged formalin drip (1:25,000 for 8 hours.) On rare occasions it is necessary to treat a group of fish for bacterial pathogens, in which case medicated food containing oxytetracycline is used.

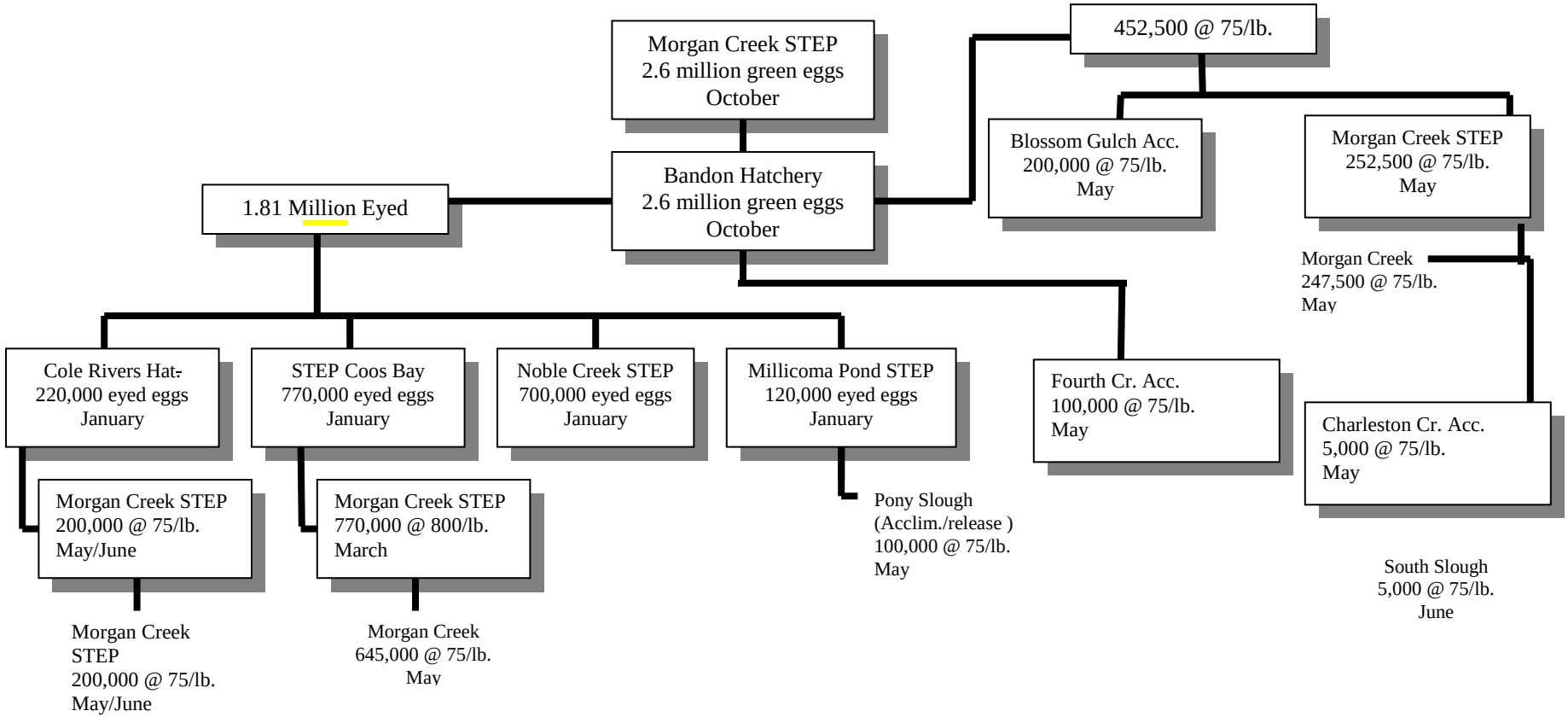
Routine feedings of Aquamycin (erythromycin) are given to control bacterial kidney disease in the Coho salmon stocks raised at Cole Rivers Hatchery. In the event of bacterial gill disease potassium permanganate is used a t a rate of 1 ppm, 1.25 ppm or 1.5 ppm administered either as a bath or a flow through treatment. A five-year disease history of Cole Rivers Hatchery is summarized in Table 13-2.

Table 13-2. Five-year disease history by fish stock at Cole Rivers Hatchery, 1996-2000.

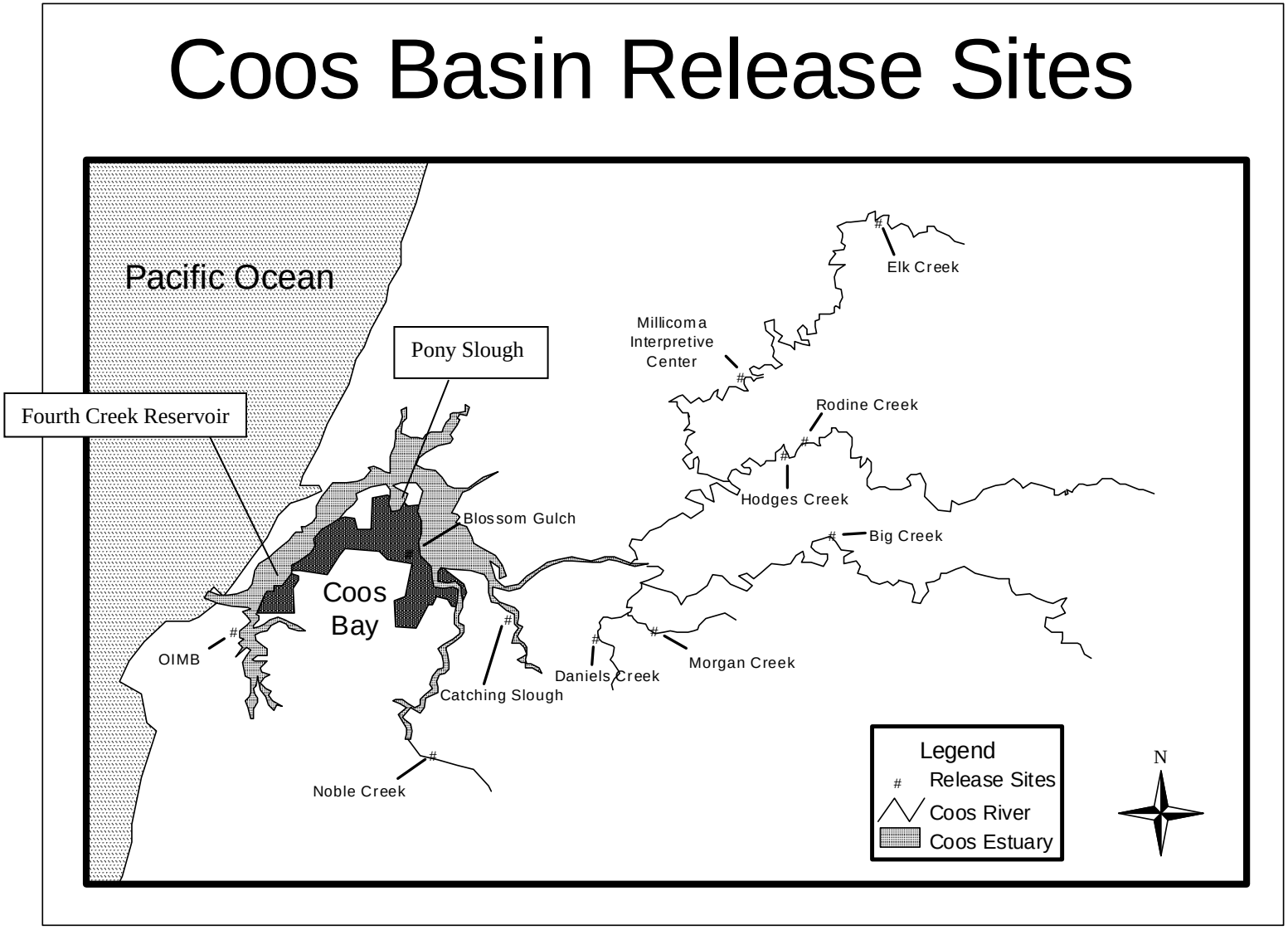
Disease/Organism	**Stock/Species**					
	53 Rb	**37 ChF**	**18 Co**	**72 Rb**	**44 Co**	**55 Co**
IHNV	No	no	no	no	no	no
EIBS	No	no	no	no	no	no
CAD	No	no	yes	no	yes	yes
Fl. psychrophilum	Yes	no	yes	yes	yes	yes
Fl. columnare	No	no	no	no	no	no
Aeromonas salmonicida	No	no	no	no	no	no
Aeromonas/Pseudomonas	Yes	yes	yes	yes	yes	yes
Yersinia ruckeri	No	no	no	no	no	no
R. salmoninarum	No	no	yes	no	yes	no
Internal mycosis	No	no	no	no	no	no
External mycosis	No	no	no	no	no	no
Ichthyobodo	No	yes	yes	yes	yes	yes
Gyrodactylus	Yes	no	no	yes	no	no
Ichthyophthirius	No	yes	no	no	no	no
Gill Amoeba	No	no	no	no	no	no
Trichodinids	No	yes	yes	yes	yes	no

In May of 2006, the rearing presmolts (’05 brood year) were destroyed at Cole Rivers Hatchery due to exposure to IHN virus. This incident did not affect the entire water supply and was isolated to certain ponds/raceways on the hatchery facility. No further incidence of IHN in stock 37 (Coos) Chinook has been observed.

Appendix. B—Fall Chinook - Stock 37 (Coos River)



APPENDIX C.—Map of Release Sites in the Coos Basin. Chinook are released at Blossom Gulch, Noble Creek, Morgan Creek, Pony Slough, Fourth Creek, and OIMB. Other sites are winter steelhead or discontinued release sites.



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Appendix E. Coos Monitoring and Evaluation Plan

Review of Coos River Fall Chinook STEP Fish Propagation Projects Project Monitoring and Evaluation Plan (3/06)

Background

The Department is conducting a scheduled review of six Salmon and Trout Enhancement Program (STEP) fish propagation projects in the Eel/Tenmile, Coos, and Coquille Basins. The periodic review is required by the STEP OAR's to determine whether the projects will be approved for renewal and if any changes are needed.

Four of the six projects rear juvenile salmon for the Department's Coos River fall Chinook hatchery program: Morgan Creek, Daniels Creek, Noble Creek, and the Millicoma Interpretive Center. The four collectively comprise the largest STEP fish rearing effort in the state and the largest fall Chinook hatchery program on the Oregon Coast.

Many issues have been discussed during this review and the Department has received comment from a variety of staff, the STEP Advisory Committee (STAC), and the public. To ensure each project complies with Native Fish Conservation Policy, Fish Hatchery Management Policy, and the statute and rule that govern STEP, five main questions asked were:

- Do the projects achieve the objective of providing a fishery?
- Are the projects consistent with the conservation of naturally produced native fish?
- Are the projects conducted in a manner that minimizes adverse ecological impacts to area watersheds?
- Is the current monitoring adequate and, if not, what changes or additional efforts are needed?
- In addition to fish production, what other objectives of STEP are met?

As part of the review, staff was convened to develop a monitoring and evaluation program for the combined Coos River fall Chinook hatchery projects. Implementation of the program will be a requirement of the STEP project approvals. The group was comprised of staff from Bandon Hatchery, the Umpqua Watershed District, and the Fish Division Fish Propagation, Recreational Fisheries, and Conservation and Recovery Programs.

Each of the four STEP projects is well integrated into the broader Coos fall Chinook hatchery program. Fish are transferred between the STEP and other ODFW facilities, and more than one stage of the fish production operation is often conducted at each site including broodstock collection, egg incubation, juvenile rearing, and acclimation. Although the current and more extensive project review process is required only of the STEP fish rearing operations, staff recognized that an effective monitoring and evaluation program must consider all releases of hatchery fall Chinook in the basin including the acclimated fish and unfed fry.

Recommendations

Staff recommendations focus on two areas: changes to the current STEP fish propagation operations and implementation of a monitoring program.

A. Propagation Operations

The recommended changes to the current STEP fish propagation operations will ensure:

- Each project rears and/or acclimates fish to a size that will optimize juvenile-to-adult survival and contribution to the fishery;
- Each project rears and/or acclimates the number of fish appropriate for the facility and site requirements;
- Each project is conducted in a manner that minimizes adverse ecological impacts to naturally produced native fish and area watersheds;
- Each project and the broader Coos River fall Chinook program can be adequately monitored and evaluated;
- Each project has opportunities for volunteer participation.

A sufficient number of the hatchery fish released by the STEP projects must be marked to ensure adequate evaluation of the projects and program. Recognizing that the mark rates may in the future need to be further increased, the proposed changes will:

- Establish one size-at-release group of pre-smolts at 75 fish/lb;
- Establish adipose-fin-clip/coded wire tag (Ad/CWT) groups representative of the three major program release areas:
    - √ Combined Morgan Creek and Daniels Creek;
    - √ West Fork Millicoma
    - √ Noble Creek and Isthmus Slough
- Ensure a percentage of pre-smolts reared at all project sites will be marked with a ventral fin clip. The ventral fin clip will be differentially applied between the two major release groups:
    - √ Combined Morgan Creek, Daniels Creek, Millicoma Interpretive Center;
    - √ Noble Creek.

Some of the following changes can be implemented this year but most will be implemented in the 2006 brood year. For example, several require fish to be marked or tagged at a STEP facility where marking/tagging does not currently occur. These and other logistics including the additional demand on staff and costs associated with a larger number of coded wire tags will need to be worked out prior to the rearing/acclimation periods for the 2006 brood.

Basin-wideReleases

Unfed Fry Releases

1. Eliminate releases of fall Chinook unfed fry in the Coos River Basin. The unfed fry releases cannot be adequately marked and evaluated, and will compromise attempts to assess the success and potential impacts of other STEP hatchery releases. An equivalent number of adults will be produced through an increase to the number of acclimated pre-smolts.
2. Volunteer opportunities for hatchbox fry rearing projects in the Coos fall Chinook program will continue by having these projects assume a portion of the needed fry production then transfer the fish to the pre-smolt rearing facilities.

Morgan Creek Releases

Pre-smolt Rearing

1. Continue to rear 645,000 pre-smolts (75 fish/lb) at Morgan Creek for release in May.
   (a) Mark with a left ventral fin clip (LV) 200,000 fish (31%). None of these fish are currently marked. The marking will be done by adult and/or youth volunteers.
   (b) Ad/CWT mark 30,000 of the remaining fish. The tagging will be done on-site.

Pre-smolt Acclimation

1. Continue to acclimate 247,500 pre-smolts (75 fish/lb) at Morgan Creek for a period of two to three weeks for release in May or June. These fish are reared at Bandon Hatchery then transferred to Morgan Creek.
   (a) No longer Ad/CWT mark 30,000 fish from this group. The Ad/CWT group representing acclimated pre-smolts released from Morgan Creek will be the fish transferred from Cole Rivers Hatchery (see below).
   (b) Pond capacity at Morgan Creek may require the fish to be acclimated after the reared pre-smolts are released.

2. Acclimate an additional 200,000 pre-smolts (75 fish/lb) at Morgan Creek for a period of two to three weeks for release in May or June. The fish are currently reared at Cole Rivers Hatchery, given an Ad/CWT mark, then transferred to Morgan Creek as smolts for release in August and September. The fish will continue to be reared at Cole Rivers Hatchery but only to the pre-smolt stage.
   (a) Ad/CWT mark 30,000 fish at Cole Rivers Hatchery.
   (b) Pond capacity at Morgan Creek may require the fish to be acclimated after the reared pre-smolts are released.

Smolt Acclimation

1. Eliminate the acclimation and release of 92,000 smolts at Morgan Creek. The fish will continue to be reared at Cole Rivers Hatchery but will be transferred to Morgan Creek as pre-smolts (75 fish/lb) and acclimated for two to three weeks before release in May or June (see above). An equivalent number of adults will be produced through an increase to the number of acclimated pre-smolts released. Adult survival rates for this group of acclimated smolts have been relatively poor or variable. Additionally, low stream flows during the late summer acclimation period present a challenge to maintaining fish health and water quality.

New Morgan Creek STEP Hatchery Facility

The Morgan Creek project sponsors are proposing to construct a new facility on property immediately upstream of the existing hatchery site. Although plans for the proposed new facility and its operation have not yet been presented to the Department for review and approval, any new construction should allow all project fish to be reared or acclimated, and released from the facility itself, and allow for potentially higher marking rates on the release groups. Facility construction should also improve the handling of returning adults and broodstock collection, and provide improved passage for native fish.

Millicoma Interpretive Center Releases

Pre-smolt Rearing

1. Continue to rear up to 100,000 pre-smolts (75 fish/lb) at Millicoma Interpretive Center for release in May.
    (a) Mark with a left ventral fin clip (LV) 70,000 fish (70%). 100% of the fish in this release group are currently marked. The marking is done by youth volunteers.
    (b) Ad/CWT mark the remaining 30,000 fish at Millicoma Interpretive Center.

Daniels Creek Releases

Pre-smolt Rearing

1. Rear 200,000 pre-smolts (75 fish/lb) at Daniels Creek for release in May. For the last three years, this facility has reared 645,000 pre-smolts to 400 fish/lb. Due to the facility constraints, rearing all fish in this group to the larger size-at-release will require a reduction in the total number of fish released.
    (a) Mark with a left ventral fin clip (LV) 50,000 fish (25%). None of these fish are currently marked. The marking will be done by adult and/or youth volunteers.

Noble Creek Releases

Pre-smolt Rearing

1. Rear 600,000 pre-smolts (75 fish/lb) at Noble Creek for release in May. Currently this facility rears 570,000 pre-smolts to 100 fish/lb and receives 30,000 Ad/CWT pre-smolts for acclimation from Bandon Hatchery.
    (a) Mark with a right ventral fin clip (RV) 200,000 fish (33%). None of these fish are currently marked. The marking will be done by adult and/or youth volunteers.
    (b) Ad/CWT mark 30,000 of the remaining fish at Noble Creek and eliminate the transfer of the Ad/CWT marked fish from Bandon Hatchery. Marking fish reared at Noble Creek rather than Bandon Hatchery will better represent the Noble Creek release group.

Other Project Releases

Pre-smolt Acclimation

1. Continue to acclimate pre-smolts (75 fish/lb) at Blossom Gulch (200,000), Isthmus Slough (17,500), Catching Slough (30,000), and Charleston Creek (5,000). The fish are reared at Bandon Hatchery then transferred to these facilities where they are acclimated for two to three weeks before release in May.
    (a) Mark with a right ventral fin clip (RV) 65,000 (25%) of the total number released from the combined projects. Because these sites are located in the mid and lower estuary, the fish will receive the same ventral fin mark as those released from Noble Creek. None of the project releases are currently marked.

B. Monitoring Program

The monitoring program will focus primarily on two areas:

- Evaluation of the STEP project and overall Coos River fall Chinook program fish contribution to the ocean and Coos Basin fall Chinook fisheries;
- Evaluation of hatchery stray rates into areas of natural production and the potential impacts on wild fish.

The information gathered during current in-basin sampling and inventory efforts is inadequate to effectively evaluate the individual projects or the broader program, and the staff resources available to take on substantial new efforts are limited. Expanded monitoring will therefore require grant or other funding and STEP volunteer involvement.

Changes to the propagation operations implemented in brood year 2006 will not be measured as adult returns in the basin-wide monitoring program until 2009. However, given the potential for volunteer involvement with monitoring, it is recommended those activities appropriate for volunteer assistance begin before 2009 to allow survey and sampling protocols to become well established and to accommodate the needed training.

Efforts to evaluate the effect(s) of the juvenile hatchery fish on wild fish rearing in the Coos Bay estuary will involve a long-term and more complex investigation beyond the scope and resources of the current review. However, the current annual sampling of juvenile fish in the estuary will continue and be expanded if the resources needed become available.

Contribution of STEP Project Fish to Fisheries

1. Current sampling of ocean fisheries is adequate to sample the proposed Ad/CWT project groups;
2. Recommend a creel of the in-basin fishery similar to that conducted in 1998 and 1999 be conducted in 2009 and 2010, the first years of adult returns from the modified juvenile release program. The creel will be developed by the ODFW Biometrician and will require three or more seasonal staff positions to achieve the desired angler encounter rate of at least

20%. The encounter rate for the earlier surveys ranged from 10-18%. Funding will be through grants such as the ODFW Fish Restoration and Enhancement (R&E) Program. The creel will be designed to estimate:

a) Total number of fish caught in the bay and estuary fishery;
b) Catch by major area of the bay and estuary;
c) Percent composition in catch of hatchery and wild fish;
d) Percent composition in catch of each facility release;
e) Percent composition in catch of each release group.

Stray Rate Evaluation

Hatchery stray rates will be evaluated to ensure compliance with NFCP interim criteria.

1. Surveys will focus primarily on inventories of live fish observed and carcasses recovered to determine:
    a) Spatial and temporal distribution of hatchery and wild fish;
    b) The ratio of hatchery fish to wild fish in natural spawning areas;
    c) Trend in abundance indicator (standard peak survey counts) of the Coos Basin naturally spawning Chinook population.
2. Fall Chinook spawning surveys currently conducted in the Coos River Basin enumerate Ad/CWT fish. Beginning in 2006, surveys will also enumerate fish with ventral fin clips. Approximately 8% of the Coos River fall Chinook hatchery pre-smolts currently released are marked with a ventral fin clip or an Ad/CWT, and 27% of the smolts with an Ad/CWT. To look for the ventral fin marks during surveys will require some additional effort on the part of projects such as ODFW's Oregon Adult Salmonid Inventory and Sampling Project.

3. Fall Chinook observed during Standard and Random spawning surveys for Coho salmon will continue to be enumerated, and carcasses checked for ventral and adipose fin clips.

4. More intensive spawning and carcass surveys will be conducted in 2009 and 2010, the first years of adult returns from the modified release and marking program. These will include established index sites to compare years and determine relative abundance.

5. The Dellwood trap located at the head of tidewater on the South Fork Coos River will be operated in 2009 and 2010 to allow for a statistically valid estimate of the proportion of hatchery fish in the total adult returns to the South Fork Coos. A mark-recapture effort for fish collected at Dellwood combined with data gathered from spawning surveys in the South Fork Coos Basin will be used to validate hatchery-to-wild ratios estimated from spawning surveys in other Coos River tributaries. Seasonal staff hired to conduct the more intensive fall Chinook spawning surveys will also operate the Dellwood trap.

6. Adults returning to each STEP facility must be accurately enumerated by mark/no mark, type of mark, etc. It must be clearly documented for each facility who is responsible for collecting, reviewing, and editing this information, transferring the information to ODFW for

data management and analysis, and ensuring adequate communication in the event that changes are needed in-season or prior to the next scheduled STEP project renewal review.

7. All adult transfers between collection and spawning facilities must be accurately recorded and tracked to ensure documentation of numbers of fish collected at each facility, and those collected off-site and brought into each facility. The information will in-turn be submitted weekly for inclusion into the Department's statewide Hatchery Management Information System (HMIS).

Monitoring of Operations at Facilities, Water Quality

Because STEP fish propagation projects are comparatively small and community-based, they can be located in areas where a larger fish production facility could not operate. However, although smaller, they are a focus of public attention so it is particularly important for these projects to strictly follow all accepted best management practices (BMP's) for fish culture activities such as feeding and the cleaning of rearing ponds. In most cases, adherence to these BMP's should prevent the need for intensive water quality monitoring and any water quality issues. Staff will work with the sponsors of the Coos fall chinook STEP projects to develop an operational plan for each facility based on these BMP's. Project volunteers will implement the protocols outlined in that plan and the tracking records will be managed by ODFW.

Public comment received during the recent project reviews included some concern for the potential impacts of fish propagation operations to downstream water quality. In addition to implementation of the BMP's, water quality will therefore be monitored at each project site. The monitoring will be conducted at a level appropriate for the operation and will include measurements of water quality entering and leaving the facility before fish are held, weekly during the rearing or acclimation period, and after fish are released. The sampling will include measurements of:

- Water temperature
- Dissolved oxygen
- Settleable solids
- pH

The monitoring will assure the community of the safe and proper operation of each facility.

Summary

These changes will achieve several objectives.

Program releases will be simplified to a single size-at-release group (pre-smolt at 75 fish/lb). Marking will be expanded to include a larger number of Ad/CWT fish and a larger number of fish with a ventral fin clip (LV or RV) resulting in more than 30% of the total number released being marked. Additionally, the mark strategy will better represent the various facilities and geographic release groups.

The monitoring and evaluation program will be expanded and provide information adequate to evaluate the benefits and risks of the STEP projects. Data gathered in 2009 and 2010 when the monitoring program is fully implemented will allow for a comprehensive program assessment when these projects will again be due for review and renewal in 2011.

Recommendations for increased marking and monitoring will, however, require resources beyond those of the current program (e.g. additional coded wire tags, staff and volunteer labor for marking, development of additional spawning surveys and creel census). ODFW will be asking the project sponsors and other STEP volunteers to assist in various ways with this intensified monitoring and evaluation of the fall Chinook program.

In regards to the public concern for maintaining a strong fishery, the proposed changes are projected to have little impact on the program contribution to the Coos fall Chinook sport fishery. To develop these recommendations, staff looked at estimates of adult returns for the preceding ten-year period when survival has varied to include both good and comparatively poor years. The estimated returns resulting from the proposed program vary from those of the current program from less than 1% to 5%. The proposed reduction to the total number of hatchery fish released will be offset by rearing more project fish to a larger release size and eliminating the relatively poor or variable survival associated with the current smolt and unfed fry releases.

These recommendations will allow the Department to manage the production of juvenile hatchery fall Chinook salmon in the Coos River Basin at a level to provide a productive fishery and have minimal impact on populations of wild fish. In short, the changes to the STEP projects will ensure they can be monitored for ongoing management to provide the greatest benefit.

Appendix F. Size-Based Broodstock Selection Protocol for the Coos River Fall Chinook Salmon Program

Beginning with a pilot trial in 2015, spawning of hatchery Chinook in the Coos Basin has transitioned from a random selection of broodstock to a more size-based selection of broodstock, based on an investigation by Hankin et al. (2009). The findings by Hankin indicated that (1) a random choice of spawners leads to substantial long-term selection for younger age at maturity, (2) a random choice of spawners, but excluding jacks, also leads to substantial (but less so) long-term selection for younger age at maturity, and (3) a spawner choice of male length ≥ female length is similar to the natural outcome of Chinook salmon mating under natural conditions. As a result of these findings, they recommended, to prevent the unintentional selection for younger age at maturity, hatchery programs for Chinook salmon spawn larger males with smaller females. However, since the publication of the investigation, Hankin has acknowledged that some jacks successfully spawn with females and has proposed the following modification to the recommended guidelines:

*The percentage of jacks in the male broodstock should not exceed X%, where X = 0.20 * the average percentage of wild jacks among the returning wild male spawners.*

Under the preceding scenario, jacks should account for no more than 2% of the males spawned annually within the ChF broodstock for the Coos Basin hatchery ChF program.
(0.085/0.836*0.2) where:
0.085 = proportion of unmarked male carcasses that were jacks within the population area (2009-2014)
0.836 = adjustment for differential observation of jack v adult male carcasses (Solazzi, 1984)
0.200 = Hankin recommendation for jacks within Chinook salmon broodstocks

Age 2+3 fish accounted for 8.3% of the unmarked female ChF recovered during spawning ground surveys completed in 2009-2014 (Table 1). Fork lengths of age 3 unmarked females averaged 777 mm and 88% of these fish were longer than 750 mm and 98% were longer than 700 mm. Table 2 shows the percentage of wild and hatchery adult ChF greater than 700mm and 750mm fork lengths. Wild ChF are unmarked fish collected on spawning surveys from 2009-2014. Hatchery ChF are fish collected at STEP hatcheries from 2012-2014. Thus, setting a minimum size of 700 mm for females seems to be a practical broodstock collection goal for female ChF and partially compensates for age-selective ocean fishing mortality because larger males are to be spawned with smaller females.

Table 1. Unmarked ChF recovered during spawning surveys.

	Male	Female	p female
Age 2	73	1	0.014
Age 3	254	78	0.235
Age 4	368	549	0.599
Age 5	147	295	0.667
Age 6	8	23	0.742

Table 2. Percentage of Wild and Hatchery adult ChF over fork length of 700mm and 750 mm.

	Wild	Hatchery
Females > 700 mm	98.8	93-96
Females > 750 mm	88.4	76-89
Males > 700 mm	87.1	53-73
Males > 750 mm	76.6	32-41

Broodstock Age Composition Goals - Coos
(in order of priority)

1. Collect up to 30% wild ChF which should be larger than 700 mm,
2. Collect males that are larger than females, except
3. No more than 2% of the collected males should be jacks.

References

Hankin, D.G., J. Fitzgibbons, and Y. Chen. 2009. Unnatural random mating policies select for younger age at maturity in hatchery Chinook salmon (*Oncorhynchus tshawytscha*) populations. Canadian Journal of Fisheries and Aquatic Sciences 66:1505–1521.

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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: Timothy Walters, Umpqua Watershed District Manager, West Region, ODFW

Signature: _____ Date: _____

Certified by: Scott Patterson, Fish Propagation Program Manager, ODFW, Salem

Signature: _____ Date: _____

Take Table: Estimated listed salmonid take levels by hatchery activity.

Listed species affected: Coho Salmon ESU/Population: Oregon Coast ESU Activity: Coos Fall Chinook Production				
Location of hatchery activity: *Coos River Basin* Dates of activity: *Ongoing* Hatchery program operator: *Michael Gray* (District Biologist)				
Type of Take	**Annual Take of Listed Fish By Life Stage (*Number of Fish*)**			
	Egg/Fry	Juvenile/Smolt	Adult	Carcass
Observe or harass a)				
Collect for transport b)				
Capture, handle, and release c)			*100*	
Capture, handle, tag/mark/tissue sample, and release d)				
Removal (e.g. broodstock) e)				
Intentional lethal take f)				
Unintentional lethal take g)			*5*	
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.