

II. Eagle Creek National Fish Hatchery

A. Description of hatchery.

- Eagle Creek NFH is at Rkm 16 on Eagle Creek, (46°16'34" N Lat. and 122°12'04" W Long.) which flows into Rkm 27 on the Clackamas River, which flows into Rkm 40 of the Willamette River, which flows into Rkm 163 of the Columbia River, HUC code 17090011 ([stHGMP, P. 9](#))
- The hatchery is located on Eagle Creek, 12.4 miles upstream from it's confluence with the Clackamas River, in Clackamas County, Oregon. ([ECNFHupdate, P. 1](#))
- The facility began producing tule fall and spring Chinook salmon in 1956. ([ECNFHupdate, P. 1](#))
- The hatchery abandoned fall Chinook production very quickly, but continued to raise spring Chinook salmon until 1987, when production was discontinued due to funding and other production priorities. ([ECNFHupdate, P. 1](#))
- Eagle Creek NFH currently produces coho salmon and winter steelhead exclusively. ([ECNFHupdate, P. 1](#))
- No ESA fish are reared at hatchery. ([stHGMP, P. 43](#))
- Today the U.S. Fish and Wildlife Service operates Eagle Creek National Fish Hatchery to restore and maintain coho salmon and winter steelhead to provide sport and commercial fisheries and provide a source of coho salmon for Tribal restoration programs upstream of Bonneville Dam. ([ECNFHupdate, P. 1](#))
- Eagle Creek National Fish Hatchery is authorized by laws and agreements to mitigate for salmon and steelhead losses at Federal dams and other Federal activities (Mitchell Act). ([stHGMP, P. 9](#))
- Funding for the hatchery is through Mitchell Act funds, which are administered by NOAA Fisheries. ([ECNFHupdate, P. 1](#))
- Eagle Creek National Fish Hatchery is authorized by laws and agreements to mitigate for salmon and steelhead losses at Federal dams and other Federal activities (Mitchell Act). ([stHGMP, P. 9](#))
- Type of program –
 - Steelhead--Isolated Harvest (Lower Columbia River) ([stHGMP, P. 3](#))
 - Coho— ([cohoHGMP, P. 3](#))
 - Isolated Harvest (Lower Columbia River)
 - Integrated Recovery (tribal restoration programs)
- Purpose (Goal) of program –
 - Produce winter steelhead trout to help *mitigate* for fish losses in the Columbia River Basin caused by federal dams and provide opportunities for sport fisheries. ([stHGMP, P. 3](#))
 - Produce coho salmon to help *mitigate* for fish losses in the Columbia River Basin caused by federal dams, to provide fish for commercial, sport, and tribal harvest, and to provide fish to support tribal *restoration* programs upstream of Bonneville Dam. ([cohoHGMP, P. 3](#))
- Legal Justification for the program: ([stHGMP, P. 3](#); [cohoHGMP, P. 3](#))
 - Treaty of 1855
 - Mitchell Act

- Fish and Wildlife Act
- Pacific Northwest Electric Power Planning and Conservation Act
- U.S. v Oregon court agreements
- Eagle Creek NFH currently operates as part of the Columbia River Fisheries Development Program and is funded through the Mitchell Act - a program to provide for the conservation of Columbia River fishery resources, administered by NOAA Fisheries (NMFS). This program is a part of the mitigation for habitat loss resulting from flooding, siltation, and fluctuating water levels caused by Bonneville Dam. The Columbia River Fish Management Plan under U.S. v Oregon is currently under renegotiation, however, current production goals are generally consistent with the production goals in the expired plan. [\(stHGMP, P. 3\)](#)
- In addition, Eagle Creek NFH production is consistent with court adopted management agreements for upper Columbia River fall Chinook, steelhead, and coho which specifically identifies production from Eagle Creek NFH for tribal restoration programs. [\(cohoHGMP, P. 3\)](#)
- The funding source for the Eagle Creek National Fish Hatchery (NFH) is through Mitchell Act funding, administered by the National Marine Fisheries Service. [\(stHGMP, P. 2\)](#)
- The approved staffing matrix for the hatchery includes 7 permanent and 1 term employee; includes the project leader, assistant manager, program assistant, maintenance mechanic and four fish culturists. [\(stHGMP, P. 2; CoHGMP, P. 2\)](#)
- The annual hatchery O&M cost for FY 2002 for the combined production of coho salmon and steelhead trout was \$524,000, approximately \$25,000 less than needed. The balance of funds in FY 2002 were supplied by the Yakama Nation which purchased fish food for the coho program. [stHGMP, P. 2-3; CoHGMP, P. 3\)](#)
- A return of 4,000 adult coho salmon is needed to collect enough eggs for a full production of 0.5 million fish for on-station volitional release, in addition to a 1.3 million egg and 1.05 million pre-smolt transfer for Tribal and the State of Idaho restoration programs, above Bonneville Dam. [\(ECNFHupdate, P. 2\)](#)
- A return of 500 adult winter steelhead is needed to collect enough eggs for full production for the on-station volitional release of 150,000 smolts. [\(ECNFHupdate, P. 2\)](#)

B. Hatchery water sources.

- Eagle Creek is the water source for the Eagle Creek NFH. [\(stHGMP, P. 26\)](#)
- The main water source for the hatchery is Eagle Creek.the Eagle Creek subbasin. [\(ECNFHupdate, P. 1\)](#)
- Water rights for the Eagle Creek NFH total 110.02 cfs. This includes 0.02 cfs from one spring for incubating eggs, two fish ladder passage ways at 27 cfs each located downstream of the hatchery in Eagle Creek, and 56 cfs for fish culture use derived from the hatchery intake structure located one quarter mile upstream of the hatchery in Eagle Creek. [\(stHGMP, P. 32\)](#)
- Water withdrawals for hatchery operation are not expected to have a significant negative impact on natural spawning populations. Hatchery effluents meet

- established NPDEP release standards criteria and are diluted by the flow in Eagle Creek reducing potential negative impacts to natural stocks. (stHGMP, P. 26)
- Water use for production ranges from 5,785 gpm to 12,380 gpm. (stHGMP, P. 33)
 - The hatchery monitors water discharges and is in compliance with the current NPDES permit. (stHGMP, P. 33)
 - The hatchery has low water alarm probes positioned in three strategic locations to prevent fish losses due to water flow failures. The alarm system is linked with a 24hr./ 7day security operator. Operators telephone hatchery staff and identify the trouble zone. Also the alarm sounds on station to alert staff. (cohoHGMP, P. 39-40)
 - Hatchery intake screens currently conform with NMFS screening guidelines. (stHGMP, P. 33)
 - An impassable barrier (falls) just above the hatchery site precludes access to the watershed above the hatchery for anadromous species use. (stHGMP, P. 26)

C. Adult broodstock collection facilities.

- Fish enter the hatchery volitionally via a fish ladder below an electric weir. Fish are trapped in the fish ladder after passing through a V-trap which is installed on one of the steps of the ladder. (stHGMP, P. 33)
- Adult fish are manually netted in the fish ladder, placed in a 300 gallon fiberglass tank which is mounted on a pickup and transported to the adult holding channel where they are held for sorting. (stHGMP, P. 33)

D. Broodstock holding and spawning facilities.

- Brood stock facilities a 10' x 120' x 3' holding channel. A mechanical crowder moves the fish into a braille lift from which the fish slide into the carbon dioxide anesthetic tank. (stHGMP, P. 33)
- The fish are checked for ripeness with green fish being returned to the upper section of the holding channel. Ripe fish are killed using a guillotine and placed on aluminum racks. (stHGMP, P. 33)

E. Incubation facilities.

- Egg incubation takes place in the nursery building using six (6) vertical 16-tray incubators with trout screens. (stHGMP, P. 33)
- Water flow is initially set at 3 gpm and increased to 4 gpm after hatching. (stHGMP, P. 33)
- Water use is primarily ambient Eagle Creek with limited spring water available for warmer incubation water to speed up egg development. The ambient water flows through a down-flow gravel bed prior to incubation or nursery tank use. (stHGMP, P. 33)
- Eggs are treated 5 times weekly with 1,667 ppm formalin for fifteen (15) minutes to control fungus. The formalin is dispensed using a delivery system ensuring proper dilution and timing. (stHGMP, P. 34)

F. Indoor rearing facilities.

- Rearing of winter steelhead begins inside the hatchery building in 3' x 16' x 3'

fiberglass nursery tanks with a 30 gpm flow of filtered Eagle Creek water.
(stHGMP, P. 34)

G. Outdoor rearing facilities.

- Rearing facilities at Eagle Creek NFH include 75 8' x80' raceways and one adult holding/rearing pond. (ECNFHupdate, P. 1)
- The main water source for the hatchery is Eagle Creek.the Eagle Creek subbasin.
- When the steelhead attain a size of 250-300 fish/lb, they are moved to the outside 8' x 80' x 2' raceways for rearing. (stHGMP, P. 34)
- The fish are held in the raceways until late March when the pond screens are removed allowing the fish to volitionally migrate downstream. (stHGMP, P. 34)
- There are three upper banks of twelve raceways and three lower banks of thirteen raceways. (stHGMP, P. 33)
- During low creek flows water is serial used through all six banks of raceways. In 2001 the water line to the upper raceways was replaced with a larger size that increased the potential for 25% more water flow. (stHGMP, P. 33)

G. Release locations and facilities.

- The fish are volitionally released from their production raceways into Eagle Creek. (stHGMP, P. 34)

I. Outmigrant monitoring facilities.

J. Additional or special facilities.

K. Outreach and public education facilities/programs.

L. Special issues or problems (e.g. water and property rights issues, law suits, etc.).

- Steelhead:
 - Increased demands on hatchery programs, including those required by ESA Biological Opinions, have strained hatchery budgets. Reductions in production programs are being made. Reducing hatchery production may allow the hatchery, and the Service, to meet some ESA requirements, but may not uphold mitigation and tribal trust responsibility. The Service is working with NOAA-Fisheries and other co-managers to address current budget shortfalls. (stHGMP, P. 9)
 - Tribal managers generally disagree with the management strategy for mass marking and selective fisheries.
 - In the past, there probably has been an overlap between the early winter steelhead (hatchery program) and native late winter fish in Eagle Creek. This should be expected as the current hatchery strain is a composite of the late winter fish, the original spawning population at the hatchery, mixed with earlier returning fish from Big Creek, University of Washington and the Skamania River. The Eagle Creek early-run stock, although starting as early as December, is strongest in mid-February through mid-March. For native late-run winter steelhead trout, adults

would be expected in Eagle Creek during March, April, and May, with the peak of the adult migration occurring in April and May. (stHGMP, P. 9)

- The states of Washington, Oregon and Idaho are implementing selective sport fisheries on marked hatchery fish. This selective fisheries management strategy requires that all hatchery produced fish targeted for harvest be mass marked. (stHGMP, P. 9)
- Coho
 - **Insufficient Operations and Maintenance Funding Through the Mitchell Act.** Increased demands on hatchery programs, including those required by ESA Biological Opinions, have strained hatchery budgets. Reductions in production programs are being made. Reducing hatchery production may allow the hatchery, and the Service, to meet some ESA requirements, but may not uphold mitigation and tribal trust responsibility. The Service is working with NOAA-Fisheries and other co-managers to address current budget shortfalls. As of December 2003, Eagle Creek NFH is in-process of eliminating the one million smolts that have been destined for the Clatsop Economic Development Commission (CEDC) in the lower Columbia River and transferring one staff person to another non-Mitchell act funded facility. The on-station release will be maintained at 500,000 smolts. (cohoHGMP, P. 9)
 - **Tribal Programs.** Eagle Creek NFH supports important tribal restoration programs, including approximately 550,000 coho yearlings for the Nez Perce Tribe to the Clearwater River, Idaho and 500,000 coho yearlings for the Yakama Nation to the Yakima River, Washington. The goal is to help support the tribal development of locally adapted brood stock.

Coho salmon reared at Eagle Creek NFH for transfer to tribal programs have varied during the past 10 years. The varying production in numbers, size, time of transfer and transfer destination to the tribes has been due to program changes at the federal hatcheries, budget problems, and fish health concerns. Future funding and policy decisions will continue to dictate changes in the production program for the tribes. (cohoHGMP, P. 9-10)

- **Marking.** The states of Washington, Oregon and Idaho are implementing selective sport and commercial fisheries (non-tribal) on marked hatchery fish. This selective fisheries management strategy requires that all hatchery produced fish targeted for harvest be mass marked.

Tribal managers generally disagree with the management strategy for mass marking and selective fisheries. Juvenile fish transferred to the Tribes are usually tagged with an internal coded-wire tag for evaluation purposes but not mass marked solely with an adipose fin clip. (cohoHGMP, P. 10)

- Ladder Operations and Unmarked Coho Salmon Adults.** The historical parentage of coho salmon at Eagle Creek NFH is a mixture of Sandy River, Toutle River and Big Creek stocks, which were brought to the hatchery to initiate production of early-run coho salmon. Early-run hatchery coho salmon are collected for brood stock at the hatchery rack September through November. Spawning operations typically occur October through November, with the peak typically in late October. The native, late-run coho salmon start passing over the North Fork Dam on the Clackamas River in October and November, with peak numbers migrating past the dam in December, January, and February. Natural spawning of late-run coho occurs from late-January through mid-March with a peak in mid to late February. Most of the production of late-run wild coho occurs above North Fork Dam on the Clackamas River and the use of Eagle Creek by native, late-run coho is unknown. There may also be adults returning to the hatchery which are the progeny of natural spawning hatchery adults in Eagle Creek. All of these fish would be unmarked, naturally produced fish.
- All juvenile coho salmon reared at Eagle Creek NFH and released into Eagle Creek are marked by an adipose fin clip (450,000), an adipose fin clip plus coded-wire tag (25,000), or a coded-wire tag (CWT; 25,000 with no external fin clip) only. On spawning days, fish are sampled for marks/coded-wire tags, with the sampling occurring after the fish have been killed. Only a sample of the total hatchery return is typically sampled, unless fewer than 1,000 fish return. All non-adipose clipped coho adults are sent through the tag detector to determine presence/absence of a CWT. Because of the run-timing separation and marking efficiency is less than 100%, it is believed that the small component of unmarked to marked fish returning are most likely hatchery fish and not the native, late-run stock. However, any coho salmon returning after November 25 with a full adipose fin and absent of an internal coded-wire tag is designated as a native late-stock coho and returned to the stream. ([cohoHGMP, P. 10](#))

M. History of Hatchery Stocks at Eagle Creek National Fish Hatchery¹

The Eagle Creek NFH was built in 1956 to propagate tule fall Chinook, spring Chinook, coho salmon and winter steelhead trout with the fish being liberated in the Clackamas River watershed. Initial stocks utilized at the hatchery from outside the watershed involved tule fall Chinook salmon from the Spring Creek NFH, Willamette River spring Chinook, and coho salmon from the Sandy River, OR, Big Creek, OR and Toutle River, WA. A few spring Chinook, coho salmon and steelhead trout entered the hatchery trap and were also utilized in establishing the hatchery run.

¹ From draft Comprehensive Hatchery Management Plan, July 2006

Tule Fall Chinook Salmon (program terminated in 1968)

Tule fall Chinook were not able to ascend Eagle Creek during the early fall months and remained in the Clackamas River or that part of Eagle Creek downstream of the lower falls to spawn. Continuation of this propagation program necessitated the annual receipt of eyed eggs or fry from the Spring Creek NFH from 1956 through 1968, the last year tule fall Chinook were reared at Eagle Creek. Except for 1961 and 1965, when no eggs or fry were received, Eagle Creek's Tule fall Chinook program varied from 1,500,000 to 7,500,000 eggs/fry annually. Tule fall Chinook fingerlings were released in Eagle Creek, Mollala River, Clackamas River, Willamette River, Santiam River and the McKenzie River.

Spring Chinook Salmon (program terminated in 1987)

Although a few spring Chinook initially entered the trap on Eagle Creek in 1957, the spring Chinook run in Eagle Creek was initially built on eggs received from Willamette River, Santiam River and McKenzie River stocks. The spring Chinook program at Eagle Creek varied from an on-station release of 200,000 in 1958 to 1,800,000 in 1967. Additional releases were made into the north fork of the Clackamas River, the mainstem Clackamas River, the Molalla River, and the Warm Springs River. In 1987, with a management decision to focus on coho salmon, the program terminated with the release of spring Chinook smolts in April 1987.

Coho Salmon

Coho salmon production at the Eagle Creek NFH began with the receiving of eyed eggs from brood year (BY) 1956 adults of Toutle River and Sandy River parentage. During following years, additional eyed eggs were received from Sandy River, Big Creek and Elochoman River early returning stocks, which spawn in October and November. At the same time, Eagle Creek native coho salmon adults were trapped and spawned at the hatchery during late November through February, providing a late run of coho. The rearing of the late run coho was discontinued in the mid-1960's in favor of the early run coho which were more desirable to and contributed more to the ocean and lower Columbia River commercial fisheries. Coho salmon reared at Eagle Creek were mostly released at the hatchery with additional releases in nearby streams including the north fork of the Clackamas River, Delph Creek, Deep Creek, North Fork Eagle Creek, and the Mollala River.

With the termination of the Spring Chinook production program at Eagle Creek in 1987, the hatchery increased coho production, which was transferred to release sites in estuaries of the lower Columbia River. These release sites were developed into net pen acclimation sites where the yearling coho smolts were held 2-3 weeks prior to release. This program was developed in concert with efforts by NOAA-Fisheries to move the commercial gill netting of salmon from the mainstem lower Columbia River into terminal fishery areas in an effort to reduce the take of threatened and endangered upriver stocks of salmon. The hatchery program involved rearing 1.0 million fish for release at the hatchery and 1.0

million smolts for transfer to net pen sites in Young's Bay, Tongue Point and Blind Slough. The hatchery also became involved in the rearing of coho salmon to assist the Yakama Nation (YN) restore coho salmon runs in the Yakima, Wenatchee and Methow Rivers. Up to 500,000 yearling coho smolts were transferred to various acclimation sites on these rivers annually.

With the return of adult coho back to the Wenatchee River system (BY 2000), and the disease finding that some of the adult fish tested positive for infectious hematopoietic necrosis virus (IHNV), a disease deadly to steelhead trout, it was determined that the coho eggs from the Wenatchee River would not go to Eagle Creek for rearing. Instead of rearing coho for the YN, the hatchery began rearing 550,000 yearling smolts for the Nez Perce Tribe for restoration of coho in the Clearwater River Basin, Idaho. This was a trade in production programs between the Little White Salmon/Willard NFH Complex and Eagle Creek NFH. In 2003, with a substantial reduction in Mitchell Act funding, Service management changed the coho production at Eagle Creek, reducing the on-station release to 500,000 yearling smolts and eliminating the coho production for Clatsop Economic Development Corporation (CEDC). In 2004, with a further Mitchell Act funding reduction, a 500,000 coho smolt program for the Yakima River at the Willard facility was reprogrammed to Eagle Creek NFH. The current coho program now constitutes 500,000 smolts for Eagle Creek, 550,000 smolts for the Clearwater River and 500,000 smolts for the Yakima River.

Eyed coho salmon eggs from Eagle Creek have been shipped to other Service hatcheries (Abernathy, Carson, Coleman, Garrison Dam, Leavenworth, Little White Salmon, Quilcene, Spring Creek, Willard, Winthrop); state fish and game agencies (North Carolina, Maine, Missouri, Nevada, Oregon, Tennessee, Vermont, Wisconsin); foreign nations (Canada, France, Japan, North Korea); Native American tribes (Elwah, Lummi, Nez Perce, Paiute, Quinault, Warm Springs); and research facilities (University of Idaho, USGS Western Fish Disease Laboratory).

Winter Steelhead

Winter steelhead production at the Eagle Creek NFH was initiated with the spawning of native Eagle Creek steelhead during the period of April 15 to June 1, 1957. Forty-two females and forty-seven males were spawned producing 121,665 eggs. The spawning of Eagle Creek native winter steelhead continued through 1965 with the resulting progeny being released as both one year-old yearlings and two year-old smolts. When released as yearlings, the steelhead ranged from 16 to 150 fish per pound in comparison to being released as two year-old smolts being 6 to 10 fish per pound.

In 1965, the hatchery began receiving winter steelhead eyed eggs of the Big Creek strain. This importation of eyed eggs continued until 1974 when a sufficient return of adult steelhead assured fishery managers that sufficient brood stock were returning to the hatchery to meet egg requirements. In 1965, the hatchery and Dr. Lauren Donaldson, University of Washington, began fertilizing returning female steelhead with sperm from male rainbows from the University of Washington. This hybridization program continued for 4 years. In 1970, winter

steelhead eyed eggs from the Skamania Hatchery (State of Washington) were received instead of Big Creek strain eyed eggs. In 1972 through 1974, eyed eggs from Big Creek were shipped to the Abernathy facility for incubation and initial rearing prior to transfer to Eagle Creek. Over time, the spawning of the earlier returning fish took precedence over the native Eagle Creek strain as the earlier fish provided a greater sport fishery and only required fish to be held one year rather than two years in the hatchery.

In the spring of 2001 and 2002, under direction from NOAA-Fisheries, the hatchery began rearing the native winter steelhead stock using eggs spawned from adults collected at PGE's Faraday Dam on the Clackamas River. A trial was set up with these eggs using chilled water to slow down incubation as these fish would be released as two year old smolts. After two years of rearing the native stock, upon recommendation by ODFW, NOAA-Fisheries decided that the hatchery would discontinue the rearing of the native stock. In place of rearing the native stock, the hatchery was directed to return to rearing the earlier Big Creek/Skamania strain which they had successfully propagated and released as one year old smolts.

Currently, the hatchery propagates and volitionally releases 150,000 early winter steelhead into Eagle Creek. A density study is on-going using raceway populations of 7,500; 15,000; and 22,500 fish per raceway. There are three raceways of each population with each of the nine raceways having different coded wire tags and all fish having an adipose – right ventral fin clip.

Eyed eggs from the Eagle Creek native steelhead stock have been shipped to other Service hatcheries (Carson, Hagerman, Little White Salmon, Willard); state fish and game agencies (Alaska, Connecticut, New Jersey, Oregon, Washington); foreign nations (USSR); Native American tribes (Warm Springs); and research facilities (USGS Columbia River Research Laboratory, University of Idaho). As the early strain run strengthened, eyed eggs from this stock were shipped to other Service hatcheries (Abernathy, Carson, Garrison Dam, New London); state fish and game agencies (North Carolina, Tennessee, Vermont); foreign nations (France); Native American tribes (Elwah, Lummi, Quinault); and research facilities (USFWS LaCrosse Laboratory, USGS Western Fish Disease Laboratory, USGS Columbia River Research Laboratory, University of Idaho).

N. NMFS ESA-listed population(s) that may be affected by the program².

Listed species occupying habitats in the lower Clackamas River and its tributaries, the lower Willamette River, and the lower Columbia River migration corridor(s) may be impacted by the presence of Eagle Creek NFH coho salmon and winter steelhead trout. NMFS ESA listed populations that may be incidentally affected are:

- Steelhead Trout (*Oncorhynchus mykiss*), Lower Columbia River ESU (Threatened Species, 63 FR 13347; March 19, 1998).
- Chinook Salmon (*Oncorhynchus tshawytscha*), Lower Columbia and Upper Willamette River ESUs (Threatened Species, 64 FR 14308; March

² from draft Hatchery and Genetic Management Plan, May 2004

24, 1999).

- Coho Salmon (*Oncorhynchus kisutch*), Lower Columbia River / Southwest Washington ESU (Candidate Species in 2004, subsequently listed as Threatened Species, 2005)^a

^a Note: the Oregon Fish and Wildlife Commission listed lower Columbia River wild coho salmon as an endangered species in July 1999. For the Clackamas River this constitutes the late-stock wild coho salmon produced primarily upstream of the North Fork Dam on the Clackamas River.

O. Current on-station hatchery objectives for Eagle Creek National Fish Hatchery³

Hatchery Objectives	Coho Salmon	Winter Steelhead
Release to EC	500,000	150,000
Transfers/Other Programs	500K to YN 550K to NPT	0
# Females Spawned	1400	175
Fecundity	2,800	4,000
Prespawn Mortality	2%	2%
Survival Egg to Eye	>92%	>92%
Survival Eye to Fry	97%	97%
Survival Fry to Smolt	93%	93%
Survival Smolt to Adult (number back to hatchery)	0.6% (3,000)	0.23% (350)

III. Winter Steelhead Trout hatchery program, Eagle Creek NFH

A. General information.

- Species and population (or stock) under propagation, and ESA status. Winter steelhead trout (*Oncorhynchus mykiss*), non-listed hatchery stock. (stHGMP, P. 1)
- The stock of winter steelhead used at ECNFH is a combination of Big Creek and native Clackamas winter steelhead stocks. Current practice is to use only those adults returning to the hatchery.” (stHGMP, P. 35)
- There are no wild fish currently used for Eagle Creek NFH production. (stHGMP, P. 35)
- Eagle Creek NFH on-station releases are moderate in magnitude (around 150,000 winter steelhead trout) relative to other Columbia River production programs. (stHGMP, P. 27)

B. Stock/Habitat/Harvest Program Goals and Purpose.

1. Purpose and justification of program.

- Legal Justification for the program: (stHGMP, P. 3)
 - Treaty of 1855

³ From draft Comprehensive Hatchery Management Plan, July 2006

- Mitchell Act
 - Fish and Wildlife Act
 - Pacific Northwest Electric Power Planning and Conservation Act
 - U.S. v Oregon court agreements
 - Eagle Creek NFH currently operates as part of the Columbia River Fisheries Development Program and is funded through the Mitchell Act - a program to provide for the conservation of Columbia River fishery resources, administered by NOAA Fisheries (NMFS). (stHGMP, P. 3)
2. Goals of program.
- This program is a part of the mitigation for habitat loss resulting from flooding, siltation, and fluctuating water levels caused by Bonneville Dam.
 - The Columbia River Fish Management Plan under U.S. v Oregon is currently under renegotiation, however, current production goals are generally consistent with the production goals in the expired plan.
3. Objectives of program.
- Produce winter steelhead trout to help *mitigate* for fish losses in the Columbia River Basin caused by federal dams and provide opportunities for sport fisheries. (stHGMP, P. 3)
4. Type of program.
- Type of program - Isolated Harvest (Lower Columbia River) (stHGMP, P. 3)
5. Alignment of program with ESU-wide plans.
- *Lower Columbia River Steelhead Trout ESU* (Threatened Species)
 - Status:** Listed as a threatened species on March 19, 1998, this ESU includes all naturally spawned populations of steelhead (and their progeny) in streams and tributaries to the Columbia River between the Willamette and Hood Rivers, in Oregon (Myers et al. 1998). This would include Eagle Creek and its tributaries. Excluded are steelhead in the upper Willamette River Basin above Willamette Falls. Both winter and summer steelhead are present in this ESU. (stHGMP, P. 13)
 - No NMFS ESA-listed populations will be directly affected by Eagle Creek National Fish Hatchery. (stHGMP, P. 12)
 - The primary NMFS listed species potentially affected by hatchery operations is the late Clackamas winter steelhead. This species is found in Eagle Creek, usually in the main stem below the middle falls and in the North Fork of Eagle Creek. (stHGMP, P. 20)
 - Listed species occupying habitats in the lower Clackamas River and its tributaries, the lower Willamette River, and the lower Columbia River migration corridor(s) may be impacted by the presence of Eagle Creek NFH winter steelhead trout. NMFS ESA listed populations that may be incidentally affected are: (stHGMP, P. 12-13)

- Steelhead Trout (*Oncorhynchus mykiss*), Lower Columbia River ESU (Threatened Species, 63 FR 13347; March 19, 1998).
- Chinook Salmon (*Oncorhynchus tshawytscha*), Lower Columbia and Upper Willamette River ESUs (Threatened Species, 64 FR 14308; March 24, 1999).
- Coho Salmon (*Oncorhynchus kisutch*), Lower Columbia River / Southwest Washington ESU (Candidate Species)^a

6. Habitat description and status

- The Clackamas River is the principal spawning and rearing area for members of this ESU that pass through the Lower Willamette River and only late-run winter steelhead are included in the Clackamas River population (Busby et al. 1996). The steelhead trout populations in this ESU are of the coastal genetic group (Schreck et al. 1986, Reisenbichler et al. 1992) and a number of genetic studies indicate that they are part of a different ancestral lineage than inland steelhead from the Columbia River. Genetic Studies also show these populations to be distinct from those in the upper Willamette River and coastal streams in Oregon and Washington (61 FR 41541). (stHGMP, P. 13)

Critical Habitat: Critical habitat was designated February 16, 2000 (65 FR 7764); this designation was vacated by the District of Columbia District Court and remanded to NOAA Fisheries for new rulemaking pursuant to a court order in May, 2002. (stHGMP, P. 13-14)

Use of the Action Area: Adult winter steelhead migrate up the Clackamas River starting in November with low numbers being counted at the North Fork Dam (RM 31.0), on the Clackamas River from November through February. Greater numbers of native, winter-run steelhead occur at the North Fork Dam starting in March, with the peak of the adult migration occurring in April and May usually ending in June (ODFW 1992). The timing of adult Lower Columbia River winter-run steelhead on Eagle Creek and its tributaries is expected to be nearly the same as that documented on the Clackamas River. Adults from this ESU would be expected in Eagle Creek from November through mid-June, with a peak in March, April and May. (stHGMP, P. 14)

7. Size of program and production goals (No. of spawners and smolt release goals).

- A return of 500 adult winter steelhead is needed to collect enough eggs for full production for the on-station volitional release of 150,000 smolts. (ECNFHupdate, P. 2)
- Performance Indicators” addressing benefits. (stHGMP, P. 4-5)

	Benefits	
Performance Standard	Performance Indicator	Monitoring and Evaluation
Program contributes to mitigation for construction of dams as defined in the Mitchell Act of 1937.	Achieve 0.33% smolt to adult survival back to the hatchery to collect 500 winter steelhead brood stock to produce 150K smolts for on-station release.	Monitor adult returns, smolt production, and survival rates and perform best rearing strategies to meet spawning and production goals.
Successfully maintain a brood stock of winter steelhead at Eagle Creek NFH without the need for out of basin egg or fish transfers to the hatchery.	Achieve a minimum 0.1% smolt-to-adult return back to the hatchery.	Smolt-to-adult survival rates are monitored for each brood-year release.
Assure that hatchery operations support production and harvest objectives.	Contribute to a meaningful harvest for sport fisheries from December through March of each year in the Willamette and Clackamas rivers and Eagle Creek. Achieve a 10-year average of 1% smolt-to-adult survival that includes harvest plus escapement.	Survival back to the hatchery will be estimated for each brood year released. Work with co-managers to establish meaningful fisheries and manage adult fish returning in excess of brood stock need.
Develop outreach to enhance public understanding, participation, and support of the U.S. Fish and Wildlife Service and Eagle Creek NFH programs.	Increase the visibility of the Fish and Wildlife Service facilities and to provide information about Service programs to internal and external audiences. For example, local schools and special interest groups tour the facility to better understand hatchery operations. Off station efforts include festivals, classroom participation, stream adoptions, and county fairs.	Evaluate use and/or exposure of program materials and exhibits as they help support goals of the information and education program.
Implement measures for brood stock management to maintain integrity and genetic diversity of Eagle Creek hatchery stock.	A minimum of 500 adults are collected throughout the spawning run in proportion to age and sex composition at return.	Annual run timing, age and sex composition, and return data is collected and compared to historical data.
Communicate and coordinate effectively with co-managers in the Columbia River basin.	Participate in <u>US v Oregon</u> production advisory committee (PAC) and technical advisory committee (TAC) meetings. Discuss management issues for Eagle Creek NFH at an annual coordination meeting each spring between the Service and cooperators, including ODFW,	Develop technical reports for PAC and TAC. Hold hatchery evaluation team meetings each spring to review progress.

		Benefits	
Performance Standard	Performance Indicator	Monitoring and Evaluation	
	NOAA Fisheries, Yakama Nation, Nez Perce Tribe, BLM, USFS, and PGE.		
Design and implement projects to improve the quality of fish production at Eagle Creek NFH.	Projects are identified, reviewed, and implemented that will increase survival of program fish while minimizing impacts on wild populations.	Monitoring programs will be incorporated into project designs. Examples of projects include: diet studies, rearing and release studies, and rearing environment projects.	
Release groups are sufficiently marked in manner consistent with information needs and protocols to determine impacts to natural and hatchery origin fish in fisheries.	On-station release: All winter steelhead released into Eagle Creek are adipose and right ventral (AdRV) fin clipped.	Returning fish are sampled throughout their return for length, sex, and mark recovery.	
Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens. Follow USFWS Fish Health Policy and Implementation Guidelines and the Integrated Hatchery Operation Team (IHOT) Policy.	Necropsies of fish to assess health, nutritional status, and culture conditions.	Columbia River Fish Health Center (LCRFHC) inspect adult brood stock yearly and monitor juvenile fish on a monthly basis to assess health and detect potential disease problems. As necessary, the LCRFHC recommends remedial or preventative measures to prevent or treat disease, with administration of therapeutic and prophylactic treatments as deemed necessary.	
	Release and/or transfer exams.	Three to six weeks prior to transfer or release, 60 fish per lot are examined in accordance to the USFWS and co-managers policies.	
	Inspection of adult brood stock.	At spawning, a minimum of 150 female and 60 male brood stock are examined for pathogens.	

Benefits		
Performance Standard	Performance Indicator	Monitoring and Evaluation
	Inspection of off-station fish/eggs prior to transfer to hatchery.	Control of specific fish pathogens through eggs/fish movements are conducted in accordance to the USFWS and co-managers policies. No fish or eggs from virus-positive brood stock are allowed into Eagle Creek NFH.
	Applied research on new and existing techniques.	Evaluate new and existing procedures for effects on health, disease control and prevention.

C. Description of program and operations.

1. Broodstock goal and source.

- 500 proposed annual brood stock collection level, assuming equal numbers of males and females (maximum number of adult fish). (stHGMP, P. 7)
- Steelhead hatchery production from Eagle Creek NFH are uniquely marked and only those marked fish from the hatchery are used for brood stock. (stHGMP, P. 36)

2. Adult collection procedures and holding.

- The stock of winter steelhead used at ECNFH is a combination of Big Creek and native Clackamas winter steelhead stocks. Current practice is to use only those adults returning to the hatchery. (stHGMP, P. 35)
- There are no wild fish currently used for Eagle Creek NFH production. (stHGMP, P. 35)
- Returning winter steelhead are collected for brood stock at the hatchery rack in Eagle Creek, December to mid-March. (stHGMP, P. 26)
- Returns to the hatchery are used for hatchery production of winter steelhead. If numbers of returning brood stock were insufficient to meet the hatchery production goals, production was met using Clackamas River stock. (stHGMP, P. 35)
- Fish enter the hatchery volitionally via a fish ladder below an electric weir. Fish are trapped in the fish ladder after passing through a V-trap which is installed on one of the steps of the ladder. (stHGMP, P. 33)
- Adult fish are manually netted in the fish ladder, placed in a 300 gallon fiberglass tank which is mounted on a pickup and transported to the adult holding channel where they are held for sorting. (stHGMP, P. 33)
- Brood stock facilities include the collection pool in the fish ladder and a 10' x 120' x 3' holding channel. A mechanical crowder moves the fish into a braille lift from which the fish slide into the carbon dioxide anesthetic tank. (stHGMP, P. 33)
- Stray steelhead from other locations are not known to occur at Eagle Creek NFH. (stHGMP, P. 26)

- Steelhead hatchery production from Eagle Creek NFH are uniquely marked and only those marked fish from the hatchery are used for brood stock. (stHGMP, P. 26)

3. Adult spawning.

a. Spawning protocols.

- The fish are checked for ripeness with green fish being returned to the upper section of the holding channel. Ripe fish are killed using a guillotine and placed on aluminum racks. (stHGMP, P. 33)
- Eagle Creek brood stock are randomly selected and spawned at a 2:2 male to female ratio. (stHGMP, P. 36)
- When excess steelhead eggs are taken, a portion of eggs from each female is kept for on-station rearing. (stHGMP, P. 36)
- The remaining eggs are either destroyed or transferred for use in other programs where acceptable. (stHGMP, P. 36)
- Fish are randomly spawned throughout run. (stHGMP, P. 36)

b. No. of males and females spawned each year over past 10 years (Table)

- Brood stock collection levels for the last twelve years (e.g. 1988-99), or for most recent years available: (stHGMP, P. 37)

Year	Adults Spawned		Eggs	Juveniles
	Females Jacks	Males		
1988	149	149		
1989	213	188		
1990	152	150		
1991	207	167		
1992	324	335		
1993	488	345		
1994	125	117		
1995	401	475		
1996	115	122		
1997	308	327		
1998	307	258		
1999	389	441		
2000	171	171		
2001	252	263		

Data source: USFWS Columbia River information System (CRiS), Vancouver, WA

4. Fertilization.

a. Protocols.

- Eagle Creek brood stock are randomly selected and spawned at a 2:2 male to female ratio. [\(stHGMP, P. 36\)](#)
- When excess steelhead eggs are taken, a portion of eggs from each female is kept for on-station rearing. [\(stHGMP, P. 36\)](#)
- Fish are spawned randomly over entire run, from ripe fish on selected days over a 3 to 4 week period. [\(stHGMP, P. 38\)](#)
- If short of males, the hatchery will use males more than once as needed. [\(stHGMP, P. 38\)](#)
- 2:2 individual matings, 1% saline solution used to enhance fertilization, ovarian fluid is drained. [\(stHGMP, P. 38\)](#)
- Cryopreservation is not used at Eagle Creek NFH. [\(stHGMP, P. 38\)](#)

b. Number of eggs collected and fertilized each year over past 10 years (Table)

- Number of eggs taken and survival rates to eye-up and/or ponding. [\(stHGMP, P. 39\)](#)

Brood Year		Eggs Taken	Eyed	On-Feed ⁴	Released ⁵
92	#	1,119,573	1,057,043	358,407	187,654
	%		94	84	
93	#	2,287,269	2,023,158	441,086	175,669
	%		95	71	
94	#	574,547	515,960	325,117	178,199
	%		90	87	
95	#	1,443,214	1,272,801	1,250,839	175,765
	%		88	87	
96	#	450,913	417,530	411,605	206,735
	%		93	91	
97	#	1,233,044	1,178,944	342,449	206,051
	%		96	85	

⁴ Accounts for number of eggs and unfed fry discarded, shipped, and mortality (from CRiS Egg Summary report). Percent survival is cumulative from eggs taken to # on-feed.

⁵ The number transferred in and out will need to be accounted for before calculating survival from # on-feed to # released (from CRiS SR80s distribution report), but is generally about 93% (IHOT 1996).

Brood Year		Eggs Taken	Eyed	On-Feed ⁴	Released ⁵
98	#	1,346,569	1,285,415	329,132	204,931
	%		96	83	
99	#	1,592,107	1,516,965	305,397	205,447
	%		95	79	
00	#	789,864	772,040	189,512	112,717
	%		98	91	

5. Incubation.

- Egg incubation takes place in the nursery building using six (6) vertical 16-tray incubators with trout screens. (stHGMP, P. 33)
- Fertilized eggs from four females (12,000 - 20,000 eggs) are placed into each incubation tray. (stHGMP, P. 40)
- Temperatures during incubation range from 34 to 50 degrees F. (stHGMP, P. 40)
- Water flow is initially set at 3 gpm and increased to 4 gpm after hatching. Water use is primarily ambient Eagle Creek with limited spring water available for warmer incubation water to speed up egg development. (stHGMP, P. 33)
- The ambient water flows through a down-flow gravel bed prior to incubation or nursery tank use. (stHGMP, P. 33)
- Eggs are treated 5 times weekly with 1,667 ppm formalin for fifteen (15) minutes to control fungus. The formalin is dispensed using a delivery system ensuring proper dilution and timing. (stHGMP, P. 33-34)
- At eye-up, after shocking and picking, live eyed-eggs are randomly selected from each tray to maximize a genetic cross-section of the entire run. (stHGMP, P. 40)
- Eyed eggs are enumerated at 9,000 per tray for a total of twenty (20) trays. (stHGMP, P. 40)

6. Ponding.

a) Protocols.

- Rearing of winter steelhead begins inside the hatchery building in 3' x 16' x 3' fiberglass nursery tanks with a 30 gpm flow of filtered Eagle Creek water. (stHGMP, P. 33)
- Swim-up fry are transferred from the incubation trays into inside fiberglass 3' x 16' x 3' hatchery nursery tanks. Two (2) trays are placed into each tank (10 tanks total) for a total of approximately 18,000 fry per tank (180,000 feeding fry). (stHGMP, P. 40)

b) Number of fry ponded each year, including % hatch each year.

7. Rearing/feeding protocols.

- When the steelhead attain a size of 250-300 fish/lb, they are moved to the outside 8' x 80' x 2' raceways for rearing. (stHGMP, P. 33)
- When the fish attain a size of 250-300 fish per pound, they are transferred to the outside raceways (two tanks per raceway). (stHGMP, P. 40)
- When the fish are mass marked during the summer or early fall, the raceway inventory is established at 16,000 fish per raceway. (stHGMP, P. 40)
- Temperature readings are taken using thermograph probes which take readings continuously. Temperatures in the raceways range from 32 ° F to 65 ° F for the containment of winter steelhead trout. (stHGMP, P. 41)
- Mortalities are removed daily, recorded, and deducted from raceway inventory. (stHGMP, P. 41)
- Raceways are cleaned with a broom while effluent water is drained to a pollution abatement pond. Cleaning is performed as needed but no less than once a week. (stHGMP, P. 41)
- Dissolved oxygen, carbon dioxide and total gas pressure have not been regularly monitored, is not considered a problem, and is measured periodically, as necessary. (stHGMP, P. 41)
- Fish are reared on creek gravity flow water. (stHGMP, P. 41)
- The fish are held in the raceways until late March when the pond screens are removed allowing the fish to volitionally migrate downstream. (stHGMP, P. 33)
- Steelhead fry are placed in fiberglass tanks and initially fed Bio Oregon's Starter Diet #1 and #2 by hand. (stHGMP, P. 42)
- When they begin actively feeding, they are fed Bio Starter #3, Bio Dry 1000 1.0 mm and 1.3 mm pellets via overhead automatic feeders. (stHGMP, P. 42)
- When they attain a size of 250-300 fish per pound, the fish are moved to outside raceways where they are fed Bio Dry 1000 1.3 mm, Bio Dry 500 1.5 mm and 2.0 mm by hand until early September. (stHGMP, P. 42)
- During the summer months, the fish are also fed during the evening hours to maximize growth. (stHGMP, P. 42)
- In early September, the fish are fed Bio Dry 500 in 2.5 mm, 3.0 mm and 4.0 mm pellet utilizing demand feeders (two per raceway) until volitional release the following April. (stHGMP, P. 42)

8. Fish growth profiles.

- Current production goals are to have a final density index of below 0.54 and a flow index of no higher than 1.5 (Piper et al., 1982, Banks et al 1992). Maximum density and loading criteria are for maximum loadings of 8 lbs/gpm or 3.25 lbs/cu. ft. (stHGMP, P. 40)
- End of Month Growth Parameters for Eagle Creek NFH Winter Steelhead, Brood Year 2000. (stHGMP, P. 42)

Month	Total Length (inches)	#/lb	Conversion	Density Index	Flow Index
April	1.20	1666		0.14	0.40
May	1.85	449	0.66	0.27	0.75
June	2.57	168	0.98	0.08	0.20
July	3.37	75		0.10	0.28
Aug.	4.41	33	1.68	0.11	0.29
Sept.	5.29	19	1.38	0.15	0.42
Oct.	5.70	15	3.86	0.18	0.49
Nov.	6.60	10	0.39	0.24	0.65
Dec.	6.60	10		0.24	0.65
Jan.	7.22	7.6	0.92	0.29	0.78
Feb.	7.22	7.6		0.29	0.78
Mar.	7.61	6.5	1.10	0.32	0.87
April	7.91	5.8	1.31	0.33	0.91

Fish were volitionally released by May 15th.

Data extrapolated from Lot History Production, CRiS 12/05/02.

9. Fish health.

- Personnel from the Lower Columbia River Fish Health Center test for the listed pathogens as defined by USFWS Fish Health Policy and Implementation Guidelines (infectious hematopoietic necrosis virus (IHNV), infectious pancreatic necrosis virus (IPNV), viral hemorrhagic septicemia virus (VHSV), *Renibacterium salmoninarum* (BKD), *Aeromonas salmonicida*, and *Yersinia ruckeri*, and *Myxobolus cerebralis*) and for *Ceratomyxa shasta* and erythrocytic inclusion body syndrome. (stHGMP, P. 36-37)
- Samples are taken from 150 female and 60 male adults throughout the spawning period to ascertain the health profile. (stHGMP, P. 36-37)
- As defined by the USFWS Fish Health Policy, Eagle Creek NFH is classified as a virus-free facility so adult fish from facilities with a history of virus are not allowed on station:
 - The steelhead are remarkably healthy with only two findings of virus in over 30 years and a very low incidence of the reportable bacterial pathogens that plague other hatcheries (Fish Health Inspection Reports, 1970 to present, Lower Columbia River Fish Health Center). (stHGMP, P. 27-28)
 - Adults return with no virus and low levels of two bacterial pathogens so there is little or no vertical transmission of disease to their offspring. (stHGMP, P. 28)
 - Juvenile fish are rarely affected by more than dorsal fin erosion. (stHGMP, P. 28)

- Because Eagle Creek juveniles are downstream of the major dams en route to the ocean, there is reduced potential for transmission of pathogens to other populations. (stHGMP, P. 28)

10. Chemotherapeutant use.

11. Tagging and marking of juveniles.

- The states of Washington, Oregon and Idaho are implementing selective sport fisheries on marked hatchery fish. This selective fisheries management strategy requires that all hatchery produced fish targeted for harvest be mass marked. (stHGMP, P. 9)
- All on-station releases of winter steelhead are mass marked (adipose and right ventral fin clipped) for the purpose of selective fisheries and brood stock management. Brood years 1989 through 1993 were also coded-wire tagged but few fishery recoveries were observed (Pastor 1998 and Pastor 2000). Most coded-wire tagged fish were recovered at the hatchery, a very low percent were reported in freshwater sport fisheries, and none were recovered in ocean fisheries. (stHGMP, P. 23)
- All hatchery releases from Eagle Creek are externally marked with a unique fin clip, currently adipose and right ventral fins are clipped. (stHGMP, P. 36)
- All winter steelhead released into Eagle Creek are 100% marked with an adipose and right ventral fin clip. (stHGMP, P. 45)

12. Fish Release.

a) Protocols.

- Smolt development indices (e.g. gill ATPase activity), if applicable --Not measured. (stHGMP, P. 43)
- Use of "natural" rearing methods as applied in the program--None applied other than volitional release ponds. (stHGMP, P. 43)
- Winter steelhead yearlings are volitionally released on-station April and May at approximately 5 to 6 fish/lb. Those remaining at the end of the volitional release period are forced out (generally less than 2% of total production). (stHGMP, P. 43)
- Proposed fish release levels. (stHGMP, P. 44)

Age Class	Maximum Number	Size (fpp)	Release Date	Location
Eggs				
Unfed Fry				
Fry				
Fingerling				
Yearling	150,000 on-station	5 to 6 fpp	April – May	Eagle Creek

- Specific location(s) of proposed release(s). (stHGMP, P. 43)

Stream, river, or watercourse: On-Station Release into Eagle Creek

Release point: Eagle Creek, Rkm 16, 46°16'34" N Lat. And 122°12'04" W Long.

Major watershed: Clackamas, Oregon

Basin or Region: Lower Willamette and Columbia Rivers

b) Number of fish released each year (subyearlings?; yearlings?; other?)

- Actual numbers and sizes of fish released by age class through the program. Eagle Creek NFH winter steelhead releases in Eagle Creek. (stHGMP, P. 44-45)

Release year	Eggs/ Unfed Fry	Avg size	Fry	Avg size	Fingerling	Avg size	Yearling	Avg size
1990							169,000	6/lb.
1991							167,000	7/lb.
1992							151,000	7/lb.
1993							188,000	7/lb.
1994							176,000	6/lb.
1995							178,000	5/lb.
1996							176,000	5/lb.
1997							207,000	5/lb.
1998							206,000	5/lb.
1999							205,000	6/lb.
2000							205,000	6/lb.
2001							113,000	6/lb.
2002							142,000	8/lb.
Average							176,000	6/lb.

Data source: USFWS Columbia River information System (CRiS), Vancouver, WA 09/19/02

D. Program benefits and performance.

1. Adult returns.

- Numbers of adult returns (need data for the past 10-20 years).
- Return timing and age-class structure of adults.

- On average, 60% and 40% of Eagle Creek's winter steelhead have returned as 3 and 4 year old fish respectively. Occasionally, some 5 year old steelhead have been observed. ([ECNFHupdate, P. 2](#))

c. Smolt-to-adult return rates.

BY	Number Released	Returns to the Hatchery				Total	CRIS\SM 07/19/2 %
		Age 2	Age 3	Age 4	Age 5		
87	155,422		355	405	8	768	0.494
88	148,800		38	76	9	123	0.083
89	171,334	1,272	607	2	3	1,884	1.100
90	167,040		307	213	12	532	0.318
91	150,844		36	157		193	0.128
92	188,106		854	91	4	949	0.505
93	175,669		162	75	4	241	0.137
94	179,499	1,036	343			1,379	0.768
95	175,765		271	256	1	528	0.300
96	206,735		819	207		1,026	0.496
97	206,051		463	114		577	0.280
98	204,931		674	1,119		1,793	0.875
99	205,447	2,552	501			3,053	1.486
00	112,717		618	203		821	0.728
01	141,904		592	235		827	0.583
02	157,810		87	107		194	0.123
03	149,078		440			440	0.295
(age 4 > 0)							
Number			634	294	3	0	
Average %			61%	38%	1%	0%	0.525

From reviewing hatchery escapement records and catch information provided in ODFW (1992) and Keeley (1995), we have estimated catch per escapement statistics. On average 1.86 fish are caught in Eagle Creek for each fish returning to the hatchery (65% catch in Eagle Cr / 35% hatchery escapement). An average 2.7 fish are caught in the entire Clackamas subbasin for each fish returning to the hatchery (73% catch in Clackamas & lower Willamette fisheries / 27% hatchery escapement). Based on these statistics winter steelhead production from Eagle Creek can provide a substantial sport fishery. <extracted from the May 2004 HGMP>

d. Stock productivity (e.g. recruits per spawner).

2. Contributions to harvest and utilization (e.g. food banks).

- Eagle Creek winter steelhead, contribute significantly to recreational fisheries in the lower Columbia, Willamette, Clackamas Rivers and Eagle Creek. Past studies have indicated that for every fish returning to the hatchery another two to three fish are caught in the sport fishery. [\(ECNFHupdate, P. 3\)](#)

3. Contributions to conservation.

4. Other benefits.

E. Research, monitoring, and evaluation programs.

- The Service has developed monitoring and evaluation programs to determine the extent of ecological interactions between fish released from the hatchery and wild fish populations in the Eagle Creek subbasin. For example, the migration timing of hatchery juveniles released volitionally in the spring was determined using radio-telemetry. A monitoring program is in place to (1) determine the movement and behavior of adult hatchery fish using radio telemetry; and (2) estimate the reproductive success and contribution to smolt production of hatchery fish using genetic analyses. [\(ECNFHupdate, P. 2\)](#)
- A proportion of returning adults are sampled at the hatchery for biological information. Sex and length are recorded and scales are collected so that age can be determined. Fish are also sampled for coded-wire tags implanted in the snouts of fish during juvenile rearing. By using sample information and the number of returning fish, it is possible to calculate the number of returning fish for each age group and, consequently, the number of fish returning from each brood year or release year. [\(ECNFHupdate, P. 2\)](#)
- A three year density study has been initiated to determine which rearing density will maximize survival and adult yield of winter steelhead at Eagle Creek NFH. The results of this study may be applicable to other hatchery programs that support recreational and Tribal fisheries. [\(ECNFHupdate, P. 2\)](#)
- Reports on various hatchery evaluations and monitoring programs can be found on the web at: <http://www.fws.gov/pacific/columbiariver/> [\(ECNFHupdate, P. 2\)](#)

F. Program conflicts.

1. Biological conflicts (e.g. propagated stock maladapted to hatchery water source).

- More research is needed to assess the impacts of both hatchery releases and natural spawning coho and winter steelhead on wild steelhead in Eagle Creek. To help guide hatchery operations. [\(ECNFHupdate, P. 2\)](#)

2. Harvest conflicts (e.g. mixed stock fishery on hatchery and wild fish limits harvest opportunities on hatchery fish).
 - The number of fish returning from a hatchery release is influenced by early rearing at the hatchery, downstream migration, ocean conditions, and the harvest rate in the various fisheries. [\(ECNFHupdate, P. 2\)](#)
3. Conservation conflicts (e.g. competition between unlisted hatchery fish and ESA-listed wild fish).
 - Wild steelhead in Eagle Creek are part of the Lower Columbia River population listed as threatened under the Endangered Species Act (ESA). [\(ECNFHupdate, P. 1\)](#)
 - More research is needed to assess the impacts of both hatchery releases and natural spawning coho and winter steelhead on wild steelhead in Eagle Creek. To help guide hatchery operations. [\(ECNFHupdate, P. 2\)](#)
4. Other conflicts between the hatchery program, or fish produced by the program, and other non-hatchery issues.

IV. Coho Salmon hatchery program, Eagle Creek NFH

A. General information.

- Species and population (or stock) under propagation, and ESA status. coho salmon (*Oncorhynchus kisutch*), non-listed hatchery stock [\(cohoHGMP, P. 2\)](#)
- A return of 4,000 adult coho salmon is needed to collect enough eggs for a full production of 0.5 million fish for on-station volitional release, in addition to a 1.3 million egg and 1.05 million pre-smolt transfer for Tribal and the State of Idaho restoration programs, above Bonneville Dam. [\(ECNFHupdate, P. 2\)](#)
- Eagle Creek NFH supports important tribal restoration programs, including approximately 550,000 coho yearlings for the Nez Perce Tribe to the Clearwater River, Idaho and 500,000 coho yearlings for the Yakama Nation to the Yakima River, Washington. The goal is to help support the tribal development of locally adapted brood stock. [\(cohoHGMP, P. 3\)](#)
- Fish are transferred to lower Columbia River CEDC net pens for terminal area fisheries near Youngs Bay, Astoria, Oregon, which will be covered under a separate HGMP. [\(cohoHGMP, P. 9\)](#)
- Eagle Creek NFH is at Rkm 16 on Eagle Creek, in the Clackamas River watershed, Estacada, Oregon (46°16'34" N Lat. and 122°12'04" W Long. , pers. comm. Steve Vigg, NMFS). [\(cohoHGMP, P. 3\)](#)

B. Stock/Habitat/Harvest Program Goals and Purpose.

1. Purpose and justification of program.

Legal Justification: [\(cohoHGMP, P. 3\)](#)

- **Treaty of 1855**
 - **Mitchell Act**
 - Fish and Wildlife Act
 - Pacific Northwest Electric Power Planning and Conservation Act
 - U.S. v Oregon court agreements
- Eagle Creek NFH currently operates as part of the Columbia River Fisheries Development Program and is funded through the Mitchell Act - a program to provide for the conservation of Columbia River fishery resources, administered by NOAA Fisheries (NMFS). ([cohoHGMP, P. 3](#))

2. Goals of program.

- This program is a part of the mitigation for habitat loss resulting from flooding, siltation, and fluctuating water levels caused by Bonneville Dam. ([cohoHGMP, P. 3](#))
- The Columbia River Fish Management Plan under U.S. v Oregon is currently under renegotiation, however, current production goals are generally consistent with the production goals in the expired plan. In addition, Eagle Creek NFH production is consistent with court adopted management agreements for upper Columbia River fall Chinook, steelhead, and coho which specifically identifies production from Eagle Creek NFH for tribal restoration programs. ([cohoHGMP, P. 3](#))
- In addition, Eagle Creek NFH production is consistent with court adopted management agreements for upper Columbia River fall Chinook, steelhead, and coho which specifically identifies production from Eagle Creek NFH for tribal restoration programs. ([cohoHGMP, P. 3](#))

3. Objectives of program.

- Produce coho salmon to help mitigate for fish losses in the Columbia River Basin caused by federal dams, to provide fish for commercial, sport, and tribal harvest, and to provide fish to support tribal restoration programs upstream of Bonneville Dam. ([cohoHGMP, P. 3](#))

4. Type of program.

- Isolated Harvest (Lower Columbia River) ([cohoHGMP, P. 3](#))
- Integrated Recovery (tribal restoration programs) ([cohoHGMP, P. 3](#))

5. Alignment of program with ESU-wide plans.

- 1999 Biological Opinion on Hatchery Operations in the Columbia River. ([cohoHGMP, P. 10](#))
- ESA Informal Consultation and EFH Consultation regarding the Eagle Creek fish barrier replacement project at the Eagle Creek National Fish Hatchery, Clackamas County, Oregon (tracking number I/NWR/2002/00771). ([cohoHGMP, P. 10](#))

- Lower Columbia River Coho Endangered Species Management Plan, Oregon Fish and Wildlife Commission, July 2002. ([cohoHGMP, P. 11](#))
- Listed species occupying habitats in the lower Clackamas River and its tributaries, the lower Willamette River, and the lower Columbia River migration corridor(s) may be impacted by the presence of Eagle Creek NFH coho salmon. NMFS ESA listed populations that may be incidentally affected are: ([cohoHGMP, P. 13](#))
 - Steelhead Trout (*Oncorhynchus mykiss*), Lower Columbia River ESU (Threatened Species, 63 FR 13347; March 19, 1998).
 - Chinook Salmon (*Oncorhynchus tshawytscha*), Lower Columbia and Upper Willamette River ESUs (Threatened Species, 64 FR 14308; March 24, 1999).
 - Coho Salmon (*Oncorhynchus kisutch*), Lower Columbia River / Southwest Washington ESU (**Note: when HGMP was written this was a Candidate Species. Columbia River coho were ESA listed as Threatened on 6/28/05 (70 FR 37160)**)
- *Lower Columbia River/Southwest Washington Coho Salmon* ([cohoHGMP, P. 19-20](#))

Status: This ESU includes naturally-spawning coho from all tributaries of the Lower Columbia River up to the Deschutes River on the Oregon side, including the Willamette River up the Willamette Falls (NMFS 2002). This ESU was previously reviewed by NMFS for possible listing as a threatened species but was determined not to warrant listing because of apparent widespread dilution of the native populations with hatchery fish. The NMFS is presently reviewing new information on the status of coho in this ESU and will be making a determination of whether to go forward with another proposal to list in the near future. (**Note: when HGMP was written this was a Candidate Species. Columbia River coho were ESA listed as Threatened on 6/28/05 (70 FR 37160)**)

Wild coho salmon that migrate through the Lower Willamette River spawn in the Clackamas River and are included in this ESU. Coho salmon that spawn in the Clackamas River consist of an early-run spawning component and late-run spawning component (Cramer and Cramer 1994). ODFW considers the late run component to be a native population. The native coho population of the Clackamas River is thought to be the last remaining viable wild coho population in the Columbia Basin (Cramer and Cramer 1994). Genetic evidence suggests that native, late-run coho component in the Clackamas River is unique from the native coho of the Sandy River and other Columbia River tributaries. The early-run coho population is thought to be remnant of liberated hatchery fish that persist as naturally-spawning, self-sustaining population. The Clackamas River late-run coho population is considered depressed, vulnerable to over-harvest, and in danger of extinction in the foreseeable future (Weitkamp et al. 1995).

Use of the Action Area: Adult, late-run, native coho salmon migrating through the lower Willamette River are returning primarily to the Clackamas River to

spawn. Most of the production of late-run wild coho is thought to occur above North Fork Dam on the Clackamas River (ODFW 1992). The ten-year average late run of coho to the Clackamas River numbered 759 fish from November 1989 through March 1998 (StreamNet 2002). This number dropped to a record low in the 1996-1997 migration when only two (2) late-run fish were recorded at the North Fork Dam (Strobel and Hansen 2001). The native, late-run coho salmon start passing over the North Fork Dam (RM 31.0) in October and November, with peak numbers migrating past the dam in December, January, and February. Spawning occurs from late-January through mid-March with a peak in mid to late February (Cramer and Cramer 1994).

The use of Eagle Creek by native, late-run coho is not well documented. Adult migration timing on Eagle Creek would be expected to follow the same pattern as found on the Clackamas River at the North Fork dam. Coho smolts and fry are collected at the North Fork Eagle Creek screw trap from March through June indicating that spawning occurs in the North Fork Eagle Creek (Lumianski 2000, Strobel and Hansen 2001). It is not known if the coho spawning there are native or hatchery strays. Hatchery coho are produced at the Eagle Creek NFH and hatchery adults may spawn naturally below the hatchery. Spawning by native coho or by coho of hatchery origin may also occur in the main stem Eagle Creek below the hatchery and in Delph Creek.

The majority of coho salmon mature in their third year of life, having spent about four to six months in incubation and up to fifteen months rearing in freshwater, followed by a sixteen-month growing period at sea (Sandercock 1991). These fish are designated 1.1 (i.e., one winter in freshwater and one winter in salt water), based on scale patterns. There are many variations to this pattern as some juveniles may rear in freshwater for two winters and return as age 2.1 fish (Sandercock 1991). Juvenile coho are known to rear throughout the summer in the upper Clackamas River basin preferring beaver ponds, glides and side channels and quiet edge habitats where woody debris and cover is prevalent (Everest et al. 1986). Juvenile coho would be expected to be present in Eagle Creek throughout the summer.

Juvenile coho are counted migrating downstream through the North Fork Clackamas River migrant bypass system in every month of the year. Generally, outmigrants captured at the North Fork trap from April through June have a silvery smolt-like appearance, but most juveniles migrating December through March and July through October appear to be parr. The outmigration of coho juveniles for the Clackamas River generally begins in April, peaks in May and June and is essentially over by early July. Historically, a second outmigration of smolts occurred in the fall, primarily during November (Cramer and Cramer 1994).

The outmigration timing of coho juveniles on Eagle Creek would be expected to generally follow the same pattern as that found in the Clackamas River. On the

North Fork Eagle Creek, coho juveniles (fry, parr and smolts) have been collected by screw trap since 1997 (Lumianski 2000, Strobel and Hansen 2001). The peak capture date for coho juveniles (fry and parr) was March 14 and June 1 in 1999 and 2000, respectively. The mean length of these juveniles was 71.9 mm and 60.0 mm FL in 1999 and 2000, respectively.

In 2000, North Fork Eagle Creek produced an estimated 598 coho smolts, down from the 1999 estimate of 3,246 smolts (Strobel and Hansen 2001). Coho smolts were collected during all weeks between March 17 and June 8, 2000, with the majority of smolts being collected between April 14 and May 25, 2000. The peak capture date for coho smolts was May 11 and 12 in 2000 and May 19 in 1999. Mean fork length for emigrating coho smolts was 111.4 mm and 112.5 mm FL in 1999 and 2000, respectively (Lumianski 2000, Strobel and Hansen 2001).

6. Habitat description and status

- Habitat management and protection strategies in the Clackamas watershed are described in ODFW (1992) and for Lower Columbia River coho salmon in Oregon Fish and Wildlife Commission (2001). Habitat degradation has occurred from past forestry practices, roads, urban development, hydroelectric facilities, water rights over-appropriation, and poor ocean conditions. Refer to Federal Columbia River Power System (FCRPS) Biological Opinions (NMFS 2000 and USFWS 2000) and the Willamette Subbasin Summary (Bastasch et al. 2002) for further discussion on the subject. [\(cohoHGMP, P. 29\)](#)

7. Size of program and production goals (No. of spawners and smolt release goals).

- A return of 4,000 adult coho salmon is needed to collect enough eggs for a full production of 0.5 million fish for on-station volitional release, in addition to a 1.3 million egg and 1.05 million pre-smolt transfer for Tribal and the State of Idaho restoration programs, above Bonneville Dam. [\(ECNFHupdate, P. 2\)](#)

- Performance Standards for Coho Salmon at Eagle Creek National Fish Hatchery Modified from IHOT (1996): [\(cohoHGMP, P. 8\)](#)

<u>Measures</u>	<u>Hatchery Goal:</u>	<u>Average</u>	<u>Range</u>	<u>Comment</u>
Adult Capture (excludes jacks)	4,000		1,246-33,106	1
On-Station Fish Releases	500K	1.0M	0.5-1.2M	2
Egg Transfers	variable		1.5M	3
Fish Transfers	1.4-1.7 M			
Percent Survival				

Smolt to Hatchery	0.8%	0.85%	0.09-3.54%	4
Smolt to Hatchery + Harvest	2%	1.20%	0.12-2.10%	5
Smolt Size for On-station Release (fish/lb)	12	12	10-14	6

Constraints/Comments—Eagle Creek National Fish Hatchery

1. Adult capture dependent on off-station survival rates, harvest rates, and stream flow in Eagle Creek during fall immigration. Data is from 1997-2001 and excludes jacks. CRiS\ReturnPr
2. On-station release data from calendar years 1998-2002. On-station release goal was recently reduced from 1.0 million to 500K, in-part from improved survival rates and largely from reduced Mitchell Act funding. CRiS\DistBA2
3. Eggs have been transferred to other early stock hatcheries to meet Columbia River program needs or for tribal restoration programs, as agreed to by PAC.
4. Hatchery return data for brood years 1980 to 1998 including both age classes, jacks and adults.
5. Coded-wire tag data for coho salmon from Eagle Creek NFH, brood years 1993 through 1997 (CRiS\rd2). Survival is from juvenile release to total expanded recoveries of coded-wire tagged fish, including harvest and hatchery escapement, where recoveries include both age classes, jacks and adults. Although the data is not complete, brood year 1998 should exceed 3% survival. Review of the data also indicates that coded-wire tag recoveries from Eagle Creek for brood year 1997 may have some problems, and may in-fact grossly underestimate survival. For example, brood year 1997 return to the hatchery was reported as 945 jacks and 33,106 adults returning in 1999 and 2000, respectively, based on actual hatchery rack returns. Whereas, the brood year 1997 hatchery return based only on coded-wire tag recoveries was expanded to only 14,345 fish. Brood year 1997 survival may actually exceed 3.5% vs. the 1.8% calculated by coded-wire tag expansion.
6. Smolt size for fish transferred to the Yakama Nation and Nez Perce Tribe is 22-25 fish per lb.

- Performance Indicators” addressing benefits. ([cohoHGMP, P. 4-6](#))

	Benefits	
Performance Standard	Performance Indicator	Monitoring and Evaluation
Program contributes to mitigation for construction of dams as defined in the Mitchell Act of 1937.	Achieve 0.8% smolt to adult survival back to the hatchery to collect 4,000 coho salmon brood stock to produce 500K smolts for on-station release, 1.5M off-station release, and up to 1.5 million eggs for off-station programs.	Monitor adult returns, smolt production, and survival rates and perform best rearing strategies to meet spawning and production goals.
Successfully maintain a brood stock of coho salmon at Eagle Creek NFH without the need for out of basin egg or fish transfers to the hatchery.	Achieve a minimum 0.1% smolt-to-adult return back to the hatchery.	Smolt-to-adult survival rates are monitored for each brood-year release.

Benefits		
Performance Standard	Performance Indicator	Monitoring and Evaluation
Assure that hatchery operations support Columbia River Fish Management Plan (<u>U.S. v Oregon</u>) production and harvest objectives.	Contribute to a meaningful harvest for sport, tribal, and commercial fisheries from August through October of each year in the Columbia River. Achieve a 10-year average of 2% smolt-to-adult survival that includes harvest plus escapement.	Survival and contribution to fisheries will be estimated for each brood year released. Work with co-managers to manage adult fish returning in excess of brood stock need. Work with states and tribes to establish meaningful fisheries (through <u>US v Oregon</u> forums).
Develop outreach to enhance public understanding, participation, and support of the U.S. Fish and Wildlife Service and Eagle Creek NFH programs.	Increase the visibility of the Fish and Wildlife Service facilities and to provide information about Service programs to internal and external audiences. For example, local schools and special interest groups tour the facility to better understand hatchery operations. Off station efforts include festivals, classroom participation, stream adoptions, and county fairs.	Evaluate use and/or exposure of program materials and exhibits as they help support goals of the information and education program.
Implement measures for brood stock management to maintain integrity and genetic diversity of Eagle Creek hatchery stock.	A minimum of 1,000 adults are collected throughout the spawning run in proportion to age and sex composition at return.	Annual run timing, age and sex composition, and return data is collected and compared to historical data.
Program contributes to fulfilling tribal trust responsibility mandates and treaty rights.	Follow pertinent laws, agreements, policies, and executive orders on consultation and coordination with Native American tribal governments. Columbia River tribes support the service program at Eagle Creek NFH. An annual report on stock assessment and contribution to fisheries will be developed.	Hold an annual coordination meeting between the Service, Yakama Nation, and Nez Perce Tribe to identify and report on issues of interest, coordinate management, and review programs.
Communicate and coordinate effectively with co-managers in the Columbia River basin.	Participate in <u>US v Oregon</u> production advisory committee (PAC) and technical advisory committee (TAC) meetings. Discuss management issues for Eagle Creek NFH at an annual coordination meeting each spring between the Service and cooperators, including ODFW,	Develop technical reports for PAC and TAC. Hold hatchery evaluation team meetings each spring to review progress.

		Benefits	
Performance Standard	Performance Indicator		Monitoring and Evaluation
	NOAA Fisheries, Yakama Nation, Nez Perce Tribe, BLM, USFS, CEDC, and PGE.		
Design and implement projects to improve the quality of fish production at Eagle Creek NFH.	Projects are identified, reviewed, and implemented that will increase survival of program fish while minimizing impacts on wild populations.		Monitoring programs will be incorporated into project designs. Examples of projects include: diet studies, rearing and release studies, and rearing environment projects.
Release groups are sufficiently marked in manner consistent with information needs and protocols to determine impacts to natural and hatchery origin fish in fisheries.	On-station release: Most fish are adipose fin clipped (90%) for selective fisheries with another 25K (5%) AdCWT and 25K (5%) CWT only for evaluation purposes.		Returning fish are sampled throughout their return for length, sex, mark, and coded-wire tags.
Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens. Follow USFWS Fish Health Policy and Implementation Guidelines and the Integrated Hatchery Operation Team (IHOT) Policy.	Necropsies of fish to assess health, nutritional status, and culture conditions.		Columbia River Fish Health Center (LCRFHC) inspect adult brood stock yearly and monitor juvenile fish on a monthly basis to assess health and detect potential disease problems. As necessary, the LCRFHC recommends remedial or preventative measures to prevent or treat disease, with administration of therapeutic and prophylactic treatments as deemed necessary.
	Release and/or transfer exams.		Three to six weeks prior to transfer or release, 60 fish per lot are examined in accordance to the USFWS and co-managers policies.
	Inspection of adult brood stock.		At spawning, a minimum of 150 female and 60 male brood stock are examined for pathogens.

	Benefits	
Performance Standard	Performance Indicator	Monitoring and Evaluation
	Inspection of off-station fish/eggs prior to transfer to hatchery.	Control of specific fish pathogens through eggs/fish movements are conducted in accordance to the USFWS and co-managers policies. No fish or eggs from virus-positive brood stock are allowed into Eagle Creek NFH.
	Applied research on new and existing techniques.	Evaluate new and existing procedures for effects on health, disease control and prevention.

C. Description of program and operations.

1. Broodstock goal and source.

- The hatchery stock at Eagle Creek is early-run. The wild indigenous stock is considered late-run. There are no known late-run wild coho regularly returning to Eagle Creek, however additional sampling through underwater video, radio telemetry, and snorkeling would help answer this question. If late stock coho are found in Eagle Creek, reproductive success / genetics studies would be valuable as well. (cohoHGMP, P. 41)
- Current brood stock goal is 4,000 fish, averaging 50% female. (cohoHGMP, P. 40)
- 4,000 proposed annual brood stock collection level, assuming equal numbers of males and females (maximum number of adult fish). (cohoHGMP, P. 7)
- There are no wild coho salmon currently used for Eagle Creek NFH production. (cohoHGMP, P. 40)
- Returns to the hatchery are used for hatchery production of early coho. If numbers of returning brood stock are insufficient to meet the hatchery production goals, the coho production may be achieved using Sandy River, Big Creek, Bonneville, Toutle River, or Willard stocks, depending upon availability and fish health concerns. (cohoHGMP, P. 40)
- The original stock of coho salmon used at Eagle Creek NFH was a combination of Sandy, Toutle, and Big Creek stocks. (cohoHGMP, P. 40)
- Fish health policy mandates that non-Eagle Creek stocks come from adults individually certified as virus-free. (cohoHGMP, P. 40)

2. Adult collection procedures and holding.

- Fish enter the spawning facility volitionally via a fish ladder below an electric weir. Fish are trapped in the collection pond, which is 80 ft. x 120 ft. x 5 ft. with sloping sides. (cohoHGMP, P. 38)
- Adult fish can be moved using a 400 gallon fish tank, hauled by 1 ton pick-up truck. (cohoHGMP, P. 39)

- Brood holding facilities include the collection pond and a 10 ft. x 120 ft. x 3 ft. holding channel. (cohoHGMP, P. 39)

3. Adult spawning.

a. Spawning protocols.

- Fish are moved from the collection pond using a mechanical crowder, crowding fish into a water lift . Then fish slide down a tube into the holding channel. A mechanical crowder moves fish into a brail lift that transfers fish into the carbon dioxide anesthetic tank where fish are sorted. (cohoHGMP, P. 39)
- Fish not ready to spawn are returned to the holding channel. (cohoHGMP, P. 39)
- Ripe fish are handled on aluminum spawning racks. (cohoHGMP, P. 39)
- If more fish return to the hatchery than are needed for brood stock, excess fish are randomly selected and removed throughout the run. (cohoHGMP, P. 42)
- Eagle Creek NFH coho are spawned randomly over entire run, from ripe fish on selected days over a 3 to 4 week period. (cohoHGMP, P. 43)

b. No. of males and females spawned each year over past 10 years (Table)

- 4,000 adult coho and 50% female. (cohoHGMP, P. 42)
- Brood stock collection levels for the last twelve years (e.g. 1988-99), or for most recent years available: (cohoHGMP, P. 42)

Year	Adults Spawned			Eggs	Juveniles
	Females	Males	Jacks		
1988	646	550			
1989	405	391			
1990	452	486	8		
1991	1317	1257			
1992	1539	1461			
1993	190	209			
1994	937	886	161		
1995	1396	1191			
1996	717	665			
1997	585	621			
1998	2315	2260			

Year	Adults Spawned			Eggs	Juveniles
	Females	Males	Jacks		
1999	2795	2782			
2000	1728	1707			
2001	1715	1696	31		

Data source: USFWS Columbia River information System (CRiS), Vancouver, WA

4. Fertilization.

a. Protocols.

- Fish are randomly selected and spawned at a 2:2 male to female ratio. [\(cohoHGMP, P. 41\)](#)
- Coho Jacks are spawned at 1% of the spawning population. [\(cohoHGMP, P. 41\)](#)
- Excess eggs are either destroyed or transferred for use in other programs where acceptable. [\(cohoHGMP, P. 41\)](#)
- Fish are randomly spawned throughout run. [\(cohoHGMP, P. 41\)](#)
- If short of males, the hatchery will use males more than once as needed. [\(cohoHGMP, P. 41\)](#)
- 2:2 individual matings, 1% saline solution used to enhance fertilization, ovarian fluid is drained. [\(cohoHGMP, P. 43\)](#)
- Cryopreservation is not used at Eagle Creek NFH. [\(cohoHGMP, P. 43\)](#)

b. Number of eggs collected and fertilized each year over past 10 years (Table)

- Number of eggs taken and survival rates to eye-up and/or ponding. [\(cohoHGMP, P. 44\)](#)

Brood Year		Eggs Taken	Eyed	On-Feed ⁶	Released ⁷
92	#	2,694,220	2,531,105	2,494,665	980,327
	%		94	93	
93	#	486,992	463,258	461,260	987,877
	%		95	95	
94	#	2,664,780	2,238,979	2,093,958	996,618
	%		84	79	

⁶ Accounts for number of eggs and unfed fry discarded, shipped, and mortality (from CRiS Egg Summary report).

Percent survival is cumulative from eggs taken to # on-feed.

⁷ The number transferred in and out will need to be accounted for before calculating survival from # on-feed to # released (from CRiS SR80s distribution report), but is generally about 90% (IHOT 1996).

Brood Year		Eggs Taken	Eyed	On-Feed ⁶	Released ⁷
95	#	3,796,721	3,596,253	3,505,572	769,509
	%		95	92	
96	#	2,075,656	1,982,719	1,974,024	1,010,044
	%		96	95	
97	#	1,768,593	1,681,597	1,672,928	1,147,711
	%		95	95	
98	#	6,501,558	5,632,381	2,600,005	1,006,688
	%		95	88	
99	#	9,191,106	8,802,790	2,654,769	1,423,854
	%		96	87	
00	#	5,580,332	5,333,899	1,949,485	1,016,642
	%		96	88	

- Extra eggs may be taken to safeguard against potential incubation losses and short falls at other facilities. Excess eggs are fed to trout saved for “kids fishing day”. ([cohoHGMP, P. 45](#))

5. Incubation.

- Incubation is done in the nursery building. ([cohoHGMP, P. 39](#))
- There are 38 vertical 16-tray incubators with flow set initially to 3 gpm and raised to 4 gpm after hatching. ([cohoHGMP, P. 39](#))
- Water use is primarily from Eagle Creek. It is screened and filtered by a gravel bed before incubation. ([cohoHGMP, P. 39](#))
- Water temperature is monitored using thermograph probes and recorded. Temperature during incubation ranges from 32° F with typical temperatures around 42° F. ([cohoHGMP, P. 45](#))
- Dissolved oxygen levels are not regularly monitored, but have been tested and found to be at saturation. ([cohoHGMP, P. 45](#))
- Eggs are placed into incubation trays at four females (approximately 10,000-12,000 eggs) per tray. ([cohoHGMP, P. 45](#))

- At eye-up, bad eggs are removed, the remaining eggs are enumerated, then placed back into trays at a rate of 7,000-9,000 eggs per tray. Initial water flows are set at 3 gpm and increased to 4 gpm at hatch. These loading densities have been found to be the best management practice at Eagle Creek NFH to control abrasion to the yolk sac and subsequently control disease. [\(cohoHGMP, P. 45\)](#)
- Eggs are treated daily with 1,667 ppm formalin for fifteen minutes to control fungus. Formalin is dispensed using a delivery system ensuring proper dilution and timing. [\(cohoHGMP, P. 39\)](#)
- The installation of egg isolation units has been proposed to prevent potential disease transmission from eggs transported from outside the facility to Eagle Creek stocks. [\(cohoHGMP, P. 39\)](#)

6. Ponding.

a. Protocols.

- Swim-up coho salmon fry are ponded directly into 8 ft. x 80 ft. x 2 ft. raceways through release size. [\(cohoHGMP, P. 39\)](#)
- Temperature readings are taken using thermograph probes which take readings continuously. Temperatures in the raceways range from 32 ° F to 65 ° F for the containment of coho salmon. [\(cohoHGMP, P. 46\)](#)
- Mortalities are removed daily, recorded, and deducted from raceway inventory. [\(cohoHGMP, P. 46\)](#)
- Raceways are cleaned with a broom while effluent water is drained to a pollution abatement pond. Cleaning is performed as needed but no less than once a week. [\(cohoHGMP, P. 46\)](#)
- Dissolved oxygen, carbon dioxide and total gas pressure have not been regularly monitored, is not considered a problem, and is measured periodically, as necessary. [\(cohoHGMP, P. 46\)](#)
- Fish are reared on creek gravity flow water. [\(cohoHGMP, P. 46\)](#)

b. Number of fry ponded each year, including % hatch each year.

7. Rearing/feeding protocols.

- Swim-up coho salmon fry are ponded directly into 8 ft. x 80 ft. x 2 ft. raceways through release size. [\(cohoHGMP, P. 39\)](#)
- In late fall, the fish are moved to the volitional release pond (converted adult collection pond) for the remainder of containment and volitionally released. [\(cohoHGMP, P. 39\)](#)
- Coho scheduled for transfer are reared and kept in raceways until transported by other agencies. [\(cohoHGMP, P. 39\)](#)
- The raceways are set initially at 300 gpm and raised to 500 gpm when the fish reach 450 fish per pound. [\(cohoHGMP, P. 39\)](#)
- Current production goals are to have a final density index of below 0.54 and a flow index of no higher than 1.5 (Piper et al., 1982, Banks et al 1992). Maximum density and loading criteria are for maximum loadings of 8 lbs/gpm or 3.25 lbs/cu. ft. [\(cohoHGMP, P. 46\)](#)

8. Fish growth profiles.

- The fish are fed Bio Diet Starter, 1.0 mm to 1.5 mm grower, and Silver Cup Slow Sinking Salmon Diet, 2.0-3.0 mm, by hand until 45 fish per pound. After that, demand hoppers are used. The feeding ration follows manufacturer recommendations, except in December and January when no feeding is done. Overall conversions are around 1.0. ([cohoHGMP, P. 47](#))
- End of Month Growth Parameters for ECNFH Coho Brood Year 2001. ([cohoHGMP, P. 47](#))

Month	Length	#/lb	Condition Factor C	Conversion	Density Index	Flow Index
March	1.3	1275	.00035	0.85	0.06	0.25
April	1.8	472		0.88	0.12	0.49
May	2.3	225		0.93	0.20	*0.56
June	2.9	116		1.00	0.30	0.73
July	3.4	72		1.10	**0.17	** 0.42
Aug.	4.0	45		1.15	0.23	0.29
Sept.	4.6	30		1.17	0.30	0.75
Oct.	5.0	23		1.20	0.36	0.90
Nov.	5.4	18		1.20	0.43	1.06
Dec.	5.4	18		0	0.43	1.06
Jan.	5.4	18		0	0.43	1.06
Feb.	5.4	18		0	0.43	1.06
Mar.	5.7	15		1.22	0.48	***1.08
April	6.0	13	.00035	1.22	0.53	1.19

Fish were volitionally released by May 15th.

Data extrapolated from Lot History Production for Brood Year 2001 Coho Salmon.

* Increased water flows from 300 gpm to 500 gpm.

** Split raceway fish numbers

*** Increased water flows by 10%

9. Fish health.

- Fish health and disease prevention is managed in accordance with the U.S. Fish and Wildlife Service’s Fish Health Policy, the “Policy and Procedures for Columbia Basin Anadromous Salmonid Hatcheries” (IHOT 1995), and protocols of Oregon. ([cohoHGMP, P. 40](#))
- Any health problems are managed promptly by fish health personnel to limit mortality and reduce disease transmission. ([cohoHGMP, P. 40](#))

- The Eagle Creek coho juveniles and adults remain free of the regulated pathogens (viruses and *Myxobolus cerebralis*). No offspring from virus-positive brood stock are allowed on station. (cohoHGMP, P. 40)
- Eagle Creek NFH is classified as a virus-free facility so adult fish from facilities with a history of virus are not allowed on station. (cohoHGMP, P. 40)
- Fish health policy mandates that non-Eagle Creek stocks come from adults individually certified as virus-free. (cohoHGMP, P. 40)

10. Chemotherapeutant use.

11. Tagging and marking of juveniles.

- Nearly all (95%) on-station releases of coho are mass marked (adipose clipped) for the purpose of selective fisheries management. An additional 5% are coded-wire tag only fish to assess selective fisheries. (cohoHGMP, P. 24)
- All hatchery releases from Eagle Creek are externally marked with either fin clip and/or internal coded-wire tag. (cohoHGMP, P. 41)
- All coho released into Eagle Creek are marked and/or tagged, depending on fin clip and tag quality control, in the following proportions: (cohoHGMP, P. 51)
 - Adipose fin clip only = 90%
 - Adipose fin clip plus coded-wire tag = 5%
 - Coded-wire tag only = 5%

12. Fish Release.

a. Protocols.

- Coho yearlings are volitionally released on-station at approximately 12 fish/lb. Those remaining at the end of the volitional release period are forced out (generally less than 2% of total production). (cohoHGMP, P. 48)
- Fish are volitionally released directly into Eagle Creek. (cohoHGMP, P. 39)
- Coho smolts are volitionally released from the hatchery into Eagle Creek, March through May, at approximately 12 to 14 fish/lb. Those remaining at the end of the volitional release period are forced out (generally less than 2% of total production). (cohoHGMP, P. 50)
- Specific location(s) of proposed release(s). (cohoHGMP, P. 49)

Stream, river, or watercourse: On-Station Release into Eagle Creek

Release point: Eagle Creek, Rkm 16, 46°16'34" N Lat. And 122°12'04" W Long.

Major watershed: Clackamas, Oregon

Basin or Region: Lower Willamette and Columbia Rivers

Stream, river, or watercourse: Lower Columbia River

Release point: Transfer to Lower Columbia River CEDC net pens, Astoria, OR
Major watershed: Lower Columbia River
Basin or Region: Lower Columbia River

Stream, river, or watercourse: Clearwater River

Release point: Transfer to Nez Perce Tribe Clearwater River, Idaho
Major watershed: Snake River
Basin or Region: Columbia River

- b. Number of fish released each year (subyearlings?; yearlings?; other?)
- o Proposed annual fish release levels (maximum number) by life stage and location. (cohoHGMP, P. 7)

Life Stage	Release Location	Annual Release Level
Eyed Eggs	Transfer to Nez Perce Tribe (Clearwater River)	600,000 to 800,000
	Transfer to State of Idaho	700,000
	Transfer to Oregon (STEP)	5,000
Unfed Fry		
Fry		
Fingerling		
Yearling	On-station release	500,000 March through May
	Transfer to Clearwater River, ID for Nez Perce Tribe	550,000 in March
	Transfer to lower Columbia River	500,000 to CEDC in April
	CEDC net pens	500,000 to CEDC in May

- Actual numbers and sizes of fish released by age class through the program. Eagle Creek NFH coho releases in Eagle Creek. (cohoHGMP, P. 49-50)

Release year	Eggs/ Unfed Fry	Avg size	Fry	Avg size	Fingerling	Avg size	Yearling	Avg size
1988					159,396	171/lb.	1,006,329	18/lb.
1989							1,052,382	16/lb.
1990							1,012,793	13/lb.
1991					26,440	230/lb.	1,199,000	15/lb.

Release year	Eggs/ Unfed Fry	Avg size	Fry	Avg size	Fingerling	Avg size	Yearling	Avg size
1992							1,087,346	16/lb.
1993							1,060,888	14/lb.
1994							980,327	14/lb.
1995							987,877	11/lb.
1996							996,618	14/lb.
1997							769,509	13/lb.
1998							1,010,044	11/lb.
1999							1,147,711	13/lb.
2000							1,006,688	12/lb
2001							711,927	14/lb.
2002							508,321	13/lb.
Average							969,184	14/lb.

Data source: USFWS Columbia River information System (CRiS), Vancouver, WA 11/19/02

D. Program benefits and performance.

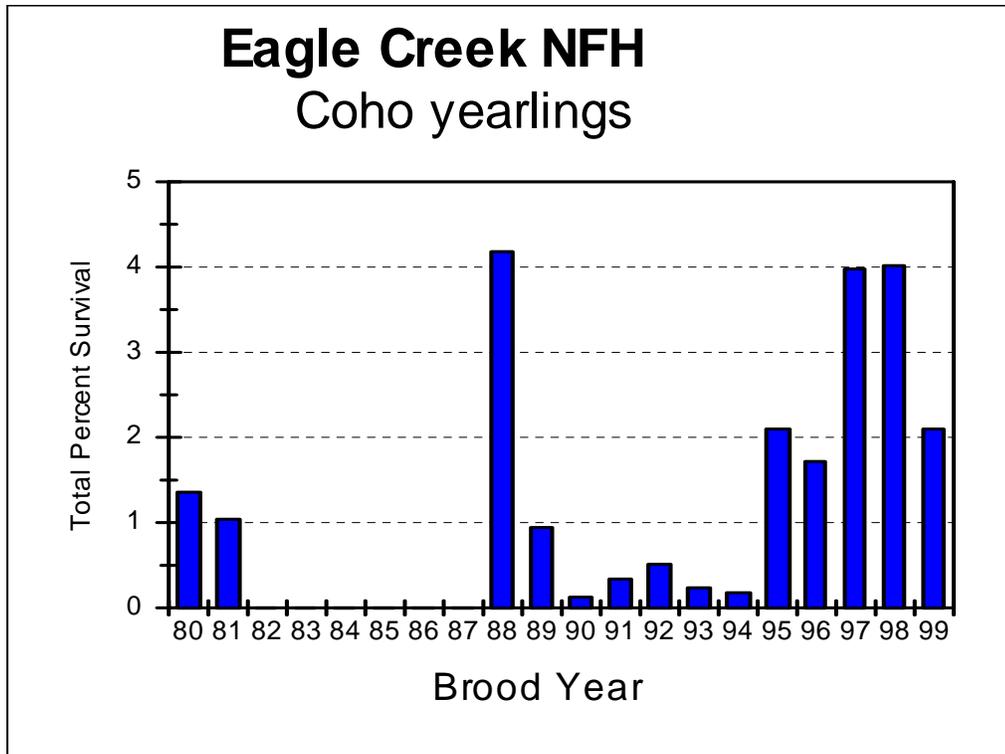
1. Adult returns.

- a. Numbers of adult returns (need data for the past 10-20 years).
 - o Range 1,246-33,106 (1997-2001) ([cohoHGMP, P. 8](#))
- b. Return timing and age-class structure of adults.
 - On average, 8% of Eagle Creek's coho have returned as two year old male jacks, and 92% as three year old adults. ([ECNFHupdate, P. 2](#))
 - c. Smolt-to-adult return rates.
 - Survival for Eagle Creek NFH coho salmon averages 1.4% of the total number of fish released for the brood years 1988 through 2001. ([ECNFHupdate, P. 3](#))

Returns to Eagle Creek NFH from Coho released in Eagle Creek as yearlings								CRIS\SME 07/19/20
BY	Number Released	Returns to the Hatchery					Total	Return %
		Age 2	Age 3	Age 4	Age 5	Age 6		
80	929,274	1,027	1,875				2,902	0.312
81	573,512	105	2,166				2,271	0.396
82	1,030,354	239	4,461				4,700	0.456
83	1,022,505	998	13,394				14,392	1.408
84	970,229	1,200	2,105				3,305	0.341
85	805,821	434	2,892				3,326	0.413
86	1,006,329	928	9,165				10,093	1.003
87	1,052,382	863	1,314				2,177	0.207
88	1,012,793	1,897	5,724				7,621	0.752
89	1,199,000	689	3,435				4,124	0.344
90	1,087,346	369	575				944	0.087
91	1,060,888	34	2,795				2,829	0.267
92	980,327	337	2,853				3,190	0.325
93	987,877	258	1,564				1,822	0.184
94	996,618	101	1,246				1,347	0.135
95	769,509	579	12,612				13,191	1.714
96	1,010,044	1,214	11,779				12,993	1.286
97	1,147,711	945	33,106				34,051	2.967
98	1,006,688	5,440	30,146				35,586	3.535
99	711,927	863	6,326				7,189	1.010
00	508,321	1,086	4,808				5,894	1.160
01	505,400	879	7,776				8,655	1.713
02	557,016	567	8,921				9,488	1.703
03	524,356	1,020					1,020	0.195
(age 3 > 0)								
Number		915	7,436					
Average %		15%	85%					0.944

c. Smolt-to-adult return rates.

<u>Measures</u>	<u>Hatchery Goal:</u>	<u>Average</u>	<u>Range</u>
Percent Survival (cohoHGMP, P. 8)			
Smolt to Hatchery	0.8%	0.85%	0.09-3.54%
Smolt to Hatchery + Harvest	2%	1.20%	0.12-2.10%



- No coded-wire tags were released in brood years 1982 through 1987.
- BY1988: Nearly 300,000 Eagle Creek coho were released from the Sandy Hatchery, and these fish did not have a unique coded-wire tag. This is highest rate survival rate on record for Eagle Creek coho.
- BY1990: Only 31 observed recoveries and an overall survival rate of 0.1228% making this the lowest survival rate since coded-wire tagging has been done consistently.
- Brood year 1993 releases included both forced and volitional releases of Eagle Creek stock and Toutle stock coho.
- Brood year 1995 was the first brood year at Eagle Creek in which coho production was “mass marked” with an adipose fin clip. A small number of fish were not adipose fin clipped, but received a coded-wire tag.
- The estimate of survival for brood year 1998 is a near record 4.0163%. Only brood year 1988 is higher. However, ODFW recoveries for this brood year are not in the most recently down loaded data set.

d. Stock productivity (e.g. recruits per spawner).

2. Contributions to harvest and utilization (e.g. food banks).

- Eagle Creek NFH produces fish for on-station release, produces coho salmon for use in Oregon’s Youngs Bay Net Pen Program, for restoration goals on Tribal lands, and other programs as requested and agreed through U.S. v Oregon forums. The production program for on-station release and

Youngs Bay are specifically targeted for selective fisheries and not natural supplementation. (cohoHGMP, P. 24)

- Eagle Creek coho contribute to ocean commercial and sport fisheries; in-river main stem sport and commercial fisheries; and terminal area sport fisheries. (cohoHGMP, P. 24)
- Weak stock management restrictions directed at other coho stocks along with jeopardy standard restrictions for Snake River wild fall chinook and wild Group B steelhead effectively keep coho fishery impacts at low levels relative to very high harvest rates in past fisheries. (cohoHGMP, P. 24)
- Carcasses have been utilized by the Warm Springs and Yakama Indian Reservations. If available, fish are also distributed to suppliers for federal prisons. (cohoHGMP, P. 43)
- Adult coho salmon carcasses have been distributed by the state and U.S. Forest Service for stream enrichment. There is minimal concern for disease transmission as the fish are historically negative for virus and *Myxobolus cerebralis* and have a low incidence and level of bacterial kidney disease. (cohoHGMP, P. 43)
- Recoveries of coded-wire tagged coho salmon from Eagle Creek National Fish Hatchery (Pastor 2002). (cohoHGMP, P. 24)

Table . Hatchery escapement, Columbia River harvest, and ocean harvest for Eagle Creek NFH coho salmon brood years 1979-2000. The total adult production number given includes all estimated sport, tribal, and commercial harvest of Eagle Creek NFH fish. Data presented in this table are calculated from coded-wire tag recovery information in the 2004 Annual Stock Assessment Report (Stephen M. Pastor USFWS). From draft Comprehensive Hatchery Management Plan, July 2006

Brood Year	National Fish Hatchery	Columbia River	Ocean
Escapement	Harvest	Harvest	
1979	2,219	1,124	24,779
1980	1,728	187	10,673
1981	1,601	1,589	2,782
1988	7,589	8,909	25,826
1989	4,332	823	6,156

1990	429	310	596
1991	3,267	205	137
1992	3,696	215	1,109
1993	1,867	121	358
1994	1,423	66	263
1995	14,031	1,052	1,078
1996	13,229	1,566	2,549
1997	39,181	1,214	5,255
1998	21,898	8,525	9,965
1999	12,682	1,352	883
2000	7,207	452	524

Notes: Mass marking was implemented in brood year 1995 to present.

This table accounts for most coded-wire tag recoveries, i.e. homing to Eagle Creek is estimated at 99.9% (Pastor 2004), with very few recoveries at other hatcheries or on spawning grounds.

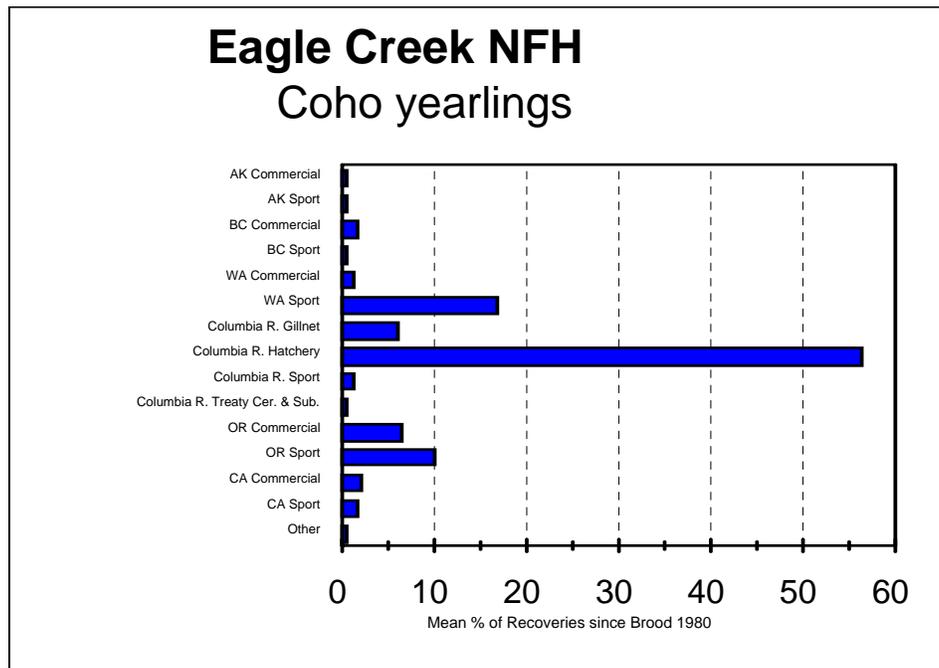


Fig. XX. Mean percent recoveries of CWTs for adult Eagle Creek hatchery coho to fisheries and hatchery, 1980-1999, excluding BY1982-1987 when no fish were CWTs were released.

3. Contributions to conservation.

- Production releases of Eagle Creek coho are not expected to add adverse effects to listed species or other stocks of concern from a harvest

management perspective beyond those currently allowable under non-jeopardy biological opinions for harvest. (cohoHGMP, P. 24)

- Eagle Creek’s coho production program for restoration efforts on Tribal lands include (cohoHGMP, P. 7)

Life Stage	Release Location	Annual Release Level
Eyed Eggs	Transfer to Nez Perce Tribe (Clearwater River)	600,000 to 800,000
	Transfer to State of Idaho	700,000
	Transfer to Oregon (STEP)	5,000
Fingerling		
Yearling	Transfer to Clearwater River, ID for Nez Perce Tribe	550,000 in March

4. Other benefits.

E. Research, monitoring, and evaluation programs.

- The Service has developed monitoring and evaluation programs to determine the extent of ecological interactions between fish released from the hatchery and wild fish populations in the Eagle Creek subbasin. For example, the migration timing of hatchery juveniles released volitionally in the spring was determined using radio-telemetry. A monitoring program is in place to (1) determine the movement and behavior of adult hatchery fish using radio telemetry; and (2) estimate the reproductive success and contribution to smolt production of hatchery fish using genetic analyses. (ECNFHupdate, P. 2)
- A proportion of returning adults are sampled at the hatchery for biological information. Sex and length are recorded and scales are collected so that age can be determined. Fish are also sampled for coded-wire tags implanted in the snouts of fish during juvenile rearing. By using sample information and the number of returning fish, it is possible to calculate the number of returning fish for each age group and, consequently, the number of fish returning from each brood year or release year. (ECNFHupdate, P. 2)
- Reports on various hatchery evaluations and monitoring programs can be found on the web at: <http://www.fws.gov/pacific/columbiariver/> (ECNFHupdate, P. 2)

F. Program conflicts.

1. Biological conflicts (e.g. propagated stock maladapted to hatchery water source).

- More research is needed to assess the impacts of both hatchery releases and natural

spawning coho and winter steelhead on wild steelhead in Eagle Creek. To help guide hatchery operations. ([ECNFHupdate, P. 2](#))

- The hatchery stock at Eagle Creek is early-run. The wild indigenous stock is considered late-run. There are no known late-run wild coho regularly returning to Eagle Creek, however additional sampling through underwater video, radio telemetry, and snorkeling would help answer this question. If late stock coho are found in Eagle Creek, reproductive success / genetics studies would be valuable as well. ([cohoHGMP, P. 41](#))

2. Harvest conflicts (e.g. mixed stock fishery on hatchery and wild fish limits harvest opportunities on hatchery fish).

- The number of fish returning from a hatchery release is influenced by early rearing at the hatchery, downstream migration, ocean conditions, and the harvest rate in the various fisheries. ([ECNFHupdate, P. 2](#))

3. Conservation conflicts (e.g. competition between unlisted hatchery fish and ESA-listed wild fish).

- The hatchery strives to produce functional smolts which survive and quickly migrate to the ocean. From the analysis presented in Section 3.5 of this document, hatchery operations will not adversely affect listed species in the watershed. However, additional studies on the behavior of hatchery and wild fish in Eagle Creek would be helpful for assessing risk (Pearsons and Hopley 1999) and provide information for future production management decisions. ([cohoHGMP, P. 51](#))

4. Other conflicts between the hatchery program, or fish produced by the program, and other non-hatchery issues.

References

CoHGMP -- HATCHERY AND GENETIC MANAGEMENT PLAN
(HGMP) Eagle Creek National Fish Hatchery, Coho Salmon, 84 pages.

ECNFHupdate -- Hatchery Update -- Eagle Creek National Fish Hatchery, 3 pages.
(http://www.fws.gov/columbiariver/pdffdocs/hatchery/ecnfh_update_2005.pdf)

StHGMP -- HATCHERY AND GENETIC MANAGEMENT PLAN
(HGMP), Eagle Creek National Fish Hatchery, Winter Steelhead Trout. 79 pages.