HATCHERY AND GENETIC MANAGEMENT PLAN (HGMP)

Hatchery Program:	Eagle Creek National Fish Hatchery
Species or Hatchery Stock:	Coho Salmon
Agency/Operator:	United States Fish and Wildlife Service
Watershed and Region:	Clackamas River, Oregon Lower Willamette and Columbia rivers
Date Submitted:	05/06/2004
Date Last Updated:	05/06/2004

SECTION 1. GENERAL PROGRAM DESCRIPTION

1.1) Name of hatchery or program.
Eagle Creek National Fish Hatchery

1.2) Species and population (or stock) under propagation, and ESA status.
coho salmon (*Oncorhynchus kisutch*), non-listed hatchery stock

1.3) Responsible organization and individuals

Name (and title): Rich Johnson (Fish and Wildlife Administrator)
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Name (and title): Douglas Dysart (Hatchery Manager)
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Other agencies, Tribes, co-operators, or organizations involved, including contractors, and extent of involvement in the program:

- U.S. Fish and Wildlife Service, Columbia River Fisheries Program Office (CRFPO), technical support/hatchery assessment/production coordination
- U.S. Fish and Wildlife Service, Lower Columbia River Fish Health Center (LCRFHC), fish health technical assistance
- Oregon Department of Fish and Wildlife, fisheries management
- National Marine Fisheries Service (NOAA Fisheries), Mitchell Act funding and ESA
- Yakama Nation, tribal restoration program management
- Nez Perce tribal restoration program management
- Bonneville Power Administration (tribal program support)
- Clatsop County Economic Development Council (CEDC), Youngs Bay net pen program in cooperation with ODFW.

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

The funding source for the Eagle Creek National Fish Hatchery (NFH) is through Mitchell Act funding, administered by the National Marine Fisheries Service. 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.

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.

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

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).

1.6) Type of program.

- Isolated Harvest (Lower Columbia River)
- Integrated Recovery (tribal restoration programs)

1.7) Purpose (Goal) 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.

1.8) Justification for the program.

Legal Justification:

- 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. 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.

1.9) List of program "Performance Standards".

See table in section 1.10.

1.10) List of program "Performance Indicators", designated by "benefits" and "risks."

1.10.1) "Performance Indicators" addressing benefits.

	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.
Assure that hatchery operations support Columbia River Fish Management Plan (U.S. v Oregon) 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 US v Oregon 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.

	Benefits	
Performance Standard	**Performance Indicator**	**Monitoring and Evaluation**
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 US v Oregon 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, NOAA Fisheries, Yakama Nation, Nez Perce Tribe, BLM, USFS, CEDC, and PGE.	Develop technical reports for PAC and TAC. Hold hatchery evaluation team meetings each spring to review progress.
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.

1.10.2) "Performance Indicators" addressing risks.
(*e.g. "Evaluate predation effects on listed fish resulting from hatchery fish releases."*).

	Risks	
Performance Standard	**Performance Indicator**	**Monitoring and Evaluation**
Minimize impacts to ESA listed and other native species, their habitat, and the environment.	Hatchery operations comply with all state and federal regulations and Biological Opinions. Hatchery juveniles are raised to smolt-size (12-15 fish/lb) and released from the hatchery to expedite migration through Eagle Creek, Clackamas, Willamette, and Columbia rivers. Mass mark production fish to identify them from naturally produced fish (except 25K CWT group).	As identified in federal and state permits and Biological Opinions: Size at release, mass mark quality. Additional Service projects pending (straying, risk assessment, instream evaluations of juvenile and adult behavior, fish health).
Artificial production facilities are operated in compliance with all applicable fish health guidelines, facility operation standards, and protocols including IHOT, USFWS Fish Health Policy, state fish health requirements, and drug usage mandates from the Federal and Drug Administration.	Hatchery goal is to prevent the introduction, amplification, or spread of fish pathogens that might negatively affect the health of both hatchery and naturally reproducing stocks and to produce healthy smolts that will contribute to the goals of Eagle Creek NFH.	Pathologists from the Lower Columbia River Fish Health Center will examine the fish once per month to ascertain health. Exams performed at each life stage include tests for virus, bacteria, parasites and/or pathological changes, as needed.
Effluent from artificial production facility will not detrimentally affect natural populations	Raceway cleaning effluent is sent to a pollution abatement pond where solids are removed prior to discharge.	Cleaning effluent and total discharge (normal operation) effluent are monitored weekly during high biomass quarters for suspended and settleable solids.

	Risks	
Performance Standard	**Performance Indicator**	**Monitoring and Evaluation**
Water withdrawals and instream water diversion structures for artificial production facility operation will not affect spawning behavior of natural populations or impact juvenile rearing environment.	The primary water source, Eagle Creek, is not accessible to anadromous fish upstream of the hatchery because of a natural falls. Hatchery intake meets screening criteria.	All fish entering the hatchery are documented.
Hatchery operations comply with ESA responsibilities.	Hatchery conducts section 7 consultations and completes an HGMP. Federal and State permits are issued when applicable.	Identified in HGMP and Biological Opinion for hatchery operations.
Harvest of hatchery-produced fish minimizes impact to wild populations.	Harvest is regulated to meet appropriate biological assessment criteria. Mass mark juvenile hatchery fish prior to release to enable state agencies to implement selective fisheries.	Harvest is monitored by state and tribal agencies to meet biological opinion on fisheries.

1.11) Expected size of program.

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

4,000 proposed annual brood stock collection level, assuming equal numbers of males and females (maximum number of adult fish).

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

Life Stage	Release Location	Annual Release Level
Eyed Eggs	Transfer to Nez Perce Tribe (Clearwater River) Transfer to State of Idaho Transfer to Oregon (STEP)	600,000 to 800,000 700,000 5,000
Unfed Fry		
Fry		
Fingerling		

Life Stage	Release Location	Annual Release Level
Yearling	On-station release Transfer to Clearwater River, ID for Nez Perce Tribe Transfer to lower Columbia River CEDC net pens	500,000 March through May 550,000 in March 500,000 to CEDC in April 500,000 to CEDC in May

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

See also discussion in Section 3.3.1 of this report.

Performance Standards for Coho Salmon at Eagle Creek National Fish Hatchery
M*odified from IHOT (1996):*

Measures	Hatchery Goal:	Average	Range	Comment
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. CRiS\SMP\Cohort.prg 09/19/2002

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.

1.13) Date program started (years in operation), or is expected to start: 1956

1.14) Expected duration of program. On-going.

1.15) Watersheds targeted by program.

Eagle Creek is the watershed targeted by this program. Eagle Creek NFH is at Rkm 16 on Eagle Creek, (46°16'34" N Lat. and 122°12'04" W Long. , pers. comm. Steve Vigg, NMFS) 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, per the PIT tag database, PTAGIS, http://www.psmfc.org/pittag/Data_and_Reports/index.html

Clearwater River a tributary of the Snake River is the target area for the tribal restoration program, which will be covered under a separate HGMP.

Transfer of fish to lower Columbia River CEDC net pens for terminal area fisheries near Youngs Bay, Astoria, Oregon, which will be covered under a separate HGMP.

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

1.16.1) Brief Overview of Key Issues

Mitigation. 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).

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.

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.

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.

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.

1.16.2) Potential Alternatives to the Current Program

Dam Removal. Mainstem Columbia River and Snake River Dam removal to restore habitat has been considered but is not currently regarded as a realistic alternative. Refer to the Federal Columbia River Power System Biological Opinion on the subject.

Restore CEDC Mitchell Act Production Funding. Reductions in Mitchell Act funding have resulted in reductions in hatchery production programs. Recent reductions will eliminate the transfer of one million smolts to the CEDC on the lower Columbia River. Funding will need to be restored in order to restart the CEDC program.

Marking. The Service has not made any unilateral decisions on marking but has undertaken actions to comply with ESA Biological Opinions. The Service will continue to coordinate actions with the states and tribes through U.S. v Oregon and NOAA Fisheries to comply with ESA actions and coordinate with the Pacific States Marine Fisheries Commission mark committee. In addition, the federal agencies are beginning discussion of a comprehensive marking strategy for the Columbia River Basin as identified by Action 174-1in the Federal Columbia River Power System Biological Opinion. The federal agencies (NOAA Fisheries lead) are meeting with the states and tribes to begin this effort.

This comprehensive marking plan should:
a) improve our ability to assess and monitor the status of naturally-producing (especially ESA listed) populations
b) monitor and evaluate hatchery programs, including hatchery reforms and stray rates
c) maintain critical harvest management and stock assessment information
d) monitor mark-selective fishery regimes established by the states
e) improve regional and watershed based marking decisions
f) be consistent with recovery plan goals
g) be coordinated through U.S. v Oregon, Pacific States Marine Fisheries Commission and U.S. - Canada forums

Downstream Migration Timing and Ecological Interactions. A pilot project was initiated in 2003 to determine if radio telemetry could be used to test the assumption that juvenile fish migrate quickly into the mainstem Columbia River migration corridor en route to the ocean. The pilot project was successful and this technique would provide additional, valuable information on the timing of emigration. Radio tagging hatchery fish along with in-stream sampling could also provide valuable information on ecological interactions between hatchery and wild fish. Hatchery rearing and release strategies may be modified to lessen impact on threatened and native fish, depending on the results. The Service provided funding for this project in 2004, with work anticipated through 2008 (see Research – Section 12 of this HGMP).

Upstream Migration and Ecological Interactions. Underwater video monitoring of passage along with radio tagging and tracking adult fish in Eagle Creek (from the lower ladder) would provide valuable information on run timing, natural production, and final

destination of hatchery and wild fish. This project would help assess ecological impact of hatchery operations, with operations modified to lessen impact, depending on the results. It would also be advantageous to begin collecting genetic samples from the naturally spawning populations of coho salmon for comparison with samples from Eagle Creek NFH. The Service provided funding for this project in 2004, with work anticipated through 2008 (see Research – Section 12 of this HGMP).

Integrated Production with the Clackamas Stocks. The current hatchery program does not involve the production of native Clackamas River Basin anadromous stocks of spring Chinook, late coho, late winter steelhead or sea-run cutthroat trout. Except for the cutthroat trout, the hatchery has reared all these stocks/species in the past, but current production requests by ODFW do not include them. By request of ODFW, Columbia Regional Office, and supported by the NOAA Fisheries, the rearing of spring Chinook and late winter steelhead is being handled by the Clackamas SFH and the rearing of early coho and early winter steelhead is done at the Eagle Creek NFH. The rearing of late coho is currently on hold, as per ODFW request, and neither facility is involved in the rearing of sea-run cutthroat trout. Production decisions for the watershed need to be made through the subbasin planning process and U.S. v Oregon co-managers. Production changes would most likely require substantial funding.

1.16.3) Potential Reforms and Investments

- Sufficient Annual Funding for Hatchery Operations $$$$ (< $600,000)
- Marking (annual) $$ (< $100,000)
- Infrastructure & Chillers for native stock rearing $$$ (< $500,000)
- Additional O&M for native stock rearing $$ (< $100,000)

SECTION 2. PROGRAM EFFECTS ON NMFS ESA-LISTED SALMONID POPULATIONS. (USFWS ESA-Listed Salmonid Species and Non-Salmonid Species are addressed in Addendum A)

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

- 1999 Biological Opinion on Hatchery Operations in the Columbia River.
- 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).

- Lower Columbia River Coho Endangered Species Management Plan, Oregon Fish and Wildlife Commission, July 2002.

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

2.2.1) <u>Description of NMFS ESA-listed salmonid population(s) affected by the program.</u>

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

No NMFS ESA-listed populations will be directly affected by Eagle Creek National Fish Hatchery.

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

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:

- 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]

[a] Note: Although not Federally listed, 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.

2.2.2) Status of NMFS ESA-listed salmonid population(s) affected by the program.[1]

*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.

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).

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.

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.

From April 12 through May 30, 2000 the hatchery staff operated a “V” trap in the lower ladder of Eagle Creek located downstream from the mouth of the North Fork of Eagle Creek. Sampling was completed by the USFWS to document the number of wild and hatchery steelhead passing the site and collect tissue samples (partial fin clip preserved in alcohol) for genetic analysis. A total of 88 unmarked wild and 17 marked hatchery fish were observed over the time period sampled. The unmarked wild fish plus three other groups were analyzed by Don Campton, USFWS Regional Geneticist. The other three groups examined were ODFW Clackamas hatchery F1 X wild crosses, Eagle Creek NFH,

[1] Information was extracted primarily from the Biological Assessment for Eagle Creek barrier replacement project for Eagle Creek National Fish Hatchery, May 15, 2002 prepared by Ellis Ecological Services for the U.S. Fish and Wildlife Service (USFWS 2002).

and ODFW Big Creek hatchery, with 60 samples taken from each group. Looking at data from 19 loci, all four groups were distinct from each other, with no two groups the same (information presented at hatchery coordination meeting, 02/22/01).

Within the Eagle Creek watershed, native winter-run steelhead spawn primarily in the North Fork of Eagle Creek, the lower 0.3 miles of Bear Creek, and in the lower two miles of Little Eagle Creek (USFS 1995). No spawning survey data was found pertaining to the main stem of Eagle Creek, however, suitable spawning habitat may be present in Delph Creek (a tributary of Eagle Creek) and main stem Eagle Creek downstream of the hatchery. Native winter-run steelhead begin spawning in April with peak spawning occurring in May. Spawning is completed by mid-June (ODFW 1992).

In the Clackamas River subbasin, juvenile winter steelhead fry emerge primarily in May and June and rear in freshwater from one to three years before out-migrating to the estuary or ocean in the spring of their second or third year (ODFW 1992). Screw trap data collected on Fish Creek in the upper Clackamas River basin indicate that a percentage of juvenile steelhead parr rear during the summertime in the main stem Clackamas River or in the reservoir complex. Others remain in their natal tributary (Everest et al. 1986). On Fish Creek, underyearling (age 0+) steelhead trout were found to make use of riffles, pools, side-channels and alcoves. Age 1+ steelhead trout were found to rear in these same habitat types as well as in beaver ponds. The availability and quality of quiet stream margins in late spring and early summer was found to be a key habitat need for post-emergent steelhead fry (Everest et al. 1986).

The timing and number of juvenile steelhead (fry and parr) as well as smolts moving downstream from North Fork Eagle Creek is monitored by the Pacific Northwest Research Station (PNW) via five-foot rotary screw traps (Strobel and Hansen 2001; Lumianski 2000). North Fork Eagle Creek enters Eagle Creek downstream of the hatchery and supports wild runs of native winter steelhead (USFS 1995). In 2000, it was estimated that a total of 5,822 steelhead juvenile migrants (fry and parr) left North Fork Eagle Creek compared to 8,162 in 1999. Peak capture date for juvenile steelhead was May 31 and May 6 in 1999 and 2000, respectively (Strobel and Hansen 2001; Lumianski 2000). The mean length of steelhead parr and fry was 99.6 mm and 100.6 mm in 1999 and 2000, respectively. An unknown percentage of these migrating juveniles would be expected to rear in the main stem Eagle Creek throughout the summer.

Juvenile steelhead smolt in the spring and emigrate downstream in March through June (ODFW 1992). In 2000, screw traps were operated on the North Fork Eagle Creek from March 17 through June 14. The 2000 steelhead smolt population estimate for North Fork Eagle Creek was 2,248, about 40 percent below the 1999 estimate (3,750) and approximately 10 percent below the mean for all estimates since 1998 (Strobel and Hansen 2001). In 2000, outmigrating smolts were collected from March 17 through June 8, with the greatest number of outmigrating steelhead smolts being captured between March 31 and May 11. In 2000, the peak capture date occurred on April 9 (Strobel and Hansen 2001), while in 1999 the peak capture date was May 24 (Lumianski 2000). The mean length of outmigrating steelhead smolts was 157.6 mm and 155.7 mm fork length

(FL) in 1999 and 2000, respectively. Steelhead smolts from this ESU are predominately 2+ years of age and typically move rapidly downstream to the ocean (Busby et al. 1996).

Lower Columbia River Chinook Salmon ESU (Threatened Species)

Status: The lower Columbia River Chinook salmon ESU was listed threatened on March 24, 1999. According to NMFS (63 FR 14307), production in this ESU appears to be predominantly hatchery-driven with few identifiable naturally spawned populations. The apparently healthy population in the Lewis River is the single exception. Long- and short-term trends in abundance of individual populations are mostly negative, some severely so. About half the populations comprising this ESU are very small. In the Williamette River Basin, a single small population of fall chinook that spawns in the lower main stem Clackamas River represents the Lower Columbia River Chinook ESU.

Both fall-run and spring-run stocks of chinook salmon are included in this ESU. The fall run is predominant. The majority of the fall run chinook salmon are called "tules" and are distinguished by their dark skin coloration and advanced state of maturation at the time of freshwater entry. The lower Clackamas River population consists of these early run "tules" and is thought to originate from hatchery stock first released into the Clackamas subbasin in 1952 (ODFW 1992).

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.

Use of the Action Area: Fall chinook salmon are not known to use Eagle Creek due to passage constraints created by low water conditions at the mouth and lower falls during adult migration periods (Dysart pers. comm. 2002). Specific information on adult run timing for native fall chinook in the Clackamas River subbasin was not available but is thought to be similar to passage timing of adults at Willamette Falls. In 1999, adult fall Chinook passed over Willamette Falls from mid-August through late September with peak passage from early to mid-September (Foster 2001).

Native fall chinook are thought to spawn in the lower main stem Clackamas River (below River Mill Dam and in the lower reaches of Clear Creek, a tributary to the Clackamas River; ODFW 1992). On the Clackamas River, fall chinook spawn from mid-September through early October (Foster 2001). The estimated fall chinook run to the Clackamas River subbasin averaged 840 fish annually from 1981 to 1991 (ODFW 1992).

Juvenile fall chinook salmon generally emigrate to the ocean as subyearling fish (age 0+). Subyearling fall chinook may outmigrate almost immediately as fry (<50 mm FL), while others may rear for 60 to 150 days before beginning emigrating to the ocean as fingerlings (50-120 mm FL) in the late summer or early fall (Healy 1991). It is assumed that juvenile chinook salmon from this ESU may be present in the Clackamas River

subbasin after emerging from the gravel in winter until outmigrating in March through June.

Upper Willamette River Chinook Salmon ESU (Threatened Species)

Status: The upper Willamette River spring chinook salmon was listed as a threatened species on March 24, 1999 (NMFS 2002). This ESU includes all naturally spawned populations of spring-run chinook salmon in the Clackamas River and in the Willamette River, and its tributaries, above Willamette Falls. Historically, five major basins produced upper Willamette spring chinook including the Clackamas, North Santiam, South Santiam, McKenzie and Middle Fork Willamette (ODFW 2001). Today, it is estimated that the McKenzie River accounts for about half of the natural production of spring chinook in the entire Willamette River basin and the Clackamas River accounts for about 20 percent of the natural production (ODFW 2001).

ODFW (2001) has defined a critical threshold of 300 spawners per year for the Clackamas spring chinook population. The interim Willamette Basin Plan escapement goal for the Clackamas subbasin plan is 2,900. Currently, the Clackamas wild population of spring chinook salmon appears to exceed critical and interim thresholds for abundance and productivity during recent years.

In 1999, ODFW (Foster 2001) estimated that 8,300 spring chinook entering the Willamette River were bound for the Clackamas River. Counts at the North Fork Dam (RM 31.0) provide an index of spawning escapement. In 1999, of the 8,300 spring chinook entering the Clackamas River, 988 were thought to be natural spawners, 888 of which were counted at the North Fork Dam. This was the lowest natural escapement above North Fork Dam since 1979. The ten-year (1989-99) average adult spring chinook escapement above North Fork Dam is 2,500 fish. In 2000, however, 2,277 adult spring chinook passed over the North Fork Dam. Spring chinook are also produced at the Clackamas Hatchery (RM 23) located on Dog Creek in McIver Park. Hatchery and wild fish cannot be distinguished until 2002 when all returning hatchery fish will be marked (ODFW 2001).

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.

Use of the Action Area: Adults of this ESU generally enter freshwater in spring, several months prior to spawning in the fall, and are usually associated with early timed runs of fish (Myers et al. 1998). Most upper Willamette River spring chinook adults return at age four and five with a small percentage returning in their third or sixth years (Foster 2001). The larger age-five fish enter the Willamette River earlier than do the smaller age-four fish.

The return of adult upper Willamette River spring chinook salmon to the Clackamas

River is monitored by Portland General Electric (PGE) at the North Fork Dam. Adults start moving over the dam in May and June with the peak occurring in July, August and September. The run continues through October with generally only a few adults ascending the dam in November (ODFW 1992; Taylor 1999). Because these fish hold downstream of North Fork Dam, run timing as observed at the dam is delayed in comparison to Eagle Creek. Adult spring chinook returning to spawn in Eagle Creek or its tributaries would be expected to hold in Eagle Creek starting in May until fall when they spawn in late August through October.

Intensive spawning surveys were conducted by ODFW (King et al. 2000) in the Clackamas River basin from 1996 through 1998 to document the timing, distribution and abundance of natural spawning. These surveys found that an average of 85 percent of the spring Chinook redds were deposited in the main stem Clackamas River above the North Fork Dam, with about 15 percent being deposited in tributaries above the dam. Spring Chinook also spawn downstream of the North Fork Dam on the Clackamas River but at much lower numbers. Surveys in 1998 estimated that the lower Clackamas River below River Mill Dam accounted for 11% of the total redds deposited (King et al. 2000); Eagle Creek was not surveyed. On the upper Clackamas River, spring Chinook salmon generally begin spawning in late August, with peak spawning activity occurring in September and October (Taylor 1999). Spawning historically occurred in Eagle Creek (King et al. 2000) and would also be expected to start in August and continue through October.

The upper Willamette River spring-run chinook salmon (including the Clackamas River spring chinook) remain one of the most genetically distinctive populations of chinook salmon in the Columbia Basin and have characteristics of both stream and ocean-type chinook salmon. Smolt emigration occurs in fall as young-of-the-year and in spring as age-1 fish (NMFS 2000). Juvenile spring chinook salmon (age 0+) would be expected to rear in Eagle Creek throughout the year. An unknown percentage of juveniles (age 0+) may move downstream to the Clackamas River during the summertime and then back upstream into their natal tributary to over winter (Everest et al. 1986). Some fall migrants (age 1+) may continue to rear in the lower Clackamas and Willamette Rivers until the following spring before emigrating to the ocean.

In 1999, a total of 113 salmonid fry (< 50 mm FL) were collected from mid-March to mid-June at the North Fork Eagle Creek screw trap and only one of these was identified as being a juvenile chinook salmon (Lumianski 2000). In 2000, a total of 275 salmonid fry were collected from the North Fork Eagle Creek by screw trap. None of these were identified as being juvenile chinook salmon in the report (Strobel and Hansen 2001).

The number of spring chinook smolts out-migrating from the Clackamas River has been monitored since 1959 by PGE at their North Fork Dam fish facility (King et al. 2000). In 1999, a total of 4,305 juveniles passed over the North Fork Dam, compared to the 10-year (1989-98) average of 13,600. Peak downstream movement of naturally produced juveniles past the North Fork Dam is in May. In 1999, 2,336 wild spring chinook juveniles (54 percent) passed over the dam in May. A second out-migration of the wild

smolts occurs in October and November (ODFW 1992). Outmigration timing for juvenile spring Chinook smolts on Eagle Creek is expected to follow the same pattern as found on the Clackamas River.

Lower Columbia River/Southwest Washington Coho Salmon (Candidate Species) [1]

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.

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

[1] Although not Federally listed, 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.

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 though 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).

2.2.3) <u>Describe hatchery activities, including associated monitoring and evaluation and research programs, that may lead to the take of NMFS listed fish in the target area, and provide estimated annual levels of take</u> *(see "Attachment 1" for definition of "take")***.**

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

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. It is feasible for the fish to ascend Eagle Creek to the hatchery, but no adult fish have been collected at the hatchery during the spawning of hatchery winter steelhead or seen in the proximity of the hatchery in the spring. In 1990, 1991, and 1992 a handful of steelhead were recorded entering the hatchery in September, October, and November. Based on appearance of the fish, they were recorded as summer steelhead (Doug Dysart, personal communication).

Adverse hatchery effects on listed steelhead would primarily be caused by the operation of the electric weir at the entrance to the adult collection pond. However, the weir is not operational from the third week of March until the middle of September making the weir a passable, non-lethal barrier during the period of time that late winter adults may be found in the area.

No take of listed steelhead is anticipated. If a take for this species occurs, trapping operations for early winter steelhead will be reduced to compensate for the arrival of late winter steelhead.

No take of listed Chinook salmon is anticipated. Spring Chinook salmon were produced and released from Eagle Creek NFH from the start of production in 1958 through brood year 1991. Since stopping the program, a handful of spring Chinook adults are still observed or recovered at the hatchery rack (King et al. 2000 – Table 4). Since brood year 1996, ODFW has mass marked all hatchery raised spring Chinook in the Willamette watershed, including Clackamas hatchery, with either an adipose fin clip, adipose fin clip plus coded-wire tag, or code-wire tag only (ODFW 2001). In the unusual event that unmarked "listed" Chinook enter the hatchery, the fish will be placed in a temporary holding pond and NMFS (Rich Turner, 503-736-4737 phone) and ODFW (Jim Muck, 503-657-2000 phone) will be contacted for further directions.

The primary State of Oregon listed species potentially affected by hatchery operations is late Clackamas coho salmon (not federally listed). Take of State of Oregon listed late-stock coho salmon is possible, but minimal, during brood stock operations for hatchery coho salmon and winter steelhead.

Returning early run hatchery coho salmon are collected for brood stock at the hatchery rack in Eagle Creek, September through November. Spawning operations typically occur October through November, with the peak typically in late October. With 95% of all

hatchery coho salmon now marked before release into Eagle Creek, any unmarked fish returning to the facility are likely from Eagle Creek stock that escaped marking during the juvenile fin-clipping operation. Also some coho juveniles (between 25,000 and 50,000) at the hatchery are tagged with a coded-wire tag but not fin clipped (double index mark). Fish missing an adipose fin do not necessarily equate to a wild fish. Wild coho populations in the upper Clackamas watershed (state-listed) are late returning coho salmon which primarily pass the North Fork Dam from November through March and peak in January (ODFW 1992). Spawning operations at the hatchery are nearing completion for coho salmon when late-run coho potentially begin their return to the upper Clackamas River. While hatchery brood stock collection for early run winter steelhead, December to early March, coincides with late returning coho salmon, documentation of later returning coho salmon at the hatchery is rare.

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

No known take of NMFS-ESA listed fish occurred during operation of Eagle Creek NFH coho salmon production.

The documentation is not clear on whether the fish were "wild" late returning coho, but records from 1993 indicate that 15 males and 13 females returned on December 13, 1993 with an additional 16 males returning on December 22, 1993. Because late run wild coho are currently listed under the State of Oregon's Endangered Species Act, the disposition of any late run coho which now return to Eagle Creek NFH will be determined by the ODFW District Biologist, Jim Muck, (503) 657-2000, phone.

- **Provide projected annual take levels for listed fish by life stage (juvenile and adult) quantified (to the extent feasible) by the type of take resulting from the hatchery program (e.g. capture, handling, tagging, injury, or lethal take).**
*Complete the appended "take table" (**Table 1**) for this purpose. Provide a range of potential take numbers to account for alternate or "worst case" scenarios.*

No known take of NMFS-ESA listed fish will occur during operation of Eagle Creek NFH coho salmon production. In the unusual event that a late run, NMFS listed winter steelhead enters the hatchery, the Service has shown one listed steelhead as potential take (Table 1 Take Table).

In the unusual event that a State of Oregon listed coho salmon enters the hatchery, the Service has shown one state listed coho as potential take (Table 1 Take Table).

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

No take of NMFS-ESA listed fish is expected during operation of Eagle Creek NFH coho salmon production. However, in the unusual event that unmarked "listed" steelhead enter the hatchery, the fish will be placed in a temporary holding pond and NMFS (Rich Turner, 503-736-4737 phone) and ODFW (Jim Muck, 503-657-2000 phone) will be contacted for further directions.

Because late run wild coho are listed under the State of Oregon's Endangered Species Act, the disposition of any late run coho which return to Eagle Creek NFH will be determined by the ODFW District Biologist (Jim Muck, 503-657-2000 phone).

Furthermore, as part of our regular sampling program, fish killed for brood stock or surplus to production will be sampled for species identification, marks, age, sex, and tag recovery. Scales from fish that are unmarked and not tagged will be examined to determine if they are hatchery or naturally produced.

SECTION 3. RELATIONSHIP OF PROGRAM TO OTHER MANAGEMENT OBJECTIVES

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

Production of coho salmon from Eagle Creek National Fish Hatchery is consistent with:

- 1999 Biological Opinion on Columbia River hatcheries
- 2000 Biological Opinions on the Federal Columbia River Power System
- 1999 NPPC Artificial Production Review
- 2002 U.S. v Oregon Management Agreement for Upper Columbia River Fall Chinook, Steelhead and Coho
- 2001 Oregon Fish and Wildlife Commission, Lower Columbia River Coho Endangered Species Management Plan

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

Eagle Creek NFH was authorized under the Mitchell Act and operates under the auspices of the Columbia River Fish Management Plan (CRFMP) of *U.S. v Oregon*. It produces fish for on-station release and also produces coho salmon for use in Oregon's Youngs Bay Net Pen Program and for restoration goals on Tribal lands. Eagle Creek's coho production program for tribal restoration efforts is defined in the 2002 Management Agreement for the Upper Columbia River fall chinook, steelhead, and coho salmon. Even though the CRFMP has officially expired, production programs at many Columbia Basin

facilities, including Eagle Creek NFH, are still guided by the production section of the former plan. The CRFMP is currently being renegotiated. Eagle Creek NFH operates in compliance of the ESA, 1999 hatchery Biological Opinion (NMFS 1999a).

3.3) Relationship to harvest objectives.

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. Eagle Creek coho contribute to ocean commercial and sport fisheries; in-river main stem sport and commercial fisheries; and terminal area sport fisheries. West coast ocean fisheries are managed to achieve Oregon coastal natural coho stock limitations with an exploitation rate less than 15 percent. The Salmon Technical Team projected an 8.7 percent exploitation rate for the Oregon coastal natural coho stock in 1999 fisheries (PFMC 1999). In addition, the State of Oregon listed Clackamas wild coho as an endangered species in 1999 and have subsequently proposed a harvest management matrix based on abundance and marine survival (Oregon Fish and Wildlife Commission 2001)[1]. These 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. Therefore, 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. The 1999 fall season harvest biological opinion determined that fisheries managed to stay within the Snake River wild fall chinook and wild Group B steelhead jeopardy standards would not jeopardize any of the other listed species (NMFS 1999b).

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. Eagle Creek's coho production program for restoration efforts on Tribal lands is defined in Table 4 of the 2002 Management Agreement (U.S. v Oregon) for the Upper Columbia River fall chinook, steelhead, and coho salmon.

3.3.1) Describe fisheries benefiting from the program, and indicate harvest levels and rates for program-origin fish for the last twelve years (1988-99), if available. [2]

[1] Full seeding as used in the harvest matrix model was defined as 3,800 wild coho salmon spawners for the Clackamas population upstream of North Fork Dam (Oregon Fish and Wildlife Commission 2001).

[2] This information was extracted from the U.S. Fish and Wildlife Service's Annual Stock Assessment Report (Pastor 2002) and is a chronological history of survival (Figure 1) and recovery (Figure 2) from coded-wire tag studies of

Brood year 1980 survival rate was 1.3546%, and brood year 1981 survival was 1.0413%. Oregon ocean fisheries took nearly four times more fish than Washington ocean fisheries in brood year 1980. Brood year 1981 had an almost even spilt between the two fisheries.

No coded-wire tags were released in brood years 1982-1987.

The estimated total recovery from brood year 1988 was 42,345 fish, or 4.181%, the highest rate on record. This brood year contributed 11,340 fish to the Oregon ocean, and 8,930 fish to the Columbia River fisheries.

The 1989 brood year coho survival rate was 0.9446%, about one quarter of the very high 4.181% survival rate of brood year 1988 coho. Over 3,800 of the coho from this brood year were caught off the Oregon coast in the sport and commercial fisheries. Eighteen hundred were harvested in the ocean off Washington, and 200 off California. Over 200 fish were taken in British Columbia. Eight hundred twenty were also harvested in the Columbia River.

Brood year 1990 coho has a total of 31 observed recoveries and an overall survival rate of 0.1228%. Fish from Big Creek and Sandy were released along with Eagle Creek fish this year. Fewer than 600 fish were taken in the ocean, and 310 in the Columbia River. Five hundred of the ocean recoveries were reported by WDFW. The remaining 96 were split evenly between Oregon and California. Coded-wire tagged returns to the hatchery were estimated to be less than the ocean harvest of this brood year.

Total survival rate for brood year 1991 coho is now estimated to be 0.3402%. Fish from the ODFW Sandy hatchery were released this year. Only 137 fish were harvested in the ocean (91 by British Columbia and 46 by Washington), and 205 in the Columbia River. Escapement to the hatchery was about 3,300 fish. Although this brood year did better than the 1990 fish, it was much less successful than 1980, 1981, 1988 or 1989.

Brood year 1992 survival rate is estimated at 0.4758%, an improvement over the previous two broods, but still below average for broods in the 1980s. Escapement to the hatchery made up the largest segment of fish recovered, as was also the case for brood year 1991. Washington ocean fisheries took 750 fish and Oregon ocean fisheries harvested 277 fish. An additional 197 fish were taken in the Columbia River.

Brood year 1993 releases included both forced and volitional releases of Eagle Creek stock and Toutle stock coho. Expansion of individual coded-wire tags rather than using a PEF yields a total survival of 0.2375%. There were an estimated 121 recoveries in the Columbia River, and 358 in the ocean off of British Columbia and Washington.

Total survival for brood year 1994 was even lower at 0.1758%. WDFW reported ocean recoveries result in an ocean harvest of 263 fish, with 66 fish harvested in the Columbia

River estuary sport fishery.

Brood year 1995 was the first brood year in which all fish were adipose fin clipped. Prior to this brood year, only fish with a coded-wire tag were adipose fin clipped. A small number of fish were not adipose fin clipped, but received a coded-wire tag. Since externally marked fish may be harvested at a different rate than the unmarked fish, recoveries have been expanded for each coded-wire tag, rather than for a combined coded-wire tag. WDFW Columbia River estuary sport now has an additional 4 expanded recoveries. Survival is now estimated to be 2.1002%, the best since brood year 1988.

The addition of 14 expanded recoveries in the ODFW reported Columbia River estuary sport fishery increases total survival for Eagle Creek brood year 1996 coho to 1.6924%. Two thousand five hundred forty-nine fish were harvested in the ocean, and 1,316 were taken in the Columbia River.

The first estimate of survival for brood year 1997 is 1.8075%.[1] Only brood years 1995 and 1988 were higher. Over 5,200 fish were harvested in the ocean, almost equally divided between Oregon and Washington.

[1] 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.

Figure 1. Survival of Eagle Creek coho salmon from yearling release to adult recovery, including both off and on station recoveries, 1980 to 1996 brood years (Pastor 2002).

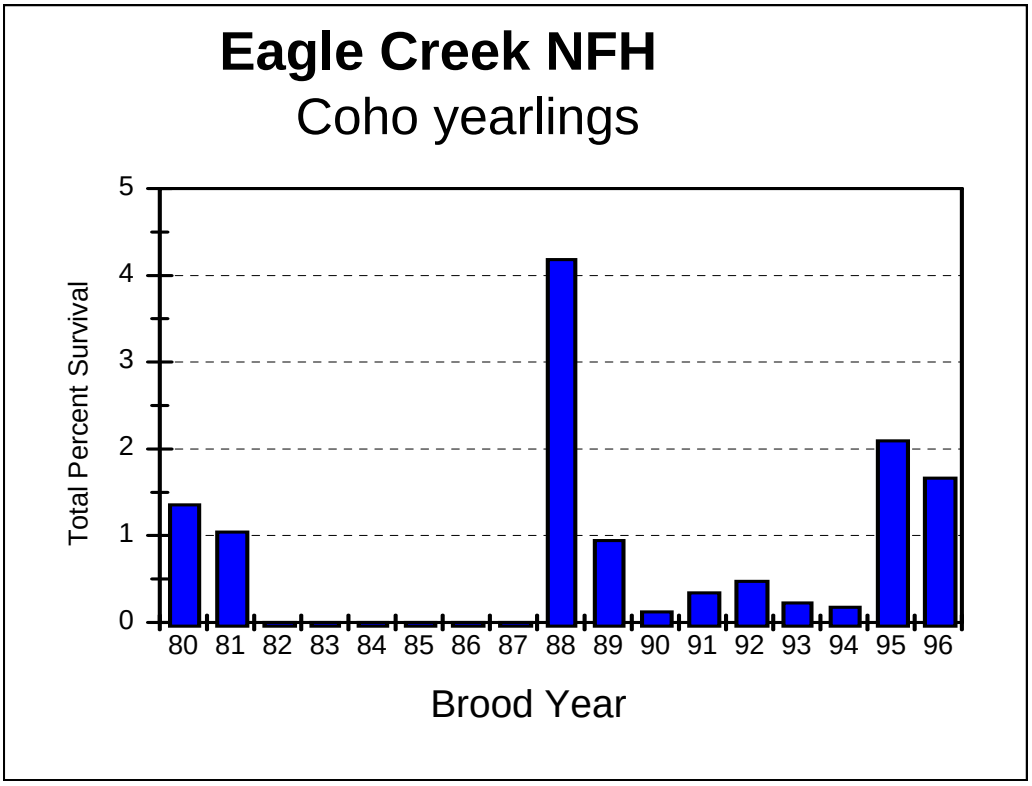
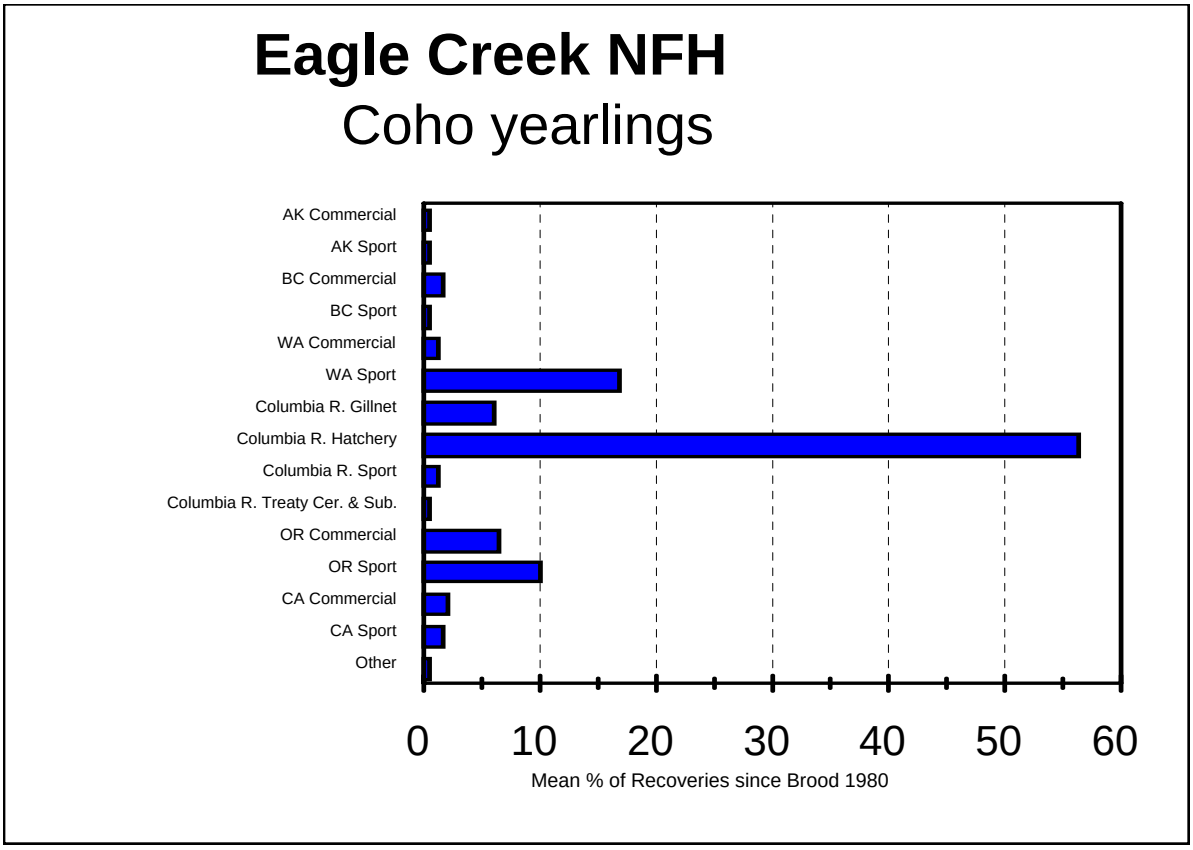


Figure 2. Recoveries of coded-wire tagged coho salmon from Eagle Creek National Fish Hatchery (Pastor 2002).[1]



[1] Columbia River gillnet fishery includes both tribal and non-tribal fisheries.

3.4) Relationship to habitat protection and recovery strategies.

As previously stated in Section 1.7, the purpose of the coho salmon program at Eagle Creek NFH is to 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.

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.

3.5) Ecological interactions. [Please review Addendum A on additional information for USFWS jurisdictional species.]

Salmonid and non-salmonid fishes or other species that could:

1) negatively impact program;

A variety of freshwater and marine predators such as northern pikeminnows, Caspian terns, and pinnipeds, can significantly reduce overall survival rates of program fish. Predation by northern pikeminnow poses a high risk of significant negative impacts on the productivity of hatchery fish (SWIG 1984). Based on PIT tags recovered at a large Caspian tern nesting colony on Rice Island, a dredge material disposal island in the Columbia river estuary, 6-25 million of the estimated 100 million out-migrating juvenile salmonids reaching the estuary were consumed by the terns in 1997 (Roby, et al. 1997). The Fish Passage Center (Berggren 1999) estimates, from about 57,000 PIT tag recoveries from Rice Island, that through 1991, about 0.2% of all PIT tagged fish released into the Columbia River showed up on Rice Island. That percentage had increased by a factor of ten by the 1997 and 1998 juvenile salmonid out-migrations, with hatchery and wild steelhead having been the most effected by the increased predation. A NMFS Working Group (NMFS 1997) determined that California sea lion and Pacific harbor seal populations in the three west coast states have risen by 5-7% annually since the mid-1970s. Their predation on salmonids may now constitute an additional factor on salmonid population declines and can effect recovery of depressed populations in some situations.

In 2001, whirling disease was detected in the rainbow trout kept on river water at a private hatchery on Clear Creek in the lower Clackamas River Basin. Pathologists of

Oregon Department of Fish and Wildlife determined that this most likely originated from straying adult steelhead that had shortcut their return journey to the Grande Ronde/Snake River Basins where the causative parasite is endemic. It is possible that this parasite could be introduced further upriver to Eagle Creek if carried by infected stray steelhead or other animals, such as birds.

2) be negatively impacted by program;

Co-occurring natural salmon and steelhead populations in local tributary areas and the Columbia River mainstem corridor areas could be negatively impacted by program fish. Of primary concern are the ESA listed endangered and threatened salmonids: Snake River fall-run chinook salmon ESU (threatened); Snake River spring/summer-run chinook salmon ESU (threatened); Lower Columbia River chinook salmon ESU (threatened); Upper Willamette River chinook salmon ESU (threatened); Upper Columbia River spring-run chinook salmon ESU (endangered); Columbia River chum salmon ESU (threatened); Snake River sockeye salmon ESU (endangered); Upper Columbia River steelhead ESU (endangered); Snake River Basin steelhead ESU (threatened); Lower Columbia River steelhead ESU (threatened); Upper Willamette River steelhead ESU (threatened); Middle Columbia River steelhead ESU (threatened); and the Columbia River distinct population segment of bull trout (threatened). An additional concern is the Southwestern Washington/Columbia River coastal cutthroat trout, pacific lamprey, and State of Oregon listed coho. See the ecological interactions discussion below.

3) positively impact program;

Returning chinook and other salmonid species that naturally spawn in the target stream and surrounding production areas may positively impact program fish. Decaying carcasses may contribute nutrients that increase productivity of the overall system.

4) be positively impacted by program;

A host of freshwater and marine species that depend on salmonids as a nutrient and food base may be positively impacted by program fish. The hatchery program may be filling an ecological niche in the freshwater and marine ecosystem. A large number of species are known to utilize juvenile and adult salmon as a nutrient and food base (Groot and Margolis 1991; and McNeil and Himsworth 1980). Pacific salmon carcasses are also important for nutrient input back to freshwater streams (Cederholm et al. 1999). Reductions and extinctions of wild populations of salmon could reduce overall ecosystem productivity. Because of this, hatchery production has the potential for playing an important role in population dynamics of predator-prey relationships and community ecology. The Service speculates that these relationships may be particularly important (as either ecological risks or benefits) in years of low productivity and shifting climactic cycles.

In addition, wild co-occurring salmonid populations might be benefited as schools of hatchery fish migrate through an area. The migrating hatchery fish may overwhelm predator populations, providing a protective effect to the co-occurring wild populations. See the ecological interactions discussion below.

Ecological Effects of Coho Salmon Hatchery Production:

Interactions between hatchery fish and other fish populations can have a negative effect on both total production from a watershed (through competition with naturally produced fish) and genetic integrity of wild fish (through crossbreeding). Specific hatchery practices such as fish size at release, time of release, acclimation, and the use of volitional release can all play a role in minimizing these interactions. For example, one important strategy for minimizing interactions is to rear fish to sufficient size so that smoltification occurs within nearly the entire population. This will help reduce the retention time in the downstream migration. Rearing smolts on parent river water can help reduce straying when they return as adults as well as increase their survival to adulthood. The use of volitional release can help ensure that only actively migrating fish are released from the hatchery pond. The specific rearing and release strategies used at this hatchery are detailed below.

Coho: Rear 500,000 fish to a yearling smolt size of 12 fish/pound and volitional release directly into Eagle Creek from March 15 to May 20. There are no fry released directly from this station into Eagle Creek.

The 1999 Biological Assessment for the Operation of Hatcheries funded by the National Marine Fisheries Service under the Columbia River Fisheries Development Program (NMFS 1999c) and the 1999 Biological Opinion on Artificial Propagation in the Columbia River Basin (NMFS 1999a) present a discussion of the potential effects of hatchery programs on listed salmon and steelhead populations. The reader is referred to the discussion in those documents.

Nine generalized types of effects that artificial propagation programs can have on listed salmon and steelhead populations were identified. These effects include: 1. Hatchery operation, 2. Brood stock collection, 3. Genetic introgression, 4. Hatchery production (density-dependent), 5. Disease, 6. Competition, 7. Predation, 8. Residualism, and 9. Migration corridor/ocean. Potential effects in these categories may apply to all hatchery programs to one degree or another depending on the particular program design.

A discussion of ecological interactions relative to the Eagle Creek NFH program follows:

1. Hatchery operation- Eagle Creek is the water source for the Eagle Creek NFH. 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. An impassable barrier (falls) just above the hatchery site precludes access to the watershed above the hatchery for anadromous species use.

2. Brood stock collection- Eagle Creek NFH coho production is an early run stock (see section 6 of this HGMP for brood stock history). An impassable falls above the hatchery precludes access of anadromous and fluvial species, however coho from Eagle Creek NFH are known to spawn below the hatchery. Their natural production success in Eagle Creek is unknown but assumed to be limited. Video monitoring, radio tagging, and genetic sampling of adult coho salmon at the lower ladder of Eagle Creek, downstream of North Fork Eagle Creek, would provide valuable information on adult immigration, natural spawning, and reproductive success. This information would supplement the information presently being collected by USDA Forest Service on juvenile outmigration.

From the USDA Forest Service sampling since 1997, naturally produced coho juveniles have been found in North Fork Eagle Creek. Whether these fish are naturalized early stock or late stock is undetermined at this time. Additional genetic sampling would be helpful. However, it is important to note that about 95% of juvenile coho production comes from the upper Clackamas watershed (Lumianski 1999).

Documentation of later returning coho salmon at the hatchery is rare, however, records from 1993 indicate that 15 males and 13 females returned on December 13, 1993 with an additional 16 males returning on December 22, 1993. Because late run wild coho are currently listed under the State of Oregon's Endangered Species Act, the disposition of any late run coho which now return to Eagle Creek NFH will be determined by the ODFW District Biologist, Jim Muck, (503)657-2000, phone.

Spring Chinook salmon were produced and released from Eagle Creek NFH from the start of production in 1958 through brood year 1991. Since stopping the program, a handful of spring Chinook adults are still observed or recovered at the hatchery rack. Since brood year 1997, ODFW has mass marked all hatchery raised spring Chinook in the Clackamas watershed with either an adipose fin clip, adipose fin clip plus coded-wire tag, or code-wire tag only (Craig Foster, ODFW, personal communication). In the unusual event that unmarked "listed" Chinook enter the hatchery, the fish will be placed in a temporary holding pond and NMFS (Rich Turner, 503-736-4737 phone) and ODFW (Jim Muck, 503-657-2000 phone) will be contacted for further directions.

All fish that enter the hatchery are identified to species and enumerated, with recognizable marks and final disposition noted. All wild fish will be returned to Eagle Creek when possible. The data is recorded into the USFWS Columbia River information System's fish removal file as our permanent record.

3. Genetic introgression- Eagle Creek hatchery (early) coho, returning in September through November and spawning in October and November, are not known to contribute to a significant straying problem. The number of recoveries of Eagle Creek NFH adults straying to areas outside of Eagle Creek and the hatchery is low. For example, for brood year 1996, 13,229 coho returned to Eagle Creek NFH with another 20 estimated recoveries from another hatchery in Washington, with all other recoveries reported as harvest (CRiS data report, 08/20/2002). Furthermore, Federal Mitchell Act funding cuts

has reduced the number of hatchery smolts released from Eagle Creek NFH from 1.0 million smolts in 1999 to 500,000 smolts in 2002. Because of temporal and spatial separation between Eagle Creek early run (September through November) and Clackamas late run coho (November through March), genetic introgression between these stocks is also minimized. The area upstream of North Fork Dam is managed by ODFW as a "wild fish only" area. Current management operations at Eagle Creek NFH is consistent with hatchery management strategies identified in ODFW's Endangered Species Management Plan (Oregon Fish and Wildlife Commission 2001).

4. Hatchery production (density dependent effects)- Eagle Creek NFH on-station releases have been reduced from 1.0 million in 1999 to 500,000 smolts in 2002 . This reduction is expected to decrease any density dependent effects in the Clackamas or lower Columbia rivers. All hatchery production released on-station are marked to promote selective harvest while providing protection for wild stocks. Eagle Creek NFH production is typically released in March, April, and May under a volitional release strategy. Volitionally released fish, with a propensity to migrate, should reduce potential migration corridor effects as the fish migrate quickly out of the system. Potential effects are discussed in more detail in the subsequent sections on disease, competition, predation, residualism, and migration corridor/ocean.

5. Disease- Many of the disease concerns related to hatchery fish are based on old management styles that emphasized the release of large numbers of fish regardless of their health status. Since then, the desire to reduce disease has instigated better husbandry, including critical decreases in fish numbers to reduce crowding and stress that affects the resistance of salmonids to disease (Salonius and Iwama 1993; Schreck et al. 1993). Along with decreased densities and improved animal husbandry, advances in fish health care and adherence to federal and interagency fish health policies have significantly decreased the possibility of disease transmission from hatchery fish to wild/native fish.

Eagle Creek NFH, like other federal hatcheries, has improved management techniques resulting in healthy coho and steelhead. Over the years, lowered rearing densities have significantly reduced disease. Other factors also contribute to the general good health of the Eagle Creek stocks. A natural barrier waterfall safeguards the hatchery water supply from straying anadromous fish and the hatchery is located on a creek that encourages well-timed (and locally-adapted) runs, both important towards preventing disease transmission. Additionally, during their migrations from and to the hatchery, the Eagle Creek stocks apparently avoid some of the interactions or environmental conditions that induce post-hatchery infections (Traxler et al 1997). This may be why the Eagle Creek adults have returned only twice with virus (infectious hematopoietic necrosis virus in steelhead only, 1988 and 1966) in the history of the hatchery. Careful disinfection of the eggs and the fact that no anadromous fish or infected native fish reside in the water supply serve to prevent infection of the susceptible juveniles. Coho adults return with no virus and low levels of two bacterial pathogens so there is little or no vertical transmission of disease agents to pass onto their offspring (Fish Health Inspection

Reports, 1970 to present, USFWS Lower Columbia River Fish Health Center). Juvenile fish are affected by coldwater disease which is caused by naturally occurring water-borne bacteria, but this has been largely controlled by the adoption of reduced fish densities and improvements in egg incubation. If necessary, antibiotic treatments are used to control outbreaks of this disease, but the last treatment occurred in 1999 and recent infections have been managed through good husbandry and warming summer water temperatures. Other environmentally-induced pathogens, such as parasites, result in rare losses and have been easily controlled when they occurred. The Lower Columbia River Fish Health Center is located nearby so fish health sampling, diagnosis, and treatment are readily available as fish health issues arise.

As long as the Eagle Creek stocks remain healthy, there are few disease concerns to the wild/native fish. An important component to this are the USFWS Fish Health Policy and IHOT policies which prohibit the introduction of stocks from virus-positive adults into a station which is classified as virus-free. Thus, Eagle Creek NFH fish have never suffered the decimating and uncontrollable losses caused by virus and have therefore never posed a viral threat to wild/native fish. The policy requirements are especially appropriate to this facility where serial reuse of water makes it difficult to isolate stocks to prevent transmission of water-borne infections.

While fish managers largely understand the epidemiology of pathogens at each hatchery, the same cannot be said of wild fish. Recent studies suggest that the incidence of some pathogens in naturally spawning populations may be higher than in hatchery populations (Elliot and Pascho 1994). Indeed, *Renibacterium salmoninarum*, the causative agent of bacterial kidney disease (BKD), appears, in general, to be significantly more prevalent among wild smolts of spring/summer chinook salmon than hatchery smolts (Congleton et al. 1995; Elliot et al. 1997). Many biologists believe disease-related losses in naturally spawning populations often go undetected, and that the impact of disease is underestimated (Goede 1986; Steward and Bjornn 1990). In addition, although pathogens may cause significant post-release mortality in fish from some hatcheries, there is little evidence that hatchery origin fish routinely infect naturally produced salmon and steelhead in the Pacific Northwest (Enhancement Planning Team 1986; Foott et al. 2000; Steward and Bjornn 1990). Additional information on wild fish health has been collected since 1997 by the USFWS Fish Health Centers through the National Wild Fish Health Survey which is being conducted to better understand the health status of wild fish and to address the issues of disease interactions (http://wildfishsurvey.fws.gov). Recently, wild fish samples have been taken from above and below the Eagle Creek NFH to examine their health status.

Eagle Creek NFH, as do all federal hatcheries in the Columbia River Basin, takes extensive measures to control disease and release healthy fish. Because Eagle Creek juveniles are downstream of the major dams en route to the ocean, their fish are not subjected to the high density impacts and stresses of collection for transport and/or diversion through multiple bypass systems which can trigger disease transmission. In addition, Eagle Creek NFH on-station releases have been reduced from 1.0 million in 1999 to 500,000 smolts in 2002, further decreasing possible interactions with native fish

in the Clackamas or lower Columbia Rivers. As a consequence, direct infection of wild fish by Eagle Creek hatchery fish is minimized.

6. Competition- Salmon and steelhead smolts actively feed during their downstream migration (Becker 1973; Muir and Emmelt 1988; Sager and Glova 1988). Competition could occur where food supplies are inadequate for migrating salmon and steelhead. However, the degree to which smolt performance and survival are affected by insufficient food supplies is unknown (Muir and Coley 1994). On the other hand, the available data are more consistent with the alternative hypothesis that hatchery-produced smolts are at a competitive disadvantage relative to naturally produced fish in tributaries and free-flowing mainstem sections (Steward and Bjornn 1990).

The impacts from competition are assumed to be greatest in the spawning and nursery areas at points of highest density (release areas) and diminish as hatchery smolts disperse (USFWS 1994). Release of hatchery smolts that are physiologically ready to migrate is expected to minimize competitive interactions as they should quickly migrate from the release site. Eagle Creek NFH hatchery production is released into Eagle Creek at the hatchery site and it is assumed that they migrate quickly into the mainstem Clackamas and Columbia River migration corridor en route to the ocean. Additional sampling such as snorkel surveys, juvenile out-migrant trapping, and radio telemetry would provide valuable information on the timing of emigration and level of residualism. Because Eagle Creek NFH releases occur "low" in the Columbia Basin system relative to many other upriver programs, there is reduced opportunity for competitive interactions.

7. Predation- Juvenile coho salmon released from Eagle Creek NFH could potentially prey on other juvenile steelhead, coho, Chinook, rainbow or cutthroat trout fry in Eagle Creek and the lower Clackamas River. One study found that hatchery coho salmon have the ability to consume fall Chinook salmon juveniles between 40% to 46% of the coho's body length (Pearsons and Fritts 1999). Pearsons and Fritts (1999) reported comparable size preferences for hatchery steelhead trout from other studies as well. Two factors should minimize this predation potential: 1) The primary spawning and rearing areas for natural trout and steelhead populations of Clackamas River are in the upper Clackamas River basin, reducing the potential for significant impacts to listed species, and 2) Release of hatchery smolts that are physiologically ready to migrate is expected to minimize predator-prey interactions in Eagle Creek and the lower Clackamas River, as they should quickly migrate from the release site to ocean rearing.

Depending on species and population, hatchery smolts are often released at a size that is greater than their naturally-produced counterparts, which is true for Eagle Creek NFH releases. In addition, for species that typically smolt at one year of age or older (e.g. steelhead, spring chinook salmon), hatchery-origin smolts may displace younger year classes of naturally-produced fish from their territorial feeding areas. Both factors could lead to predation by hatchery fish on naturally produced fish, but these effects have not been extensively documented, nor are the effects consistent (Steward and Bjornn 1990).

It is assumed that Eagle Creek NFH (like most hatcheries) facilitates faster growth than the stream rearing environment resulting in larger smolts compared to natural migrants. Data on natural migrants from the North Fork of Eagle Creek supports this. Lumianski (1999) reported naturally produced juvenile coho captured in the North Fork of Eagle Creek. These fish averaged 111mm for smolts and 63 mm for juvenile migrants (about 35 and 185 fish per lb, respectively; from Piper et al. 1982, Table I-5). Hatchery coho smolts released from Eagle Creek NFH are averaging 12 fish per pound.

In general, the extent to which salmon and steelhead smolts of hatchery origin prey on fry from naturally reproducing populations is not known, particularly in the Columbia River basin. The available information - while limited - is consistent with the hypothesis that predation by hatchery-origin fish is, most likely, not a major source of mortality to naturally reproducing populations, at least in freshwater environments of the Columbia River basin (Enhancement Planning Team 1986). However, virtually no information exists regarding the potential for such interactions in the marine environment.

Releasing large numbers of hatchery fish may also lead to a shift in the density or behavior of non-salmonid predators, thus increasing predation on naturally reproducing populations. Conversely, large numbers of hatchery fish may mask or buffer the presence of naturally produced fish, thus providing sufficient distraction to allow natural juveniles to escape (Park 1993). Prey densities at which consumption rates are highest, such as northern pikeminnow in the tailraces of mainstem dams (Beamesderfer et al. 1996; Isaak and Bjornn 1996), have the greatest potential for adversely affecting the viability of naturally reproducing populations, similar to the effects of mixed fisheries on hatchery and wild fish. However, hatchery fish may be substantially more susceptible to predation than naturally produced fish, particularly at the juvenile and smolt stages (Piggins and Mills 1985; Olla et al. 1993).

Predation by birds and marine mammals (e.g. seals and sea lions) may also be significant source of mortality to juvenile salmonid fishes, but functional relationships between the abundance of smolts and rates of predation have not been demonstrated. Nevertheless, shorebirds, marine fish, and marine mammals can be significant predators of hatchery fish immediately below dams and in estuaries (Bayer 1986; Ruggerone 1986; Beamish et al. 1992; Park 1993). Unfortunately, the degree to which adding large numbers of hatchery smolts affects predation on naturally produced fish in the Columbia River estuary and marine environments is unknown, although many of the caveats associated with predation by northern pikeminnow in freshwater are true also for marine predators in saltwater.

As discussed above, Eagle Creek NFH releases may contribute to indirect predation effects on listed stocks by attracting predators (birds, fish, pinnipeds) and/or by providing a large forage base to sustain predator populations. On the other hand, a large mass of hatchery fish moving through an area may confuse or distract predators or have a "swamping" effect towards predators providing them prey that are more readily accessible than wild stocks thereby providing a beneficial effect to listed species. The presence of large numbers of hatchery fish may also alter the listed species behavioral

patterns, which may influence vulnerability and prey susceptibility (USFWS 1994)

8. Residualism- Eagle Creek NFH hatchery production is volitionally released into Eagle Creek at the hatchery site and it is assumed that they migrate quickly into the main stem Clackamas and Columbia River migration corridor en route to the ocean. Most fish (>98%) leave the hatchery and enter Eagle Creek during the volitional release period. Those fish remaining at the end of the volitional release period are forced out (generally less than 2% of total production). Eagle Creek NFH releases are not known to residualize in Eagle Creek where they are released or in the Clackamas River, however, snorkel surveys, migrant traps, and radio telemetry projects would help to provide a definitive answer to hatchery out-migration questions.

9. Migration corridor/ocean- The hatchery production ceiling called for in the Proposed Recovery Plan for Snake River Salmon of approximately 197.4 million fish (1994 release levels) has been incorporated by NMFS into their recent hatchery biological opinions to address potential mainstem corridor and ocean effects as well as other potential ecological effects from hatchery fish. Although hatchery releases occur throughout the year, approximately 80 percent occur from April to June (NMFS 1999b) and Columbia River out-migration occurs primarily from April through August. Eagle Creek NFH production is typically released March through May under a volitional release strategy. Volitionally released fish, with a propensity to migrate, should reduce potential migration corridor effects as the fish migrate quickly out of the system. The total number of hatchery fish released in the Columbia River basin has declined by about 26 percent since 1994 (NMFS 1999c) reducing potential ecological interactions throughout the basin.

Competition in the estuary. Juvenile salmon and steelhead, of both natural and hatchery origin, rear for varying lengths of time in the Columbia River estuary and pre-estuary before moving out to sea. The intensity and magnitude of competition in the area depends on location and duration of estuarine residence for the various species of fish. Research suggests, for some species, a negative correlation between size of fish and residence time in the estuary (Simenstad et al. 1982).

While competition may occur between natural and hatchery juvenile salmonids in - or immediately above - the Columbia River estuary, few studies have been conducted to evaluate the extent of this potential problem (Dawley et al. 1986). The general conclusion is that competition may occur between natural and hatchery salmonid juveniles in the Columbia River estuary, particularly in years when ocean productivity is low. Competition may affect survival and growth of juveniles and thus affect subsequent abundance of returning adults. However, these are postulated effects that have not been quantified or well documented.

Competition in the ocean. Ocean rearing conditions are dynamic. Consequently, fish culture programs might cause density-dependent effects during years of low ocean productivity, especially in nearshore areas affected by upwelling (Chapman and Witty 1993). To date, research has not demonstrated that hatchery and naturally produced salmonids compete directly in the ocean, or that the survival and return rates of naturally

produced and hatchery origin fish are inversely related to the number of hatchery origin smolts entering the ocean (Enhancement Planning Team 1986). If competition occurs, it most likely occurs in nearshore areas when (a) upwelling is suppressed due to warm ocean temperatures and/or (b) when the abundance or concentration of smolts entering the ocean is relatively high. However, we are only beginning to understand the food-chain effects of cyclic, warm ocean conditions in the eastern north Pacific Ocean and associated impacts on salmon survival and productivity (Beamish 1995; Mantua et al. 1997). Consequently, the potential for competition effects in the ocean cannot be discounted (Emlen et al. 1990).

SECTION 4. WATER SOURCE

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

Water rights for the Eagle Creek NFH total 110.02 cfs. This includes 0.02 cfs from one spring for incubating eggs for winter steelhead, 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. The water for raceway fish production is serial use. There are three upper banks of twelve raceways and three lower banks of thirteen raceways. 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. Water use for production ranges from 5,785 gpm to 12,380 gpm. The hatchery monitors water discharges and is in compliance with the current NPDES permit.

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

Hatchery intake screens currently conform with NMFS screening guidelines. Additionally, no wild or hatchery anadromous fish are found upstream of the hatchery intake structure because the natural falls is a barrier to upstream migration.

SECTION 5. FACILITIES

5.1) Brood stock collection facilities (or methods).

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.

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

Adult fish can be moved using a 400 gallon fish tank, hauled by 1 ton pick-up truck.

5.3) Brood stock holding and spawning facilities.

Brood holding facilities include the collection pond and a 10 ft. x 120 ft. x 3 ft. holding channel. 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. Fish not ready to spawn are returned to the holding channel. Ripe fish are handled on aluminum spawning racks.

5.4) Incubation facilities.

Incubation is done in the nursery building. There are 38 vertical 16-tray incubators with flow set initially to 3 gpm and raised to 4 gpm after hatching. Water use is primarily from Eagle Creek. It is screened and filtered by a gravel bed before incubation. 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. 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.

5.5) Rearing facilities.

Swim-up coho salmon fry are ponded directly into 8 ft. x 80 ft. x 2 ft. raceways through release size. In late fall, the fish are moved to the volitional release pond (converted adult collection pond) for the remainder of containment and volitionally released. Coho scheduled for transfer are reared and kept in raceways until transported by other agencies. The raceways are set initially at 300 gpm and raised to 500 gpm when the fish reach 450 fish per pound.

5.6) Acclimation/release facilities.

Fish are volitionally released directly into Eagle Creek.

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

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

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

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.

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. Any health problems are managed promptly by fish health personnel to limit mortality and reduce disease transmission. The Eagle Creek coho juveniles and adults remain free of the regulated pathogens (viruses and *Myxobolis cerebralis*). No offspring from virus-positive brood stock are allowed on station.

SECTION 6. BROODSTOCK ORIGIN AND IDENTITY

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

6.1) Source.

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. Fish health policy mandates that non-Eagle Creek stocks come from adults individually certified as virus-free.

6.2) Supporting information.

6.2.1) History.

The original stock of coho salmon used at Eagle Creek NFH was a combination of Sandy, Toutle, and Big Creek stocks.

6.2.2) Annual size.

Current brood stock goal is 4,000 fish, averaging 50% female.

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

There are no wild coho salmon currently used for Eagle Creek NFH production.

Documentation of later returning coho salmon at the hatchery is rare, however, records from 1993 indicate that 15 males and 13 females returned on December 13, 1993 with an additional 16 males returning on December 22, 1993. Because late run wild coho are currently proposed for listing under the State of Oregon's Endangered Species Act, the disposition of any late run coho which now return to Eagle Creek NFH will be determined by the ODFW District Biologist, Jim Muck, (503)657-2000, phone.

6.2.4) Genetic or ecological differences.

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. Refer to Section 3.5 of this document for further discussion on this topic.

6.2.5) Reasons for choosing.

Available brood stock from nearby watersheds, run timing, and harvest contribution.

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

No listed fish are currently used for Eagle Creek NFH production.

SECTION 7. BROODSTOCK COLLECTION

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

Adult brood stock returning to the hatchery.

7.2) Collection or sampling design.

Adults return to Eagle Creek from September through November. Fish returning directly to the hatchery holding pond are spawned in October and November.

Fish are randomly selected and spawned at a 2:2 male to female ratio. Coho Jacks are spawned at 1% of the spawning population. Excess eggs are either destroyed or transferred for use in other programs where acceptable. Fish are randomly spawned throughout run.

7.3) Identity.

All hatchery releases from Eagle Creek are externally marked with either fin clip and/or internal coded-wire tag.

7.4) Proposed number to be collected:

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

1. 4,000 adult coho and 50% female.

2. Collect Adults Throughout Run

3. Spawning Ratio 2:2 , Male:Female ratio

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

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

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

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

If more fish return to the hatchery than are needed for brood stock, excess fish are randomly selected and removed throughout the run. See Section 7.8 for disposition of carcasses.

7.6) Fish transportation and holding methods.

Adult returning fish enter adult holding pond on own volition and are utilized for

spawning throughout run as needed.

7.7) Describe fish health maintenance and sanitation procedures applied.

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 *Myxobolis cerebralis*) and for *Ceratomyxa shasta* and erythrocytic inclusion body syndrome. Samples are taken from 150 female and 60 male adults throughout the spawning period to ascertain the health profile. 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.

7.8) Disposition of carcasses.

Carcasses have been utilized by the Warm Springs and Yakama Indian Reservations. If available, fish are also distributed to suppliers for federal prisons.

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 *Myxobolis cerebralis* and have a low incidence and level of bacterial kidney disease.

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

Refer to Section 3.5 of this document, specifically "Brood Stock Collection" discussion.

SECTION 8. MATING

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

8.1) Selection method.

Eagle Creek NFH coho are spawned randomly over entire run, from ripe fish on selected days over a 3 to 4 week period.

8.2) Males.

If short of males, the hatchery will use males more than once as needed.

8.3) Fertilization.

2:2 individual matings, 1% saline solution used to enhance fertilization, ovarian fluid is drained.

8.4) Cryopreserved gametes.

Cryopreservation is not used at Eagle Creek NFH.

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

Not Applicable.

SECTION 9. INCUBATION AND REARING -

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

9.1) Incubation:

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

Brood Year		Eggs Taken	Eyed	On-Feed[1]	Released[2]
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	
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	

[1] 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.

[2] 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[1]	Released[2]
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	

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

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".

9.1.3) Loading densities applied during incubation.

Eggs are placed into incubation trays at four females (approximately 10,000-12,000 eggs) per tray. 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.

9.1.4) Incubation conditions.

Water temperature is monitored using thermograph probes and recorded. Temperature during incubation ranges from 32° F with typical temperatures around 42° F. Dissolved oxygen levels are not regularly monitored, but have been tested and found to be at saturation. All water for incubation is filtered through a gravel bed to remove sediment.

9.1.5) Ponding.

Fish are transferred to the raceways from egg trays when most have absorbed their yolk sac (at around 1600 Temperature Units). At this time fry are poured into 30 gallon plastic containers with 12 gallons of water, moved to the appropriate raceway and poured directly into the raceway in late February through March. Average length at ponding is 3.3 cm.

9.1.6) Fish health maintenance and monitoring.

Minimal health concerns exist for progeny originating from Eagle Creek brood stock which are free from virus and have minimal incidence of vertically-transmitted pathogens. However, eggs received from other stations must be from adults individually tested and certified free of virus. The eggs are to be water-hardened in 50 ppm iodine for 30 minutes at the spawning site prior to transport to Eagle Creek NFH. Upon receipt, eggs received at Eagle Creek are disinfected with iodine to prevent virus transfer. The current treatment to control fungus on the eggs is a 1,667 ppm drip of formalin for 15 minutes 6 times a week. The first health exam of newly hatched fish occurs when approximately 50% are beyond the yolk sac stage and begin feeding. Sixty fish are sampled and tested for virus. Regular fish health checks are done on a monthly basis by the fish health specialist from the USFWS Lower Columbia River Fish Health Center.

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

None affected

9.2) <u>Rearing</u>:

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

See Table in Section 9.1.1 of this report. The number transferred in and out will need to be accounted for before calculating fed fry to smolt survival, but is generally about 90% (IHOT 1996).

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

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.

9.2.3) Fish rearing conditions

Temperature readings are taken using thermograph probes which take readings continuously. Temperatures in the raceways range from 32 ^{o} F to 65 ^{o} F for the containment of coho salmon. Mortalities are removed daily, recorded, and deducted from raceway inventory. 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. Dissolved oxygen, carbon dioxide and total gas pressure have not been regularly monitored, is not considered a problem, and is measured periodically, as necessary. Fish are reared on creek gravity flow water.

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

End of Month Growth Parameters for ECNFH Coho Brood Year 2001.

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%

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

Energy reserve information is not available. Refer to Section 9.2.4 for growth data.

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

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.

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

The Lower Columbia River Fish Health Center (LCRFHC) in Underwood, WA provides fish health care for the Eagle Creek NFH as described in the USFWS Fish Health Policy and Implementation, 713 FW and the 1995 IHOT report "Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries" as approved by state, federal, and tribal agencies. A fish health specialist visits at least once per month to examine fish in each lot, checking both healthy and symptomatic fish in the rearing ponds. Based on pathological signs, age of fish, concerns of hatchery personnel, and the history of the facility, the examining pathologist determines the appropriate tests. This usually includes an external and internal examination of skin, gills, and internal organs. Kidneys (and other tissues, if necessary) are checked for the common bacterial pathogens by culture and by a specific test for bacterial kidney disease (BKD). Blood is checked for signs of anemia or other infections. Additional tests for virus or parasites are done if warranted. As needed, appropriate remedial or chemotherapeutant treatments will be prescribed to control or prevent disease outbreaks. All juveniles originating from other stations must be checked for pathogens and certified free of virus prior to transfer to Eagle Creek. Fish with a history of virus are not allowed into Eagle Creek NFH unless the stock is considered threatened/endangered and comes from adults that were tested and certified free of virus.

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

Not measured.

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

None applied other than volitional release ponds.

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

No ESA fish reared at hatchery.

SECTION 10. RELEASE

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

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).

10.1) Proposed fish release levels.

Age Class	Maximum Number	Size (fpp)	Release Date	Location
Eggs	1.5 million	Eyed eggs		Transfer to Nez Perce Tribe (800K), State of Idaho (700K), and ODFW STEP (5K)
Unfed Fry				
Fry				
Fingerling				
Yearling	500,000 on-station 550,000 transfer 1,000,000 transfer	12 fpp 25 fpp 12 fpp	March – May March April and May	Eagle Creek Clearwater R, ID Lower Columbia

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

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

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

Eagle Creek NFH coho releases in Eagle Creek.

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.

Release year	Eggs/ Unfed Fry	Avg size	Fry	Avg size	Fingerling	Avg size	Yearling	Avg size
1990							1,012,793	13/lb.
1991					26,440	230/lb.	1,199,000	15/lb.
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

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

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).

10.5) Fish transportation procedures, if applicable.

Other agencies are responsible for moving fish off station.

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

Coho smolts are volitionally released from the hatchery into Eagle Creek, March through May, at approximately 12 to 14 fish/lb.

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

All coho released into Eagle Creek are marked and/or tagged, depending on fin clip and

tag quality control, in the following proportions:

- Adipose fin clip only = 90%
- Adipose fin clip plus coded-wire tag = 5%
- Coded-wire tag only = 5%

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

Pending discussion with co-managers through U.S. v Oregon forums, fish are either destroyed, transferred, or released on-station.

10.9) Fish health certification procedures applied pre-release.

Hatchery operations comply with the USFWS Fish Health Policy and Implementation Guidelines and the Integrated Hatchery Operations Team's Fish Health Policy. Three to six weeks prior to release, 60 fish from each lot are given a health exam. This includes a testing of the most susceptible species (steelhead) for *Myxobolis cerebralis*, causative agent of whirling disease. If fish are held longer than one month from the designated release date a second health exam is performed. Only Eagle Creek stocks are released into Eagle Creek. All stocks originating from off-station are transferred for release elsewhere to prevent vertically-transmitted disease introductions.

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

Fish are released on-station in case of emergency. If time permits, other agencies will be contacted for temporary holding facilities.

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

The 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. For a detailed discussion of potential genetic and ecological interactions, please see Section 3.5 of this report.

SECTION 11. MONITORING AND EVALUATION OF PERFORMANCE INDICATORS

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

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

Refer to Section 1.10 of this document for a discussion of how each "Performance Indicator" will be monitored and evaluated.

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

Funding and staffing is available to complete most of the monitoring and evaluation items identified in Section 1.10 of this document (see also Section 12: Research).

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

Monitoring and evaluation activities will not affect listed species.

SECTION 12. RESEARCH

Project A: Evaluate the effects of raceway rearing density on winter steelhead survival at Eagle Creek NFH, Oregon.

12.1a) Objective or Purpose

1.) Determine the effects of low, medium, and high rearing densities on condition and survival of winter steelhead trout

2.) Determine smolt to adult return rates of juvenile steelhead trout raised in low, medium, and high densities.

12.2 a) Cooperating and funding agencies

Funding for this study is being provided by the USFWS with CRFPO and hatchery staff taking the lead in conducting the study.

12.3 a) Principle investigator or project supervisor and staff

Principle Investigator: Doug Olson
USFWS, CRFPO
9317 Highway 99, Suite I
Vancouver, WA 98665
360-696-7605

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

Winter steelhead (*Oncorhynchus mykiss*), Lower Columbia ESU, threatened

Coho Salmon (*Oncorhynchus kisutch*), Lower Columbia River / Southwest Washington ESU (Candidate Species)

The status of winter steelhead trout in Eagle Creek and the Clackamas River is discussed in Section 2. The status of coho salmon in Eagle Creek and the Clackamas River is discussed in the Eagle Creek coho HGMP, Section 2.

12.5 a) Techniques: include capture methods, drugs, samples collected, tags applied.

Fish will be differentially coded-wire tagged in order to determine rates of return.

12.6 a) Dates or time period in which research activity occurs.

The study will be conducted for three complete brood years from 2004 through 2006.

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

Fish in the density treatment ponds will be fed and treated as all others not in the density study.

12.8 a) Expected type and effects of take and potential for injury or mortality.

No additional take of listed species is anticipated as a result of this study.

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

There is no take anticipated with this activity.

12.10 a) Alternative methods to achieve project objectives.

None at this time.

12.11 a) List species similar or related to the threatened species: provide number and causes of mortality related to this research project.

None related to this research project.

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

proposed research activities.

No risks to listed species are anticipated with this research project.

Project B: Eagle Creek aquatic species presence and distribution survey.

12.1 b) Objective or purpose.

1). Assess aquatic species present in Eagle Creek downstream of the hatchery.

2). Determine the distribution of the species present in Eagle Creek downstream of the hatchery.

12.2 b) Cooperating and funding agencies.

Funding for this study is being provided by the USFWS.

12.3 b) Principle investigator or project supervisor and staff.

Principle Investigator:

Doug Olson
USFWS
9317 Hwy 99, Suite I
Vancouver, WA 98665
360-6963-7605

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

Winter steelhead (*Oncorhynchus mykiss*), Lower Columbia ESU, threatened

Coho Salmon (*Oncorhynchus kisutch*), Lower Columbia River / Southwest Washington ESU (Candidate Species)

The status of winter steelhead trout in Eagle Creek and the Clackamas River is discussed in Section 2. The status of coho salmon in Eagle Creek and the Clackamas River is discussed in the Eagle Creek coho HGMP, Section 2.

12.5 b) Techniques: include capture methods, drugs, samples collected, tags applied.

Starting in the summer of 2004, sampling reaches will be designated by habitat transitions in Eagle Creek in order to perform species presence/absence surveys. Sections of Eagle Creek will be electro-fished and or snorkeled where all species observed will be documented with an associated length and weight of a representative subsample. Reach designations will be used to determine general distribution of the

species from the mouth up to the hatchery.

A subsample of fish caught will be anesthetized with MS-222 to measure length and weight. Fish will be held in a bath of MS-222 prior to biological measurements and will be placed in a recovery bath post-biological measurements. All fish will be released in the general area of their capture.

12.6 b) Dates or time period in which research activity occurs.

Electro-fishing and snorkeling activities will begin approximately the beginning of July and last until approximately the end of August.

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

Fish collected with electro-fishing equipment will be anesthetized then weighed and measured. After fish have fully recovered from the anesthetic, they will be released back into the stream. Fish captured will not be held for more than 15 to 20 minutes.

12.8 b) Expected type and effects of take and potential for injury or mortality.

Potential take as a result of electro-fishing may include handling stress and delayed mortality due to anesthesia and electrical side effects. All precautions will be taken to minimize any take.

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

Take associated with this activity will be minimal. Any direct mortality will be incidental and will not exceed 5 individuals of listed species.

12.10 b) Alternative methods to achieve project objectives.

Snorkel surveys alone could be conducted in representative samples of the sample reaches in order to determine species presence/absence and distribution. However, length-weight relationships and age distribution cannot be determined using this method.

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

Similar species to winter steelhead include spring Chinook salmon, coho salmon, cutthroat trout, and resident rainbow trout. Potential mortality is the same for these species as for winter steelhead, as is the percentage anticipated.

12.12 b) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse ecological effects, injury, or mortality to listed fish as a result of the

proposed research activities.

Settings of the electro-fishing units will be optimized to minimize the potential adverse effects on fish. This will be achieved by determining water quality parameters that directly affect the efficiency of the electro-fishers as it relates to tetany. Fish will only be held in the anesthetic bath long enough to be safely measured and weighed and subsequently placed in a recovery bucket. When the fish have fully recovered, they will be returned to the stream in the same general location of their capture. At least one biologist certified in electro-fishing will be present during the surveys.

Project C: Adult steelhead and coho movement assessment.

12.1 c) Objective or purpose.

1.) Determine the movement of adult hatchery and wild steelhead through the lower two Eagle Creek ladders up to the hatchery.

2.) Determine the movement of adult coho through the lower two Eagle Creek ladders up to the hatchery.

12.2 c) Cooperating and funding agencies.

Funding for this study is being provided by the USFWS.

12.3 c) Principle investigator or project supervisor and staff.

Principle Investigator:

Doug Olson
USFWS, CRFPO
9317 Hwy 99, Suite I
Vancouver, WA 98665
360-696-7605

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

Winter steelhead (*Oncorhynchus mykiss*), Lower Columbia ESU, threatened

Coho Salmon (*Oncorhynchus kisutch*), Lower Columbia River / Southwest Washington ESU (Candidate Species)

The status of winter steelhead trout in Eagle Creek and the Clackamas River is discussed in Section 2. The status of coho salmon in Eagle Creek and the Clackamas River is discussed in the Eagle Creek coho HGMP, Section 2.

12.5 c) Techniques: include capture methods, drugs, samples collected, tags applied.

Adult steelhead and coho will be captured at both the lower and middle ladder weirs on Eagle Creek. A sample of fish will be anesthetized using MS-222 and radio tagged to monitor movement in Eagle Creek, the North Fork Eagle Creek, and up to the hatchery. Fish not radio tagged will be marked with a Floy Tag and/or a PIT tag to be able to identify fish that have been captured. This will also be used to identify timing from the ladders to the hatchery. These two methods of marking can also be used to generate population estimates for hatchery and wild fish.

Another non-intrusive method to monitor adult fish moving through the ladders is through the use of underwater videography. Underwater video cameras will be installed into both the lower and middle ladders and digital video recorders with motion detection software will be used to record fish passage.

12.6 c) Dates or time period in which research activity occurs.

Adult steelhead return to the hatchery from mid-November to April, adult coho return to the hatchery from September to November, and wild steelhead return to Eagle Creek and North Fork Eagle Creek in April and May. The expected project duration is from 2004 through 2008.

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

Fish will be collected at the lower and middle ladder weirs on Eagle Creek. After the fish are anesthetized and the tags are implanted, fish will be placed in a recovery bucket until fully recovered and released upstream of the weirs. Fish recaptured will have their individual tags documented and then placed upstream of the weir in which they were captured.

12.8 c) Expected type and effects of take and potential for injury or mortality.

Potential take as a result of the weir operations may include handling stress, delayed tagging mortality and potential delayed migration of cutthroat, resident rainbow trout, winter steelhead, and coho salmon.

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

Level of take of listed fish is included in the take Table 1.

12.10 c) Alternative methods to achieve project objectives.

None at this time.

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

Similar species to winter steelhead include resident rainbow trout, cutthroat trout, coho salmon, and spring Chinook salmon. No mortality of these species is expected as a result of this study.

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

Adult weirs will be checked on a daily basis to minimize holding time of listed fish. Fish will be allowed to fully recover from the anesthetic and released in an area that will allow them to proceed upstream at their choosing.

Project D: Evaluation of migration patterns and potential residualization of Eagle Creek NFH winter steelhead.

12.1 d) Objective or purpose.

1.) Determine the migration patterns of juvenile winter steelhead trout in Eagle Creek.

2.) Evaluate the predictability of residualization of juvenile hatchery winter steelhead trout.

3.) Assess the holding habitat of juvenile hatchery winter steelhead trout that are suspected to be residuals or summer holdovers.

12.2 d) Cooperating and funding agencies.

Funding for this study is being provided by the USFWS.

12.3 d) Principle investigator or project supervisor and staff.

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

Winter steelhead (*Oncorhynchus mykiss*), Lower Columbia ESU, threatened

Coho Salmon (*Oncorhynchus kisutch*), Lower Columbia River / Southwest Washington ESU (Candidate Species)

The status of winter steelhead trout in Eagle Creek and the Clackamas River is discussed in Section 2. The status of coho salmon in Eagle Creek and the Clackamas River is discussed in the Eagle Creek coho HGMP, Section 2.

12.5 d) Techniques: include capture methods, drugs, samples collected, tags applied.

Fish used in this portion of the study will be netted out of the raceways and placed in an anesthetic bath of MS-222. Radio tags will be surgically implanted and the fish will be allowed to fully recover in a flow-through tank. The fish will be returned to their respective raceways for the volitional release. Migration timing and holding locations will be described using fixed-site radio telemetry receivers, mobile radio telemetry tracking units, and GPS/GIS technology. Some fish will be identified as potential holdovers or residuals by their duration in a certain relative position. If fish stay in the same relative position in Eagle Creek for a given period of time, snorkelers will try to identify the fish in the water. While there, they will record the general habitat characteristics as well as any other fish species in the area.

To determine if probability of residualism can be predicted, fish will be sampled at the hatchery at the same time that the fish are surgically radio tagged. Nonlethal biopsies of steelhead gill tissue will be preserved for ATPase analysis. Staff from the Abernathy Fish Technology Center of the USFWS will perform this analysis.

12.6 d) Dates or time period in which research activity occurs.

Surgical implantation of radio tags and gill ATPase sampling of winter steelhead will take place immediately prior to commencement of the volitional release (late March). ATPase sampling will continue with any hatchery fish caught during summer surveys. Fish will be radio tracked from the onset of the volitional release until May, but the exact time period will be dependent on the battery life of the radio tags. Snorkel surveys will most likely occur in June and/or July to ensure that fish are not just holding briefly before moving to the Clackamas River.

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

Fish will be taken directly from the hatchery raceways for surgical implantation of radio tags and gill biopsies. Fish that were anesthetized will be allowed to fully recover before being returned to the raceways. Fish will not be handled during the snorkel observations.

12.8 d) Expected type and effects of take and potential for injury or mortality.

Potential take of hatchery fish as a result of the radio telemetry may include direct or delayed mortality from handling stresses and/or surgical implantation. Take associated

with the ATPase sampling may include handling stress. There is no anticipated take from the snorkel observations.

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

There is no take of listed fish anticipated with this project.

12.10 d) Alternative methods to achieve project objectives.

There are no alternatives at this time.

12.11 d) List species similar or related to the threatened species; provide number and cause of mortality related to this research project.
Similar species include spring Chinook salmon, coho salmon, cutthroat trout, and resident rainbow trout. No mortality of these species is expected as a result of this study.

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

There is no anticipated ecological effect, injury, or mortality of listed fish.

Project E: Assessment of juvenile salmonid abundance in Eagle Creek.

12.1 e) Objective or purpose.

1.) Determine the abundance per species of juvenile salmonids in Eagle Creek.

12.2 e) Cooperating and funding agencies.

Funding for this study is being provided by the USFWS.

12.3 e) Principle investigator or project supervisor and staff.

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

Winter steelhead (*Oncorhynchus mykiss*), Lower Columbia ESU, threatened

Coho Salmon (*Oncorhynchus kisutch*), Lower Columbia River / Southwest Washington ESU (Candidate Species)

The status of winter steelhead trout in Eagle Creek and the Clackamas River is discussed in Section 2. The status of coho salmon in Eagle Creek and the Clackamas River is discussed in the Eagle Creek coho HGMP, Section 2.

12.5 e) Techniques: include capture methods, drugs, samples collected, tags applied.

A mark-recapture abundance estimate will be conducted using a backpack electro-fisher. Sample reaches will be determined prior to sampling. Fish will be collected with a single electro-fishing pass, marked with Bismarck Brown-Y tissue stain, returned to the stream, allowed to disperse overnight, and recaptured using another single electro-fishing pass. Fish will be placed in an MS-222 bath so lengths and weights can be recorded. After fish have fully recovered, they will be returned to the stream and allowed to disperse. A ratio of marked to unmarked fish will provide abundance estimates of each species.

12.6 e) Dates or time period in which research activity occurs.

Electro-fishing will occur in July and August 2005.

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

Fish will be collected with an electro-fishing unit and placed in an MS-222 bath. Fish will be weight, measured, and marked in a Bismarck Brown-Y tissue staining solution. After fish have recovered from the anesthetic and the staining, they will be returned to the stream and allowed to disperse. The next day the fish will be resampled with the electro-fishing unit, but only checked for marks and not anesthetized again. Once the fish have been checked for marks, they will be returned to the stream in the same general area where they were caught.

12.8 e) Expected type and effects of take and potential for injury or mortality.

Potential take from these activities include handling stresses, direct, and delayed mortality from the electro-fishing unit. Potential injuries to the fish include electrical burns from the electro-fishing unit. Predation may increase as a result of the tissue staining, but is believed to be negligible because of the short duration of the mark.

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

Take associated with this activity is expected to be minimal. Any direct mortality will be

incidental and will not exceed 5 individuals of listed fish.

12.10 e) Alternative methods to achieve project objectives.

Instead of a mark-recapture estimate using an electro-fishing unit, bounded counts through snorkel surveys are a viable alternative. Snorkelers make three passes through a sample reach and count the number of each salmonid species that they see. These numbers can be used to generate abundance estimates and is a much less intrusive sampling method than electro-fishing. The only drawback is that length-weight data cannot be collected using this method.

12.11 e) List species similar or related to the threatened species; provide number and cause of mortality related to this research project.

Similar species include spring Chinook salmon, coho salmon, cutthroat trout, and resident rainbow trout. Potential take includes direct and delayed mortality associated with electro-fishing.

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

Settings of the electro-fishing units will be optimized to minimize the potential adverse effects on fish. This will be achieved by determining water quality parameters that directly affect the efficiency of the electro-fishers as it relates to tetany. Fish will only be held in the anesthetic bath long enough to be safely measured and weighed and subsequently placed in a recovery bucket. Fish will be held in the Bismarck Brown-Y solution only long enough to provide the necessary mark. When the fish have fully recovered, they will be returned to the stream in the same general location of their capture.

Project F: Determine the potential for ecological interactions between hatchery and wild fish in Eagle Creek.

12.1 f) Objective or purpose.

1.) Determine if juvenile hatchery steelhead compete with wild fish for resources.

12.2 f) Cooperating and funding agencies.

Funding for this study is being provided by the USFWS.

12.3 f) Principle investigator or project supervisor and staff.

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

Winter steelhead (*Oncorhynchus mykiss*), Lower Columbia ESU, threatened

Coho Salmon (*Oncorhynchus kisutch*), Lower Columbia River / Southwest Washington ESU (Candidate Species)

The status of winter steelhead trout in Eagle Creek and the Clackamas River is discussed in Section 2. The status of coho salmon in Eagle Creek and the Clackamas River is discussed in the Eagle Creek coho HGMP, Section 2.

12.5 f) Techniques: include capture methods, drugs, samples collected, tags applied.

Snorkel observations will be performed in selected areas of Eagle Creek to determine if hatchery steelhead migrants or residuals are competing with wild fish for desired feeding and holding stations. Observers will also determine if hatchery steelhead are actively displacing wild fish from preferred areas.

12.6 f) Dates or time period in which research activity occurs.

This portion of the research will be performed in July and August of 2006 or 2007 depending on the progress of other aspects that need to be completed prior to ecological observations.

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

Fish will be observed by snorkelers and will not be handled in any way.

12.8 f) Expected type and effects of take and potential for injury or mortality.

There is no anticipated take, injury, or mortality associated with this activity.

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

There is no anticipated take of listed fish associated with this activity.

12.10 f) Alternative methods to achieve project objectives.

There are no alternatives at this time.

12.11 f) List species similar or related to the threatened species; provide number and cause of mortality related to this research project.

Similar species include spring Chinook salmon, coho salmon, cutthroat trout, and resident rainbow trout. No mortality of these species is expected as a result of this study.

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

There is no anticipated ecological effect, injury, or mortality of listed fish.

Project G: Identify genetic relationships among the different stocks of winter-run steelhead.

12.1 g) Objective or purpose

1.) Describe the genetic relationship among winter-run steelhead trout from the following sources; Eagle Creek Natural Origin, Eagle Creek Hatchery Origin, Big Creek Hatchery Origin, and Clackamas River Natural Origin.

2.) Test and evaluate the microsatellite loci used in Objective 1 for their individual and combined statistical power to genetically discriminate Eagle Creek natural origin and hatchery origin steelhead.

3.) Use the genetic based assignment test developed in Objective 2 to determine the proportion of Eagle Creek natural origin steelhead that were parented by hatchery origin fish spawning in the wild.

12.2 g) Cooperating and funding agencies.

Funding for this study is being provided by the USFWS.

12.3 g) Principle investigator or project supervisor and staff.

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

Winter steelhead (*Oncorhynchus mykiss*), Lower Columbia ESU, threatened

Coho Salmon (*Oncorhynchus kisutch*), Lower Columbia River / Southwest Washington ESU (Candidate Species)

The status of winter steelhead trout in Eagle Creek and the Clackamas River is discussed in Section 2. The status of coho salmon in Eagle Creek and the Clackamas River is discussed in the Eagle Creek coho HGMP, Section 2.

12.5 g) Techniques: include capture methods, drugs, samples collected, tags applied.

Genetic data needed to complete this objective has already been collected by NOAA-Fisheries via a contract with the USFWS.

12.6 g) Dates or time period in which research activity occurs.

Activity will occur throughout the entire study.

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

Not applicable since all of the collections have been made.

12.8 g) Expected type and effects of take and potential for injury or mortality.

There is no anticipated take, injury, or mortality associated with this activity.

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

There is no anticipated take of listed fish associated with this activity.

12.10 g) Alternative methods to achieve project objectives.

There are no alternatives at this time.

12.11 g) List species similar or related to the threatened species; provide number and cause of mortality related to this research project.

Similar species include spring Chinook salmon, coho salmon, cutthroat trout, and resident

rainbow trout. No mortality of these species is expected as a result of this study.

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

There is no anticipated ecological effect, injury, or mortality of listed fish.

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SECTION 14. CERTIFICATION LANGUAGE AND SIGNATURE OF RESPONSIBLE PARTY

"I hereby certify that the information provided is complete, true and correct to the best of my knowledge and belief."

Name, Title, and Signature of Applicant:

Certified by_____ Date:_____

Table 1. Estimated listed salmonid take levels of by hatchery activity.

Listed species affected: _steelhead trout____ ESU/Population: Lower Columbia River _____ Activity: Brood stock Collection for early-run coho salmon_

Location of hatchery activity: Eagle Creek NFH ladder_____ Dates of activity:_September – November

Hatchery program operator:_U.S. Fish and Wildlife Service_____

Type of Take	Annual Take of Listed Fish By Life Stage *(Number of Fish)*			
	Egg/Fry	Juvenile/Smolt	Adult	Carcass
Observe or harass a)				
Collect for transport b)				
Capture, handle, and release c)			< 2	
Capture, handle, tag/mark/tissue sample, and release d)				
Removal (e.g. broodstock) e)				
Intentional lethal take f)				
Unintentional lethal take g)				
Other Take (specify) h)				

a. Contact with listed fish through stream surveys, carcass and mark recovery projects, or migrational delay at weirs.
b. Take associated with weir or trapping operations where listed fish are captured and transported for release.
c. Take associated with weir or trapping operations where listed fish are captured, handled and released upstream or downstream.
d. Take occurring due to tagging and/or bio-sampling of fish collected through trapping operations prior to upstream or downstream release, or through carcass recovery programs.
e. Listed fish removed from the wild and collected for use as broodstock.
f. Intentional mortality of listed fish, usually as a result of spawning as broodstock.
g. Unintentional mortality of listed fish, including loss of fish during transport or holding prior to spawning or prior to release into the wild, or, for integrated programs, mortalities during incubation and rearing.
h. Other takes not identified above as a category.

Instructions:

1. *An entry for a fish to be taken should be in the take category that describes the greatest impact.*
2. *Each take to be entered in the table should be in one take category only (there should not be more than one entry for the same sampling event).*
3. *If an individual fish is to be taken more than once on separate occasions, each take must be entered in the take table.*

Table 1 continued. Estimated listed salmonid take levels of by hatchery activity.

Listed species affected: _late-run coho salmon____ ESU/Population: Clackamas River, State of Oregon listed population (not federally listed)_____ Activity: Brood stock Collection for early-run coho salmon_

Location of hatchery activity: Eagle Creek NFH ladder_____ Dates of activity:_September – November

Hatchery program operator:_U.S. Fish and Wildlife Service_____

Type of Take	**Annual Take of Listed Fish By Life Stage *(Number of Fish)***			
	Egg/Fry	Juvenile/Smolt	Adult	Carcass
Observe or harass a)				
Collect for transport b)				
Capture, handle, and release c)				
Capture, handle, tag/mark/tissue sample, and release d)				
Removal (e.g. brood stock) e)				
Intentional lethal take f)				
Unintentional lethal take g)			< 2	
Other Take (specify) h)				

a. Contact with listed fish through stream surveys, carcass and mark recovery projects, or migrational delay at weirs.
b. Take associated with weir or trapping operations where listed fish are captured and transported for release.
c. Take associated with weir or trapping operations where listed fish are captured, handled and released upstream or downstream.
d. Take occurring due to tagging and/or bio-sampling of fish collected through trapping operations prior to upstream or downstream release, or through carcass recovery programs.
e. Listed fish removed from the wild and collected for use as brood stock.
f. Intentional mortality of listed fish, usually as a result of spawning as brood stock.
g. Unintentional mortality of listed fish, including loss of fish during transport or holding prior to spawning or prior to release into the wild, or, for integrated programs, mortalities during incubation and rearing.
h. Other takes not identified above as a category.

Instructions:

1. An entry for a fish to be taken should be in the take category that describes the greatest impact.
2. Each take to be entered in the table should be in one take category only (there should not be more than one entry for the same sampling event).
3. If an individual fish is to be taken more than once on separate occasions, each take must be entered in the take table

ADDENDUM A. PROGRAM EFFECTS ON OTHER (AQUATIC OR TERRESTRIAL) ESA-LISTED POPULATIONS. (Anadromous salmonid effects are addressed in Section 2)

15.1) List all ESA permits or authorizations for USFWS ESA-listed, proposed, and candidate salmonid and non-salmonid species associated with the hatchery program.

- 1999 Biological Opinion on hatcheries in the Columbia River (NMFS 1999).
- 2000 Biological Opinions on the Federal Columbia River Power System (NMFS 2000 and USFWS 2000).
- ESA Informal Consultation and EFH Consultation regarding the Eagle Creek fish barrier replacement project at the Eagle Creek National Fish Hatchery, Clackamas County, Oregon (USFWS tracking number I/NWR/2002/00771).

15.2) Describe USFWS ESA-listed, proposed, and candidate salmonid and non-salmonid species and habitat that may be affected by hatchery program.

Bull Trout *(Salvelinus confluentus,* Threatened species*)*

Bull trout are listed as a threatened species in the Columbia River basin (Final Rule 50 CR Part 17, RIN 1018-AB94, June 10, 1998). Bull trout (Dolly Varden) were historically documented in the upper Clackamas River and tributaries. Status in the Clackamas River is listed as "probably extinct" (ODFW 1997).

Cutthroat Trout (*Oncorhynchus clarki,* not federally listed)

Cutthroat trout in the lower Columbia River were reviewed for listing by the USFWS in July 2002 but determined as not warranted for listing under the Endangered Species Act. From ODFW (1992): "At least three different life history strategies for cutthroat are thought to occur in the Clackamas Subbasin: 1) "anadromous" searun cutthroat, 2) freshwater migratory, or "potamodromous" cutthroat, and 3) "resident" cutthroat with little or no migration. Searun cutthroat are listed as Sensitive in Oregon. Very little is known about the status of migratory cutthroat in the Clackamas Subbasin." Additional information on cutthroat trout can be found in USFWS (2002).

Bald Eagle (*Haliaeetus leucocephalus,* Threatened Species – Delisting Proposed) [1]

[1] Information is from the Biological Assessment for Eagle Creek barrier replacement project for Eagle Creek National Fish Hatchery, May 15, 2002 prepared by Ellis Ecological Services for the U.S. Fish and Wildlife Service, USFWS Species List Reference # 1-7-02-SP-280 (USFWS 2002).

Status: Bald Eagles were listed as endangered in the conterminous United States under the ESA on March 6, 1967 (32 FR 4001). The population in the Pacific Northwest was later downlisted on February 14, 1978 to threatened. Eagles in the remaining states were subsequently downlisted to threatened on July 12, 1995 (60 FR 36000). Bald eagle populations have rebounded considerably within the last few years, with nearly all recovery goals met for Oregon, Washington, and other regions of the country. On July 6, 1999 the USFWS proposed delisting bald eagles from the ESA. Bald eagles and golden eagles are, and will continue to, be protected under the Bald Eagle and Golden Eagle Protection Act of 1940 (as amended) and the Migratory Bird Treaty.

The northern bald eagle is closely associated with freshwater, estuarine, and marine ecosystems that provide abundant prey and suitable habitat for nesting and communal roosting (Watson et al. 1991). Breeding territories are typically located within one mile of permanent water in predominantly coniferous, uneven-aged stands with old-growth structural components (Anthony et al. 1982, Stalmaster 1987, Anthony and Isaac 1989). Bald eagles winter along ice-free lakes, streams, and rivers where food and perch sites are abundant and the level of human disturbance is low (USFS 1977, Steenhof 1978, Stalmaster 1980). Communal nights roosts are used by bald eagles primarily during the winter months. In the Pacific Northwest, communal roosts generally occur in multi-layered mature or old-growth conifer stands that provide protection from weather and human disturbance (Stalmaster and Newman 1979).

Home range size varies greatly according to food abundance and the availability of suitable nest and perch trees (Stalmaster 1987). Favored nest trees are usually the largest tree or snag in a stand that provides an unobstructed view of the surrounding area and a clear flight to and from the nest (Stalmaster 1987). Nest are usually built on limbs just below the crown, with the canopy above providing cover (USFS 1977). Nesting behaviors typically begin in January, followed by egg laying and incubation in February and March (Isaac et al. 1983). Young are reared throughout April, May, and June. Fledging occurs in July and August. Bald eagles are primarily predators but also opportunistic scavengers that feed on a variety of prey including salmon, other fish, small mammals, waterfowl, seabirds, and carrion (Snow 1981). Bald eagles usually forage in large open areas with a wide visual field and suitable perch trees near the food source (USFS 1985).

The bald eagle occurs throughout the United States and Canada. It winters primarily along rivers south of the Canadian border. The historic decline of the bald eagle has been attributed to the loss of feeding and nesting habitat, organochloride pesticide residues, shooting, poisoning, and electrocution (Snow 1981, USFWS 1986). Human interference has been shown to adversely affect the distribution and behavior of wintering bald eagles (Stalmaster and Newman 1978).

Critical Habitat: Critical habitat for bald eagles has not been formally designated by USFWS.

Use Of The Action Area: Bald eagles are not known to nest in lower Eagle Creek but

occasionally forage in the lower watershed during the winter months (USFS 1995). The closest known bald eagle nest site is located approximately 11 miles northwest of ECNFH along lower Goose Creek (Issacs et al. 2001).

Northern Spotted Owl (*Strix occidentalis caurina*, Threatened Species) [1]

Status: The northern spotted owl was listed as a threatened species throughout its entire range in June 1990 (55 FR 26114). It ranges from southern British Columbia south to Marion County, California and east to the shrub steppe of the Great Basin in Oregon and California. In the Western Cascades, the northern spotted owl can be found from approximately sea level to 4000 feet in elevation (USFWS 1992).

Most observations of spotted owl habitat use have been made in forests with a component of old-growth and mature forests consisting of western hemlock, Douglas-fir and western red cedar. However, the northern spotted owl has been observed to use a wide variety of habitat types and forest stand conditions, including managed stands, for nesting, feeding or roosting (USFWS 1992). In general, northern spotted owls preferentially use forests with greater complexity and structure. In the Western cascades, the home range of northern spotted owl pairs ranges in size from approximately 1,450 acres to 9,750 acres with a median home range size of 2,950 acres (USFWS 1992).

Spotted owls do not build their own nests. They depend on suitable naturally occurring nest sites such as broken-top trees and cavities in older-age forests, abandoned raptor nests, squirrels nests and debris accumulations. Most northern spotted owl nest sites observed on public lands have been located in old-growth or mature forests (USFWS 1992). However, spotted owls are known to nest in managed stands, especially if residual old-growth characteristics are present. Owlets remain in the nest for three to five weeks and generally leave the nest before they can fly. They usually remain near the nest in nearby branches or on the ground where they are fed and tendered by both adults before dispersing in early fall (late September to early October) (USFWS 1992).

Roosting habitat are typically areas of relatively dense vegetation (high canopy closure dominated by large-diameter trees). Spotted owls respond to variations in temperature and move within the canopy to find favorable microclimate conditions which are facilitated by multistoried stand structure of roost sites (USFWS 1992).

Spotted owl foraging habitat is more varied but is generally characterized by high canopy closure and complex structure. Spotted owls are primarily nocturnal and eat small mammals, birds and insects. Both the woodrat (*Neotoma fuscipes and N. cinerea*) and the northern flying squirrel (*Glaucomys sabrinus*) compose the majority of the prey base of the spotted owl (USFWS 1992).

[1] Information is from the Biological Assessment for Eagle Creek barrier replacement project for Eagle Creek National Fish Hatchery, May 15, 2002 prepared by Ellis Ecological Services for the U.S. Fish and Wildlife Service, USFWS Species List Reference # 1-7-02-SP-280 (USFWS 2002).

Critical Habitat: Critical habitat is designated for the northern spotted owl solely on 6.9 million acres of federal lands (57 FR 1796). Areas managed by the U.S. Forest Service (USFS) in upper Eagle Creek watershed are part of the critical habitat designation for northern spotted owl.

Use Of The Action Area: The USFS conducted spotted owl surveys between 1991 and 1993 in upper Eagle Creek watershed. Due to the sensitivity of spotted owl data, the USFS does not provide exact locations of spotted owl nest sites. However, there are no sites known to occur within the action area for the Fish Barrier Replacement Project, although individual spotted owls may occasionally pass through the area while foraging. There are four known spotted owl nesting sites within the upper Eagle Creek watershed and three additional sites just outside of the watershed. All of the spotted owl sites are within the Salmon-Huckleberry Wilderness Area or the Late-Successional Reserve (LSR), managed by USFS, immediately adjacent to the wilderness area. There are approximately 4720 acres of suitable nesting, roosting, and foraging habitat in the Eagle Creek watershed, primarily within the wilderness area and LSR (USFS 1995).

Willamette Daisy (*Erigeron decumbens*, Endangered Species) [1]

Status: The Willamette daisy is a member of the sunflower family (Asteraceae). This is another species that was originally found on native prairie habitat in the Willamette Valley and has been found in Benton, Clackamas, Lane, Linn, Marion, Polk, Washington, and Yamhill Counties.

Use of the Action Area: This species has not been reported at the project site and is not likely to occur. Currently no habitat exists at the project site for this species.

Bradshaw's Lomatium (*Lomatium bradshawii*, Endangered Species) [1]

Status: Bradshaw's lomatuim is a member of the Apiacea family, and also is known as Bradshaw's desert parsley. This species is endemic to wet, native prairies of the Willamette and Umpqua Valleys, and was once locally abundant. Habitat loss and degradation have led to this species' extirpation from most of its range. Bradshaw's lomatium is a perennial herb that grows from 8 to 20 inches tall, with finely divided basal leaves and small yellow flowers, subtended by green bracts divided characteristically by three (Eastman 1990, Guard 1995).

Use of the Action Area: There are no records of Bradshaw's lomatium occurring at the project site. In addition, pockets of wet, native grassland habitat do not occur at the project site.

Golden Indian Paintbrush (*Castilleja levisecta*, Threatened Species) [1]

[1] Information is from the Biological Assessment for Eagle Creek barrier replacement project for Eagle Creek National Fish Hatchery, May 15, 2002 prepared by Ellis Ecological Services for the U.S. Fish and Wildlife Service, USFWS Species List Reference # 1-7-02-SP-280 (USFWS 2002).

Status: Golden Indian paintbrush is a member of *Scrophulariacea* family. This species is presumed extirpated and it has not been seen in Oregon for over 40 years. Golden Indian paintbrush was once found in the Willamette Valley in wet prairie areas with gravelly soils but without standing water, and was associated with wet prairie species such as tufted hairgrass *(Deschampsia caepitosa)* and camas *(Camassia)*.

Use of the Action Area: This species has not been reported to occur at the project site. The project site does not contain habitat that could support golden Indian Paintbrush.

Howellia (*Howellia aquatilis*, Threatened Species) [1]

Status: Howellia is a member of the bellflower family (*Campanulaceae*). This species historically occurred over a large area of the Pacific Northwest. Howellia is a hydrophytic annual plant that grows 4 to 24 inches in height, and has extensively branched stems with both submerged and emergent flowers. Low genetic variability of howellia limits the species to a highly specific habitat (USFWS 1994). Currently, howellia is known to exist in Washington, Montana, and Idaho but has been extirpated from California, Oregon and some sites in Washington and Idaho.

Use of the Action Area: There are no records of water howellia occurring at the project site. The project site does not contain habitat that could support water howellia.

Kincaid's Lupine (*Lupinus sulphureus* var. *kincaidii*, Threatened Species) [1]

Status: Kincaid's lupine is a member of the pea family *(Fabaceae)*. This species historically occurred west of the Cascade Mountains from Douglas County, Oregon to Lewis County, Washington. Kincaid's lupine is a perennial plant that grows 16 to 32 inches in height, and is associated with native upland prairie and open oak woodlands that have a history of fire disturbance. Currently, Kincaid's lupine is known to exist in 48 sites in the Willamette Valley, four sites in Douglas County, Oregon and two sites in Lewis County, Washington (USFWS 2000).

Use of the Action Area: This species is restricted to mesic to slightly xeric soils in native upland prairies, and is often found in association with fire resistant Oregon white oak (*Quercus garryana)*. There are no records of Kincaid's lupine occurring at the project site. The project site does not contain habitat that could support Kincaid's lupine.

Nelson's Checker-Mallow (*Sidalcea nelsoniana*, Threatened Species) [1]

Status: Nelson's checker-mallow is a member of the mallow family (*Malvaceae)*. This species historically occurred in western Oregon and Washington between southern Benton County, Oregon and Lewis County, Washington. Nelson's checker-mallow is a perennial herb that grows 16 to 40 inches in height, and is associated with streams,

[1] Information is from the Biological Assessment for Eagle Creek barrier replacement project for Eagle Creek National Fish Hatchery, May 15, 2002 prepared by Ellis Ecological Services for the U.S. Fish and Wildlife Service, USFWS Species List Reference # 1-7-02-SP-280 (USFWS 2002).

meadows, swales and other open areas. Currently, Nelson's checker-mallow is known to exist at 48 sites in seven counties in Oregon and two sites in Lewis County, Washington (WNHP 1997, USFWS 1993).

Use of the Action Area: There are no records of Nelson's checker-mallow occurring at the proposed project site. The Project site does not contain any wet, native prairie habitat that could support Nelson's checker-mallow.

15.3) Analyze effects.

Identify potential direct, indirect, and cumulative effects of hatchery program on species and habitat (immediate and future effects, including duration and area of effects). Please focus analysis on the impact of hatchery program on listed/proposed species reproduction, numbers, and distribution.
Identify potential level of take (past and projected future).

No take of USFWS trust species will occur or be adversely affected by operation of Eagle Creek National Fish Hatchery. However, wild cutthroat and rainbow trout (not Federally listed) are occasionally observed at the hatchery during brood stock collection of coho and winter steelhead.

Bald eagles occasionally forage in the lower watershed during the winter months (USFS 1995). Adult hatchery fish in Eagle Creek could potentially serve as a forage base for bald eagles. Adult hatchery carcasses in Eagle Creek can also enhance nutrients and ecosystem productivity of the stream (Cederholm et al. 1999).

15.4 Actions taken to minimize potential effects.

No actions are necessary to address effects for USFWS ESA trust species. However, Eagle Creek has been identified as a stream for wild trout management (ODFW 1992). Natural production of cutthroat and rainbow trout (not Federally listed) is reported to occur in Eagle Creek, above and below the impassable falls at the hatchery. Unmarked "wild" trout which come into the hatchery during brood stock collection of coho and winter steelhead will be temporarily placed in a holding pond then returned to the creek per discussions with the ODFW District Biologist, Jim Muck, (503)657-2000.

15.5 References

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