

HATCHERY AND GENETIC MANAGEMENT PLAN (HGMP)

Hatchery Program:	Big Creek Hatchery Winter Steelhead Program
Species or Hatchery Stock:	Winter Steelhead Stock-13
Agency/Operator:	Oregon Department of Fish and Wildlife
Watershed and Region:	Big Creek, Gnat Creek, and NF Klaskanine River; Lower Columbia River Estuary ODFW North Coast Watershed District
Date Submitted: First Update Submitted: Second Update Submitted:	March 3, 2005 December 7, 2007 July 11, 2016
Date Last Updated:	June 30, 2016

SECTION 1

GENERAL PROGRAM DESCRIPTION

1.1) Name of hatchery or program.

Big Creek Hatchery Winter Steelhead (Stock 13) program. Stock 13 winter steelhead production is targeted for release in Big Creek, Gnat Creek, and the North Fork Klaskanine River.

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

Big Creek winter steelhead *Oncorhynchus mykiss* are part of the lower Columbia River Distinct Population Segment (DPS), and is listed as threatened under the Federal Endangered Species Act (ESA) as of December 22, 1999.

1.3) Responsible organization and individuals.

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

Big Creek Hatchery: 70% funded from Mitchell Act (administered by NOAA) and 30% funded from State funding.

Gnat Creek Hatchery: 100% funded by Bonneville Power Administration (BPA)

Klaskanine Hatchery: 100% funded by Bonneville Power Administration (BPA)

Annual Operating Costs:

Big Creek Hatchery: \$987,000 (8 full time equivalent employees, 2 stationed at Klaskanine Hatchery).

Klaskanine Hatchery: \$188,750 (1 FTE)

Gnat Creek Hatchery: \$505,403 (3 FTE)

Note: Funding (other than personnel costs) for the winter steelhead program at Klaskanine Hatchery and Gnat Creek Hatchery is provided by Big Creek Hatchery. Winter steelhead production represents approximately 9.0% of the production at these facilities. The overall cost for Stock 13 winter steelhead is estimated to be \$90,000 for the current production of 140,000 smolts.

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

Adult Collection: Big Creek Hatchery is located in the Big Creek watershed, approximately 15 miles east of Astoria near the town of Knappa. The hatchery facility is located on Big Creek at River Mile (RM) 3.3. A weir spanning Big Creek is located at the hatchery and directs returning adults into the trap. All trapping activity takes place at the hatchery trapping facility. Beginning in late November, adults return to the trap facility and are collected for broodstock and held until spawning. Refer to Section 5 for further facility detail.

Klaskanine Hatchery is located approximately 12 miles southeast of Astoria on Highway 202. The hatchery (and trap) is on the North Fork Klaskanine River at RM 2. A weir spanning the North Fork Klaskanine is located at the hatchery and directs returning adults into the trap. All trapping activity takes place at the hatchery trapping facility. Refer to Section 5 for further facility detail.

Gnat Creek Hatchery is located in the Gnat Creek watershed approximately 18 miles east of Astoria on Highway 30. The hatchery is located on the south side of the highway, on Gnat Creek at RM 2.25. There is no adult trapping facility at Gnat Creek Hatchery.

Spawning, egg incubation, rearing:

Adults are spawned from January to early February, and eggs are incubated at Big Creek Hatchery. Refer to Section 5 for further facility detail.

Acclimation Sites:

Juvenile steelhead scheduled for release in Gnat Creek and the North Fork Klaskanine River are transferred to Gnat Creek Hatchery and Klaskanine Hatchery, respectively. Transfer is completed in November or early December, and fish are reared to smolt size at each facility. Refer to Section 5 for further facility detail.

Gnat Creek Hatchery is located in the Gnat Creek Watershed approximately 18 miles east of Astoria on Highway 30. The hatchery is located on the south side of the highway, on Gnat Creek at RM 2.25.

Klaskanine Hatchery is located approximately 12 miles southeast of Astoria on Highway 202. The hatchery is on the North Fork Klaskanine River at RM 2.

1.6) Type of program.

Harvest Augmentation – To increase sport harvest opportunities by releasing artificially propagated steelhead smolts

STEP – The use of stream side, or classroom, incubators and rearing facilities to provide educational/learning opportunities to students.

1.7) Purpose (Goal) of program.

Hatchery winter steelhead smolts are released in Big Creek, Gnat Creek, and the North Fork Klaskanine River with a goal of providing adults for freshwater recreational harvest.

STEP activities are conducted in classrooms for educational purposes.

1.8) Justification for the program.

The program is designed to support a consumptive sport fishery in Big Creek, Gnat Creek, and the North Fork Klaskanine River. The program produces full-term smolts for release into the identified systems. Smolts are 100% fin marked to allow selective harvest of hatchery adults. These streams are closed to wild (unmarked) steelhead harvest.

1.9 and 1.10) List of program “Performance Standards” and “Performance Indicators”.

Indicator 1 – Harvest

Standard 1.1: Provide adult hatchery steelhead for harvest of Stock 13 winter steelhead in such a way that impacts to listed fish populations are kept within acceptable limits, and that estimated harvest benefits exceed program costs, operations and capital. Incidental impacts from steelhead angling on listed species will be minimized during the winter steelhead sport fishery. **(Benefit)**

Indicator: Number of hatchery winter steelhead caught and estimated economic benefit, and number of angler days generated associated with this program. **(Benefit)**

Indicator: Estimated number of listed species (steelhead, coho and chum) caught and released during winter steelhead fisheries. **(Risk)**

Standard 1.2: All hatchery juvenile steelhead will be externally marked. **(Benefit)**

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

Indicator: Prerelease quality checks indicate a minimum 95 percent retention of identifiable marks. **(Benefit)**

Indicator 2 – Life History Characteristics

Standard 2.1: Winter steelhead broodstock will be collected in a manner that approximates the distribution in timing, age, and size of hatchery fish returning to Big Creek Hatchery. Jacks (1-salt males) will typically make up no more than 5 percent of males spawned. **(Benefit)**

Indicator: Temporal distribution of Stock 13 adult winter steelhead returns and adults collected. **(Risk - unknown)**

Indicator: Age distribution of Big Creek Hatchery adult winter steelhead returns and broodstock spawned. **(Benefit)**

Indicator: Size at age distribution of Stock 13 adult winter steelhead returns and broodstock spawned. **(Risk - unknown)**

Standard 2.2: Releases of Stock 13 winter steelhead will limit impacts to naturally produced salmonids through control of hatchery release numbers and timing by minimizing spatial and temporal overlap with natural populations. **(Risk)**

Indicator: Number of Stock 13 winter steelhead released. **(Risk)**

Indicator: Dates of Stock 13 winter steelhead releases. **(Risk)**

Indicator: Location of Stock 13 winter steelhead released. **(Risk)**

Standard 2.3: All Stock 13 winter steelhead smolts will be released as yearlings. **(Risk - unknown)**

Indicator: Beginning and ending dates of Stock 13 winter steelhead smolt releases. **(Risk - unknown)**

Indicator: Size and length frequency of Stock 13 winter steelhead smolts released. **(Risk - unknown)**

Standard 2.4: Stock 13 winter steelhead in excess of production needs will be released at times and locations that minimize impacts to naturally rearing salmonids. Any surplus Stock 13 fry or fingerlings may be released into standing water bodies, or they may be destroyed. **(Benefit)**

Indicator: Location, number, and timing of Stock 13 winter steelhead fry and fingerling releases. **(Benefit)**

Indicator 3 – Genetic Characteristics

Standard 3.1: Hatchery adult winter steelhead spawning naturally in the Big Creek, Gnat Creek, and Klaskanine River basins will not exceed standards identified in the Lower Columbia River Conservation and Recovery Plan for Oregon Populations of Salmon and Steelhead. **(Benefit)**

Indicator: Estimated abundance of naturally spawning winter steelhead in the respective basins. **(Benefit)**

Indicator: Estimated abundance of naturally spawning winter steelhead in the respective basins that are of hatchery origin based on scales, marks or tags. **(Benefit)**

Standard 3.2: Only Stock 13 Big Creek winter steelhead, or adult returns from smolts released for this program, will be used as broodstock for the Big Creek Hatchery Stock 13 winter steelhead program. **(Risk - unknown)**

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

Indicator: Fin clips on fish collected for brood. **(Benefit)**

Standard 3.3: Stock 13 winter steelhead broodstock will be spawned following appropriate mating and spawning protocols. **(Benefit)**

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

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

Indicator 4 – Operation of Artificial Production Program

Standard 4.1: The Big Creek Hatchery winter steelhead program will be operated in compliance with the ODFW Hatchery Management Policy and IHOT fish health guidelines. See Attachment A. **(Benefit)**

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

Indicator: Rearing survival rates, egg to fry and fry to smolt. Results of fish health examinations. **(Benefit)**

Indicator: Number of juveniles sampled and pathogens observed immediately prior to release. **(Benefit)**

Standard 4.2: Big Creek Hatchery, Gnat Creek Hatchery, and Klaskanine Hatchery effluent will comply with the conditions and water quality limitations identified in the current NPDES permit. **(Benefit)**

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

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

Standard 4.3: Big Creek Hatchery water withdrawals will comply with NOAA Fisheries juvenile screening criteria. **(Benefit)**

Indicator: Screens are in compliance. **(Benefit)**

Standard 4.4: Big Creek Hatchery steelhead carcass placements for stream nutrient enrichment comply with annual Memorandum of Understanding (MOA) between ODFW and the Oregon Department of Environmental Quality (ODEQ). **(Benefit)**

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

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

Standard 4.5: Wild steelhead, spring chinook, coho, chum, and cutthroat that enter the Big Creek Hatchery adult trap are handled and released in a manner that minimizes stress, injury, mortality, and delay in migration. **(Risk)**

Indicator: Number of unmarked adult steelhead, spring chinook, coho, chum, and cutthroat collected and released alive from the Big Creek Hatchery trap and the Klaskanine Hatchery trap. **(Risk - unknown)**

Indicator: Number of unmarked adult steelhead, spring chinook, coho, chum, and cutthroat mortalities at Big Creek Hatchery and Klaskanine Hatchery during operation of the hatchery adult trap. **(Risk)**

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

Standard 4.6: Releases of Stock 13 winter steelhead smolts will limit predation impacts to naturally produced salmonids through control of hatchery release numbers and by minimizing spatial and temporal overlap of wild salmonid juveniles. **(Risk - unknown)**

Indicator: Location, dates, and sizes of Stock 13 winter steelhead releases. **(Risk - unknown)**

Indicator 5 - Socio-Economic Effectiveness

Standard 5.1: Estimated harvest benefits will equal or exceed hatchery production costs for Stock 13 winter steelhead, based on the benefit-cost model in ODFW (1999), or an updated version of that model. **(Benefit)**

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

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

1.11) Expected size of program.

The program goal is to produce 140,000 full term smolts for release annually. The smolts are scheduled for release as follows:

Big Creek: 60,000 smolts

Gnat Creek: 40,000 smolts

North Fork Klaskanine River: 40,000 smolts

A small number of fry (usually <2000) are released from STEP classroom incubators annually.

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

Existing program requires a minimum 60 females and 60 males for broodstock needs. Additional adults may be collected as necessary to cover shortages resulting from, but not limited to, fecundity variation, early egg mortality, positive disease test, etc.

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

Proposed annual release numbers are shown in Table 1.1.

**Table 1-1
Proposed Annual Release Levels.**

Life Stage	Release Location	Annual Release Level
Eyed Eggs	N/A	N/A
STEP-Unfed Fry ¹	Lower Columbia River tributaries ²	2000 (Classroom Incubator)
Fry	Standing Water	Excess to production, varies ³
Fingerling	Standing Water	Excess to production, varies ³
Yearling	Big Creek	60,000
Yearling	Gnat Creek ⁴	40,000
Yearling	NF Klaskanine ⁴	40,000

Life Stage	Release Location	Annual Release Level
<p>Data source: District files</p> <p>¹ Unfed fry from classroom incubators varies yearly depending on the number of schools that may choose to become involved. Due to this variation, it is difficult to predict a “proposed” release level. For the last 5 years, releases have been < 2000 annually. Release sites are typically in systems close to the participating school, and are generally low in the system, often near the head of tidewater or even in tidewater areas.</p> <p>² Releases occur in Lower Columbia River tributaries downstream of Hunt Creek (in Oregon), in Youngs Bay or its tributaries, or in the Skipanon River system.</p> <p>³ This program does not produce fingerlings for release as a program goal for Stock 13 winter steelhead. In any given year there may be surplus fingerlings (typically from above average fry and fingerling survival). These will be released to standing water bodies.</p> <p>⁴ These fish are incubated and initially reared at Big Creek Hatchery. Juveniles are transferred to the respective facilities for final rearing.</p>		

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

Estimates of adult winter steelhead production from the Big Creek stock hatchery winter steelhead program components for the last 12 years are presented in Tables 1-2 to 1-4. The estimated number of adult hatchery winter steelhead produced was derived from a variety of data sources. The “Freshwater Sport” column is based on harvest card estimates of catch in the various basins. The harvest card estimates of catch were attributed to hatchery and wild fish and age classes based on average results from scales collected during the 1983-84 through 1991-92 fishery seasons. Since 1994 these areas have been managed for selective harvest of hatchery steelhead, based on the presence of a fin clip. Harvest card data is currently only available through 1999. The “Hatchery Return” column depicts the actual count of adult winter steelhead returns at Big Creek and Klaskanine hatcheries, with the adult age composition based on the average of the 1983-84 to 1991-92 fishery scale data. There is no adult collection facility in Gnat Creek. Thus there is no hatchery return data for Gnat Creek releases. Estimates are not available for the number of hatchery winter steelhead that strayed to natural spawning areas in these (or other) areas. A minimum smolt-to-adult survival is calculated as the sum of the prior 3 columns divided by the “Smolt Release” columns.

Table 1-2

Estimated Adult Winter Steelhead Produced by the Big Creek Hatchery Winter Steelhead Smolts Released in the Big Creek Basin, 1999 to 2010 Brood Years. n.a. = not available. Estimate represents a minimum value.

Brood Year	Big Creek Smolt Release	2-Salt Return Year	Estimated Adult Hatchery STW (2-salt + 3-salt)			
			Freshwater Sport *	Hatchery Return **	Spawning grounds	Smolt to Adult Survival
1999	61,372	2001-02	410	1,665	n.a.	3.38
2000	60,423	2002-03	261	876	n.a.	1.88
2001	60,522	2003-04	297	1011	n.a.	2.16
2002	59,846	2004-05	342	1185	n.a.	2.55
2003	63,766	2005-06	545	1787	n.a.	3.66
2004	60,787	2006-07	390	1164	n.a.	2.56
2005	60,952	2007-08	195	612	n.a.	1.32
2006	61,499	2008-09	255	440	n.a.	1.13
2007	61,341	2009-10	370	696	n.a.	1.74
2008	61,290	2010-11	421	880	n.a.	2.12
2009	61,198	2011-12	344	810	n.a.	1.89
2010	58,643	2012-13	177	353	n.a.	0.90

Data Source: HMS, District files

* Big Creek catch, based on harvest card returns. Hatchery/wild and age composition estimated, based on average of the 1983-84 to 1990-91 scale data.

** Used average age composition from fishery scales to assign age to Big Creek hatchery returns.

Table 1-3

Estimated Adult Winter Steelhead Produced by the Big Creek Hatchery Winter Steelhead Smolts Released in the Gnat Creek Basin, 1999 to 2010 Brood Years. n.a. = not available. Estimate represents a minimum value.

Brood Year	Gnat Creek Smolt Release	2-Salt Return Year	Estimated Adult Hatchery STW (2-salt + 3-salt)			
			Freshwater Sport *	Hatchery Return	Spawning grounds	Smolt to Adult Survival
1999	41,218	2001-02	168	n.a.	n.a.	0.41
2000	37,629	2002-03	157	n.a.	n.a.	0.42
2001	40,358	2003-04	202	n.a.	n.a.	0.50
2002	40,044	2004-05	209	n.a.	n.a.	0.52
2003	39,294	2005-06	278	n.a.	n.a.	0.71
2004	35,607	2006-07	234	n.a.	n.a.	0.66
2005	40,380	2007-08	208	n.a.	n.a.	0.51
2006	40,900	2008-09	130	n.a.	n.a.	0.32
2007	40,901	2009-10	146	n.a.	n.a.	0.36
2008	41,263	2010-11	143	n.a.	n.a.	0.35
2009	39,926	2011-12	145	n.a.	n.a.	0.36
2010	38,604	2012-13	62	n.a.	n.a.	0.16

Data Source: HMS, District files

* Gnat Creek catch, based on harvest card returns. Hatchery/wild and age composition estimated, based on average of the 1983-84 to 1990-91 scale data.

Table 1-4

Estimated Adult Winter Steelhead Produced by the Big Creek Hatchery Winter Steelhead Smolts Released in the North Fork Klaskanine Basin, 1999 to 2010 Brood Years. n.a. = not available. Estimate represents a minimum value.

Brood Year	NF Klaskanine Smolt Release	2-Salt Return Year	Estimated Adult Hatchery STW (2-salt + 3-salt)			
			Freshwater Sport *	Hatchery Return **	Spawning grounds	Smolt to Adult Survival
1999	62,103	2001-02	274	276	n.a.	0.89
2000	56,210	2002-03	153	282	n.a.	0.77
2001	29,633	2003-04	177	231	n.a.	1.38
2002	59,784	2004-05	149	274	n.a.	0.71

2003	59,699	2005-06	221	467	n.a.	1.15
2004	60,870	2006-07	155	369	n.a.	0.86
2005	61,165	2007-08	117	446	n.a.	0.92
2006	41,059	2008-09	164	527	n.a.	1.68
2007	41,026	2009-10	243	482	n.a.	1.77
2008	41,308	2010-11	177	371	n.a.	1.33
2009	41,900	2011-12	133	263	n.a.	0.95
2010	38,873	2012-13	87	91	n.a.	0.46
Data Source: HMS, District files						
* Big Creek catch, based on harvest card returns. Hatchery/wild and age composition estimated, based on average of the 1983-84 to 1990-91 scale data.						
** Used average age composition from fishery scales to assign age to Klaskanine Hatchery returns.						

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

The first egg take of Big Creek winter steelhead was in 1939. The facility was expanded with the addition of more ponds and buildings in 1952.

The STEP program has been in place since 1981. Participation by local schools varies from year to year.

1.14) Expected duration of program.

The Big Creek Hatchery winter steelhead program is ongoing and is expected to continue indefinitely into the future.

The STEP program is ongoing, and eggs will be made available for classroom incubators if requested by program participants.

1.15) Watersheds targeted by program.

Big Creek, a tributary of the lower Columbia River
Gnat Creek, a tributary of the lower Columbia River
North Fork Klaskanine River, a tributary of Youngs Bay in the lower Columbia River

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

1.16.1) Brief Overview of Key Issues

1. Adult Passage - Upstream fish migration is stopped at barriers on all three release streams. Unmarked adult steelhead and coho that enter the hatchery trap at Big Creek and Klaskanine hatcheries are hauled upstream above barriers. Chum salmon trapped at Big Creek are released upstream of the hatchery, transferred to adjacent basins to spawn naturally, or spawned as part of the Chum Reintroduction Project (see Big Creek Hatchery Chum Salmon HGMP). No passage

is possible on Gnat Creek due to the lack a trapping facility. ODFW has identified providing passage at these barriers as part of the Lower Columbia Coho Recovery Plan.

2. Disease - Passage of adults above the hatchery facility may increase the risk of diseases being passed to fish rearing at the hatchery.

3. Recycling adult steelhead - Recycling adult steelhead through the sport fishery provides for increased angling opportunity and some level of harvest on hatchery fish. May increase interactions with wild fish if hatchery fish are not caught and do not return to the hatchery. Recycling is very popular with anglers.

1.16.2) Potential Alternatives to the Current Program

Alternative 1 - Reduce program size

Description and Implications - This alternative would reduce the number of smolts released. The winter steelhead sport fishery in Gnat Creek, Big Creek, and the North Fork Klaskanine River could be affected if the reduction resulted in fewer adults available to anglers. Any impacts of hatchery steelhead on listed species would potentially be reduced also. Hatchery operating costs would decrease, although winter steelhead are a small percentage of the overall hatchery production.

Alternative 2 - Increase program size

Description and Implications - This alternative would increase the number of smolts released. The winter steelhead sport fishery in Gnat Creek, Big Creek, and the North Fork Klaskanine River may be enhanced if the increase resulted in more adults available to anglers. Any impacts from Stock 13 hatchery steelhead on listed species would potentially increase also. Hatchery operating costs would increase to some extent. Increased adult returns would increase the workload of hatchery personnel to handle the additional fish.

Alternative 3 - Eliminate program

Description and Implications - This alternative would eliminate the program. The consumptive winter steelhead sport fishery in Gnat Creek, Big Creek, and the North Fork Klaskanine River would be virtually eliminated, limited to only the occasional stray hatchery steelhead (unless a fishery for unmarked fish was allowed). Any impacts of Stock 13 hatchery steelhead on listed species would be eliminated. Hatchery operating costs associated with the program would be eliminated.

Alternative 4 - Eliminate recycling of adult steelhead

Description and Implications - This alternative would eliminate this portion of the program. The consumptive winter steelhead sport fishery in Gnat Creek, Big Creek, and the North Fork Klaskanine River would be reduced to some degree, depending on the number of adults recycled and their contribution. Any additional interactions of hatchery steelhead with wild fish would be eliminated. Adult hatchery fish could be transported to standing waters to provide angling opportunity. Adult hatchery fish could be donated to local food bank programs or killed for stream enrichment.

Alternative 5 - Incorporate unmarked fish into brood

Description and Implications - Use of unmarked, naturally produced adults in the brood may enhance the gene pool of Big Creek Hatchery winter steelhead (although the stock is derived from Big Creek fish). Over the last several years, small numbers of unmarked steelhead (see table 2-2) have been trapped at Big Creek Hatchery. Insufficient numbers of unmarked fish may be available to meet genetic needs, or a high percentage of the natural population would have to be “mined” for this purpose. Until the numbers of unmarked fish increase substantially, unmarked fish will continue to be passed upstream to spawn naturally.

Alternative 6 - Increase smolt production and expand release locations to include other Lower Columbia tributaries

Description and Implications - This option would increase the number of smolts produced and expand the range of Stock 13 hatchery steelhead releases to include other lower Columbia River tributaries, such as the Lewis and Clark River, Youngs River, Bear Creek, or others. Expanding the range of releases could enhance sport angling opportunity and/or reduce angler crowding in current release streams. Expanding the range of releases could increase impacts to naturally producing salmonid populations by increasing the interactions with hatchery steelhead. The level of increase in production and numbers of fish released and the location(s) of releases would have to be determined. Alternatively, production could remain the same, with releases spread into more basins.

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

1.16.3 Potential Reforms and Investments

1. Modify adult passage barriers - Funding is needed to provide or enhance passage at the barrier falls on Gnat Creek and at hatchery weirs on Big Creek and the North Fork Klaskanine River. Past estimates to restore passage (including associated water treatment facilities, screening, engineering, and other construction costs) were \$1.2 million for Big Creek and \$1.75 million for Gnat Creek. No cost estimate is available for Klaskanine Hatchery (ODFW, 2002). Updated cost estimates are not available at this time.
2. Equipment may be needed to facilitate passage of unmarked steelhead and unmarked coho. Items such as portable liberation tanks, trucks or other similar equipment could be used to transport fish above barriers.
3. Improvements may be necessary to provide pathogen free water for egg incubation. Passing adults above hatchery facilities increases the chance of disease. Equipment may be needed to treat incoming water to destroy any pathogens present. Costs are included above with estimate for modifying passage.
4. Funding could be made available for sampling downstream migrating juvenile salmonids in one or more of these basins. This would increase our knowledge of the habitat and production of juveniles resulting from passing adult fish above the hatcheries. Downstream migrant traps could be associated with barrier modifications, or by portable traps (i.e. screw traps). No cost estimate is available, is dependent on duration, number of traps, personnel, etc.

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

SECTION 2

PROGRAM EFFECTS ON ESA - LISTED SALMONID POPULATIONS

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

The HGMP for this program was submitted to NMFS on 3/3/2005 for ESA permit or take authorization. This is an updated version of the previously submitted HGMP.

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

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

Lower Columbia Chum Salmon, Lower Columbia Coho Salmon, and Lower Columbia Fall Chinook Salmon inhabit areas within the same sub-basin.

Upper Willamette Spring Chinook Salmon, Snake River Spring/Summer and Fall Chinook Salmon, Lower Columbia River Steelhead, Upper Willamette River Steelhead, Middle Columbia River Steelhead, Snake River Basin Steelhead, and Snake River Sockeye Salmon inhabit sub-basins upstream of the program area

These populations all share a common estuarine rearing area in the lower Columbia River basin.

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

Lower Columbia Coho Salmon and Lower Columbia Chum Salmon are directly affected by this program (via trapping activities).

Lower Columbia Fall Chinook may be directly affected by this program; however due to run time differences these fish are rarely, if ever, encountered during steelhead program operations. Little to no direct impact to this population is expected.

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

Upper Willamette Spring Chinook Salmon, Snake River Spring/Summer and Fall Chinook Salmon, Lower Columbia River Steelhead, Upper Willamette River Steelhead, Middle Columbia River Steelhead, Snake River Basin Steelhead, and Snake River Sockeye Salmon inhabit sub-basins upstream of the program area and could be incidentally affected by this program.

As stated above, all populations share a common estuarine rearing area in the Lower Columbia River. All populations could be indirectly affected through interactions or competition with smolts released for this program.

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

The following populations may be directly affected by the Stock 13 hatchery winter steelhead program:

Lower Columbia Chum Salmon - Threatened

Lower Columbia Fall Chinook Salmon - Threatened

Lower Columbia River Coho Salmon - Threatened

The following populations are located upstream in the Columbia River basin, and may be indirectly affected by the Stock 13 hatchery winter steelhead program. It is expected any impacts to these populations would be minimal since they do not inhabit systems within the program area (although they share a common estuarine rearing area):

Upper Willamette Spring Chinook Salmon - Threatened

Snake River Spring/Summer and Fall Chinook Salmon - Threatened

Lower Columbia River Steelhead - Threatened

Upper Willamette Steelhead - Threatened

Middle Columbia River Steelhead - Threatened

Snake River Basin Steelhead - Threatened

Snake River Sockeye Salmon – Endangered

-Describe the status of listed natural population(s) relative to “critical” and “viable” population threshold.

Due to the low likelihood that listed populations from outside the Lower Columbia are affected by this program, only assessments of listed populations within the Lower Columbia are presented here.

Lower Columbia Fall Chinook and Coho Salmon populations are considered non-viable with high to very high extinction probabilities. Lower Columbia Chum Salmon are considered functionally extirpated (an extensive re-introduction program is in progress). Detailed analysis of the viability ratings is presented in the Lower Columbia River Conservation and Recovery Plan for Oregon Populations of Salmon and Steelhead (ODFW 2010) and the Lower Columbia Chum Salmon Reintroduction Plan (Homel, 2014)

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

- Due to the low likelihood that listed populations from outside the Lower Columbia are affected by this program, only assessments of listed populations within the Lower Columbia are presented here.

Little data is available to describe productivity of listed Coho, Fall Chinook, and Chum Salmon in the Lower Columbia River. Productivity assessments are described in the Lower Columbia River Conservation and Recovery Plan for Oregon Populations of Salmon and Steelhead (ODFW 2010) and the Lower Columbia Chum Salmon Reintroduction Plan (Homel, 2014)

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

- Due to the low likelihood that listed populations from outside the Lower Columbia are affected by this program, only assessments of listed populations within the Lower Columbia are presented here.
- Abundance data is provided in Table 2-1.

Table 2-1. Abundance measurements for wild Lower Columbia River Coho, wild Fall Chinook, and Chum Salmon (Oregon side only)

-Year	-Coho	Fall Chinook	-Chum ²
-2002	-3,963	-n.a	-0
-2003	-5,343	-n.a	-1
-2004	-5,627	-n.a	-1
-2005	-4,822	-n.a	-0
-2006	-6,425	-n.a	-0
-2007	-5,782	-n.a	-0
-2008	-4,992	-n.a	-0
-2009	-12,674	-n.a	-1
-2010	-7,717	-n.a	-0
-2011	-8,321	-n.a	-1
-2012	-4,377	-1,107	-16
-2013	-6,003 ¹	-3,302	-6
-2014	-21,729 ¹	-926	-23
-2015	-2,972 ¹	-2,580	-68

- Data from ODFW spawning ground surveys and from the Chum Re-introduction project. Fall Chinook data should be considered preliminary.
- ⁻¹ No sampling occurred in the Big Creek or Young's Bay populations. Abundance is likely underestimated.
- ⁻² Represents peak count of spawner surveys in Big Creek.

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

- Due to the low likelihood that listed populations from outside the Lower Columbia are affected by this program, only assessments of listed populations within the Lower Columbia are presented here.

Estimates of the proportion of hatchery fish in the spawning population are presented in Table 2-2.

-Table 2-2. Estimates of the proportion of naturally spawning salmon of hatchery origin in the Lower Columbia River (Oregon side only).

-Year	-Coho	Fall Chinook	-Chum²
-2002	-63%	-n.a	-n.a
-2003	-20%	-n.a	-n.a
-2004	-25%	-n.a	-n.a
-2005	-42%	-n.a	-n.a
-2006	-66%	-n.a	-n.a
-2007	-24%	-n.a	-n.a
-2008	-26%	-n.a	-n.a
-2009	-27%	-n.a	-n.a
-2010	-35%	-n.a	-n.a
-2011	-18%	-n.a	-n.a
-2012	-22%	-91%	-n.a
-2013	-19% ¹	-77%	-74%
-2014	-12% ¹	-92%	-55%
-2015	-9% ¹	-76%	-65%

- Data from ODFW spawning ground surveys and from the Chum Re-introduction project. Fall Chinook data should be considered preliminary.
- ¹ No sampling occurred in the Big Creek or Young’s Bay populations. Hatchery fraction is likely underestimated.
- ² Based on returns to Big Creek Hatchery. May not represent actual spawning ground fractions. See Big Creek Hatchery Chum Salmon HGMP for more information.

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

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

Hatchery adult trapping - Adult steelhead are trapped at Big Creek and Klaskanine hatcheries from November to March annually. The hatchery trap is closed down during hatchery steelhead smolt releases (usually late March-April). If the trap is left open during the volitional releases, many smolts would collect and hold in the trap facility. They are then very difficult to flush out of the trap. After releases are complete and most fish have migrated downstream, the trap is re-opened (generally late April or in May). The trap operation beginning in May is aimed primarily at collection of spring chinook, although late arriving winter steelhead could be trapped. In recent years, however, no winter steelhead have been collected after the trap closure period. The ability to trap/pass winter steelhead during April is an issue that would be addressed by the fish passage reforms and investments (Section 1.16.3).

Listed fish species may be handled if they enter the trapping facility. Unmarked steelhead and unmarked coho trapped are hauled in a portable liberation tank upstream of hatchery barriers and released. Listed wild steelhead may be present, trapped, and passed upstream since they cannot be differentiated from other unmarked steelhead. However, it is believed that the number of listed steelhead present is extremely low. This is due to the fact that Big Creek winter steelhead are part of the SW Washington ESU, and are not listed. Listed steelhead are present in other ESU's in the Columbia River basin upstream of Big Creek (i.e. Upper Willamette). Thus, any listed steelhead present would be strays from other ESU's. Since the number of unmarked steelhead trapped is relatively low, and likely only some of those are strays from elsewhere (which may or may not be listed), it stands to reason that very few listed steelhead are present.

It is possible that late run fall chinook or early migrating spring chinook could be trapped during steelhead collection. Fall Chinook are mass marked, thus returning hatchery adults can be distinguished from wild adults. Fall chinook adults will be handled using the protocol outlined in the Big Creek/Klaskanine Hatchery Fall Chinook HGMP(s). Hatchery spring chinook are mass marked. Hatchery adults can be distinguished from wild adults. All unmarked, wild spring chinook trapped will be transported back downstream and released. Handling mortality may occur during this process, although no mortalities have been observed. Note: Fall chinook and spring chinook are rarely, if ever, trapped during the period of winter steelhead adult collection.

Listed chum salmon are trapped during winter steelhead collection. Chum salmon collected are handled as described in the Big Creek Hatchery Chum Salmon HGMP as part of the lower Columbia River Chum Reintroduction Project. Chum salmon trapped at Big Creek are transferred to adjacent basins to spawn naturally. Chum are considered extirpated in Lower Columbia River tributaries and until direction is provided in the Lower Columbia River Salmon Recovery Plan (under development) no chum will be passed upstream. Trapped chum are of unknown origin, would increase disease potential in the facility, and may suffer significant impingement on intake screens. Additionally there is no assessment of available chum habitat above the hatchery. Handling mortality may occur during this process, although no mortalities of released fish have been observed.

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

Data of the past take levels (captured, handled, and released) during return years 2006-2015 are shown in Tables 2-3 and 2-4 at Big Creek Hatchery and Klaskanine Hatchery, respectively. The brood collection for winter steelhead program usually occurred from November 15 to March 31, which overlap brood collection programs for Coho Salmon, Chum Salmon and fall Chinook Salmon programs. And thus the past take levels in Tables 2-3 and 2-4, include all programs at Big Creek and Klaskanine hatcheries without proportionating the take levels for each program.

Table 2-3. Number of unmarked coho, steelhead, and chum captured associated with all programs at Big Creek Hatchery, 2006-2015.

Return Year	Unmarked Coho	Unmarked Steelhead	Chum
2006-07	252	84	198
2007-08	225	65	1
2008-09	246	57	3
2009-10	515	17	22
2010-11	275	85	26
2011-12	168	94	4
2012-13	215	79	37
2013-14	251	25	15
2014-15	644	26	135

Data Source: HMS; hatchery files

Table 2-4. Number of unmarked coho, steelhead, and chum captured associated with all programs at Klaskanine Hatchery including other programs, 2006-2015.

Return Year	Unmarked Coho	Unmarked Steelhead	Chum
2006-07	12	0	0
2007-08	26	8	0
2008-09	28	1	4
2009-10	40	2	0
2010-11	23	2	2
2011-12	20	3	0
2012-13	10	2	0
2013-14	17	0	0
2014-15	59	0	0

Data Source: HMS; hatchery files

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

See Tables 2-5 to 2-14

Table 2-5. Estimated Listed Salmonid Take Levels by Hatchery Activity

Listed Species Affected: Coho Salmon ESU/Population: Lower Columbia River (State) Activity: StW Broodstock Trapping				
Location of Hatchery Activity:	Big Creek Hatchery	Dates of Activity:	Nov. 15 – March 31	Hatchery Program Operator: Oregon Department of Fish and Wildlife
Type of Take	Annual Take of Listed Fish By Life Stage (<i>Number of Fish</i>)			
	Egg/Fry	Juvenile/Smolt	Adult	Carcass
Observe or harass a)				
Collect for transport b)				
Capture, handle, and release c)			0-250*	
Capture, handle, tag/mark/tissue sample, and release d)			0-250*	
Removal (e.g. broodstock) e)				
Intentional lethal take f)				
Unintentional lethal take g)			<10**	
Other Take (specify) h)				
<p>a) Contact with listed fish through stream surveys, carcass and mark recovery projects, or migrational delay at weirs.</p> <p>b) Take associated with weir or trapping operations where listed fish are captured and transported for release.</p> <p>c) Take associated with weir or trapping operations where listed fish are captured, handled and released upstream or downstream.</p> <p>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.</p> <p>e) Listed fish removed from the wild and collected for use as broodstock.</p> <p>f) Intentional mortality of listed fish, usually as a result of spawning as broodstock.</p> <p>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.</p> <p>h) Other takes not identified above as a category.</p> <p>* Fish may be scale sampled and/or marked before being passed upstream. The take numbers reflect the total number of fish, and are not additive (they are listed in both categories to account for annual differences in handling technique). Previous scale sampling has shown that unmarked hatchery fish make up a proportion of the unmarked adults collected, so not all unmarked coho are wild.</p> <p>** No direct mortalities have been observed during trap and haul operations.</p>				

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

Listed Species Affected: Coho Salmon ESU/Population: Lower Columbia River (State) Activity: StW Broodstock Trapping				
Location of Hatchery Activity: Klaskanine Hatchery		Dates of Activity: Nov. 15 – March 31		Hatchery Program Operator: Oregon Department of Fish and Wildlife
Type of Take	Annual Take of Listed Fish By Life Stage (<i>Number of Fish</i>)			
	Egg/Fry	Juvenile/Smolt	Adult	Carcass
Observe or harass a)				
Collect for transport b)				
Capture, handle, and release c)			0-100*	
Capture, handle, tag/mark/tissue sample, and release d)			0-100*	
Removal (e.g. broodstock) e)				
Intentional lethal take f)				
Unintentional lethal take g)			<5**	
Other Take (specify) h)				
<p>a) Contact with listed fish through stream surveys, carcass and mark recovery projects, or migrational delay at weirs.</p> <p>b) Take associated with weir or trapping operations where listed fish are captured and transported for release.</p> <p>c) Take associated with weir or trapping operations where listed fish are captured, handled and released upstream or downstream.</p> <p>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.</p> <p>e) Listed fish removed from the wild and collected for use as broodstock.</p> <p>f) Intentional mortality of listed fish, usually as a result of spawning as broodstock.</p> <p>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.</p> <p>h) Other takes not identified above as a category.</p> <p>* Fish may be scale sampled before being passed upstream. The take numbers reflect the total number of fish, and are not additive (they are listed in both categories to account for annual differences in handling technique). Previous scale sampling has shown that unmarked hatchery fish make up a proportion of the unmarked adults collected, so not all unmarked coho are wild.</p> <p>** No direct mortalities have been observed during trap and haul operations.</p>				

Table 2-7. Estimated Listed Salmonid Take Levels by Hatchery Activity

Listed Species Affected: Chum Salmon		ESU/Population: Lower Columbia		Activity: StW Broodstock Trapping	
Location of Hatchery Activity: Big Creek Hatchery		Dates of Activity: Nov. 15– March 31		Hatchery Program Operator: Oregon Department of Fish and Wildlife	
Type of Take	Annual Take of Listed Fish By Life Stage (<i>Number of Fish</i>)				
	Egg/Fry	Juvenile/Smolt	Adult	Carcass	
Observe or harass a)					
Collect for transport b)			350*		
Capture, handle, and release c)			1500*		
Capture, handle, tag/mark/tissue sample, and release d)					
Removal (e.g. broodstock) e)			350*		
Intentional lethal take f)					
Unintentional lethal take g)			35**		
Other Take (specify) h)					
<p>a) Contact with listed fish through stream surveys, carcass and mark recovery projects, or migrational delay at weirs.</p> <p>b) Take associated with weir or trapping operations where listed fish are captured and transported for release.</p> <p>c) Take associated with weir or trapping operations where listed fish are captured, handled and released upstream or downstream.</p> <p>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.</p> <p>e) Listed fish removed from the wild and collected for use as broodstock.</p> <p>f) Intentional mortality of listed fish, usually as a result of spawning as broodstock.</p> <p>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.</p> <p>h) Other takes not identified above as a category.</p> <p>* These take numbers reflect both hatchery and wild chum handled during chum reintroduction efforts. Currently numbers are much lower, but may increase as populations increase. Refer to the Big Creek Hatchery Chum Salmon HGMP for details.</p> <p>** No direct mortalities have been observed during trap and haul operations..</p>					

Table 2-8. Estimated Listed Salmonid Take Levels by Hatchery Activity

Listed Species Affected:	Chum Salmon	ESU/Population:	Lower Columbia	Activity:	StW Broodstock Trapping
Location of Hatchery Activity:	Klaskanine Hatchery	Dates of Activity:	Nov. 15 – March 31	Hatchery Program Operator:	Oregon Department of Fish and Wildlife
Type of Take	Annual Take of Listed Fish By Life Stage (<i>Number of Fish</i>)				
	Egg/Fry	Juvenile/Smolt	Adult	Carcass	
Observe or harass a)					
Collect for transport b)					
Capture, handle, and release c)			150*		
Capture, handle, tag/mark/tissue sample, and release d)			350*		
Removal (e.g. broodstock) e)			150*		
Intentional lethal take f)					
Unintentional lethal take g)			10**		
Other Take (specify) h)					
<p>a) Contact with listed fish through stream surveys, carcass and mark recovery projects, or migrational delay at weirs.</p> <p>b) Take associated with weir or trapping operations where listed fish are captured and transported for release.</p> <p>c) Take associated with weir or trapping operations where listed fish are captured, handled and released upstream or downstream.</p> <p>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.</p> <p>e) Listed fish removed from the wild and collected for use as broodstock.</p> <p>f) Intentional mortality of listed fish, usually as a result of spawning as broodstock.</p> <p>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.</p> <p>h) Other takes not identified above as a category.</p> <p>*Chum reintroduction efforts may expand into Youngs Bay in the future and chum could possibly be collected at Klaskanine Hatchery</p> <p>**No chum have been trapped in recent years. No mortalities observed from trap and haul at Big Creek Hatchery.</p>					

Table 2-9. Estimated Listed Salmonid Take Levels by Hatchery Activity

Listed Species Affected: Fall Chinook Salmon ESU/Population: Lower Columbia Activity: StW Broodstock Trapping				
Location of Hatchery Activity: Big Creek Hatchery		Dates of Activity: Nov. 15 – March 31		Hatchery Program Operator: Oregon Department of Fish and Wildlife
Type of Take	Annual Take of Listed Fish By Life Stage (<i>Number of Fish</i>)			
	Egg/Fry	Juvenile/Smolt	Adult	Carcass
Observe or harass a)				
Collect for transport b)				
Capture, handle, and release c)			0-10*	
Capture, handle, tag/mark/tissue sample, and release d)			0-10*	
Removal (e.g. broodstock) e)				
Intentional lethal take f)				
Unintentional lethal take g)			<3	
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.

*** No fall chinook have been collected during steelhead trapping in recent years. The take numbers reflect the total number of fish, and are not additive (they are listed in both categories to account for annual differences in handling technique)**

Table 2-10. Estimated Listed Salmonid Take Levels by Hatchery Activity

Listed Species Affected: Fall Chinook Salmon					ESU/Population: Lower Columbia		Activity: StW Broodstock Trapping		
Location of Hatchery Activity: Klaskanine Hatchery			Dates of Activity: Nov. 15 – March 31		Hatchery Program Operator:		Oregon Department of Fish and Wildlife		
Type of Take	Annual Take of Listed Fish By Life Stage (<i>Number of Fish</i>)								
	Egg/Fry	Juvenile/Smolt	Adult	Carcass					
Observe or harass a)									
Collect for transport b)									
Capture, handle, and release c)			0-10*						
Capture, handle, tag/mark/tissue sample, and release d)			0-10*						
Removal (e.g. broodstock) e)									
Intentional lethal take f)									
Unintentional lethal take g)			<3						
Other Take (specify) h)									
<p>a) Contact with listed fish through stream surveys, carcass and mark recovery projects, or migrational delay at weirs.</p> <p>b) Take associated with weir or trapping operations where listed fish are captured and transported for release.</p> <p>c) Take associated with weir or trapping operations where listed fish are captured, handled and released upstream or downstream.</p> <p>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.</p> <p>e) Listed fish removed from the wild and collected for use as broodstock.</p> <p>f) Intentional mortality of listed fish, usually as a result of spawning as broodstock.</p> <p>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.</p> <p>h) Other takes not identified above as a category.</p> <p>* No fall chinook have been collected during steelhead trapping in recent years. The take numbers reflect the total number of fish, and are not additive (they are listed in both categories to account for annual differences in handling technique)</p>									

Table 2-11. Estimated Listed Salmonid Take Levels by Hatchery Activity

Listed Species Affected: Spring/Summer Chinook Salmon ESU/Population: Snake River Spring/Summer Upper Willamette Spring Activity: StW Broodstock Trapping				
Location of Hatchery Activity: Big Creek Hatchery Dates of Activity: Nov. 15 – March 31 Operator: Hatchery Program Oregon Department of Fish and Wildlife				
Type of Take	Annual Take of Listed Fish By Life Stage (<i>Number of Fish</i>)			
	Egg/Fry	Juvenile/Smolt	Adult	Carcass
Observe or harass a)				
Collect for transport b)				
Capture, handle, and release c)			0-10*	
Capture, handle, tag/mark/tissue sample, and release d)			0-10*	
Removal (e.g. broodstock) e)				
Intentional lethal take f)				
Unintentional lethal take g)			<3	
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.

*** No spring chinook have been collected during steelhead trapping in recent years. The take numbers reflect the total number of fish, and are not additive (they are listed in both categories to account for annual differences in handling technique)**

Table 2-12. Estimated Listed Salmonid Take Levels by Hatchery Activity

Listed Species Affected:	Spring/Summer Chinook Salmon	ESU/Population:	Snake River Spring/Summer Upper Willamette Spring	Activity:	StW Broodstock Trapping
Location of Hatchery Activity:	Klaskanine Hatchery	Dates of Activity:	Nov. 15 – March 31	Hatchery Program Operator:	Oregon Department of Fish and Wildlife
Type of Take	Annual Take of Listed Fish By Life Stage (<i>Number of Fish</i>)				
	Egg/Fry	Juvenile/Smolt	Adult	Carcass	
Observe or harass a)					
Collect for transport b)					
Capture, handle, and release c)			0-10*		
Capture, handle, tag/mark/tissue sample, and release d)			0-10*		
Removal (e.g. broodstock) e)					
Intentional lethal take f)					
Unintentional lethal take g)			<3		
Other Take (specify) h)					
<p>a) Contact with listed fish through stream surveys, carcass and mark recovery projects, or migrational delay at weirs.</p> <p>b) Take associated with weir or trapping operations where listed fish are captured and transported for release.</p> <p>c) Take associated with weir or trapping operations where listed fish are captured, handled and released upstream or downstream.</p> <p>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.</p> <p>e) Listed fish removed from the wild and collected for use as broodstock.</p> <p>f) Intentional mortality of listed fish, usually as a result of spawning as broodstock.</p> <p>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.</p> <p>h) Other takes not identified above as a category.</p> <p>* No spring chinook have been collected during steelhead trapping in recent years. The take numbers reflect the total number of fish, and are not additive (they are listed in both categories to account for annual differences in handling technique)</p>					

Table 2-13. Estimated Listed Salmonid Take Levels by Hatchery Activity

Listed Species Affected: Winter Steelhead		ESU/Population: Upper Willamette Lower Columbia Middle Columbia Snake River Basin		Activity: StW Broodstock Trapping	
Location of Hatchery Activity: Big Creek Hatchery		Dates of Activity: Nov. 15 – March 31		Hatchery Program Operator: Oregon Department of Fish and Wildlife	
Type of Take	Annual Take of Listed Fish By Life Stage (<i>Number of Fish</i>)				
	Egg/Fry	Juvenile/Smolt	Adult	Carcass	
Observe or harass a)					
Collect for transport b)					
Capture, handle, and release c)			0-20*		
Capture, handle, tag/mark/tissue sample, and release d)			0-20*		
Removal (e.g. broodstock) e)					
Intentional lethal take f)					
Unintentional lethal take g)			<3**		
Other Take (specify) h)					
<p>a) Contact with listed fish through stream surveys, carcass and mark recovery projects, or migrational delay at weirs.</p> <p>b) Take associated with weir or trapping operations where listed fish are captured and transported for release.</p> <p>c) Take associated with weir or trapping operations where listed fish are captured, handled and released upstream or downstream.</p> <p>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.</p> <p>e) Listed fish removed from the wild and collected for use as broodstock.</p> <p>f) Intentional mortality of listed fish, usually as a result of spawning as broodstock.</p> <p>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.</p> <p>h) Other takes not identified above as a category.</p> <p>*Unmarked fish are assumed to be of local origin. Unmarked steelhead of non-local origin cannot be distinguished from local stocks. Thus, listed wild steelhead may inadvertently be passed. Fish may be scale sampled before being passed upstream. The take numbers reflect the total number of fish, and are not additive (they are listed in both categories to account for annual differences in handling technique). Previous scale sampling has shown that unmarked hatchery fish make up a proportion of the unmarked adults collected, so not all unmarked steelhead are wild.</p> <p>** No direct mortalities have been observed during trap and haul operations.</p>					

Table 2-14. Estimated Listed Salmonid Take Levels by Hatchery Activity

Listed Species Affected: Winter Steelhead		ESU/Population: Upper Willamette Lower Columbia Middle Columbia Snake River Basin		Activity: StW Broodstock Trapping	
Location of Hatchery Activity: Klaskanine Hatchery		Dates of Activity: Nov. 15 – March 31		Hatchery Program Operator: Oregon Department of Fish and Wildlife	
Type of Take	Annual Take of Listed Fish By Life Stage (<i>Number of Fish</i>)				
	Egg/Fry	Juvenile/Smolt	Adult	Carcass	
Observe or harass a)					
Collect for transport b)					
Capture, handle, and release c)			0-20*		
Capture, handle, tag/mark/tissue sample, and release d)			0-20*		
Removal (e.g. broodstock) e)					
Intentional lethal take f)					
Unintentional lethal take g)			<3**		
Other Take (specify) h)					
<p>a) Contact with listed fish through stream surveys, carcass and mark recovery projects, or migrational delay at weirs.</p> <p>b) Take associated with weir or trapping operations where listed fish are captured and transported for release.</p> <p>c) Take associated with weir or trapping operations where listed fish are captured, handled and released upstream or downstream.</p> <p>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.</p> <p>e) Listed fish removed from the wild and collected for use as broodstock.</p> <p>f) Intentional mortality of listed fish, usually as a result of spawning as broodstock.</p> <p>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.</p> <p>h) Other takes not identified above as a category.</p> <p>* Unmarked fish are assumed to be of local origin. Unmarked steelhead of non-local origin cannot be distinguished from local stocks. Thus, listed wild steelhead may inadvertently be passed. Fish may be scale sampled before being passed upstream. The take numbers reflect the total number of fish, and are not additive (they are listed in both categories to account for annual differences in handling technique). Previous scale sampling has shown that unmarked hatchery fish make up a proportion of the unmarked adults collected, so not all unmarked steelhead are wild.</p> <p>** No direct mortalities have been observed during trap and haul operations.</p>					

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

The Big Creek Hatchery and/or Klaskanine trap facility and handling procedures will be modified immediately if listed fish mortality can be identified, appears in or near the trap, and appears to be related to operation of the facility. This may include, but is not limited to, additional staff training or review of proper procedures, trap modifications, cessation of trapping, modified operation by hatchery personnel, etc.

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.**

The program is consistent with measures identified for hatchery programs in the *Oregon Plan for Salmon and Watersheds*. The Oregon Fish and Wildlife Commission (OFWC) adopted the Native Fish Conservation Policy (NFCP) in 2002. The NFCP provides a framework to protect and enhance Oregon's naturally produced native fish populations through the development of conservation plans for Species Management Units (SMU) in the state. The *Lower Columbia River Conservation and Recovery Plan for Oregon Populations of Salmon and Steelhead* was adopted in 2010. A Hatchery Management Policy (HMP) was also adopted. The HMP requires that Hatchery Program Management Plans (HPMP) be developed for each hatchery program. HGMP's will serve as HPMP's if they are consistent with guidance provided in the HMP. The conservation and hatchery management plans (along with this HGMP) will provide guidance for hatchery programs of species within the associated SMU.

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

Big Creek Hatchery is partially funded through and operates under the guidance of the Mitchell Act. Klaskanine Hatchery and Gnat Creek Hatchery is funded through and operates under a contract from the Bonneville Power Administration.

ODFW has an MOA with ODEQ for placement of carcasses for stream enrichment purposes. This MOA is not needed for operation of the program, only to allow for disposition of carcasses into designated streams.

- 3.3) Relationship to harvest objectives.**

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

The hatchery steelhead are mass marked as a means of integration of hatchery and harvest management. Mass marking allows for selective harvest of hatchery fish while requiring release of all wild fish. Mass marking also allows for better monitoring and control of impacts of the hatchery program to wild steelhead populations.

No cost/benefit analysis has been completed for the Stock 13 winter steelhead program.

- 3.3.1) Describe fisheries benefiting from the program, and indicate harvest levels**

and rates for program-origin fish for the last twelve years (1990-2001), if available.

Freshwater sport fisheries in Big Creek, Gnat Creek, and the North Fork Klaskanine River benefit from this program. Mainstem Columbia River sport fisheries may benefit also, but likely at a very low rate. Sport fisheries are selective for hatchery steelhead, thus this program supports the only consumptive harvest opportunity for steelhead in the lower Columbia River tributaries downstream of Hunt Creek (in Oregon).

Recent harvest data is presented in Tables 1-2 to 1-4.

3.4) Relationship to habitat protection and recovery strategies.

This harvest augmentation program is not directly related to habitat protection or recovery. It is designed to provide hatchery winter steelhead for harvest in freshwater fisheries, while other actions are taken to protect and restore habitat. Management of the hatchery program will focus on attaining harvest objectives using methods that minimize impacts to wild fish and their habitats.

Major factors affecting natural production in tributaries of the lower Columbia River are unknown; however, it is suspected that ocean survival may be the largest contributing factor. In general, habitat condition in these basins is slowly improving. Dominant land use in the lower Columbia River basin in which this program operates is logging and agriculture. Regulations governing these activities should improve water quality and reduce sedimentation in streams. Unfavorable natural events (flooding) are common in the basins and can have detrimental effects on egg depositions and juvenile rearing.

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

3.5) Ecological interactions

1. Negatively impact program

Competition for food between Stock 13 winter steelhead smolts and other salmonids (hatchery and wild) in release streams, Youngs Bay, or the lower Columbia River estuary and near shore ocean environment may negatively impact this program. Avian and marine mammal predation may negatively impact this program also.

2. Be negatively impacted by program

Competition for food between Stock 13 winter steelhead smolts and wild salmonid juveniles in release streams, Young's Bay or the lower Columbia River estuary and near shore ocean environment may negatively impact the wild juveniles. Large concentrations of hatchery reared fish may attract predators, which may cause increased predation on

wild salmonid juveniles. Increased angling pressure on hatchery steelhead may increase incidental mortality of wild steelhead.

3. Positively impact program

Increased abundance of naturally produced adult salmonids, primarily chinook and coho salmon, will increase stream nutrient levels and biomass productivity of the prey base used by hatchery and naturally produced fish. Use of hatchery salmon carcasses for stream enrichment activities will further enhance this nutrient base and positively influence the steelhead program.

4. Be positively impacted by program

Adult Stock 13 winter steelhead carcasses may be used in stream enrichment activities. The nutrients provided by these carcasses will benefit salmonid and non-salmonid fishes in the streams where the carcasses are placed. Carcasses are used in the stream enrichment program in the lower Columbia River basin (west of Hunt Creek) in Oregon as permitted through the Oregon Department of Environmental Quality (DEQ).

General Information

Interactions between migrating hatchery smolts and listed fish species are likely to be minimal. Steelhead are reared to smolt size and expected to migrate upon, or soon after release. Smolt releases occur at each hatchery facility. Target release size is about 6 fish per pound with release timing of late March to mid-April. All fish are sampled and disease tested by ODFW fish health staff and cleared before release. It is possible that some may residualize after release, but it is anticipated that interactions with listed species are minimal based upon their species-specific rearing and life history characteristics. Furthermore, unfed fry and fingerlings from hatchery production may be released into habitat locations (standing water) that are unlikely to overlap with rearing fry/fingerling of listed species. Hatchery steelhead carcasses may be used in the stream enrichment program and are permitted through the Oregon Department of Environmental Quality.

STEP Program

ODFW has had a Salmon and Trout Enhancement Program (STEP) in place and operational since 1981. A portion of the program (STEP hatchbox program) is the incubation of eggs and release of unfed fry by public participants. Egg requests are handled as part of annual hatchery production operations. Early stage eyed eggs are given to volunteers for incubation in classroom incubators. Direct stream releases are made when fish are in the late “button-up” stage. Typically, releases are directed into locations that are geographically low in the basin system.

Habitat Above Hatchery Facilities

BIG CREEK

Big Creek and some tributaries met several of the benchmarks for general quality salmonid habitat when ODFW Aquatic Habitat Inventory surveys were conducted in the summer of 1992 and the winter of 1993. There are 16.3 miles of anadromous (primarily coho, steelhead, and cutthroat) fish habitat available upstream of Big Creek Hatchery. Although relative pool area is deficient in many of the reaches, pool frequency is well within the desirable range for all but one reach. Instream large wood volume and key pieces were low in the lower reaches of the stream, but in very good condition in the upper basin. ODFW has worked cooperatively with the major landowner(s) in the basin on habitat enhancement projects and will continue to conduct habitat enhancement projects in conjunction with timber management operations.

Spawning gravel abundance is generally high, and presence of fine sediments is low; both signs of quality habitat.

GNAT CREEK

Gnat Creek has approximately 3.5 miles of potential anadromous fish habitat upstream of Gnat Creek Hatchery. This habitat has an average gradient of a 6% and is dominated by cascade (58.55%) and rapid (23.89%) habitat types. Scour pools (6.77%) and riffles (5.06%) are the next most common types of stream habitat in this area. The majority of the watershed above Gnat Creek Hatchery is forested with a large part of the watershed owned by the Oregon Department of Forestry (Clatsop State Forest). Past clearance of large wood (LWD) from the stream channel has decreased the complexity and productivity of the habitats above the hatchery, but LWD conditions should improve over time under current forest management practices. The steep gradient of the stream channel above the hatchery provides suitable habitat for steelhead and cutthroat trout. This habitat is extremely limited and of marginal quality for coho, chinook or chum salmon due to the natural physical characteristics of the stream (e.g. gradient).

NORTH FORK KLASKANINE

Limited habitat data is available for the North Fork Klaskanine River upstream of Klaskanine Hatchery. A 1950 assessment of habitat conditions above the hatchery indicated that there was 7 miles of available coho habitat, and an average of 8% of the area was available for spawning. Barth Falls historically created a natural barrier for chum, chinook, coho and cutthroat trout. Steelhead may have been able to pass above the falls during certain flow conditions prior to the construction of a fish ladder. There are approximately 12 miles of salmonid habitat above the hatchery, including the area above the falls. An ODFW Aquatic Habitat Inventory survey was completed in the summer of 1995, but the survey only included 5.5 miles of habitat above the hatchery. More detailed habitat surveys, both summer and winter, are needed to provide a better assessment of this habitat

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.

Big Creek Hatchery is supplied with gravity flow water from Big Creek, Mill Creek, and two springs. From the green egg stage to ponded fry stage (in incubator trays, troughs, and starter tank), the water source is from Mill Creek and the two springs. During the juvenile to full-term smolt stage, all fish are reared in water from Big Creek and Mill Creek. Water from Big Creek is directed to an intake system by a weir spanning the stream approximately 1/2 mile upstream of the hatchery. Water from Mill Creek is directed to an intake system by a weir spanning the stream just upstream of the hatchery. Water availability varies from 5,200 to 18,000 gallons per minute (gpm) with a total water right of 80 cubic feet per second (cfs).

Gnat Creek Hatchery is supplied by gravity flow from Gnat Creek. Water from Gnat Creek is directed to an intake system by a weir spanning the stream approximately 1/4 mile upstream of the hatchery. The hatchery has water rights for 40 cfs from Gnat Creek. Volume of flow during the period which steelhead are on-site is approximately 2000-3000 gpm. Additional water rights exist for small tributary streams in proximity to the hatchery; however this water has not been used previously for this program.

Klaskanine Hatchery water is obtained by gravity flow from the North Fork Klaskanine River and the North Fork of the North Fork Klaskanine River. Weirs located on each stream a short distance upstream direct water flow into the hatchery. Availability varies from 1,000 to 11,000 gpm with a total water right of 50 cfs.

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.

Big Creek Hatchery, Gnat Creek Hatchery, and Klaskanine Hatchery currently operate and discharge effluents under a NPDES 0300J permit. The hatcheries are in compliance with the requirements of their permits.

Intake screening at Big Creek Hatchery complies with NOAA criteria. Gnat Creek Hatchery and Klaskanine Hatchery intake are screened, but do not comply with current NOAA criteria. This problem has been identified by the ODFW Fish Screening and Passage Program in the Lower Columbia Coho Recovery Plan process, and in the Columbia Basin Artificial Production Review and Evaluation process. To date, no funding is available to modify the facilities to meet NOAA standards. Long term plans include upgrading the screens when funding has been secured.

SECTION 5 FACILITIES

5.1) Broodstock collection facilities (or methods).

The Big Creek Hatchery trap is located in the Big Creek watershed 2 miles east of Knappa off Highway 30 (RM 3.3). Beginning in November, adults return to the Big Creek trap and are collected for broodstock and held until spawning in January to early February. The adult holding area consists of a large upper pond and a lower pond divided into 7 sections with a total capacity of up to 10,000 fish depending on the species. The Big Creek trap utilizes water from Big Creek. Fish enter the trap via an adjacent fish ladder. Fish are manually sorted and held in the same facility until spawning.

Klaskanine Hatchery is located approximately 12 miles southeast of Astoria on Highway 202. The hatchery (and trap) is on the North Fork Klaskanine River at RM 2. Beginning in November, adults return to the trap and are collected for broodstock (if necessary) and held until spawning in January to early February. Adult facilities consist of a trap and one raceway, which can be divided into 3 sections. Total adult holding capacity is about 4,000 fish.

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

Broodstock are collected and held in the Big Creek and/or Klaskanine trap facility. All off station transfers are done with the use of a large liberation truck or a portable liberation tank (see description below).

The transfer of juvenile fish on station (from one pond to another) is done by the use of a distribution box, irrigation pipe and a gas powered water pump. Juvenile fish are dip-netted and hand weighed to determine the number of fish. The fish are then placed in the distribution box and are transported through the irrigation pipe to another raceway.

Gnat Creek Hatchery does not have a recapture facility. No collection or transportation of returning adults occurs. Juvenile rearing is conducted in one raceway. No movement of juveniles on station is typically necessary after being transferred to the facility.

Klaskanine Hatchery handles adults in a similar manner as Big Creek Hatchery. Adults collected at Klaskanine Hatchery are a backup source of broodstock for the program and are held in the hatchery trap facility (if needed for that purpose). Juvenile rearing is conducted in raceways. No movement of juveniles on station is typically necessary after being transferred to the facility.

Carcasses for stream enrichment are transported in plastic totes in the back of full size pickup trucks. Haul time varies depending on the location, but is usually less than 1.5 hours.

Adult fish are transported in liberation trucks similar to those used for juveniles (see section 10.5), or in a portable liberation tank carried in a full-size pickup truck. Liberation trucks are typically 1000-2500 gallon capacity units, either mounted on a large flatbed truck, or a tanker style truck. The lib trucks are equipped with oxygen diffusing systems, water re-circulation pumps, and dissolved oxygen meters. The portable liberation tank has a capacity of 300 gallons of water, and is equipped with an oxygen diffusion system. Adult fish hauled upstream of hatchery facilities (Big Creek and

Klaskanine) are transported a short distance (usually less than 1 mile), which only takes a few minutes. Adult fish recycled downstream are transported less than 10 miles, with a haul time generally less than 20 minutes. Adult fish recycled to lakes are transported various distances, depending on the lake chosen. Haul time is generally no more than 1 hour.

When spawning is conducted at Klaskanine Hatchery, eggs and sperm are transported separately to Big Creek Hatchery. Transportation is done in small containers, such as plastic buckets (eggs) or small plastic bags (sperm). The containers are transported in the back of a pickup truck to Big Creek Hatchery. The containers are covered (usually with burlap sacks or tarps) to shield them from the weather. Transportation time is approximately 45 minutes.

5.3) Broodstock holding and spawning facilities.

Broodstock is held in the Big Creek or Klaskanine trap facility. Spawning takes place in a portion of the trapping facility at each location. Spawning at Big Creek is conducted within a covered, three-sided metal building. Spawning at Klaskanine Hatchery is conducted in large, covered wooden shed. See section 5.1 for further detail.

5.4) Incubation facilities.

Incubation is done at Big Creek Hatchery in fiberglass incubation troughs with a capacity of 100,000 eggs per trough. The troughs are of two sizes, shallow or deep. The deep troughs measure 17" W x 15"D x 16' and are divided into 10 sections. The shallow troughs measure 17"W x 7"D x 16' and are divided into 6 sections. Flow through the incubators is 10 gpm. All incubation is completed inside the large hatchhouse building. Vertical stack incubators ("Heath" style) may also be used. These have a capacity of up to 10,000 eggs each.

5.5) Rearing facilities.

After hatching at Big Creek Hatchery, swim-ups are reared in four fiberglass Canadian style tanks in the hatchhouse. The Canadian troughs are 21' x 32" x 24", with a volume of 658 gallons of water. Approximately 44,000 fry are reared in each trough.

At ponding, juvenile steelhead are transferred outside to an 80' x 20' concrete raceway (4,400 ft³). As the fish grow, they are split into additional raceways, up to a maximum of eight. Maximum capacity of each raceway is 6000 lbs. of fish. Big Creek Hatchery winter steelhead production is contained in three raceways (20,000 fish per raceway). At the target size of 6 fish per pound, there are about 3,333 pounds of fish in each raceway (about 56% of maximum capacity). The remainder is transferred to Gnat Creek and Klaskanine hatcheries in the fall (after marking) for rearing to smolt size and release the following spring.

After transfer to Gnat Creek Hatchery, all juveniles are reared in one 16' x 100' concrete raceway (5600 ft³). The capacity of the raceway is about 7600 lbs. of fish. At the target size of 6 fish per pound, there are about 6,667 pounds of fish in the raceway (about 88% of maximum capacity).

After transfer to Klaskanine Hatchery, juveniles are reared in concrete raceways with a capacity of approximately 6,000 lbs. There are 20,000 fish per raceway. At the target

size of 6 fish per pound, there are about 3,333 pounds of fish in each raceway (about 56% of maximum capacity)

5.6) Acclimation/release facilities.

All steelhead smolts from Big Creek Hatchery are released volitionally directly from the ponds into Big Creek. Juveniles are transferred to Gnat Creek and Klaskanine hatcheries for final rearing from November/early December-April. Steelhead smolts are released volitionally from Gnat Creek Hatchery and Klaskanine Hatchery into Gnat Creek and the N.F. Klaskanine River, respectively.

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

The only major problems that have caused fish loss were in the egg stages. This was caused by human error.

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

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.

Winter steelhead propagated under this program are not listed. Any operational failures would be anticipated to have minimal or no effect on listed species.

The three hatcheries are staffed full time, 24 hours per day. Several alarm systems (including a pager system at Klaskanine Hatchery) are in place to warn employees of low water, plugged intakes, and other problems. Employees work schedules are adjusted as conditions warrant (i.e. during large storm events) to maintain hatchery operations.

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

Broodstock is collected at Big Creek Hatchery. Hatchery adults collected at Klaskanine Hatchery may be used if needed to make production goals. Adults are descendant of Big Creek origin stock. Big Creek winter steelhead are part of the SW Washington ESU and are not listed under the Federal ESA.

6.2) Supporting information.

6.2.1) History

Big Creek stock 13 origin is from natural spawners from Big Creek. The hatchery was first opened in 1941, with substantial upgrades in 1957. Based on historical records available, it appears the winter steelhead hatchery program first began in the early 1960's.

6.2.2) Annual size

Existing program requires a minimum of 60 females and 60 males for broodstock needs. Additional adults may be collected as necessary to cover shortages resulting from, but not limited to, fecundity variation, early egg mortality, positive disease test, etc.

6.2.3) Past and proposed level of natural fish in broodstock

Prior to the 1992-93 adult return, which were the first returns of 100 percent finmarked hatchery winter steelhead, naturally produced steelhead could not be differentiated from hatchery fish and would have been incorporated in the broodstock. Because they could not be distinguished visually, it is unknown at what level, if any, naturally produced fish were included in the broodstock. With the return of 100 percent marked fish back to the facility, no unmarked (naturally produced) adults have been used for broodstock purposes. Unmarked winter steelhead trapped have been passed above the weir/trap facility to spawn naturally since 2001.

6.2.4) Genetic or ecological differences

The current broodstock (locally adapted Big Creek progeny) are likely to exhibit differences from the naturally produced Lower Columbia basin winter steelhead. A significant percentage of returning hatchery adults appear to be 2-salt fish, and represent a higher percentage than would be expected in a naturally producing population. Return timing appears to be in an earlier period (late November through February, peaking in late December to early January) compared to a wild steelhead return period (January through April, usually peaking in mid to late March). Little information is available on spawning locations; however, in general we have observed that hatchery adults tend to spawn in smaller tributaries, and wild stock steelhead appear to spawn in larger tributaries and upper mainstem areas. This may vary significantly between basins based on local geography within the basins.

6.2.5) Reasons for choosing.

Big Creek stock eggs have been used for winter steelhead production at Big Creek from the program's inception. It was felt the use of a "locally adapted" stock was likely to reduce out-of-basin straying and provide broodstock better suited to the basins of release. The Big Creek stock appears to be a good contributor to angling success. Prior to 1992-93 return year, there was not 100 percent marking of hatchery fish; however, it was assumed that—based on timing—fish being taken for broodstock were primarily of hatchery origin.

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

Conceivably, listed steelhead could stray into Lower Columbia River tributaries associated with the Stock 13 winter steelhead hatchery program. It is possible that some listed steelhead may be collected at hatchery trap facilities at Big Creek or Klaskanine hatcheries. If trapped, they would be passed upstream along with other unmarked steelhead since there is currently no means to readily differentiate stocks of unmarked steelhead. The number of listed steelhead that enter these trap facilities is thought to be low. The passing of unmarked steelhead at these facilities likely has minimal impact on listed steelhead populations.

Additional risk aversion measures associated with the Big Creek winter steelhead broodstock collection (and selection) are discussed in Section 7.9.

SECTION 7

BROODSTOCK COLLECTION

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

Adult Stock 13 hatchery steelhead are collected to meet the objective of 140,000 smolts and to meet genetic guidelines.

7.2) Collection or sampling design.

In November, adults begin returning to the Big Creek and Klaskanine traps. Fish are collected throughout the run and held for broodstock during December and January, with spawning completed in January to early February.

7.3) Identity.

The hatchery reared winter steelhead have distinctive external fin clips that distinguish them from the unmarked naturally produced fish. The adipose fin clip is used to mark Big Creek hatchery winter steelhead, although other marks may be considered if necessary.

7.4) Proposed number to be collected:

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

Existing program targets 60 females and 60 males for broodstock to meet production goals and genetic guidelines. Additional adults may be collected as necessary to cover shortages resulting from, but not limited to, fecundity variation, early egg mortality, positive disease test, etc. Sufficient numbers of fish are spawned during the early portion of the run to ensure that production goals will be met and for genetic purposes. Once spawning is complete, surplus eggs from the early egg takes are culled randomly and destroyed. Approximately 200,000 eggs are needed (about 240,000 total are taken, with the excess culled) for this program, with a goal of 140,000 smolts. In addition, 10,000 eggs are provided to the U.S. Fish and Wildlife Service for research purposes.

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

Table 7-1

Brood stock collection levels for Stock 13 winter steelhead (2000-2014 brood years). Represents all fish collected at Big Creek Hatchery. Spawned fish are selected randomly throughout the run.

Brood Year	Females	Adults Males	Jacks	Eggs¹	Smolts released²
2000	227	230	0	811,471 (427,024)	154,262
2001	67	71	0	294,202 (240,785)	130,513
2002	969	1118	0	269,000	159,692
2003	415	353	10	222,000	162,759
2004	595	512	2	342,369	157,267
2005	372	436	3	383,822	162,497
2006	939	1046	17	387,698	143,458
2007	810	555	26	376,954	102,242
2008	399	337	5	244,524	143,861
2009	168	179	3	229,769	143,024
2010	351	288	0	194,220	136,120
2011	395	421	15	285,255	114,849
2012	569	447	0	274,750	150,273
2013	202	171	3	254,050	142,340

Brood Year	Females	Adults Males	Jacks	Eggs ¹	Smolts released ²
2014	155	157	0	203,300	134,439
2015	489	753	1	299,900	109,362

Data source: HMS, Big Creek Hatchery.

¹Numbers in parentheses are the number of eggs taken at Klaskanine Hatchery.

²Big Creek, Gnat Creek, and N.F. Klaskanine releases only. Prior to the 2001 brood year, Stock 13 winter steelhead were used in several other programs. The large egg takes reflect the needs of those since discontinued programs.

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

Winter steelhead are collected for hatchery broodstock at the Big Creek (and NF Klaskanine if necessary) trap facility. Surplus green adults not needed for the program may be recycled back into Big Creek (or the Klaskanine River). Excess ripe fish are recycled into local lakes, providing additional fishery opportunities for the public. Ripe females may be stripped of eggs and recycled downstream into Big Creek (or the NF Klaskanine River). In addition, spawned adults and/or surplus adults may be used for stream enrichment. All naturally produced steelhead (unmarked) collected are passed upstream (above all hatchery weirs) to spawn.

7.6) Fish transportation and holding methods.

Adult hatchery winter steelhead collected for brood at the Big Creek and Klaskanine traps are held in the trapping facility until ready to spawn. All spawning activities take place at the Big Creek (or Klaskanine) trap facility. Eggs from adult steelhead spawned at Klaskanine Hatchery are transported to Big Creek Hatchery for incubation (see section 8.3).

See Sections 5.2, 8.3, and 10.5 for description of transportation equipment and procedures.

7.7) Describe fish health maintenance and sanitation procedures applied.

Developing eggs receive regular treatments with formalin to prevent/control fungus (*Saprolegnia parasitica*) outbreaks. Green eggs are water-hardened in an iodine solution to prevent disease or viral contamination. Juveniles are treated, if necessary, with medicated feed or formalin as directed by ODFW fish health staff. Additional sanitation procedures are described in section 9.2.7. See Attachment A.

7.8) Disposition of carcasses.

Hatchery winter steelhead carcasses may be used for stream enrichment activities in Oregon tributaries of the lower Columbia River. Specific criteria and guidelines for operation of the stream enrichment program are identified in a MOA between ODFW and

DEQ. Carcasses not used for stream enrichment, food programs, or sold, are buried or disposed of in a landfill.

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

There should be minimal likelihood for adverse genetic or ecological effects to listed fish as a result of broodstock collection. The following measures will be used to minimize adverse genetic or ecological effects to listed fish:

- Wild steelhead, coho, and cutthroat that enter the Big Creek Hatchery or Klaskanine Hatchery trap will be released alive above the trapping facility (hailed upstream of the hatchery intake). The hatchery trap will be visually checked at least daily, and fish sorted at least weekly (or as needed) to minimize delay and potential harm to wild steelhead and coho.
- Unmarked spring chinook that enter the Big Creek Hatchery or Klaskanine Hatchery trap will be hauled downstream and released. The hatchery trap will be visually checked at least daily, and fish sorted at least weekly (or as needed) to minimize delay and potential harm to wild spring chinook. Spring chinook are rarely, if ever, trapped during winter steelhead collection.
- . Unmarked fall chinook may be held for broodstock, released to spawn naturally, donated to food banks, or sold. Pond and trap mortalities are buried or disposed of in a landfill. Refer to the Big Creek Hatchery and/or Klaskanine Hatchery Fall Chinook HGMP for further detail. Fall chinook are rarely, if ever, trapped during winter steelhead collection.
- Chum salmon that enter the trap will be handled as indicated in the Big Creek Hatchery Chum Salmon HGMP as part of the Chum Reintroduction Project. This may include using for broodstock, or released in areas with suitable spawning habitat.

SECTION 8 MATING

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

8.1) Selection method.

Collection of winter steelhead for use as broodstock occurs throughout the run. Fish are typically spawned randomly during the collection period, and depends on the number of fish available and ripe at time of spawning. All brood selection is done on a random basis from throughout the run, with an attempt to balance the number of fish collected from the first, middle, and end of the run. Excess eggs are collected from the early portion of the run to assure meeting the production goal. Excess eggs from the early portion of the run are typically culled randomly after later spawning is completed.

8.2) Males.

Males are generally only used once during spawning. If necessary, in the case of a shortage of males, individual fish may be spawned more than once. Jacks (1-salt fish) will be included in the broodstock when available, typically up to about 5% of the spawners.

8.3) Fertilization.

Winter steelhead are kill spawned with the goal of a 1:1 male-to-female ratio. Each fish is typically only used once in spawning, however if necessary, in the case of a shortage of males, individual fish may be spawned more than once.

Spawning is conducted using a 5x5 matrix. Eggs from five females are spawned into plastic buckets. The eggs are then divided into five separate buckets. Five males are spawned, one into each of the five buckets of eggs. These groups are held separate for 5 minutes then mixed into larger groups to facilitate the incubation system.

Eggs and sperm from fish spawned at Klaskanine Hatchery are held separately during transportation to Big Creek Hatchery. The gametes are mixed once they arrive at Big Creek, and are then placed in the incubators. Eggs and sperm are transported in small containers, such as plastic buckets (eggs) or small plastic bags (sperm). Transportation time is approximately 45 minutes. Alternatively, adult steelhead may be transported for spawning at Big Creek Hatchery.

Samples (ovarian fluid, kidney, spleen) are taken from 60 females for viral analysis. Fertilized eggs are water-hardened in an iodine solution prior to placement in incubators. Eggs that test positive for disease may be kept or destroyed, at the direction of ODFW fish health staff.

8.4) Cryopreserved gametes.

Cryopreservation of winter steelhead gametes is not used in the Stock 13 Big Creek winter steelhead program.

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

The Stock 13 winter steelhead mating scheme has no effect on listed species.

Broodstock are randomly selected from throughout the winter steelhead run. Spawning is done randomly based on availability of ripe fish. Matings are done with a goal of a 1:1 sex ratio (i.e. one male and one female). Each fish is only used once in spawning, however if necessary, in the case of a shortage of males, individual fish may be spawned more than once.

**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.

Survival data is presented in Table 9-1.

Table 9-1. Eggs Taken and Survival Rates

Year	Egg Take	Percent Survival to Eye-up
2006	387,698	86.0
2007	376,954	83.3
2008	244,524	82.7
2009	229,769	88.3
2010	194,220	81.7
2011	285,255	86.8
2012	274,750	93.1
2013	254,050	95.2
2014	203,300	95.2
2015	299,900	90.9

Data Source: HMS; Big Creek Hatchery files

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

Extra winter steelhead eggs are typically collected in order to compensate for egg to smolt mortality and genetic considerations, such as increased family size to promote genetic diversity, etc. In addition, extra eggs are taken during the early portion of the run to assure that enough eggs are collected to meet production goals. All surplus eggs are later destroyed. Eggs are culled randomly across the early egg take groups to retain diversity among those adults spawned. Mortality and culled eggs are all disposed of by freezing and then burial or disposed of in a landfill.

9.1.3) Loading densities applied during incubation.

Winter steelhead egg average size is 225 eggs per ounce. Average fecundity is approximately 4,200 eggs. The egg incubators have a water flow of 10 gpm. Each bulk incubator receives up to 100,000 eggs per trough. Vertical stack (“Heath” style) incubating trays may be used also. These have a capacity of up to 10,000 eggs per tray.

Loading densities for STEP classroom incubators varies with the size and setup of equipment being used but typically runs from 200 to 1,000 eggs. A standard aquarium

re-circulating type pump supplies flow. No flow rates have been calculated but the flow is sufficient for the small number of eggs used in these programs.

9.1.4) Incubation conditions.

The water supply to the egg incubator is supplied by Mill Creek, and the upper and lower springs. The water is monitored for flow and temperature daily. The incubating eggs are held in water that is 40° to 47°F. The dissolved oxygen (DO) for the influent water ranges between 10 to 11 parts per million (ppm). No data is available for the effluent water.

Students will sometimes monitor temperature in the STEP classroom incubators; however, it is likely to vary significantly between incubators, rooms, and schools. Typically, these systems run at ambient room temperatures, but have ice added daily to keep temperatures in the optimum range of 50 to 60° F., but below the prolonged exposure lethal level of 63° degrees F. A standard aquarium re-circulating type pump supplies flow.

9.1.5) Ponding.

Fry are physically relocated from the incubator trays to starter troughs when the fry are 100 percent buttoned up. This occurs with approximately 1,100 temperature units. Winter steelhead fry average approximately 2,100 fish per pound at this point. Fry are relocated to an outside raceway when they reach about 600 fish per pound.

9.1.6) Fish health maintenance and monitoring.

See Attachment A regarding state approved fish health protocols.

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

Incubation of Big Creek winter steelhead eggs should have no effect on listed species. Personnel check incubating eggs daily to remove dead eggs, treat eggs for disease/fungus, and keep the incubation facility clean.

9.2) Rearing:

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.

Survival from fry to the time of marking has ranged from 89.5%-95.9% since the 2006 brood year. See Table 9-2.

Overall survival from fry to release has ranged from 88.8% to 95.1% since the 2006 brood year. See Table 9-2.

Table 9-2. Big Creek Hatchery Stock 13 winter steelhead survival rates

Brood Year	Fry Pondered	Juveniles at Marking ¹	Fish Released ¹	Percent Survival to Marking	Percent Survival to Release
2006	218,786	143,947	110,199	89.5%	88.8%
2007	167,712	154,535	71,869	93.5%	92.5%
2008	160,505	151,440	68,173	94.0%	93.3%
2009	158,003	151,782	69,251	95.9%	95.1%
2010	165,422	137,309	58,643	94.3%	92.8%
2011	156,546	116,217	48,450	92.7%	90.4%
2012	180,754	162,392	69,830	89.8%	86.4%
2013	176,157	143,300	60,139	91.4%	90.2%
2014	176,631	135,626	56,492	93.7%	92.1%
2015	180,942	144,063	49,708	90.4%	89.4%

Data Source: HMS; Big Creek Hatchery files

¹ Survival based on fish retained at Big Creek Hatchery. Includes excess juveniles released to standing water

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

Approximately 175,000 fish are transferred into 4 Canadian troughs at about 2100 fish/lb. after eggs button up. At approximately 600 fish/lb. they are moved to an outside raceway. They are split into six ponds at marking (typically in June) at about 160 fish/lb.(approximately 27,000 fish per pond) Fish to be released in Gnat Creek and the NF Klaskanine River are transferred to Gnat Creek and Klaskanine hatcheries, usually in November or early December at around 14 fish/lb for final rearing.

Juveniles at Gnat Creek Hatchery are held in one concrete raceway (40,000 fish). This is a density of about 7.1 fish/ft³.

Juveniles at Klaskanine Hatchery, are reared in concrete raceways with approximately 20,000 fish each. This is about 4.2 fish/ft³.

The raceways at Big Creek and Klaskanine hatcheries are managed for a maximum of 3,333 pounds of fish per raceway (about .75 lb/ft³).

Gnat Creek Hatchery rears a maximum of about 6,667 pounds of fish in the raceway used for winter steelhead (about 1.2 lb/ft³).

Maximum density occurs at release when the fish are at their largest size (target size is 6 fish/lb).

9.2.3) Fish rearing conditions

Winter steelhead reared at Big Creek Hatchery, Klaskanine Hatchery, and Gnat Creek Hatchery grow on incoming river water; hence, rearing water temperatures vary with seasons and with natural fluctuations. Water temperatures range from 54° to 67°F during

summer and from 40 ° to 56 ° F during the fall. DO (dissolved oxygen) levels coming into the facility are typically between 10.0 ppm and 11 ppm in the fall and winter. However, in the summer, DO levels can be as low as 6.5 ppm. Re-circulation of effluent water through the ponds is possible in extreme drought conditions, but has not been necessary for this program in the past.

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

Weight samples are collected for inclusion in monthly pond reports. Length frequency (Table 9-4) and condition factor measurements are made at the time of liberation; mark quality observations are also made at this time. Table 9-3 shows average monthly weights for the program from ponding to release.

Table 9-3
Average Monthly Fish Size for Big Creek Winter Steelhead (2013-2015)

Week	Size in fish/pound*
Ponding	2100
Week 4	1316
Week 8	442
Week 12	181
Week 16	89
Week 20	46.6
Week 24	24.6
Week 28	16.3
Week 32	12.3
Week 36	10.0
Week 40	8.3
Week 44	7.0
Week 48 or release	6.5

Data Source: ODFW HMS database; Big Creek Hatchery files
 * Numbers represent end-of-month averages

Table 9-4
Average Fork Length Frequency Percentages at Release

Fork Length Size Range	Average Percentages of 2000 and 2001 Releases
< 18 cm.	48%
18 – 22 cm.	51.4%
> 22 cm.	.6%

Data Source: HMS; Big Creek Hatchery files

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

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

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).

Big Creek winter steelhead juveniles are fed a fish food diet at a rate and frequency that varies with fish size. During the first month after ponding, the fish are fed a dry food via a belt feeder for 8-10 hours/day. The belt feeder consists of a rotating belt onto which the feed is placed, and is controlled by a timer. The feed falls from the belt into the trough as the unit rotates.

During the second month, they are hand fed 8 times per day (about once/hour during a normal 8 hour day). During the third month, the fish are hand fed twice a day, once in the morning and once in the afternoon. For the next 5-6 months, the fish are demand fed (fed until they stop eating), by hand once per day.

During the last 3 months of rearing, prior to release, the fish feed ration is reduced to a slow rate of growth and/or maintenance diet to meet the desired size and condition factor at release. Feeding is conducted by hand during this stage as well.

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

Fish health of rearing juvenile winter steelhead is monitored regularly by ODFW fish health staff. ODFW fish health staff diagnoses disease problems and prescribes the appropriate treatments to eliminate or control disease.

All tools and equipment used for winter steelhead rearing are kept separate from those used for other species. Due to this, disinfecting equipment (other than allowing to air dry) is not routinely conducted. During the winter steelhead spawning season, no other adults are on station. The spawning facilities are not routinely disinfected during the spawning season.

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

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

Weight samples of the fish are taken monthly to ensure proper growth rate. Prior to release, length frequencies are taken and condition factors are calculated. A visual mark quality check is completed on a representative sample of the fish targeted for release.

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

No "natural" rearing methods are applied in this program.

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

Stock 13 winter steelhead reared in this program are not listed under either the Federal or State ESA. However, fish will be reared to full-term smolt size and released directly into rivers. Juveniles are transferred to Gnat Creek and Klaskanine hatcheries to acclimate while completing rearing to full term smolts.

Fish are released directly from each hatchery facility, which are relatively low in the respective river systems.

**SECTION 10
RELEASE**

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

10.1) Proposed fish release levels. (Use standardized life stage definitions by species presented in Attachment 2. "Location" is watershed planted (e.g. "Elwha River").

**Table 10-1
Proposed fish release levels.**

Age Class	Maximum Number	Target Size (fpp)	Release Date	Location
Eggs				
Unfed Fry (STEP)	2000	1000-2000	April-May	Lower Columbia Tributaries ¹
Fry ²	Surplus	1000-2000	April-May	Standing Water
Fingerling ²	Surplus	15-30	Sep.-Oct.	Standing Water
Yearling	60,000	6.0	March/April	Big Creek
Yearling	40,000	6.0	March/April	N.F. Klaskanine River
Yearling	40,000	6.0	March/April	Gnat Creek

Data Source: ODFW hatchery production schedules; District files

¹Releases are in the Skipanon River, Youngs Bay, or lower Columbia River tributaries downstream of Hunt Creek in Oregon.

²This program does not produce fingerlings for release as a program goal for Stock 13 winter steelhead. In any given year there may be surplus fingerlings (typically from above average fry and fingerling survival). These will be released to standing water bodies or destroyed.

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

Stream, river, or watercourse: *Big Creek*

Release point: Big Creek Hatchery (RM 3)

Major watershed: Big Creek

Basin or Region: Columbia River Estuary

Stream, river, or watercourse: *Gnat Creek*

Release point: Gnat Creek Hatchery (RM 2.25)

Major watershed: Gnat Creek

Basin or Region: Columbia River Estuary

Stream, river, or watercourse: *NF Klaskanine River*

Release point: Klaskanine Hatchery (RM 2)

Major watershed: Klaskanine River

Basin or Region: Columbia River Estuary (Young's Bay)

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

Table 10-2
Big Creek Releases (2000-2015 brood years). Averages based on years when releases occurred.

Brood year	Eggs/ Unfed Fry	Avg size (fpp)	Fry	Avg size (fpp)	Fingerling ¹	Avg size (fpp)	Yearling	Avg size (fpp)
2000	210,200	Eggs				--	60,700	5.5
2001	0	Eggs			17,430	30.0	60,522	6.6
2002	6,200	Eggs			6,612	14.8	59,846	6.7
2003	6,200	Eggs			--	--	63,766	6.0
2004	27,150	Eggs			--	--	60,787	6.8
2005	6,450	Eggs			40,905	27	60,952	6.5
2006	42,200	Eggs			48,700		61,499	6.7
2007	0	Eggs			10,528		61,341	6.9
2008	1,700	Eggs	200	2100	6,883		61,290	7.6
2009	500	Eggs			8,053		61,198	6.3
2010	1,200	Eggs				--	58,643	6.9
2011	20,550	Eggs				--	48,450	7.1
2012	750	Eggs			5,011		64,819	6.9
2013	1,950	Eggs				--	60,139	5.9
2014	1,950	Eggs				--	56,492	5.8
2015	2,000	Eggs				--	49,708	6.5
Average	20,563	Eggs	200	2100	18,015		59,385	6.5

Data source: HIMS; Big Creek Hatchery files

¹Fingerling releases were to various standing water bodies

Eggs and Fry were transfers to STEP facilities or other hatcheries.

**Table 10-3
Gnat Creek Releases (2000-2015 brood years).**

Brood year	Eggs/ Unfed Fry	Avg size (fpp)	Fry	Avg size (fpp)	Fingerling ¹	Avg size (fpp)	Yearling	Avg size (fpp)
2000							37,629	7.4
2001							40,358	7.2
2002							40,044	7.2
2003							39,294	6.0
2004							35,607	6.3
2005							40,380	6.0
2006							40,900	6.3
2007							40,901	6.7
2008							41,263	7.6
2009							39,926	7.1
2010							38,604	7.9
2011							33,121	7.2
2012							42,306	7.4
2013							40,933	6.7
2014							39,045	5.6
2015							29,849	6.0
Average							38,760	6.8

Data source: HMS; Big Creek Hatchery files

¹Fingerling releases were to various standing water bodies

Table 10-4
NF Klaskanine Releases (2000-2015 brood years).

Brood year	Eggs/ Unfed Fry	Avg size (fpp)	Fry	Avg size (fpp)	Fingerling ¹	Avg size (fpp)	Yearling	Avg size (fpp)
2000							62,103	7.8
2001							56,210	7.9
2002							59,784	7.3
2003							59,699	6.7
2004							60,870	7.0
2005							61,165	6.8
2006							41,059	7.0
2007							41,026	7.2
2008							41,308	6.8
2009							41,900	7.0
2010							38,873	7.0
2011							33,278	7.0
2012							43,148	6.7
2013							41,268	5.7
2014							38,902	5.3
2015							29,805	6.8
Average							46,900	6.9

Data source: HMS; Big Creek Hatchery files

¹Fingerling releases were to various standing water bodies

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

Winter steelhead smolts are released annually in late March or April. Smolts are released semi-volitionally from each facility (fish are given a period of time to leave on their own and then the remaining fish are pushed out of the raceways, if necessary). Examples of recent release dates follow:

**Table 10-5
Annual Winter Steelhead Smolt Release Dates**

Year	Big Creek	Gnat Creek	Klaskanine
2008	4/1/2008	4/1/2008	3/25/2008
2009	4/1/2009	4/1/2009	4/10/2009
2010	4/1/2010	4/1/2010	4/5/2010
2011	4/14/2011	4/1/2011	4/5/2011
2012	4/13/2012	3/3/2012	3/29/2012
2013	3/22/2013	4/1/2013	3/28/2013
2014	3/27/2014	3/31/2014	3/24/2014
2015	3/27/2015	3/13/2015	3/16/2015

Data Source: HMS; hatchery files
 Note: These dates represent the final date of release. Fish were allowed to leave volitionally for various periods of time prior to the remaining fish being pushed out. Unless directed otherwise by fish health or Department staff, date(s) of release is determined annually based on the ODFW production schedule and the size of the fish.

STEP fry are usually released in mid-April to mid-May, dependent on incubation water temperatures in individual classrooms. Depending on the situation, temperature may be “controlled” (to the extent feasible) by teachers to allow fry release timing to avoid spring break periods when students are unavailable for release activities. Transportation is typically done in a set of buckets or garbage can (some with aeration) to the site and a direct release into the stream by students using a small aquarium dipnet. Transportation time is typically very short, less than 20 minutes.

10.5) Fish transportation procedures, if applicable.

Winter steelhead smolts released from Big Creek, Gnat Creek, or Klaskanine hatcheries are released semi-volitionally directly from the hatchery raceways. The screens at the downstream end of the raceways are removed, and the fish are allowed to migrate on their own. After a period of time (generally 1-2 weeks), any remaining fish are physically pushed out of the raceways through the use of a crowding device.

Juvenile steelhead in excess of production needs are released to standing water bodies at the time of marking. Juveniles are hauled in liberation trucks to the selected release site. Liberation trucks are typically 1000-2500 gallon capacity units, either mounted on a large flatbed truck, or a tanker style truck. The lib trucks are equipped with oxygen diffusing systems, water re-circulation pumps, and dissolved oxygen meters.

Adult steelhead not needed for broodstock are transported in liberation trucks similar to those used for juveniles (see above), or in a portable liberation tank carried in a full-size pickup truck. The portable liberation tank has a capacity of 300 gallons of water, and is equipped with an oxygen diffusion system. Adult fish hauled upstream of hatchery facilities are transported a short distance (usually less than 1 mile), which only takes a few minutes. Adult fish recycled downstream are transported less than 10 miles, with a haul time generally less than 20 minutes. Adult fish recycled to lakes are transported various distances, depending on the lake chosen. Haul time is generally no more than 1 hour.

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

Juvenile steelhead are transferred to Klaskanine and Gnat Creek hatcheries for acclimation and final rearing to smolt size. Transfer generally occurs in November or early December at about 14 fish per pound. Fish are transported in liberation trucks and released into rearing ponds (raceways) at each facility, where they are held until release the following April. See Section 5 for more detailed description of the respective facilities.

Juvenile fish transported to Gnat Creek Hatchery and Klaskanine Hatchery are released through liberation hoses/pipes into raceways. Transportation time is approximately 15 minutes to Gnat Creek Hatchery and about 45 minutes to Klaskanine Hatchery.

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

All winter steelhead smolts are mass marked with an adipose fin clip (although alternate clips may be used if necessary). Fry released from STEP programs are unmarked.

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

Any fish surplus to production are released into standing water as fry or fingerlings, prior to or at the time of marking, not at the time of smolt release. Smolt releases have generally been within programmed and approved levels.

10.9) Fish health certification procedures applied pre-release.

See Attachment A.

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

In the event of a water system failure an emergency release of steelhead juveniles will only occur after:

- The hatchery crew has exhausted all possibilities for retaining the fish.
- The hatchery crew has consulted with the ODFW District Biologist.
- The release will be into the Big Creek, Gnat Creek, NF Klaskanine River, or into a closed water body.

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

Winter steelhead smolts are full-term smolts and released shortly before naturally produced winter steelhead smolts typically emigrate. Peak outmigration of naturally produced steelhead smolts typically occurs during late April/early May. The hatchery smolts are expected to migrate upon or shortly after release, which should keep freshwater residence time to a minimum. All smolts are volitionally released on-site at the respective hatcheries.

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

SECTION 11

MONITORING AND EVALUATION OF PERFORMANCE INDICATORS

11.11) 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.

Existing staff, funds and resources are available to conduct the following monitoring and evaluation activities. These activities will directly measure performance standards and indicators previously described in Sections 1.9 and 1.10. Information on the catch of hatchery winter steelhead is compiled from returned salmon/steelhead tags and is available from Fish Division in the Salem office of ODFW. Specific economic data for sport caught fish is not routinely developed for all stocks. Economic data that is compiled is available in the Salem Headquarters. Steelhead population health goals are currently being developed under the *Oregon Plan for Salmon and Watersheds*. New performance standards (and subsequent M&E) may be prescribed in the future as these population health goals are established. Monitoring of naturally spawning salmon and steelhead has increased in the Lower Columbia. Additional information regarding the number of naturally spawning steelhead of hatchery origin may become available in the future.

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

Adults

- The number of females, males, and jacks collected at Big Creek and Klaskanine hatcheries, (Standard 2.1; 3.3).
- Number of unmarked winter steelhead, unmarked coho, unmarked spring chinook, chum, and cutthroat handled and released from Big Creek and Klaskanine hatcheries, (Standard 4.5).
- Any observed mortalities of unmarked winter steelhead, unmarked coho, unmarked spring chinook, chum, and cutthroat handled at Big Creek and Klaskanine hatcheries (Standard 4.5).
- Date of entry into the Big Creek and Klaskanine hatchery traps, specified by hatchery and wild fish, (Standard 2.1).
- Date of entry into the Big Creek and Klaskanine hatchery traps for fish retained for broodstock, (Standard 2.1).
- Dates of spawning at Big Creek Hatchery and Klaskanine Hatchery, (Standard 2.1).
- The number of males, jacks and females spawned, (Standard 3.3).
- Fecundity of females spawned, (Standard 2.1).
- Disposition (spawned, sold, stream enrichment, etc.) of all winter steelhead collected, (Standard 4.4).

Juvenile Rearing

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

Release

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

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

Funding and staffing are available as part of normal hatchery operation for those activities associated with hatchery operations.

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

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

The in-hatchery monitoring program is not expected to increase risks to listed fish above those imposed by operation of the program. Thus, risk aversion measures for the monitoring program are the same as those discussed under prior sections of this document

SECTION 12
RESEARCH

No research activities are currently associated with this program directly. Annually, about 10,000 eggs may be supplied to the U.S. Fish and Wildlife Service for studies conducted at Abernathy National Fish Hatchery. ODFW has no further involvement with this project.

SECTION 13 CITATIONS

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SECTION 14

CERTIFICATION LANGUAGE AND SIGNATURE OF RESPONSIBLE PARTY

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

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

Signature: _____ Date: _____

Certified by: Scott Patterson, Fish Propagation Program Manager

Signature: _____ Date: _____

SECTION 15

ATTACHMENTS

Attachment A

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

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

Disease Treatment

Winter Steelhead juveniles are treated for cold water disease using Florfenicol and TM-100, which is applied as a medication in the feed. Trichodina using a Hydrogen Peroxide drip; and Ichthyophthirius using a static formalin treatment (one hour treatment in re-circulating water within a raceway). Eggs are treated for fungus with a formalin drip (15 minutes per application).

