Endangered Species Act (ESA) Section 7(a)(2) Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat (EFH) Consultation

Sandy River Spring Chinook Salmon, Coho Salmon, Winter Steelhead, and Summer Steelhead Hatchery Programs.

NMFS Consultation Number: 2011/02491

Action Agencies: National Marine Fisheries Service
Program Operators: Oregon Department of Fish and Wildlife

Affected Species and Determinations:

<table>
<thead>
<tr>
<th>ESA-Listed Species</th>
<th>Status</th>
<th>Is Action Likely to Adversely Affect Species or Critical Habitat?</th>
<th>Is Action Likely To Jeopardize the Species?</th>
<th>Is Action Likely To Destroy or Adversely Modify Critical Habitat?</th>
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<tr>
<td>Lower Columbia River steelhead (<em>Oncorhynchus mykiss</em>)</td>
<td>Threatened</td>
<td>Yes</td>
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<td>Lower Columbia River Chinook salmon (<em>O. tshawytscha</em>)</td>
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<td>Lower Columbia River Coho Salmon (<em>O. kisutch</em>)</td>
<td>Threatened</td>
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<td>No</td>
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<tr>
<td>Columbia River Chum Salmon (<em>O. keta</em>)</td>
<td>Threatened</td>
<td>Yes</td>
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Fishery Management Plan That Describes EFH in the Project Area

<table>
<thead>
<tr>
<th>Fishery Management Plan That Describes EFH in the Project Area</th>
<th>Does Action Have an Adverse Effect on EFH?</th>
<th>Are EFH Conservation Recommendations Provided?</th>
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<tbody>
<tr>
<td>Pacific Coast Salmon</td>
<td>Yes</td>
<td>Yes</td>
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</table>

Consultation Conducted By: The National Marine Fisheries Service, Northwest Region

Issued By: William W. Stelle, Jr.
Regional Administrator

Date: Sept 28, 2012
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1. **Introduction**

1.1. **Background**

The Oregon Department of Fish and Wildlife (ODFW) applied for take coverage under limit 5 of the 4(d) rule for four hatchery programs in the Sandy River basin (Table 1). ODFW operates each of the programs. The 4(d) rule does not prohibit the take of salmon and steelhead listed as threatened species under the Endangered Species Act (ESA) if the action agency follows a Hatchery and Genetics Management Plan (HGMP) that meets the 4(d) rule criteria and is approved by NOAA’s National Marine Fisheries Service (NMFS) (July 10, 2000; 65 FR 42422, amended June 28, 2005, 70 FR 37160).

HGMPs are developed and approved in the following manner: The action proponent, in this case ODFW, develops an HGMP or HGMPs that meet the requirements of the 4(d) rule and submits the HGMP(s) to NMFS for consideration. If NMFS concurs that the HGMP(s) meet the 4(d) rule criteria, the HGMP(s) and a draft National Environmental Policy Act document are made available for public review and comment. Public comment is used to revise the HGMP(s) and the National Environmental Policy Act (NEPA) document, if necessary. NMFS then notifies the action agency that it concurs that the HGMP(s) meet the criteria of the 4(d) limit and that the HGMP(s) is in compliance with the ESA. NMFS then monitors implementation of the hatchery program to ensure compliance with the HGMP(s).

This biological opinion (opinion) documents NMFS’ ESA review of the HGMPs and its determination under limit 5 of the 4(d) rule. The opinion and incidental take statement portions of this document were prepared in accordance with section 7(b) of the ESA of 1973, as amended (16 U.S.C. 1531, *et seq.*), and implementing regulations at 50 CFR 402. With respect to designated critical habitat, the following analysis relied only on the statutory provisions of the ESA, and not on the regulatory definition of “destruction or adverse modification” at 50 CFR 402.02.

NMFS has also completed an Essential Fish Habitat (EFH) consultation. It was prepared in accordance with section 305(b)(2) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) (16 U.S.C. 1801, *et seq.*) and implementing regulations at 50 CFR 600.

The opinion and EFH conservation recommendations are both in compliance with section 515 of the Treasury and General Government Appropriations Act of 2001 (Public Law 106-544) (“Data Quality Act”) and underwent pre-dissemination review. The administrative records for both consultations are on file at the Salmon Management Division (SMD) in Portland, Oregon.
Table 1. Sandy River HGMPs and the action proponent.

<table>
<thead>
<tr>
<th>Hatchery and Genetics Management Plan</th>
<th>Action Proponent</th>
</tr>
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<tbody>
<tr>
<td>Sandy River spring Chinook salmon</td>
<td>ODFW</td>
</tr>
<tr>
<td>Sandy River coho salmon</td>
<td>ODFW</td>
</tr>
<tr>
<td>Sandy River winter steelhead</td>
<td>ODFW</td>
</tr>
<tr>
<td>Sandy River summer steelhead</td>
<td>ODFW</td>
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1.2. Consultation History

The evolution of hatchery consultations in the Columbia River basin, leading to and including this consultation, is described below. The first consultations followed the first listings of Columbia Basin salmon under the ESA. Snake River sockeye salmon were listed as an endangered species on November 20, 1991, Snake River spring/summer Chinook and Snake River fall Chinook salmon were listed as threatened species on April 22, 1992, and the first hatchery consultation and opinion was completed on April 7, 1994 (NMFS 1994). The 1994 opinion was superseded by the “Endangered Species Act Section 7 Biological Opinion on 1995-1998 Hatchery Operations in the Columbia River Basin, Consultation Number 383” completed on April 5, 1995 (NMFS 1995a). This opinion determined that hatchery actions jeopardize listed Snake River salmon and required implementation of reasonable and prudent alternatives to avoid jeopardy.

A new opinion was completed on March 29, 1999, after Upper Columbia River (UCR) steelhead were listed (62 FR 43937, August 18, 1997) and following the expiration of the previous opinion on December 31, 1998 (NMFS 1999a). This opinion concluded that Federal and non-Federal hatchery programs jeopardize Lower Columbia River (LCR) steelhead and Snake River steelhead protected under the ESA and described measures and conditions necessary to avoid jeopardy including restricting the use of non-endemic hatchery steelhead; limiting adult non-endemic salmon and steelhead stray rates to less than 5% of the annual natural population in the receiving stream; and criteria for the size of steelhead smolts. Soon after, NMFS reinitiated consultation when LCR Chinook salmon, UCR spring Chinook salmon, Upper Willamette Chinook salmon, Upper Willamette steelhead, Columbia River chum salmon, and Middle Columbia steelhead were added to the list of endangered and threatened species (Smith 1999).

Between 1991 and the summer of 1999, the number of distinct groups of Columbia Basin salmon and steelhead listed under the ESA increased from 3 to 12, and this prompted NMFS to reassess its approach to hatchery consultations. In July 1999, NMFS announced that it intended to conduct 5 consultations and issue 5 opinions “instead of writing one biological opinion on all hatchery programs in the Columbia River Basin.” Opinions would be issued for hatchery programs in the, (1) Upper Willamette, (2) Middle Columbia, (3) LCR, (4) Snake River, and (5) UCR, with the UCR NMFS’ first priority (Smith 1999). Between August 2002 and October 2003, consultations under the ESA were completed for approximately twenty hatchery programs in the UCR. For the Middle Columbia, NMFS completed a draft opinion and distributed it to hatchery operators and funding agencies for review on January 4, 2001, but completion of
consultation was put on hold pending several important basin-wide review and planning processes.

The jump in ESA listings, during the mid to late 1990s, triggered a period of investigation, planning, and reporting across multiple jurisdictions and this served to complicate, at least from a resources and scheduling standpoint, hatchery consultations. A review of Federal funded hatchery programs ordered by Congress was underway at about the same time that the 2000 Federal Columbia River Power System (FCRPS) opinion was issued by NMFS (NMFS 2000a). The Northwest Power and Conservation Council (Council) was asked to develop a set of coordinated policies to guide the future use of artificial propagation, and Reasonable and Prudent Alternative (RPA) 169 of the FCRPS opinion called for the completion of NMFS-approved hatchery operating plans (i.e., Hatchery and Genetic Management Plans (HGMPs)) by the end of 2003. The RPA required the Action Agencies to facilitate this process, first by assisting in the development of HGMPs, and then by helping to implement identified hatchery reforms (NMFS 2000a). Also at this time, a new U.S. v. Oregon Columbia River Fisheries Management Plan (CRFMP), which included goals for hatchery management, was under negotiation and new information and science on the status of salmon and steelhead and the recovery goals, was emerging from Technical Recovery Teams. Work on HGMPs under the FCRPS opinion was undertaken in cooperation with the Council’s Artificial Production Review and Evaluation process, with CRFMP negotiations, and with ESA recovery planning (Jones 2002; Foster 2004). HGMPs were submitted to NMFS under RPA 169; however, many were returned to the applicant(s) because they were incomplete and therefore, were not found to be sufficient for ESA consultation.

ESA consultations and an opinion were completed in 2007 for nine hatchery programs that produce a substantial proportion of the total number of salmon and steelhead released into the Columbia River annually (NMFS 2007a). These programs are located in the lower and middle Columbia and are operated by the FWS and by the Washington Department of Fish and Wildlife (WDFW). The opinion (NMFS 2007a), determined that operation of the programs would not jeopardize salmon and steelhead protected under the ESA.

On May 5, 2008, NMFS published a Supplemental Comprehensive Analysis (SCA) and an opinion and RPAs for the FCRPS to avoid jeopardizing ESA-listed salmon and steelhead in the Columbia Basin (NMFS 2008a; 2008b). The SCA Environmental Baseline included “the past effects of hatchery operations in the Columbia River Basin. Where hatchery consultations have expired or where hatchery operations have yet to undergo ESA section 7 consultation, the effects of future operations cannot be included in the baseline. In some instances, effects are ongoing (e.g., returning adults from past hatchery practices) and included in this analysis despite the fact that future operations cannot be included in the baseline. The proposed action does not encompass hatchery operations per se, and therefore no incidental take coverage is offered through this biological opinion to hatcheries operating in the region. Instead, we expect the operators of each hatchery to address its obligations under the ESA in separate consultations, as required” (see May 2008 SCA at 5-40). RPA number 39 required the completion of “consultation under the ESA on the operation of hatchery programs funded by the FCRPS Action Agencies including the submittal of updated and complete HGMPs”. As set out in the RPA, the schedule for completing ESA consultations was July 2009 for hatchery programs in the UCR,
January 2010 for programs in the Middle Columbia, and August 2010 for programs in the Snake Basin. Pursuant to this prioritization, NMFS proceeded first with the fifty plus hatchery programs in the UCR, Middle Columbia, and Snake River basins. This sequence of reviews made sense because of the pending completion of the Lower Columbia River Recovery Plan for ESA-listed salmon and steelhead and the pending five year status review update.

Because it was aware of the scope and complexity of ESA consultations facing the co-managers and hatchery operators, NMFS offered substantial advice and guidance to help. In September 2008, NMFS announced its intent to conduct a series of ESA consultations and that “from a scientific perspective, it is advisable to review all hatchery programs (i.e., Federal and non-Federal) in the UCR affecting ESA-listed salmon and steelhead concurrently” (Walton 2008). In November 2008, NMFS expressed again the need for re-evaluation of UCR hatchery programs and provided a “framework for ensuring that these hatchery programs are in compliance with the Federal Endangered Species Act” (Jones 2008). NMFS also “promised to share key considerations in analyzing HGMPs” and provided those materials to interested parties in February 2009 (Jones 2009a).

On April 28, 2010, NMFS issued a letter to “co-managers, hatchery operators, and hatchery funding agencies” that described how NMFS “has been working with co-managers throughout the Northwest on the development and submittal of fishery and hatchery plans in compliance with the Federal Endangered Species Act (ESA).” NMFS stated “In order to facilitate the evaluation of hatchery and fishery plans, we want to clarify the process, including consistency with U.S. v. Oregon, habitat conservation plans and other agreements…. With respect to “Development of Hatchery and Harvest Plans for Submittal under the ESA,” NMFS clarified: “The development of fishery and hatchery plans for review under the ESA should consider existing agreements and be based on best available science; any applicable multiparty agreements should be considered, and the submittal package should explicitly reference how such agreements were considered. In the Columbia River, for example, the U.S. v. Oregon agreement is the starting place for developing hatchery and harvest plans for ESA review….”

On March 5, 2009, NMFS notified Federal Action Agencies and state, tribal, and Federal hatchery operators of its intent to conduct a series of consultations to ensure that hatchery programs are in compliance with the ESA, with the NEPA, and with RPA 39 of the FCRPS opinion. To meet the schedule in RPA 39, NMFS advised that HGMPs needed to be submitted and determined sufficient for formal consultation by July 1, 2009 (Jones 2009b).

In May 2011, ODFW asked NMFS to provide comments on four draft HGMPs for hatchery programs in the Sandy River basin (ODFW 2011a, 2011b, 2011c, 2011d, 2011e, 2011g,). NMFS recommended changes and ODFW resubmitted the HGMPs (ODFW 2011f, 2011h, 2011i, 2011j). In a letter dated June 14, 2011(McIntosh 2011), ODFW requested NMFS concurrence that the revised HGMPs satisfy the criteria under Limit 5 of the 4(d) rule. NMFS responded with the determination that the HGMPs are sufficient and are ready for public review and comment contingent on ODFW confirming that NMFS has accurately characterized each proposed action and its effects on salmon and steelhead listed under the ESA (Jones 2011). NMFS subsequently received ODFW confirmation (Latif 2011), including additional information on the proposed installation and operation of weirs to prevent hatchery-origin spring
Chinook salmon, coho salmon, winter steelhead, and summer steelhead from spawning naturally and to collect hatchery broodstock and on the operation of a screw trap in Cedar Creek to monitor the production of natural-origin coho salmon and winter steelhead that spawn upstream of the hatchery.

The HGMPs and accompanying draft environmental assessment were made available for public comment in May 2012. After reviewing public comment on the HGMPs, ODFW made several adjustments to the proposed action and updated HGMPs were provided to NMFS (Alsbury 2012). These updated HGMPs are what is considered in this opinion and are described in section 1.3, below.

1.3. Proposed Action

“Action” means all activities, of any kind, authorized, funded, or carried out, in whole or in part, by the action agency or action agencies. Interrelated actions are those that are part of a larger action and depend on the larger action for their justification. Interdependent actions are those that have no independent utility apart from the action under consideration.

The proposed action is described in McIntosh (2011) as modified by Alsbury (2012). It includes four hatchery programs in the Sandy River Basin near Portland, Oregon. Implementation of the four hatchery programs is a requirement of the Federal Energy Regulatory Commission (FERC) license (Project No. 2821-000) issued to the City of Portland for the construction and for the continued operation of the dams in the Bull Run River, a tributary of the Sandy River. The City of Portland and the ODFW fund the hatchery programs and ODFW operates them. ODFW previously received funding through grants by NMFS pursuant to the Mitchell Act. Continued funding pursuant to these funding sources is part of the proposed action.

The scientific basis and support for developing the proposed action comes from several different sources. Deliberations over the proposed action and the development of the corresponding HGMPs were timed to take advantage of several investigations that are particularly relevant to this situation, including the draft ESA Recovery Plan for LCR salmon and steelhead listed under the ESA (NMFS 2012), the LCR Conservation & Recovery Plan for Oregon Populations of Salmon and Steelhead (Recovery Plan) (ODFW 2010), and a 2009 report by the Hatchery Science Review Group (HSRG). Each of these documents describes how hatchery programs in the Sandy River Basin can operate consistent with the conservation of listed salmon and steelhead. Other information cited in the HGMPs includes, the Native Fish Conservation Policy (ODFW 2003a), and the Fish Hatchery Management Policy (ODFW 2003b).

Each of the HGMPs has several things in common. Features that are unique to each HGMP are described below in sections 1.3.1, 1.3.2, 1.3.3, and 1.3.4. At the core of the HGMPs are three principles: (1) best management practices (BMPs), (2) scientifically based performance standards, and (3) monitoring and reporting requirements to ensure accountability. The BMPs that each of the HGMPs have in common include using hatchery fish for broodstock instead of using natural-origin fish at the expense of natural population abundance, externally marking hatchery fish for easy identification and to maximize management flexibility, release strategies and release locations that limit interactions between juvenile hatchery fish and fish from natural populations, meeting NMFS screen criteria for water diversions that serve the hatcheries, and
weir operations and water diversions that take into account juvenile and adult fish spatial
distribution. Each of the HGMPs has performance standards or strict limits on hatchery fish that
escape to spawn naturally and each HGMP includes annual monitoring and reporting to validate
hatchery program performance and compliance with NMFS’ 4(d) determination. Monitoring and
performance standard compliance information will be made available to the public in a timely
manner.

1.3.1. Sandy River Spring Chinook Salmon Hatchery Program

Proposed Broodstock Collection

- Method and location for broodstock collection: Broodstock will be collected from
  volitional returns to the Sandy hatchery, and if needed, at temporary weirs, with hook and
  line, and with live capture nets located throughout the Sandy basin. Potential sites for
temporary weirs are identified in section 1.5 of ODFW 2011i. Temporary weirs would
be installed in May or June and removed before coho salmon begin returning to the
Sandy River in September and October. No changes to aquatic or riparian habitat would
occur.
- Origin of the fish and the maximum number collected: Broodstock are hatchery fish
  from “Oregon stock 11. Stock 11 is included in the LCR Chinook salmon ESU. 200
  adult fish are needed for broodstock.
- Sorting and handling of natural-origin fish: The HGMP seeks authorization to handle up
to 2,750 total natural-origin spring Chinook salmon total at four weir locations annually,
in the Salmon River, Zigzag River, Cedar Creek, and in the Bull Run River. Natural-
origin fish would rest and recover in holding ponds and then be returned unharmed to the
river to spawn naturally.

Proposed Protocols for Each Release Group

- Life-stage: 1 year smolts.
- Acclimation (Y/N): Yes.
- Volitional Release (Y/N): No.
- Mark(s): All 300,000 are otolith marked and adipose fin clipped and 50,000 receive
coded-wire-tags (CWT),
- Maximum number released: 300,000.
- Release location: All 300,000 smolts will be acclimated and released from the Bull Run
  acclimation pond.

Proposed Adult Management

- Anticipated number or range in hatchery fish returns: Unknown
- Methods for removing hatchery fish and the anticipated number of natural-origin fish
  encountered: Volitional returns to the Sandy hatchery, terminal fisheries, and removal at
  weirs. The use of the weirs started and 2011 and there are no data, as yet, to describe the
  actual number of natural-origin adults that are likely to be encountered.
- Appropriate uses for returning hatchery fish: hatchery broodstock, harvest, human
  consumption (e.g. food banks), and in-stream nutrient enhancement.
- Are hatchery fish intended to spawn naturally (Y/N): No
• Performance standard for pHOS (proportion of naturally spawning fish that are of hatchery-origin): 0.10 maximum for all locations in the Sandy Basin.
• Performance standard for stray rates: no more than 0.05 of any natural-origin population outside the Sandy Basin.

Proposed Operations and Facilities
• Water source(s) and quantity for hatchery facilities: The Sandy Hatchery uses water from Cedar Creek, totaling up to 12,577 gallons per minute (gpm) under Oregon water permit number 23300. The Clackamas hatchery uses well water and water removed from the Clackamas River under permits issued by the state of Oregon (numbers S49433 and S42105). Juvenile rearing also occurs at Willamette and Leaburgh hatcheries and these operations are authorized in NMFS 2008a.
• Water diversions meet NMFS screen criteria (Y/N): Yes for the Sandy hatchery and no for the Clackamas hatchery. ODFW will screen the Clackamas hatchery intake to meet NMFS screen criteria.
• Barriers to juvenile or adult fish passage (Y/N): Yes. Natural-origin fish are transported around the weir at the Sandy Hatchery on Cedar Creek.
• Pollutant discharge and location (Y/N): Water from Clackamas hatchery is discharged into the Clackamas River under National Pollutant Discharge Evacuation Permit (NPDES) number 102663. Return water from the Sandy Hatchery is authorized under NPDES permit 10598.

Proposed Research Monitoring and Evaluation
• Adult sampling, purpose, methodology, location, and the number of ESA-listed fish handled: Complete census, across the Sandy Basin, of the location, number, and timing of naturally spawning hatchery fish.
• Juvenile sampling, purpose, methodology, location, and the number of ESA-listed fish handled: Natural production monitoring (i.e., smolt trapping).

1.3.2. Sandy River Coho Salmon Hatchery Program

Proposed Broodstock Collection
• Method and location for broodstock collection: Collect coho salmon that volunteer into the fish ladder and enter the Sandy River hatchery. The Sandy River hatchery is located at RM 0.75 on Cedar Creek, a tributary to the Sandy River.
• Origin of the fish and the maximum number collected: 400 Sandy River hatchery-origin fish. Sandy River hatchery coho are included in the LCR coho salmon ESU.
• Sorting and handling of natural-origin fish: Natural-origin coho that enter the hatchery are passed above the weir to spawn naturally. In 2011, 230 natural-origin coho were passed upstream.

Proposed Protocols for Each Release Group
• Life-stage: 1 year smolts
• Acclimation: (Y/N): Yes, at Sandy hatchery.
• Volitional release (Y/N): Yes
• Mark(s): 475,000 are adipose fin clipped. The remaining 25,000 fish receive a CWT (no adipose clip).
• Maximum number released: 500,000.
• Release location: Cedar Creek at RM 0.75.

Proposed Adult Management
• Anticipated number or range in hatchery fish returns: Unknown, highly variable.
• Methods and collateral effects on natural-origin fish: Hatchery fish are removed at the Sandy Hatchery and in terminal fisheries. Weirs at other locations will be removed when the first coho salmon return to the upper Sandy.
• Appropriate uses for returning hatchery fish: Hatchery broodstock, harvest, human consumption (e.g., food banks), and in-stream nutrient enhancement.
• Are hatchery fish intended to spawn naturally (Y/N): No
• Performance standard for pHOS: 0.10 maximum for areas in the Sandy Basin.
• Performance standard for stray rates: 0.05 maximum for of any natural-origin population outside the Sandy Basin.

Proposed Operations and Facilities
• Water source(s) and quantity for hatchery facilities: For Sandy hatchery, water is diverted from Cedar Creek under Oregon water permit number 23300.
• Water diversion(s) meet NMFS screen criteria (Y/N): Yes. A new intake and diversion screen that meets NMFS screen criteria was completed in 2012.
• Barriers to juvenile or adult fish passage (Y/N): Yes. Adult passage is stopped at the broodstock collection weir in Cedar Creek. Hatchery fish are removed and natural-origin fish are returned unharmed to Cedar Creek to spawn naturally. Minimum flows below the intake structure will be maintained to ensure juvenile passage.
• Pollutant discharge and location: Water is returned to Cedar Creek under NPDES permit number 10598.

Proposed Research Monitoring and Evaluation
• Adult sampling, purpose, methodology, location, and the number of ESA-listed fish handled: Spawning ground surveys will be conducted throughout the Sandy River basin, downstream and upstream of Sandy Hatchery, to monitor pHOS, natural-origin fish abundance, and natural spawner distribution.
• Juvenile sampling, purpose, methodology, location, and the number of ESA-listed fish handled: Natural production will be monitored annually in Cedar Creek using a rotary screw trap. Up to 5,000 smolts will be handled annually.

1.3.3. Sandy River Winter Steelhead Hatchery Program

Proposed Broodstock Collection
• Method and location for broodstock collection: Broodstock are collected from volitional returns to the Sandy hatchery.
• Origin of the fish and the maximum number collected: A maximum of 120 Sandy River hatchery winter steelhead are needed to meet production goals. Sandy River winter steelhead are included in the LCR steelhead DPS.
• Sorting and handling of natural-origin fish: Natural-origin steelhead and coho salmon that enter the hatchery are immediately returned to Cedar Creek, above the hatchery, to spawn naturally.

Proposed Protocols for Each Release Group
• Life-stage: 1 year smolts.
• Acclimation: (Y/N): Yes,
• Volitional release (Y/N): Yes.
• Mark(s): 100% adipose fin-clipped.
• Maximum number released: 160,000.
• Release location: Cedar Creek at RM 0.75.

Proposed Adult Management
• Anticipated number or range in adult returns: Unknown.
• Methods and collateral effects on natural-origin fish: Hatchery fish are removed in terminal fisheries and at the Sandy hatchery weir. Natural-origin steelhead are passed over the weir, unharmed, to spawn naturally.
• Appropriate uses for returning hatchery fish: Hatchery broodstock, supplement natural spawners in Cedar Creek when natural-origin returns are below critical thresholds, harvest, human consumption, and in-stream nutrient enrichment. Hatchery fish are recycled, once, through the fishery in the lower Sandy and only before February 16 of each year.
• Are hatchery fish intended to spawn naturally (Y/N): No (except for Cedar Creek when natural-origin escapement is below a critical threshold).
• Performance standard for pHOS: 0.10 maximum for areas in the Sandy basin.
• Performance standard for stray rates: Maximum pHOS of 0.05 for any natural-origin population outside the Sandy Basin.

Proposed Operations and Facilities:
• Water source(s) and quantity for hatchery facilities: Fish are reared at the Sandy and Bonneville hatcheries and at Oak Spring hatchery in the Deschutes River basin. See section 1.3.2. for a description of water sources and quantity for Sandy and Bonneville hatcheries. For Oak Spring hatchery, water comes from natural springs at the rate of 24,063 gpm.
• Water diversions meet NMFS screen criteria (Y/N): See section 1.3.2 for the Sandy and Bonneville hatcheries. For Oak Spring, screens are not necessary, ESA-listed species are not present in the water supply.
• Barriers to juvenile or adult fish passage (Y/N): Yes. Natural-origin fish are stopped at the broodstock collection weir in Cedar Creek and then transported upstream of the hatchery to spawn naturally. A new intake structure has been completed that will restore passage conditions for juvenile salmon and steelhead.
• Pollutant discharge and location (Y/N): Yes. Discharge from the Oak Spring hatchery is authorized under NPDES permit number 64515. Also, see 1.3.2 for pollutant discharge information for Sandy Hatchery.

Proposed Research Monitoring and Evaluation
• Adult sampling, purpose, methodology, location, and the number of ESA-listed fish handled: Spawning grounds surveys, upstream and downstream of Cedar Creek, to determine natural-origin fish abundance and distribution and to determine pHOS.
• Juvenile sampling, purpose, methodology, location, and the number of ESA-listed fish handled: ODFW will monitor steelhead re-colonization of Cedar Creek and natural production by monitoring the juvenile outmigration, annually. Up to 3,500 natural-origin steelhead smolts would be inspected and returned to Cedar Creek annually.

1.3.4. Sandy River Summer Steelhead Hatchery Program

Proposed Broodstock Collection
• Method and location for broodstock collection: Fish collection facilities at Foster Dam on the South Santiam River.
• Origin of the fish and the maximum number collected: Skamania stock 24. Approximately 35 pairs are needed to satisfy production goals. These fish are not included in the LCR steelhead DPS.
• Sorting and handling of natural-origin fish: Unknown

Proposed Protocols for Each Release Group
• Life-stage: 1 year smolts.
• Acclimation: (Y/N): Yes.
• Mark(s): 100% adipose fin-clipped.
• Maximum number released: 75,000
• Release location: RM 0.75 on Cedar Creek. All hatchery smolts that do not volitionally emigrate from the hatchery facility after 48 hours will not be allowed to enter running waters accessible to anadromous fishes.

Proposed Adult Management
• Anticipated number or range in adult returns: Unknown.
• Methods and collateral effects on natural-origin fish: Terminal fisheries and removal at weirs located throughout the Sandy River basin. Hatchery fish are recycled through fisheries in the lower Sandy River up to July 31 of each year.
• Appropriate uses for returning hatchery fish: Hatchery broodstock, harvest, human consumption (e.g., food banks), and stream enrichment. Hatchery fish may also be planted in isolated ponds and lakes.
• Are hatchery fish intended to spawn naturally (Y/N): No.
• Performance standard for pHOS: 0.05 maximum for all waters accessible to steelhead and designated as important for recovery (ODFW 2010).
• Performance standard for stray rates: 0.05 maximum.
Proposed Operations and Facilities

- Water source and quantity for hatchery facilities: Fish are reared at the Sandy, Oak Springs, Bonneville, and South Santiam hatcheries. A description of water source and quantity for the Sandy, Oak Springs, and Bonneville hatcheries is provided in sections 1.3.2. and 1.3.3. Operation at the South Santiam hatchery were previously evaluated and authorized under NMFS 2008a.
- Water diversions meet NMFS screen criteria (Y/N): See sections 1.3.2. and 1.3.3.
- Barriers to juvenile or adult fish passage (Y/N): Yes, at the Cedar Creek weir. See sections 1.3.2. and 1.3.3.
- Pollutant discharge and location (Y/N): See sections 1.3.2. and 1.3.3.

Proposed Research Monitoring and Evaluation

- Adult sampling, purpose, methodology, location, and the number of ESA-listed fish handled: None proposed
- Juvenile sampling, purpose, methodology, location, and the number of ESA-listed fish handled: None proposed

1.4. Action Area

The “Action Area” means all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR 402.02). The action area resulting from this analysis are tributaries of the Sandy River accessible to anadromous fish and reaches of the Sandy River accessible to anadromous fish and downstream to its confluence with the Columbia River. ESA-listed species in the watershed include LCR Chinook salmon, chum salmon, and coho salmon, LCR steelhead, and Pacific Eulachon (Table 2).

NMFS considered whether the mainstem Columbia River, the estuary, and the ocean should be included in the action area but the effects analysis was unable to detect or measure effects of the proposed action beyond the area described above, based on best available scientific information (AMIP 2009). Available knowledge and techniques are insufficient to discern the role and contribution of the proposed action to density dependent interactions affecting salmon and steelhead growth and survival in the mainstem Columbia River, the Columbia River estuary, and in the Pacific Ocean\(^1\). From the scientific literature, the general conclusion is that the influence of density dependent interactions on growth and survival is likely immeasurably small. While there is evidence that hatchery production, on a scale many times larger than the proposed action, can impact salmon survival at sea, the degree of impact or level of influence is not yet understood or predictable. NMFS will monitor emerging science and information and will reinitiate section 7 consultation in the event that new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not considered in this consultation (50 CFR 402.16).

\(^{1}\) NMFS determined that the proposed hatchery programs would have no effect on southern resident killer whales or Steller sea lions and so did not extend the action area beyond the Sandy River Basin. This is because the hatchery fish produced from the programs would represent a very small proportion of the salmonids that could serve as prey for these species.
Table 2. Federal Register notices for final rules that list threatened species, designate critical habitat, or apply protective regulations to listed species considered in this consultation.

<table>
<thead>
<tr>
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<th>Listing Status</th>
<th>Critical Habitat</th>
<th>Protective Regulations</th>
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<td>9/02/05; 70 FR</td>
<td>6/28/05; 70 FR</td>
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<td>37160</td>
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<td>6/28/05; 70 FR</td>
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2. ENDANGERED SPECIES ACT: BIOLOGICAL OPINION AND INCIDENTAL TAKE STATEMENT

2.1. Introduction to the Biological Opinion

Section 7(a)(2) of the ESA requires Federal agencies, in consultation with NMFS, to ensure that their actions are not likely to jeopardize the continued existence of endangered or threatened species, or adversely modify or destroy their designated critical habitat.

“To jeopardize the continued existence of a listed species” means to engage in an action that would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of the species in the wild by reducing the reproduction, numbers, or distribution of that species or reduce the value of designated or proposed critical habitat (50 CFR 402.02).

This opinion uses the statutory provisions of the ESA to complete the following analysis with respect to critical habitat. It does not rely on the regulatory definition of 'destruction or adverse modification' of critical habitat at 50 CFR 402.02. NMFS will use the following approach to assess the effects of the proposed action described in Section 1.3.

Range-wide status of the species and critical habitat

This section describes the status of species and critical habitat that are the subject of this opinion. NMFS has developed specific guidance for analyzing the status of salmon and steelhead in a

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2 Memorandum from William T. Hogarth to Regional Administrators, Office of Protected Resources, NMFS (Application of the “Destruction or Adverse Modification” Standard Under Section 7(a)(2) of the Endangered Species Act) (November 7, 2005).
“viable salmonid populations” paper (VSP; McElhany et al. 2000). The VSP approach considers four attributes, the abundance, productivity, spatial structure, and diversity of each population (natural-origin fish only), as part of the overall review of a species’ status. For salmon and steelhead protected under the ESA, the VSP criteria therefore encompass the species’ “reproduction, numbers, or distribution” (50 CFR 402.02). In describing the range-wide status of listed species, we rely on viability assessments and criteria in technical recovery team documents, ESA Status Review updates, and recovery plans, where available, that describe how VSP attributes are applied to specific populations, major population groups (MPG), and species. We determine the status of critical habitat by examining its physical and biological features (also called “primary constituent elements” or PCEs). Status of the species and critical habitat are discussed in Section 2.2.

Describe the environmental baseline

The environmental baseline includes the past and present impacts of Federal, state, or private actions and other human activities in the action area. It includes the anticipated impacts of proposed Federal projects that have already undergone formal or early section 7 consultation and the impacts of state or private actions that are contemporaneous with the consultation in process. The environmental baseline is discussed in Section 2.3 of this opinion.

Cumulative effects

Cumulative effects, as defined in NMFS’ implementing regulations (50 CFR 402.02), are the effects of future state or private activities, not involving Federal activities, that are reasonably certain to occur within the action area. Future Federal actions that are unrelated to the proposed action are not considered because they require separate section 7 consultation. Cumulative effects are considered in Section 2.5 of this opinion.

Integration and synthesis

Integration and synthesis occurs in Section 2.6 of this opinion. In this step, NMFS adds the effects of the proposed action (Section 2.4) to the status of ESA protected species under the environmental baseline (Section 2.3) and to cumulative effects (Section 2.5) to formulate the agency’s opinion as to whether the hatchery action is likely to: (1) result in appreciable reductions in the likelihood of both survival and recovery of the species in the wild by reducing its numbers, reproduction, or distribution; or (2) reduce the value of designated or proposed critical habitat. Said another way, effects of the hatchery action are added to the effects of all human activities in the action area, including any anticipated Federal, state or private projects, to reach an opinion of whether the viability of a species would improve except for the proposed hatchery action and whether critical habitat would be reduced.

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3 The “environmental baseline” includes the past and present impacts of all Federal, state, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early ESA section 7 consultation, and the impact of state or private actions which are contemporaneous with the consultation in process (50 CFR 402.02).

4 Cumulative effects” are those effects of future state or private activities, not involving Federal activities that are reasonably certain to occur within the action area of the Federal action subject to consultation (50 CFR 402.02).
Jeopardy and adverse modification

Based on the Integration and Synthesis analysis in section 2.6, the opinion determines whether the proposed action is likely to jeopardize ESA protected species or destroy or adversely modify designated critical habitat in Section 2.7.

Reasonable and prudent alternative(s) to the proposed action

If NMFS determines that the action under consultation is likely to jeopardize the continued existence of listed species or destroy or adversely modify designated critical habitat, NMFS must identify a RPA or RPAs to the proposed action.

NMFS also considered the potential effects of the proposed action on Pacific eulachon (*Thaleichthys pacificus*) and determined that the proposed action was not likely to adversely affect this species or its designated critical habitat, as described in section 2.11.

2.2. Range-wide Status of the Species and Critical Habitat

This opinion examines the status of each species that would be affected by the proposed action. The status is the level of risk that the listed species face, based on parameters considered in documents such as recovery plans, status reviews, and listing decisions. The species status section helps to inform the description of the species’ current “reproduction, numbers, or distribution” as described in 50 CFR 402.02. The opinion also examines the condition of critical habitat throughout the designated area, evaluates the conservation value of the various watersheds and coastal and marine environments that make up the designated area, and discusses the current function of the essential physical and biological features that help to form that conservation value.

For Pacific salmon and steelhead NMFS commonly uses four parameters to assess the viability of the populations that, together, constitute the species: spatial structure, diversity, abundance, and productivity (McElhany et al. 2000). These “viable salmonid population” (VSP) parameters therefore encompass the species’ “reproduction, numbers, or distribution” as described in 50 CFR 402.02. When these parameters are collectively at appropriate levels, they maintain a population’s capacity to adapt to various environmental conditions and allow it to sustain itself in the natural environment. These attributes are influenced by survival, behavior, and experiences throughout a species’ entire life cycle, and these characteristics, in turn, are influenced by habitat and other environmental conditions.

“Spatial structure” refers both to the spatial distributions of individuals in the population and the processes that generate that distribution. A population’s spatial structure depends fundamentally on habitat quality and spatial configuration and the dynamics and dispersal characteristics of individuals in the population.

“Diversity” refers to the distribution of traits within and among populations. These range in scale from DNA sequence variation at single genes to complex life history traits (McElhany et al. 2000).
“Abundance” generally refers to the number of naturally-produced adults (i.e., the progeny of naturally-spawning parents) in the natural environment (e.g., on spawning grounds).

“Productivity,” as applied to viability factors, refers to the entire life cycle; i.e., the number of naturally-spawning adults produced per their naturally spawning parental pair. When progeny replace or exceed the number of parents, a population is stable or increasing. When progeny fail to replace the number of parents, the population is declining. McElhany et al. (2000) use the terms “population growth rate” and “productivity” interchangeably when referring to production over the entire life cycle. They also refer to “trend in abundance,” which is the manifestation of long-term population growth rate.

For species with multiple populations, once the biological status of a species’ populations has been determined, NMFS assesses the status of the entire species using criteria for groups of populations, as described in recovery plans and guidance documents from technical recovery teams. Considerations for species viability include having multiple populations that are viable, ensuring that populations with unique life histories and phenotypes are viable, and that some viable populations are both widespread, to avoid concurrent extinctions from mass catastrophes, and spatially close, to allow functioning as metapopulations (McElhany et al. 2000).

“Species” Definition: The ESA of 1973, as amended, 16 U.S.C. 1531 et seq. defines “species” to include any “distinct population segment (DPS) of any species of vertebrate fish or wildlife which interbreeds when mature.” To identify DPSs of salmon species, NMFS follows the “Policy on Applying the Definition of Species under the ESA to Pacific Salmon” (56 FR 58612). Under this policy, a group of Pacific salmon is considered a distinct population, and hence a “species” under the ESA if it represents an evolutionarily significant unit (ESU) of the biological species. The group must satisfy two criteria to be considered an ESU: (1) It must be substantially reproductively isolated from other con-specific population units; and (2) It must represent an important component in the evolutionary legacy of the species. To identify DPSs of steelhead, NMFS applies the joint FWS-NMFS DPS policy (61 FR 4722). Under this policy, a DPS of steelhead must be discrete from other populations, and it must be significant to its taxon. LCR steelhead constitute a DPS of the taxonomic species Oncorhynchus mykiss, and LCR spring Chinook, coho, and chum salmon, each constitute an ESU (salmon DPS) of the taxonomic species Oncorhynchus tshawytscha, and as such each are considered a “species” under the ESA.

2.2.1. Life History and Status of LCR Chinook Salmon

The Sandy River spring Chinook salmon population is part of the LCR Chinook Salmon ESU. The LCR Chinook Salmon ESU is characterized by numerous short- and medium-length rivers that drain the coast range and the west slope of the Cascade Mountains. Myers et al. (2003) identified 31 historical populations within the ESU (Figure 1 and Figure 2) and estimated that of these populations, 8-10 have been extirpated, most of these being spring Chinook salmon. The ESU now includes all naturally spawning Chinook salmon from the mouth of the Columbia River to the crest of the Cascade Range, including the White Salmon in Washington and the Hood River basin in Oregon (Figures 2 and 3). The ESU excludes populations above Willamette Falls. The Cowlitz, Kalama, Lewis, Washougal, and White Salmon Rivers constitute the major
systems in Washington; the lower Willamette, Hood and Sandy Rivers are the major systems in Oregon (BRT 2003). The ESU does not include spring Chinook salmon populations in the Clackamas River or the introduced Carson spring Chinook salmon stock. Tule fall Chinook salmon in the Wind and Little White Salmon Rivers are included in this ESU, but not the introduced upriver bright fall Chinook salmon in the Wind and White Salmon Rivers and those spawning naturally below Bonneville Dam (Myers et al. 1998). NMFS determined that 17 Chinook salmon hatchery programs were part of the LCR Chinook Salmon ESU (Ford 2011).

Chinook salmon exhibit a wide variety of life history patterns that include variations in: age at seaward migration; length of freshwater, estuarine, and oceanic residence; ocean distribution; ocean migratory patterns; and age and season of spawning migration. Two distinct races of Chinook salmon are generally recognized: “stream-type” and “ocean-type” (Healey 1991; Myers et al. 1998). There are three different forms of Chinook salmon included in the LCR ESU: spring-run, early-fall “tules” and late fall “brights”. Spring-run Chinook salmon are a stream-type life history. Spring Chinook ocean distribution is far from the coast (Healey 1983; 1991). These fish return to freshwater as adults in March and April, well in advance of spawning in August and September (Fulton 1968; Healey 1991). Spring Chinook spawn in the upper most reach of tributary streams. Historically, fish migrations were synchronized with periods of high rainfall or snow melt to provide access to upper reaches of most tributaries where spring stocks would hold until spawning (Fulton 1968; Olsen et al. 1992; WDF et al. 1993). The tule and bright fall Chinook salmon exhibit an ocean-type life history and northerly ocean migration patterns, with bright fish tending to travel farther north than the tule Chinook salmon. Tule fall Chinook salmon enter the Columbia River in August, rapidly moving into LCR tributaries to begin spawning in September and October. Bright fall Chinook salmon enter the Columbia River over a longer period of time beginning in August and do not begin spawning until October with spawning observed as late as the following March. All LCR Chinook salmon mature at two to six years of age, primarily returning as three- and four-year-old adults (Myers et al. 1998).
Figure 1. Historical independent LCR early and late fall Chinook salmon populations (Myers et al. 2006).
Spring Chinook salmon were present historically in the Sandy, Clackamas, Cowlitz, Kalama, Hood, White Salmon and Lewis Rivers. Spawning and juvenile rearing areas have been eliminated or greatly reduced, primarily by dam construction. Dam construction substantially reduced the range of spring Chinook salmon in the Cowlitz and Sandy Rivers (Myers et al. 1998). Spring Chinook were extirpated in the White Salmon River after the completion of Condit Dam in 1917. They were extirpated in the Lewis River after the completion of Merwin Dam in 1931. In the Hood River, spring Chinook were extirpated in the 1960s following the breaching of a glacial dam and reintroduction efforts are underway there using closely related spring Chinook salmon from the Deschutes River.

Recent escapement estimates for Sandy River spring Chinook salmon are provided in Table 3. Spring Chinook salmon spawn primarily upstream of the old Marmot Dam site, with most spawning occurring in the Salmon River up to Final Falls and in Still Creek from its confluence upstream about 3 miles. Spawning also occurs in the Zigzag River, the upper Sandy River (mostly above Clear Creek), and in the lower reaches of Clear Creek and Lost Creek. Spawning has also been observed in the lower Bull Run River (NMFS 2008c). The Sandy River Working Group (NMFS 2008c), identified anchor habitats for salmon and steelhead in the Sandy River. Anchor habitats were defined as distinct stream reaches that currently harbor specific life history

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5 Clackamas River spring Chinook salmon are considered part of the listed Upper Willamette River Chinook salmon ESU.

<table>
<thead>
<tr>
<th>Run Year</th>
<th>Spring Chinook&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Coho&lt;sup&gt;d&lt;/sup&gt;</th>
<th>Winter Steelhead&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Summer Steelhead&lt;sup&gt;a&lt;/sup&gt;</th>
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<tr>
<td></td>
<td>Total&lt;sup&gt;c&lt;/sup&gt;</td>
<td>Wild&lt;sup&gt;b&lt;/sup&gt;</td>
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<sup>a</sup> Spring Chinook were not 100 percent marked until the 1997 brood year (2002 -2005 adult return years). Coho were not mass marked until the 1996 brood year (1999-2000 adult returns). Summer and winter steelhead have been 100 percent marked since 1996.

<sup>b</sup> 1992-1998 estimate of wild fish from LCRCRP (ODFW 2010). Wild fish count prior to 2008 does not include unmarked fish found below the former Marmot Dam.

<sup>c</sup> Hatchery fish identified by adipose fin-clip were removed from the system beginning in 1998. Count corrected for estimated proportion of unmarked hatchery fish found upstream of the former Marmot Dam.


stages of salmon and steelhead to a greater extent than the stream system at large. Spring Chinook salmon anchor habitat is located in the upper Sandy River basin upstream of Cedar Creek. The coho salmon, winter steelhead, and summer steelhead hatchery programs release their fish in Cedar Creek. Two reaches in the mainstem Sandy River, from approximately RM 24 (2 mi. above the mouth of Cedar Creek) to the Salmon River confluence, were identified as anchor habitat. Other identified anchor habitats were all in the mainstem Salmon River up to Final Falls (RM 14), the Sandy River from the Salmon River confluence to the Zigzag River, the
lower end of Clear Fork Creek in the upper Sandy River, and the lower end of Still Creek (downstream of Cool Creek).

**Lower Columbia River Chinook salmon: Updated Risk Summary**

Ford (2011) recently updated the status review completed in 2005 (Good et al. 2005) concluding that the ESU as a whole is currently at very high risk of extinction. The Sandy River late fall (bright) population is one of only two populations in the ESU considered to be at low or very low risk (LCFRB 2010; ODFW 2010). It has maintained high spawner abundances since the last BRT evaluation (LCFRB 2010; ODFW 2010). The tule fall Chinook salmon population is considered to be at very high risk (ODFW 2010). The Sandy River spring Chinook salmon population is considered at moderate risk (ODFW 2010).

The recovery plan for LCR salmon and steelhead (ODFW 2010) identified reduced habitat complexity and diversity; access to off-channel habitats; impacts on the estuary habitat from hydro-system operations; and stray hatchery fish interbreeding with natural-origin adults as the primary factors limiting Sandy river salmon and steelhead recovery. Past hatchery practices have posed substantial threats to natural populations.

Recent evaluations show that, while many hatchery programs are being reshaped to provide better protection for natural-origin populations, more improvements are needed (HSRG 2007). The major concern is the threat from interactions on the spawning grounds from hatchery fish (HSRG 2007). Currently naturally spawning hatchery spring Chinook salmon make-up a substantial proportion of the natural spawning population (Table 3).

The recovery goal for the Sandy River population of spring Chinook salmon, as described in Oregon’s recovery plan (ODFW 2010), is for the population to be at low risk of extinction (< 5 percent probability) with an annual abundance of at least 1,230 natural-origin adults. Recommendations specifically related to the spring Chinook salmon program at Sandy Hatchery can be found in Table 9-3 of the Recovery Plan (ODFW 2010). In addition, Table 9-3 (ODFW 2010) also includes other ESU-wide actions that can be applied to the hatchery programs. Most of the actions described in Table 4 are designed to reduce the proportion of hatchery spring Chinook salmon spawning naturally with the goal of having the nine-year averaged proportion to be less than or equal to 10 percent (ODFW 2010). This corresponds to a pHOS level of 0.10.
Table 4. Actions called for in the Recovery Plan (ODFW 2010) for the spring Chinook salmon hatchery program in the Sandy River.

<table>
<thead>
<tr>
<th>Action ID</th>
<th>Action</th>
<th>Status in the Sandy Basin</th>
</tr>
</thead>
<tbody>
<tr>
<td>238-SY</td>
<td>Acclimate 100 percent of hatchery spring Chinook releases into the Sandy (Sandy Hatchery and Bull Run River or Gordon Creek)</td>
<td>On-going</td>
</tr>
<tr>
<td>239-SY</td>
<td>Trap and sort hatchery adults: Collect (weir and trap at or near acclimation sites) hatchery spring Chinook if stray rate is too high (mouth of Cedar Creek and Bull Run River or Gordon Creek)</td>
<td>Underway</td>
</tr>
<tr>
<td>240-SY</td>
<td>Increase water quantity in Cedar Creek for more attraction (end illegal diversions, increase outreach and coordination with Oregon Water Resource Department, potentially purchase water rights).</td>
<td>To be completed</td>
</tr>
<tr>
<td>241-SY</td>
<td>Implement a sliding scale for take of wild winter steelhead and spring Chinook broodstock for the integrated hatchery programs based on the forecasted total returns of wild fish to the population (&lt;500: no take; 500-1000: reduced take); develop forecast model as necessary.</td>
<td>Action under review</td>
</tr>
<tr>
<td>242-SY</td>
<td>Eliminate the upper basin and Marmot Dam acclimation pond releases</td>
<td>Completed</td>
</tr>
</tbody>
</table>

Source: LCRCRP, ODFW 2010

2.2.2. Life History and Status of LCR River Coho Salmon

The Sandy River coho salmon population is part of the LCR Coho Salmon ESU. In 2001, the NMFS Biological Review Team (BRT) reconvened to update information on the biological status of LCR coho salmon and reaffirmed the conclusion that it should be regarded as a separate ESU from southwest Washington (SWA) coho salmon (NMFS 2001b). This conclusion was supported by new tagging data and analyses indicating that SWA and LCR coho salmon populations have differing marine distributions and are genetically distinct (Shaklee et al. 1999; NMFS 2001b). This finding is consistent with the stock structure exhibited by LCR Chinook salmon and O. mykiss populations (McElhany et al. 2004) (Figure 3). The 2001 BRT also concluded that the historical ESU still exists in the LCR. The primary evidence to support this conclusion is the consistent genetic and life history differences between LCR coho salmon and populations from other areas. The BRT concluded that, because of presumably very low survival rates, stock transfers from Oregon coastal populations 40-80 years ago probably had relatively little permanent effect on the genetic makeup of LCR coho salmon. Nevertheless, the BRT recognized that evidence for appreciable natural production is limited to two Oregon populations (in the Sandy and Clackamas Rivers) that represent the clearest link to historic populations.
within the ESU (NMFS 2001b). Based on available information, most coho salmon returning to areas outside these two streams appear to be derived from naturally spawning hatchery fish. The 2001 BRT concluded that, collectively, these hatchery-produced fish contain a key portion of the historical diversity of LCR coho salmon, albeit in somewhat altered form. In determining the upstream boundary of the LCR Coho Salmon ESU, the BRT (2003) concluded that UCR coho salmon were likely a different ESU, and that the Cascade Crest represents the most likely eastern terminus of the LCR Coho Salmon ESU.

Based on the foregoing, NMFS concluded that the LCR Coho Salmon ESU includes all naturally spawned populations of coho salmon in the Columbia River and its tributaries from the mouth of the Columbia up to and including the White Salmon and Hood Rivers (Figure 3).

![Figure 3. The LCR coho salmon ESU (from Meyers et al. 2006).](Image)

LCR coho salmon show considerable temporal variability in river entry and spawn timing (LCFRB 2010). Coho salmon begin to return to the Columbia River in August, continuing through December/January and peaking in September/October. This variability resembles the pattern of river entry in other river systems, such as the Chehalis in southwest Washington, the Skagit in northern Washington, and the Klamath in southern Oregon (Leidy and Leidy 1984; WDF et al. 1993).

In some regions, individual coho salmon stocks show exceptionally early or late run timings; these stocks are often referred to as summer or winter runs, respectively (Godfrey 1965), and are
thought to have evolved in response to particular flow conditions (Sandercock 1991). In some cases, differently-timed, sympatric runs are thought to be largely reproductively isolated from each other (Houston 1983; Cramer and Cramer 1994), and in other cases, there is believed to be reproductive overlap (WDF et al. 1993). These “very late or very early” timed runs are found in many geographic areas. However, because there is no evidence to suggest that all runs of a certain type are closely related, differently timed runs are considered to be a component of overall life history diversity within each area (NMFS 1995b).

After emergence, coho salmon fry move to shallow, low velocity rearing areas, primarily along the stream edges and in side channels. All coho salmon juveniles remain in freshwater rearing areas for a full year after emerging from the gravel.

Most juvenile coho salmon migrate seaward as smolts in late spring, typically during their second year. Coho salmon use estuaries primarily to adjust physiologically to salt water. Most research indicates that, upon entering the ocean, coho salmon remain in nearshore environments over the continental shelf for up to several months before they disperse. Coho salmon typically spend 18 months in the ocean before returning to fresh water. Jacks (i.e., precocial males), spend 5 to 7 months in the ocean before returning to freshwater to spawn.

Columbia River coho salmon generally return in two runs:
- Early-returning (Type S) coho salmon enter the Columbia River in mid-August and begin entering tributaries in early September, with peak spawning from mid-October to early November.  
- Late-returning (Type N) coho salmon pass through the lower Columbia from late September through December and enter tributaries from October through January. Most spawning occurs from November to January, but spawn timing can range into March. The onset of spawning is tied to the first substantial fall freshet. The salmon often mill near the river mouths or in lower river pools until freshets occur.

In general, early returning fish spawn farther upstream than later migrating fish, which enter rivers in a more advanced state of sexual maturity (Sandercock 1991). In the LCR, peak spawning is in late October for early run coho salmon (Type S) and between December and January for late run coho salmon (Type N).

There are only two extant coho salmon populations in the LCR ESU with appreciable natural production (the Clackamas and Sandy River populations), compared to an estimated 23 historical populations in the ESU (Figure 3). Although adult returns in 2000 and 2001 exhibited moderate increases, the recent 5-year mean of natural-origin spawners for the two populations represents less than 1,500 adults. The Sandy River population has exhibited recruitment failure in 5 of the last 10 years ending in 2003, and has exhibited a poor response to reductions in harvest. Short- and long-term trends in productivity are below replacement. The BRT also expressed concern that approximately 40 percent of historical habitat is currently inaccessible (BRT 2003).

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6 referred to as Type S because their ocean migration is generally south of the Columbia River.
7 referred to as Type N because of a more northern ocean distribution.
The paucity of naturally produced spawners in this ESU is contrasted by the very large number of hatchery produced adults. The abundance of hatchery coho salmon returning to the LCR in 2001 and 2002 exceeded one million and 600,000 fish, respectively. The BRT (2003) observed that although the scale of hatchery production poses genetic and ecological threats to the extant natural populations in the ESU, collectively these hatchery populations represent a key portion of the ESU’s remaining genetic resources. The BRT (2003) found extremely high risks for each of the VSP categories, particularly for ESU abundance and spatial structure. This ESU was listed as Threatened under the ESA in 2005 (70 FR 37160).

In 2010, ODFW completed a recovery plan that addressed Oregon populations of LCR coho. Also in 2010, the Lower Columbia Fish Recovery Board (LCFRB) completed a revision of its recovery plan that includes Washington populations of LCR coho. Both plans include an assessment of LCR coho. These assessments relied and built upon the viability criteria developed by the Willamette Lower Columbia (WLC) Technical Recovery Team (TRT) (McElhany et al 2006) and an earlier evaluation of Oregon WLC populations (McElhany et al. 2007). These evaluations assessed the status of populations based on VSP parameters (McElhany et al. 2000). The conclusion was that all of the Washington coho salmon populations and all but two of the Oregon populations are at “very high risk”. Two populations in Oregon, the Scappoose and Clackamas, were considered by ODFW to be in the moderate risk category.

**Lower Columbia River Coho salmon: Updated Risk Summary**

Ford (2011) recently updated the status review completed in 2005 (Good et al., 2005) and concluded that consistent with previous evaluations, the LCR coho salmon ESU is at very high risk of extinction. Of the 27 historical populations in the ESU, 24 are considered at very high risk. The remaining three, Sandy, Clackamas and Scappoose, are considered to be at moderate to high risk.

Table 3 provides escapement information for coho salmon returning to the Sandy River. Note that prior to 2007 abundance estimates and the proportion of hatchery spawners was based on counts at Marmot Dam. Spawning surveys have been conducted to estimate abundance for the most recent years (2008-2010) and have included tributaries to the Sandy River below the former site of Marmot Dam, which may account for the increase in the proportion of hatchery coho salmon observed.

The majority of the coho salmon anchor habitat reaches are located in the upper Sandy River upstream of the confluence of the Sandy and Salmon Rivers and upstream from the Sandy Hatchery where coho salmon are released (The Sandy River Working Group 2007 in NMFS 2008c). The majority of suitable spawning and rearing habitat is located above the former Marmot Dam site in the mainstem Sandy River, in the Salmon River and its tributaries below Final Falls, and in Still Creek. Lower Sandy River tributaries that could support coho salmon included Cedar, Trout, Beaver, Gordon, and Buck Creeks and the Bull Run River (NMFS 2008c).

The conservation and recovery plan for Oregon populations of salmon and steelhead (ODFW 2010) identified reduced habitat complexity and diversity; access to off-channel habitats; impacts on the estuary habitat from hydro-system operations; and harvest in consumptive fisheries as the
primary factors limiting coho salmon survival and recovery in the Sandy Basin. Hatchery practices, including interactions on the spawning grounds with hatchery fish, were not considered a limiting factor. The hatchery weir located at the Sandy Hatchery on Cedar Creek was identified as a factor limiting adult escapement into Cedar Creek and this problem has since been fixed.

The recovery goal for Sandy River coho salmon, as described in Oregon’s recovery plan (ODFW 2010), is for the population to be at a low risk of extinction (< 5 percent probability) with an annual abundance of at least 5,685 natural-origin adults. The plan identified one hatchery action that would benefit coho recovery (Table 5). Actions specifically related to the coho program at Sandy Hatchery can be found in Table 9-3 of the Recovery Plan (ODFW 2010) and below in Table 5.

Table 5. Recommended hatchery actions to support coho salmon recovery in the Sandy Basin (ODFW 2010).

<table>
<thead>
<tr>
<th>Action ID</th>
<th>Action</th>
<th>Status in the Sandy Basin</th>
</tr>
</thead>
<tbody>
<tr>
<td>237-SY</td>
<td>Eliminate/reduce/shift program: Reduce hatchery coho releases (700k to 500k in 2010; shifted to Youngs Bay).</td>
<td>Completed</td>
</tr>
</tbody>
</table>

2.2.3. Life History and Status of LCR Steelhead

The Sandy River winter steelhead population is part of the LCR Steelhead DPS. The DPS includes all naturally produced steelhead in tributaries to the Columbia River between the Cowlitz and Wind Rivers in Washington State and in the Willamette and Hood Rivers in Oregon, excluding steelhead in the upper Willamette River above Willamette Falls (Upper Willamette DPS) (Busby et al. 1996)(Figure 4, summer steelhead are not shown). Steelhead in this DPS belong to the coastal genetic group (Schreck et al. 1986; Reisenbichler et al. 1992; Chapman et al. 1994) and include both winter steelhead (Cowlitz, Toutle, Coweeman, Kalama, Washougal, Sandy, Hood, Clackamas and Wind Rivers) and summer steelhead (Kalama, Lewis, Hood, Wind, and Washougal Rivers). The WLCR TRT (Myers et al. 2003), identified 23 historical populations within the DPS and determined that four of these have been extirpated (Figure 4, summer steelhead are not shown). Hatchery programs using endemic natural stocks of winter steelhead have been developed in the Cowlitz, Sandy, Kalama, and Hood River basins and are considered to be part of the DPS (71 FR 834, Jones 2011).
Oncorhynchus mykiss has an anadromous form, commonly referred to as steelhead, of which LCR steelhead are a DPS. They depend on freshwater areas for spawning and rearing and marine environments for growth and maturation. They differ from other Pacific salmon in that they are iteroparous or capable of spawning more than once before death.

Steelhead can be divided into two basic run types based on the level of sexual maturity at the time of river entry and the duration of the spawning migration (Burgner et al. 1992). The stream-maturing type (inland), or summer steelhead, enter freshwater in a sexually immature condition. The ocean-maturing type (coastal), or winter steelhead, enter freshwater with well-developed gonads and spawn shortly after river entry (Barnhart 1986). Variations in migration timing exist between populations. Both summer and winter steelhead occur in Washington and Oregon; Idaho has only summer steelhead (Busby et al. 1996). In the Pacific Northwest, summer steelhead enter freshwater between May and October and winter steelhead enter freshwater between November and April. Summer steelhead usually spawn further upstream than winter steelhead (Withler 1966; Behnke 1992). Juveniles typically rear in freshwater from 1 to 4 years before migrating to the ocean. Winter steelhead generally smolt after 2 years in freshwater (Busby et al. 1996). Steelhead typically reside in marine waters for 2 or 3 years before returning to their natal stream to spawn at age 4 or 5.

Based on catch data, juvenile steelhead tend to migrate directly offshore during their first summer, rather than migrating nearer to the coast as do salmon. During fall and winter, juveniles move southward and eastward (Harrt and Dell 1986). Available fin-mark and coded-wire tag data suggests that winter steelhead tend to migrate farther offshore but not as far north into the Gulf of Alaska as summer steelhead (Burgner et al. 1992). Maturing Columbia River steelhead

Figure 4. The LCR winter steelhead DPS (from Meyers et al. 2006).
are found off the coast of Northern British Columbia and west into the North Pacific Ocean (Busby et al. 1996).

No estimates of historical abundance (pre-1960s) are available for the LCR steelhead DPS. Since 1996 when the status review was completed, LCR steelhead populations have generally increased, with some populations rebounding more quickly than others.

Busby et al. (1996) identified a number of factors contributing to the decline of steelhead in this DPS. Hatchery practices were identified as a limiting factor in addition to barriers limiting spatial structure and abundance and habitat degradation reducing steelhead productivity. The widespread and intensive production of hatchery steelhead within this DPS is thought to have reduced steelhead productivity and diversity where there appears to be substantial overlap in spawning between hatchery and natural fish (Busby et al. 1996). Some hatchery fish are derived from local populations and are included in the DPS and others are not. Summer steelhead appear to be more at risk from habitat degradation than winter steelhead. Exploitation rates (i.e. the sum total of all harvest) have ranged from 20 percent to 50 percent for hatchery and natural-origin fish combined, but exploitation rates on natural-origin steelhead are low, between 0 percent to 4 percent in recent years, due to new regulations designed to protect natural-origin fish but still harvest hatchery steelhead.

A major area of uncertainty is the level of interaction, genetic and ecological, between hatchery steelhead and steelhead from natural populations. For winter steelhead populations in Washington, the WDFW concludes that there is little overlap in spawning between natural and hatchery fish (i.e., hatchery-origin steelhead spawning naturally are largely isolated from natural-origin steelhead spawners). However, with the exception of detailed studies of the Kalama River winter populations, this conclusion is based largely on models with assumed run timing rather than empirical data. For summer steelhead, WDFW reports that there is substantial interaction between hatchery fish and fish from natural populations. There is little or no information on interactions between hatchery and natural-origin fish on the Oregon side of the LCR (Busby et al. 1996). In the Clackamas River, Chilcote (2001) and Kostow and Zhou (2006) have observed interactions between hatchery and natural-origin steelhead and have concluded that these interactions have resulted in reduced productivity for the winter steelhead population.

**Lower Columbia River steelhead: Updated Risk Summary**

Ford (2011) recently updated the status review completed in 2005 (Good et al., 2005). Three status evaluations of LCR steelhead, all based on WLC-TRT criteria, have been conducted since the last BRT status update in 2005 (McElhany et al. 2007; ODFW 2010; LCFRB 2010). All three evaluations concluded that the DPS is at high risk. Of the 26 historical populations in the ESU, 17 are considered at high or very high risk.

Table 3 provides escapement information for winter steelhead returning to the Sandy River. Note that prior to 2007 abundance estimates and the proportion of hatchery spawners were based on counts at Marmot Dam. Spawning surveys have been conducted to estimate abundance for the most recent years (2008-2010) and have included tributaries to the Sandy River below the former site of Marmot Dam. ODFW estimates that 70 percent of the spawning habitat for winter steelhead is located above the former Marmot Dam site. This area is some distance from the
Sandy Hatchery where winter and summer hatchery steelhead are released. Estimates of summer steelhead escapement are also found in Table 3. Releases of hatchery summer steelhead in the basin above Marmot Dam and at Marmot Dam ended after 1996, and since then all releases have been into Cedar Creek, after acclimation at the Sandy Hatchery.

The conservation and recovery plan for Oregon populations of LCR salmon and steelhead (ODFW 2010) identified reduced habitat complexity and diversity, including access to off-channel habitats; impacts on estuary habitat from hydro-system operations; and interactions on the spawning grounds with hatchery fish as factors limiting winter steelhead survival and recovery in the Sandy River. Fish passage problems at the Sandy Hatchery weir have been fixed and are no longer a factor limiting steelhead spatial distribution and recovery.

The recovery goal for Sandy River winter steelhead, as described in Oregon’s recovery plan (ODFW 2010), is for the population to be at very low risk of extinction (< 1 percent probability) with an annual abundance of at least 1,519 natural-origin adults. Summer steelhead are not indigenous to the Sandy River and thus there is not a recovery goal for these fish. The plan also recommended implementation of several actions or changes to the steelhead programs at the Sandy Hatchery that would benefit winter steelhead recovery and those actions are described in Table 9-3 of the plan and in Table 6 below. These actions are designed to reduce interactions with hatchery fish. The HGMPs for winter steelhead and for summer steelhead go beyond these actions and reduce threats to steelhead survival and recovery even more. The winter steelhead HGMP features a pHOS standard of 0.01 or less and the summer steelhead HGMP pHOS standard is 0.05. The HGMPs also require annual monitoring and reporting to verify that these standards are accomplished.

Table 6. Recommended hatchery actions to benefit Sandy River steelhead (ODFW 2010).

<table>
<thead>
<tr>
<th>Action ID</th>
<th>Action</th>
<th>Status in the Sandy Basin</th>
</tr>
</thead>
<tbody>
<tr>
<td>219-SY</td>
<td>Provide / improve fish passage at Sandy Hatchery</td>
<td>In process of being implemented</td>
</tr>
<tr>
<td>241-SY</td>
<td>Implement a sliding scale for take of wild winter steelhead and spring Chinook broodstock for the integrated hatchery programs based on the forecasted total returns of wild fish to the population (&lt;500: no take; 500-1000: reduced take); develop forecast model as necessary.</td>
<td>Action under review</td>
</tr>
<tr>
<td>242-SY</td>
<td>Eliminate the upper basin and Marmot Dam acclimation pond releases</td>
<td>Completed</td>
</tr>
<tr>
<td>243-SY</td>
<td>Explore adding a life-cycle monitoring site in the Sandy population on Cedar Creek or in the Sandy River</td>
<td>Action under review</td>
</tr>
</tbody>
</table>
2.2.4. Life History and Status of LCR Chum Salmon

The LCR chum salmon ESU includes all naturally produced chum salmon in the Columbia River (Figure 5). Historically, chum salmon were abundant in the lower reaches of the Columbia River and may have spawned as far upstream as the Walla Walla River (Johnson et al. 1997). Habitat losses limit chum salmon to Columbia River mainstem and tributary areas below Bonneville Dam. The WLCR TRT identified 16 historical populations in the ESU (Myers et al. 2003). These areas remain where natural spawning is substantial and persistent including the Grays River, the mainstem Columbia River near Portland, Oregon and the mainstem Columbia River and several tributaries in the vicinity of Bonneville Dam. Hatchery fish have had little influence on the status of this ESU.

Chum salmon are semelparous, spawn primarily in freshwater, and apparently exhibit obligatory anadromy, as there are no recorded landlocked or naturalized freshwater populations (Randall et al. 1987). The species is known for the enormous canine-like fangs and striking body color (a calico pattern, with the anterior two thirds of the flank marked by a bold, jagged, reddish line and the posterior third by a jagged black line) of spawning males. Females are less flamboyantly colored and lack the extreme dentition of the males.

The species has the widest natural geographic and spawning distribution of any Pacific salmonid. Chum salmon range from Korea and the Japanese island of Honshu, east, around the rim of the North Pacific Ocean, to Monterey Bay in California. Presently, major spawning populations are found only as far south as Tillamook Bay on the Northern Oregon coast. Chum salmon may historically have been the most abundant of all salmonids: Neave (1961) estimated that prior to the 1940s, chum salmon contributed almost 50 percent of the total biomass of all salmonids in the Pacific Ocean. Chum salmon also grow to be among the largest of Pacific salmon, second only to Chinook salmon in adult size, with individual chum salmon reported up to 108.9 cm in length and 20.8 kg in weight (Pacific Fisherman 1928). Average size for the species is around 3.6 to 6.8 kg (Salo 1991).
Chum salmon spend more of their life history in marine waters than other Pacific salmonids. Chum salmon spend two to five years in the northeast Pacific prior to returning to their natal streams (WDFW/PNPT 2000). Most chum salmon mature as four year old adults (Johnson et al. 1997). Chum salmon usually spawn in the lower reaches of rivers, mainstem and side-channel areas. Some chum salmon spawn up to 100 km from the ocean. Chum salmon, like pink salmon, usually spawn in coastal areas, and juveniles out migrate to seawater almost immediately after emerging from the gravel (Salo 1991). This ocean-type migratory behavior contrasts with the stream-type behavior of coho salmon and steelhead, which usually migrate to sea at a larger size, after months or years of freshwater rearing. This means survival and growth in juvenile chum salmon depends less on freshwater conditions than on favorable estuarine and ocean conditions. Another behavioral difference between chum salmon and species that rear extensively in freshwater is that chum salmon form schools, presumably to reduce predation (Pitcher 1986), especially if their movements are synchronized to swamp or confuse predators (Miller and Brannon 1982).

For this ESU there is some information on ocean migration patterns (Johnson et al. 1997). Speculation is that Columbia River chum salmon have a more southerly ocean distribution similar to LCR coho salmon (Sandercock 1991). Grays River chum salmon enter the Columbia River from mid-October to mid-November, but apparently do not enter the Grays River until late October to early December. These fish spawn from early November to late December. Fish returning to Hamilton and Hardy Creeks, upstream of Bonneville Dam, enter the Columbia River...
earlier than Grays River fish (late September to late October) and have a more protracted spawn timing (mid-November to mid-January). In a study of chum salmon spawning near Ives Island, chum salmon selected areas of upwelling with flows that averaged 3 degrees C higher than the ambient river water temperature (van der Naald et al. 2002). Fry emergence occurs between February and April. Fry are between 40 and 50 mm in length when they leave spawning areas for the ocean between March and May. Recent genetic analysis of chum salmon from Hardy and Hamilton creeks and of chum salmon from Grays River, indicate that they are genetically distinct from other chum salmon in Washington State (Salo 1991; WDF et al. 1993; Johnson et al. 1997).

**Columbia River chum salmon: Updated Risk Summary**

Ford (2011) recently updated the status review completed in 2005 (Good et al. 2005) and found that the vast majority (14 out of 17) of Columbia River chum populations are extirpated. The Grays River and Lower Gorge populations showed a sharp increase in abundance in 2002, but have since declined and are at abundance levels in the range of variation observed over the last several decades. Chinook and coho from the LCR exhibit similar trends, suggesting that observed increases in chum abundance are likely related to ocean conditions.

Chum salmon are only sporadically found in Oregon tributaries, most notably Big Creek. Few if any chum salmon are known to use the Sandy River. The conservation and recovery plan for Oregon populations of salmon and steelhead (ODFW 2010) did not make any direct connections to what is limiting chum salmon production in the Sandy River. Recommendations that would benefit Chinook, coho, and steelhead would in many cases also benefit chum salmon. The plan does note that altered hydrology, excessive inputs and accumulations of fine sediment, and barriers to fish passage would likely limit chum salmon production. Other threats to chum salmon re-colonization include altered hydrologic processes and/or reduced water quantity due to land use practices on upland slopes.

So little is known about chum salmon in the LCR, outside the several areas where they seem to persist in small numbers, that there is little information and guidance on how to recover them. There is a recovery goal for chum salmon in the Sandy River, but even that is extremely vague, a population at low risk of extinction (< 5 percent probability). As a result, specific changes to hatchery programs for the purpose of benefiting chum salmon have not been identified as yet.

**2.2.5. Status of Critical Habitat**

NMFS has reviewed the status of critical habitat affected by the proposed action. Critical habitat is designated for LCR Chinook, and chum salmon and for LCR steelhead in the Sandy River basin within the action area (September 2, 2005; 70 CFR 52630). Critical habitat includes the stream channels within the proposed stream reaches, and includes a lateral extent as defined by the OHWL (33 CFR 319.11).

We review the status of designated critical habitat affected by the proposed action by examining the condition and trends of essential physical and biological features throughout the designated area. These features are essential to the conservation of the listed species because they support one or more of the species’ life stages (e.g., sites with conditions that support spawning, rearing, migration and foraging).
For salmon and steelhead, NMFS ranked watersheds within designated critical habitat at the scale of the fifth-field hydrologic unit code (HUC5) in terms of the conservation value they provide to each listed species they support\(^8\); the conservation rankings are high, medium, or low. To determine the conservation value of each watershed to species viability, NMFS’ critical habitat analytical review teams (CHARTs; NOAA Fisheries 2005) evaluated the quantity and quality of habitat features (for example, spawning gravels, wood and water condition, and side channels), the relationship of the area compared to other areas within the species’ range, and the significance to the species of the population occupying that area. Thus, even a location that has poor quality of habitat could be ranked with a high conservation value if it were essential due to factors such as limited availability (e.g., one of a very few spawning areas), a unique contribution of the population it served (e.g., a population at the extreme end of geographic distribution), or the fact that it serves another important role (e.g., obligate area for migration to upstream spawning areas).

This section examines critical habitat condition for the affected salmonid species. The analysis is combined because of the similarity of essential physical and biological features for each species, and the overlapping critical habitat areas.

The action area for this proposed action are tributary streams in the Sandy River basin accessible to anadromous fishes and the Sandy River itself downstream to its confluence with the Columbia River. PCEs consist of the physical and biological elements identified as essential to the conservation of the species. LCR Chinook, coho, and chum salmon and steelhead have overlapping ranges, similar life history characteristics and, therefore, many of the same PCEs. These PCEs include sites essential to support one or more life stages (sites for spawning, rearing, and migration) and contain the physical and biological features essential to the conservation of each species. For example, important features include spawning gravels, forage species, cover in the form of submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, side channels, and undercut banks and migration corridors free of artificial obstruction with sufficient water quantity and quality.

For all of the listed species affected by these programs, the watersheds that are within the action area (as described in section 2.2) have been designated as essential for spawning, rearing, juvenile migration, and adult migration. In the action area, the major factors affecting PCEs are the same as those habitat related limiting factors described for each of the listed species above including reduced habitat complexity and diversity; and access to off-channel habitats (ODFW 2010). Land use practices such as channelization, diking, wetland conversion, stream clearing, splash damming, and gravel extraction have severed access to historically productive habitats, simplified many remaining tributary habitats, and weakened the important watershed processes and functions that once created healthy ecosystems for salmon and steelhead production.

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\(^8\) The conservation value of a site depends upon “(1) the importance of the populations associated with a site to the ESU [or DPS] conservation, and (2) the contribution of that site to the conservation of the population through demonstrated or potential productivity of the area” (NOAA Fisheries 2005).
No new permanent facilities are being proposed for these hatchery programs. The facilities used for the proposed hatchery programs are located high in the floodplain and have not led to altered channel morphology and stability, reduced and degraded floodplain connectivity, excessive sediment input, or the loss of habitat diversity. These facilities are designed and used such that they do not reduce access to spawning and rearing habitat, or increase water temperatures.

For the proposed hatchery programs, the features potentially affected in the Sandy River Basin would result from the installation and operation of temporary weirs in some of the Sandy River tributaries. The installation and operation of the weirs to collect hatchery spring Chinook salmon may affect PCEs for rearing and freshwater migration. These factors are considered in the effects analysis below (see section 2.4.1).

2.2.6. Climate Change

Climate change has negative implications for designated critical habitats in the Pacific Northwest (CIG 2004; Scheuerell and Williams 2005; Zabel et al. 2006; ISAB 2007). Average annual Northwest air temperatures have increased by approximately 1°C since 1900, or about 50% more than the global average over the same period (ISAB 2007). The latest climate models project a warming of 0.1 °C to 0.6 °C per decade over the next century. According to the Independent Scientific Advisory Board (ISAB), these effects pose the following impacts over the next 40 years:

- Warmer air temperatures will result in diminished snowpacks and a shift to more winter/spring rain and runoff, rather than snow that is stored until the spring/summer melt season.

- With a smaller snowpack, these watersheds will see their runoff diminished earlier in the season, resulting in lower streamflows in the June through September period. River flows in general and peak river flows are likely to increase during the winter due to more precipitation falling as rain rather than snow.

- Water temperatures are expected to rise, especially during the summer months when lower streamflows co-occur with warmer air temperatures.

These changes will not be spatially homogeneous across the entire Pacific Northwest. Low-lying areas are likely to be more affected. Climate change may have long-term effects that include, but are not limited to, depletion of cold water habitat, variation in quality and quantity of tributary rearing habitat, alterations to migration patterns, accelerated embryo development, premature emergence of fry, and increased competition among species (ISAB 2007).

To mitigate for the effects of climate change on listed salmonids, the ISAB (2007) recommends planning now for future climate conditions by implementing protective tributary, mainstem, and estuarine habitat measures, as well as protective hydropower mitigation measures. In particular, the ISAB (2007) suggests: increased summer flow augmentation from cool/cold storage reservoirs to reduce water temperatures or to create cool water refugia in mainstem reservoirs and the estuary; and the protection and restoration of riparian buffers, wetlands, and floodplains.
2.3. Environmental Baseline

Under the Environmental Baseline, NMFS describes what is affecting listed species and designated critical habitat before including any effects resulting from the proposed action. The ‘environmental baseline’ includes the past and present impacts of all Federal, state, or private actions and other human activities in the action area and the anticipated impacts of all proposed federal projects in the action area that have already undergone formal or early section 7 consultation (50 CFR 402.02). The effects of future actions over which the Federal agency has discretionary involvement or control will be analyzed as ‘effects of the action.’

In order to understand what is affecting a species, it is first necessary to understand the biological requirements of the species. Each phase of a salmon and steelheads life-history has its own biological requirements (Groot and Margolis 1991; NRC 1996; Spence et al., 1996). Generally speaking, during spawning migrations, adult salmon require clean water with cool temperatures and access to thermal refugia, dissolved oxygen near 100 percent saturation, low turbidity, adequate flows and water depths to allow passage over barriers to reach spawning sites, and sufficient holding and resting sites. Anadromous fish select spawning areas based on species-specific requirements of flow, water quality, substrate size, and groundwater upwelling. Embryo survival and fry emergence depend on substrate conditions (e.g., gravel size, porosity, permeability, and oxygen concentrations), substrate stability during high flows, and, for most species, water temperatures of 13°C or less. Habitat requirements for juvenile rearing include seasonally suitable microhabitats for holding, feeding, and resting. Migration of juveniles to rearing areas, whether the ocean, lakes, or other stream reaches, requires free access to these habitats.

A wide variety of human activities have had impacts on the action area, significantly changing it from its pre-development state.

Timber harvest began in the mid-1800s and intensified after the turn of the century. Initially logs were floated down streams. Material changes began to occur in the early 1900s when work began on the Bull Run hydroelectric project and road and rail access to that site was developed. The railroad meant that logging activities could be further expanded. Road expansion during the 1950s-1970s resulted in more widespread timber harvest. Logging in riparian areas was common until the 1970s and timber was removed from many accessible sensitive slopes. Also, rivers and streams were altered to facilitate moving of logs by water. Timber harvest, and associated sawdust and mill waste, also impacted water quality. Road construction also resulted in soil erosion and associated sediment flows to fish habitat, increased surface runoff, and culverts blocked fish passage. Timber harvest continues today but current harvest and regeneration techniques are designed to reduce impacts on the watershed.

Mining of sand and gravel has historically occurred in the Sandy River basin and caused impacts on fish habitat, for example, reduced habitat complexity through degradation of channel stability and extraction of spawning gravels. However, mining in the delta area ceased when it became part of the Columbia River Gorge Scenic area.

By the late 1800s agricultural use was common in the lower basin and continues today, although some land has been converted to residential and commercial uses. These activities have
impacted habitat conditions in the lower watershed as wetlands and floodplains were drained and filled, riparian vegetation was removed, and water was used for irrigation.

Municipal water supply activities began in the late 1800s, as the City of Portland sought to provide its citizens with water from the Bull Run River, a Sandy River tributary. The facilities were expanded in the early 1900s, including a crib structure in 1915 which raised the lake’s storage capacity, Headworks Dam built in 1922 (with no fish passage facilities), and Ben Morrow Dam in 1929. Since 1922, Headworks Dam has blocked all salmon and steelhead access to the upper Bull Run system, about 37 miles of high-quality habitat in the mainstem and tributaries. In addition, water diversions at Headworks Dam have damaged habitat conditions in the six miles of free-flowing river below the dam. The diversions reduce flows in the lower Bull Run River from late spring to fall, and limit recruitment of gravel and large woody materials that had once created healthy, diverse fish habitat. In April 2009 the City of Portland completed a 50 year Habitat Conservation Plan (HCP) for its Bull Run municipal water supply facilities. The HCP includes 49 measures to protect and improve habitat and to avoid or minimize the impacts of the Bull Run water supply system. These measures were designed to address the flow, temperature, and habitat impacts of the water supply system.

Hydroelectric power facilities were developed on the Sandy and Little Sandy rivers in the early 1900s. The Bull Run Project was constructed in 1912 and included the Little Sandy diversion dam. The dam was 16 feet high and blocked salmon and steelhead access to about 6.5 miles of habitat above the dam. It also reduced streamflows in the 1.7-mile reach between the dam’s lower end and the river’s confluence with the Bull Run River. The 1913 Marmot Dam project involved a 30-foot-high dam which diverted water from the Sandy River to the Little Sandy River via a network of canals and tunnels. The dam had a fish ladder, that many times was damaged by flood waters, but the facilities were repeatedly repaired and improved throughout the decades to increase upstream fish passage. The Sandy River diversion dam was removed in 2008 and the Marmot Dam was removed in 2007.

More recently, a wide variety of restoration and recovery activities have been undertaken in the action area. For example, programmatic section 7 consultations with the Army Corps of Engineers (COE) for stream restoration and fish passage have been completed that authorize nine categories of actions, some of which will occur in the action area. They are: boulder placement, fish passage restoration, spawning gravel restoration, large wood restoration, off- and side-channel habitat restoration, piling removal, set-back existing berms, dikes, and levees, streambank restoration, and water control structures. Additional section 7 consultations with other Federal agencies have been completed that expand on this list of restoration program activities to a total of 19 actions. They are: 1. large wood, boulder, and gravel placement, 2. reconnect existing side-channels and alcoves, 3. head-cut stabilization and associated fish passage, 4. streambank restoration, 5. fish passage at culverts and bridges, 6. screen installation and replacement at irrigation diversions, 7. nutrient enhancement, 8. floodplain overburden removal, 9. reduce recreation impacts, 10. estuary restoration, 11. riparian vegetation treatment (non-commercial, mechanical), 12. riparian and upland juniper treatment (non-commercial), 13. riparian vegetation treatment (controlled burning), 14. invasive plant control, 15. fencing riparian areas (with water gaps and stream crossings), 16. riparian vegetation plantings, 17. control sediment input from roads, 18. removal of legacy structures, and 19. fisheries, hydrology,
geomorphology, wildlife, botany, and cultural surveys in support of aquatic restoration. These projects will benefit LCR salmon and steelhead by improving abundance, productivity, and spatial structure.

The PCSRF was established by Congress to contribute to the protection and recovery of salmon and steelhead populations and their habitats (NMFS 2007b). The states of Washington, Oregon, California, Idaho and Alaska, and the Pacific Coastal and Columbia River tribes receive Congressional PCSRF appropriations from NMFS each year. The fund supplements existing state, tribal and local programs to foster development of federal-state-tribal-local partnerships in salmon and steelhead recovery. NMFS has established memoranda of understanding (MOU) with the states and with three tribal commissions on behalf of 28 Indian tribes; the Northwest Indian Fisheries Commission, Klamath River Inter-Tribal Fish & Water Commission, and the Columbia River Inter-Tribal Fish Commission. These MOUs establish criteria and processes for funding PCSRF projects. The PCSRF has made substantial progress in achieving program goals, as indicated in Reports to Congress, workshops and independent reviews.

NMFS has completed ESA consultation on the activities of the NOAA Restoration Center in the Pacific Northwest (NMFS 2004). These include participation in the Damage Assessment and Restoration Program, Community-based Restoration Program (CRP), and the Restoration Research Program. The CRP is a financial and technical assistance program which helps communities to implement habitat restoration projects. Projects are selected for funding based on their ecological benefits, technical merit, level of community involvement, and cost-effectiveness. National and regional partners and local organizations contribute matching funds, technical assistance, land, volunteer support or other in-kind services to help citizens carry out restoration.

Some of the restoration projects specific to the Sandy River basin are undertaken by the Sandy River Basin Partners. (http://www.sandyriverpartners.org/partners.html) To the extent that those projects have already occurred and have a federal nexus they are included in the environmental baseline.

Information relevant to the environmental baseline is also discussed in detail in Chapter 5 of the Supplemental Comprehensive Analysis (SCA), which in turn cross-references back to the related 2008 FCRPS biological opinion. (NMFS 2008b, Chapter 5; NMFS 2008a). Chapter 5 of the SCA, and related portions of the FCRPS Opinion, provide an analysis of the effects of past and ongoing human and natural factors on the current status of the species, their habitats and ecosystems, within the entire Columbia River Basin. In addition, chapter 5 of the SCA, and related portions of the FCRPS Opinion, evaluate the effects of those ongoing actions on designated critical habitat with that same area. Those portions of chapter 5 of the SCA, and environmental baseline section of the FCRPS Opinion, that deal with effects in the action area (as described in Section 1.4 above) are hereby incorporated here by reference. In addition, the environmental baseline for this opinion includes the impacts of the proposed action described in the FCRPS and Reclamation biological opinions (NMFS 2008a).
2.4. **Effects on ESA Protected Species and on Designated Critical Habitat**

This section describes the effects of the proposed action, independent of the environmental baseline, and cumulative effects which are taken into account in the integration and synthesis section. The “effects of the action” means the direct and indirect effects of the action on the species and on designated critical habitat, together with the effects of other activities that are interrelated or interdependent, that will be added to the environmental baseline (50 CFR 402.02). Indirect effects are those that are caused by the proposed action and are later in time, but still are reasonably certain to occur. In section 2.6, the proposed action, the status of ESA protected species and designated critical habitat under the Environmental Baseline, and the cumulative effects of activities within the action area that are reasonably certain to occur are analyzed comprehensively to determine whether the proposed action is likely to appreciably reduce the likelihood of survival and recovery of ESA protected species or to adversely modify critical habitat.

2.4.1. **Factors to be Considered**

For Pacific salmon, NMFS evaluates extinction processes and effects of the proposed action beginning at the population scale (McElhany et al. 2000). NMFS defines population performance measures in terms of natural-origin fish and four key attributes: abundance, productivity, spatial structure, and diversity and then relates effects of the proposed action at the population scale to the survival and recovery of an entire ESU or DPS.

2.4.2. **Methodology for Analyzing Hatchery Effects**

This section describes how NMFS analyzes hatchery effects, positive and negative, on salmon ESUs and steelhead DPSs and on designated critical habitat. The analysis is based on the most recent scientific information available. The effects of the proposed action are analyzed in section 2.4.3 of the opinion.

The proposed action is analyzed for effects on the attributes that define population viability, including abundance, productivity, diversity, and spatial structure. The effects of a hatchery program on the status of an ESU or steelhead DPS “will depend on which of the four key attributes are currently limiting the ESU, and how the hatchery fish within the ESU affect each of the attributes.” NMFS also analyzes and takes into account the effects of hatchery facilities, for example weirs and water diversions, on each VSP attribute and on designated critical habitat. The presence of hatchery fish within the ESU can positively affect the overall status of the ESU by increasing the number of natural spawners, by serving as a source population for repopulating unoccupied habitat and increasing spatial distribution, and by conserving genetic resources. “Conversely, a hatchery program managed without adequate consideration can affect a listing determination by reducing adaptive genetic diversity of the ESU, and by reducing the reproductive fitness and productivity of the ESU” (70 FR 37215 June 28, 2005). Funding is considered as well, such as Mitchell Act funding identified in the proposed action, but funding on its own does not result in any effects not already included in this analysis.
The effects, positive and negative, for two categories of hatchery programs are summarized in Table 7. Generally speaking, effects range from beneficial to harmful for programs that use local 
fish9 for hatchery broodstock and from neutral or negligible to harmful when a program does not use local fish for broodstock10. When hatchery programs use fish originating from a different population, MPG, or from a different ESU or DPS, including programs like the proposed Sandy River Summer Steelhead Program, NMFS is particularly interested in how effective the program will be at isolating hatchery fish and avoiding interactions that potentially disadvantage fish from natural populations. The range in effects are refined and narrowed after available scientific information and the circumstances and conditions that are unique to individual hatchery programs are taken into account.

Information that NMFS needs to analyze the effects of a hatchery program on ESA-listed species must be included in an HGMP. Draft HGMPs are reviewed by NMFS for their sufficiency11 before formal review and analysis of the proposed action can start.

Table 7. Effects, benefits (+), and threats (-) on natural population viability posed by two categories of hatchery programs.

<table>
<thead>
<tr>
<th>Natural population viability parameters</th>
<th>Broodstock originate from the local population and are included in the ESU or DPS</th>
<th>Broodstock originate from a non-local population or from fish that are not included in the same ESU or DPS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Productivity</td>
<td>+/- 1</td>
<td>-</td>
</tr>
<tr>
<td>Diversity</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Abundance</td>
<td>+/- 2</td>
<td>-</td>
</tr>
<tr>
<td>Spatial Structure</td>
<td>+/- 3</td>
<td>-</td>
</tr>
</tbody>
</table>

1 Unlikely to benefit productivity except in cases where the natural population’s small size is, in itself, a predominant factor limiting population growth.
2 Increases the number of natural spawners and thus the number of fish in the gene pool.
3 Can accelerate re-colonization and increase spatial structure.

NMFS analyzes eight factors for their effects on ESA-listed species. The eight factors are: (1) broodstock collection, (2) interactions on the spawning grounds from hatchery returns and from returns of naturally spawning hatchery fish, (3) interactions in juvenile rearing areas from hatchery releases and from the progeny of naturally spawning hatchery fish, (4) interactions in the migration corridor, the estuary, and in the ocean from hatchery releases and from the progeny of naturally spawning hatchery fish, (5) research, monitoring, and evaluation (RM&E), (6) masking (i.e., when hatchery fish are not identifiable from other fish and thus undermine or confuse the status of a population), (7) construction, operation, and maintenance (e.g., handling

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9 The term “local fish” is defined to mean fish that are no more than moderately divergent from the local natural population. See 70 FR 37204; June 28, 2005
10 Exceptions include restoring extirpated populations and gene banks.
11 “Sufficient” means: (1) the purpose of the hatchery program is described in meaningful and measurable terms, (2) available scientific and commercial information and data are included, (3) the proposed action, including any research, monitoring, and evaluation, is clearly described both spatially and temporally, (4) application materials provide an analysis of effects on ESA-listed species, and (5) preliminary review suggests that the program has addressed criteria for issuance of ESA authorization such that public review of the application materials, would be meaningful.
fish at weirs), and (8) fisheries. The analysis assigns an affect for each factor from the following categories. The categories are: (1) net biological benefit, (2) not a threat, (3) an uncertain threat, or (4) is a threat. The category of effect assigned to each factor is based on an analysis of available scientific information weighed against the affected population(s) current risk level for abundance and productivity and for spatial structure and diversity (low, moderate, high, or very high), the role of the affected natural population(s) in ESU or steelhead DPS recovery (primary, contributing, or stabilizing), and the target viability (highly viable, viable, or maintained) for the affected natural population(s).

**Broodstock collection**

The key factors for this part of the analysis are the origin and number of fish used for hatchery broodstock. Facilities used for broodstock collection, for example weirs and ladders, are analyzed under “construction, operations and maintenance”. The first consideration in defining the range in potential effects is broodstock origin (see Table 7). The analysis looks at whether broodstock are of local origin, the proportion of natural-origin fish used for broodstock, if the program selects for ESA-listed natural-origin or hatchery-origin fish, and if the program “backfills” with fish from outside the local or immediate area. Also important is the number of fish needed for broodstock.

**Interactions on the spawning grounds from hatchery returns and from the returns of naturally spawning hatchery fish**

NMFS also analyzes the effects of hatchery returns and the progeny of naturally spawning hatchery fish on the spawning grounds. There are two aspects to this part of the analysis: genetic effects and ecological effects or competitive interactions on the spawning grounds between fish from a natural population and hatchery fish. At this time, based on the weight of available scientific information, NMFS believes that artificial breeding and rearing tends to result in some degree of genetic change and fitness reduction in hatchery fish and in the progeny of naturally spawning hatchery fish relative to desired levels of diversity and productivity for natural populations. Hatchery fish often pose a threat to natural population rebuilding and recovery when they interbreed with fish from natural populations. That risk may be outweighed under circumstances where demographic or short-term extinction risk to the population is greater than risks to population diversity and productivity. However, the extent and duration of genetic change and fitness loss and the short and long-term implications and consequences for different species, for species with multiple life-history types, and for species subjected to different hatchery practices and protocols remains unclear and should be the subject of further scientific investigation. As a result, NMFS believes hatchery intervention, following best management practices, is typically a legitimate and useful tool to help avert, at least in the short-term, salmon and steelhead extinction, but otherwise managers should seek to limit interactions between hatchery and natural-origin fish and implement hatchery practices that harmonize conservation with the implementation of treaty Indian fishing rights and other applicable laws and policies.

Hatchery fish are typically a threat to natural population productivity and diversity when they interbreed with natural-origin fish. Gene flow occurs naturally among salmon and steelhead populations, a process referred to as straying (Quinn 1993; Quinn 1997). Natural straying serves a valuable function in preserving diversity through genetic drift and in re-colonization of vacant
habitat, and is only considered a risk when it occurs at unnatural levels or from unnatural sources. Hatchery fish straying is not the same and is considered a risk because it results in additional and potentially harmful gene-flow. In fact, hatchery fish may exhibit reduced homing fidelity relative to natural-origin fish (Grant 1997; Quinn 1997; Goodman 2005; Jonsson et al. 2003), resulting in unnatural levels of gene flow into recipient populations, either in terms of sources or rates. One goal for hatchery programs should be to ensure that hatchery practices do not lead to higher rates of genetic exchange with fish from natural populations than would occur naturally (Ryman 1991). Rearing and release practices and ancestral origin of the hatchery fish can all play a role in straying (Quinn 1997).

Gene-flow into a natural population from naturally spawning hatchery fish can have two effects. It can increase genetic diversity (e.g., Ayllon et al. 2006) but it can also alter established allele frequencies (and co-adapted gene complexes) and reduce the population’s level of adaptation, a phenomenon called out-breeding depression (Edmands 2007, McClelland and Naish 2007). In general, the greater the geographic separation between the source or origin of hatchery fish and the recipient natural population, the greater the genetic difference between the two populations (ICTRT 2007), and the greater potential for out-breeding depression. NMFS advises hatchery action agencies to develop locally derived hatchery broodstocks. Additionally, unusual rates of straying into other populations within or beyond the population’s MPG or ESU or a steelhead DPS can have an homogenizing effect, decreasing intra-population genetic variability (e.g., Vasemagi et al. 2005), and increasing risk to population diversity, one of the four attributes measured to determine population viability. Reduction of within-population and among-population diversity can reduce adaptive potential.

HGMPs should estimate and analyze gene-flow using the best scientific information available. The most common surrogate for gene flow is estimating the proportion of natural spawners comprised of hatchery-origin fish (i.e., pHOS). The number of hatchery fish entering natural spawning areas is another surrogate that is sometimes used to measure gene-flow and appropriate cautions and qualifications should be taken when using it to analyze hatchery affects. Adult salmon may wander on their return migration, entering and then leaving tributary streams before finally spawning (Paster 2004). These “dip-in” fish may be detected and counted as strays, but may eventually spawn in other areas, resulting in an overestimate of the number of strays that potentially interbreed with the natural population (Keefer et al. 2008). Caution must also be taken in assuming that strays contribute genetically in proportion to their abundance. Several studies demonstrate little genetic impact from straying despite a considerable presence of strays in the spawning population (Saisa et al. 2003; Blankenship et al. 2007). The causative factors for poorer breeding success of strays are likely similar to those identified as responsible for reduced productivity of hatchery-origin fish in general, e.g., differences in run and spawn timing, spawning in less productive habitats, and reduced survival of their progeny (e.g., Leider et al. 1990; Reisenbichler and McIntyre 1977; McLean et al. 2004; Williamson et al. 2010).

Selection in the hatchery, often called domestication, is a threat to natural population productivity or fitness when hatchery and natural-origin fish interbreed. Hatchery selection occurs when selection pressures imposed by hatchery spawning and rearing differ greatly from those imposed by the natural environment. These differing selection pressures can be a result of differences in environments or a consequence of protocols and practices used by a hatchery
program. Hatchery selection can range from relaxation of selection that would normally occur in nature, to selection for different characteristics in the hatchery and natural environments, to intentional selection for desired characteristics (Waples 1999).

Genetic change and fitness reduction resulting from hatchery selection depends on: 1) the difference in selection pressures; 2) the exposure or amount of time the fish spends in the hatchery environment; and, 3) the duration of hatchery program operation (i.e., the number of generations that fish are propagated by the program). On an individual level, exposure time in large part equates to fish culture, both the environment experienced by the fish in the hatchery and natural selection pressures, independent of the hatchery environment. On a population basis, exposure is determined by gene-flow proportions of natural-origin fish being used as hatchery broodstock and hatchery-origin fish spawning in the wild (Lynch and O’Hely 2001; Ford 2002), and then by the number of years the exposure takes place. In assessing risk or determining impact, all three levels must be considered. Theoretically, strong selective fish culture with low hatchery-wild interbreeding can pose less risk than relatively weaker selective fish culture with high levels of interbreeding.

Most of the empirical evidence of hatchery selection comes from studies of steelhead, a species that is reared in the hatchery environment for an extended period – one to two years – prior to release. Exposure time, in the hatchery, for fall and summer Chinook salmon and for chum salmon is much shorter, just a few months. One especially well publicized steelhead study (Araki et al. 2008) showed dramatic fitness declines in the progeny of naturally spawning hatchery steelhead. Researchers and managers alike have wondered if these results could be considered a potential outcome applicable to all salmonid species, life-history types, and hatchery rearing strategies.

Information that NMFS is particularly interested in and that should be included in an HGMP includes the number, location and timing of naturally spawning hatchery fish, the estimated level of gene-flow between hatchery fish and fish from natural populations, the origin of the hatchery stock, the more distant the origin, compared to the affected natural population, the greater the threat, the level and intensity of hatchery selection, and the duration of gene-flow.

This is also the appropriate place to assess competitive interactions on the spawning grounds between hatchery returns and returns from naturally spawning hatchery fish and fish from natural populations. Hatchery fish continue to be the responsibility of the hatchery action agencies for the duration of their life cycle. To the extent there is spatial overlap between natural spawners, the potential exists for hatchery derived fish to superimpose or destroy the eggs and embryos of listed species. HGMPs should include best available information and a technical analysis describing the extent of this threat.

**Interactions in rearing areas from hatchery releases and the progeny from naturally spawning hatchery fish**

Another factor that NMFS analyzes is the potential for competition, predation, and premature emigration when the progeny of naturally spawning hatchery fish and hatchery releases use juvenile rearing areas. Generally speaking, competition and a corresponding reduction in productivity and survival may result from direct interactions when hatchery-origin fish interfere
with the accessibility to limited resources by natural-origin fish or through indirect means, when the utilization of a limited resource by hatchery fish reduces the amount available for fish from the natural population (SIWG 1984). Naturally produced fish may be competitively displaced by hatchery fish early in life, especially when hatchery fish are more numerous, of equal or greater size, when hatchery fish take up residency before naturally produced fry emerge from redds, and when hatchery releases become non-migrants and residualize. Hatchery fish might alter naturally produced salmon behavioral patterns and habitat use, making them more susceptible to predators (Hillman and Mullan 1989; Steward and Bjornn 1990). Hatchery-origin fish may also alter naturally produced salmonid migratory responses or movement patterns, leading to a decrease in foraging success (Steward and Bjornn 1990; Hillman and Mullan 1989). Actual impacts on naturally produced fish would thus depend on the degree of dietary overlap, food availability, size-related differences in prey selection, foraging tactics, and differences in microhabitat use (Steward and Bjornn 1990).

Information that is typically critical for this analysis and that should be provided in an HGMP includes the quality and quantity of spawning and rearing habitat in the action area, including the distribution of spawning and rearing habitat by quality and best estimates for spawning and rearing habitat capacity. Additional information that should be provided, if available, includes the abundance, distribution, and timing for naturally spawning hatchery fish and natural-origin fish, the timing of emergence and the distribution and estimated abundance for progeny from both hatchery and natural-origin natural spawners, the abundance, size, distribution, and timing for juvenile hatchery fish in the action area, and the size of hatchery fish relative to co-occurring natural-origin fish.

Salmon and steelhead are piscivorous and are known to feed on other salmon and steelhead. Predation, either direct (direct consumption) or indirect (increases in predation by other predator species due to enhanced attraction) can result from hatchery fish released into the wild. Considered here is predation by hatchery-origin fish and by the progeny of naturally spawning hatchery fish and by avian and other predators attracted to the area by an abundance of hatchery fish. Hatchery fish originating from egg boxes and fish planted as non-migrant fry or fingerlings can prey upon fish from the local natural population during juvenile rearing. Hatchery fish released at a later stage, to emigrate quickly to the ocean, can prey on fry and fingerlings that are encountered during the downstream migration. Some of these hatchery fish do not emigrate and instead take up residence in the stream (residuals) where they can prey on stream-rearing juveniles over a more prolonged period. The progeny of naturally spawning hatchery fish also can prey on fish from a natural population and pose a threat. In general, the threat from predation is greatest when natural populations of salmon and steelhead are at low abundance and when spatial structure is already reduced, when habitat, particularly refuge habitat, is limited, and when environmental conditions favor high visibility.

SIWG (1984) rated most risks associated with predation as unknown, because there is relatively little documentation in the literature of predation interactions in either freshwater or marine areas. Predation may be greatest when large numbers of hatchery smolts encounter newly emerged fry or fingerlings, or when hatchery fish are large relative to naturally produced fish

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12 “Action area” means all areas to be affected directly or indirectly by the action in which the effects of the action can be meaningfully detected and evaluated.
Some reports suggest that hatchery fish can prey on fish that are ½ their length (HSRG 2004; Pearsons and Fritts 1999), but other studies have concluded that salmonid predators prey on fish 1/3 or less their length (Horner 1978; Hillman and Mullan 1989; Beauchamp 1990; Cannamela 1992; CBFWA 1996). Hatchery fish may also be less efficient predators as compared to their natural-origin conspecifics, reducing the potential for predation impacts (Sosiak et al. 1979; Bachman 1984; Olla et al. 1998).

Due to their location in the stream or river, size, and time of emergence, newly emerged salmonid fry are likely to be the most vulnerable to predation. Their vulnerability is believed to be greatest immediately upon emergence from the gravel and then their vulnerability decreases as they move into shallow, shoreline areas (USFWS 1994). Emigration out of important rearing areas and foraging inefficiency of newly released hatchery smolts may reduce the degree of predation on salmonid fry (USFWS 1994).

There are several steps that hatchery programs can implement to reduce or avoid the threat of predation. The potential for predation by hatchery fish can be minimized by ensuring that a high proportion of hatchery fish have physiologically achieved full smolt status and by releasing actively migrating smolts through volitional release practices. Juvenile salmon migrate seaward rapidly when fully smolted and fewer become residuals, limiting the potential for encounters between hatchery and natural-origin fish. For hatchery programs that are not supplementing a natural population, it is also advisable to release hatchery smolts in lower river areas or in areas that are not critical habitat for protected species.

**Interactions in the migration corridor, in the estuary, and in the ocean from hatchery releases and the progeny of naturally spawning hatchery fish**

Based on a review of the scientific literature, the general conclusion is that the influence of density dependent interactions on the growth and survival of salmon and steelhead is likely small compared with the effects of large scale and regional environmental conditions and while there is evidence that large-scale hatchery production can impact salmon survival at sea, the degree of impact or level of influence is not yet well understood or predictable. It is beyond the scope of current knowledge and research abilities to understand and estimate the effect of Sandy River hatchery releases on the growth and survival of listed salmon and steelhead in the main-stem Columbia River, the Columbia River estuary, and the Pacific Ocean. NMFS is hopeful that new research will be funded to discern and to measure the frequency, the intensity, and the resulting effect of density-dependent interactions between hatchery and natural-origin fish. In the meantime, NMFS will monitor emerging science and information and will reinitiate section 7 consultation in the event that new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not considered in this consultation (50 CFR 402.16).

**Research, monitoring, and evaluation**

NMFS also reviews a proposed hatchery action for its RM&E component. Generally speaking, the review process assesses the benefits and risks of implementing the proposed RM&E, including the effects on ESA-listed species and on designated critical habitat. There are five factors that NMFS takes into account when it assesses hatchery RM&E and they are: 1) the
status of the affected species and effects of the proposed RM&E on the species and on designated critical habitat, 2) critical uncertainties over effects of the proposed action on the species, 3) performance monitoring and determining the effectiveness of the hatchery program at achieving its goals and objectives, 4) identifying and quantifying collateral affects, and 5) tracking compliance of the hatchery program with the terms and conditions for implementing the program. After assessing the proposed hatchery RM&E and before it makes any recommendations to the action agencies, NMFS considers the benefit or usefulness of new or additional information, whether the desired information is available from another source, the effects on ESA-listed species, and cost.

**Masking hatchery fish identity**

Hatchery actions also must be assessed for masking effects. For these purposes, masking is when hatchery fish included in the proposed action mix with and are not identifiable from other fish. The effect of masking is that it undermines and confuses RM&E and status and trends monitoring and it reduces management flexibility. For example, management decisions may be more conservative than necessary because of uncertainty over their effects on protected species. Both adult and juvenile hatchery fish can have masking effects.

Masking has major implications for evaluating proposed actions under sections 4(d), 7, and 10 of the ESA and for conserving listed species in general. When presented with a proposed hatchery action, NMFS analyzes the nature and level of uncertainties caused by masking and whether and to what extent listed salmon and steelhead are at increased risk. The analysis also takes into account the role of the affected salmon and steelhead population(s) in recovery and whether unidentifiable hatchery fish compromise important RM&E.

**Construction, operation, and maintenance activities**

Construction, operation, and maintenance activities ongoing at hatchery facilities can alter fish behavior and injure or kill eggs, juveniles and adults. NMFS analyzes the incidental effects on ESA-listed fish from sorting through the run at large to collect hatchery broodstock. Some programs collect their broodstock from fish volunteering into the hatchery itself, typically into a ladder and holding pond, while others sort through the run at large, usually at a weir, ladder, or sampling facility. Generally speaking, the more a hatchery program accesses the run at large for hatchery broodstock – the more fish that are handled or delayed during migration - the greater the threat to listed species. The information NMFS uses for this analysis includes a description of the facilities, practices, and protocols for collecting broodstock, the environmental conditions under which broodstock can be handled, and the encounter rate for ESA-listed fish. These activities can also adversely modify designated critical habitat. The analyses identifies effects on VSP attributes from changes in water quantity and quality, riparian habitat, channel morphology and habitat complexity, in-stream substrates, and from the location and protocols for operating diversion structures and weirs, and conducting maintenance activities. For diversion structures and fish passage facilities, a key consideration is whether they are constructed and operated consistent with NMFS criteria. Hatchery facilities often host multiple hatchery programs for distinct periods of time. Where possible, NMFS attempts to assign facility effects on the specific program or programs under review.
Weirs are installed and operated to collect broodstock and to prevent hatchery fish from spawning naturally. Weirs are devices that are employed to effectively block upstream passage and force returning adult fish to enter a trap and holding area. The effects of weirs on natural-origin adult salmonids have been evaluated by NMFS (e.g., NMFS 2010, NMFS 2011a). The physical presence and operation of a weir and trap can cause:

- Delayed upstream migration;
- Rejection of the weir, thus inducing spawning downstream of the weir;
- Impacts from increased fallback of fish released above the weir;
- Injury or mortality from fish when they attempt to jump the barrier;
- Physical harm to the fish during their capture and retention in the trap;
- Harm to fish that are held for long periods of time;
- Harm to fish during handling; and
- An increase in the fish’s susceptibility to downstream displacement and predation during recovery period.

There are number of actions that can be taken to address these effects (2011 WDFW Weir Biop, Nisqually weir). Weir rejection, fallback, handling injury, and delay from the operation of the weir and trap have been reduced by using trained personnel, removing debris, preventing poaching, holding fish for the shortest time possible, and removing any fish not needed for broodstock to allow for recovery and release.

**Fisheries**

There are two aspects of fisheries that NMFS considers here. One is when listed species are inadvertently and incidentally taken in fisheries targeting hatchery fish, and the other is when fisheries are used as a tool to prevent hatchery fish from spawning naturally. The latter case includes ESA-listed hatchery fish that are surplus to recovery needs. In each case, the fishery must be strictly regulated based on the take of ESA-listed species.

### 2.4.3. Effects of the Proposed Action

Effects assignments for each of the eight factors that NMFS analyzes are described below in Table 8. Effects for the four salmon and steelhead species are generally the same, except where otherwise described. Therefore, the following effects analysis is organized around the type of effect, rather than by species. Conclusions for each species are separately stated below.
Table 8. Effects of the Sandy River spring Chinook salmon, coho salmon, winter steelhead, and summer steelhead hatchery programs on LCR Chinook, coho, and chum salmon and on LCR steelhead, and on designated critical habitat. The framework NMFS followed for analyzing effects of the hatchery programs is described in section 2.4.2 of this opinion.

<table>
<thead>
<tr>
<th>Factors</th>
<th>Range in Effects</th>
<th>Assigned Effects Category and Mitigation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hatchery broodstock collection when broodstock originate from the same ESU or DPS</td>
<td>Beneficial to harmful</td>
<td>The spring Chinook and coho salmon programs do not use natural-origin fish for hatchery broodstock and small numbers of natural-origin fish encountered during broodstock collection are returned unharmed to Cedar Creek or to the Sandy River to spawn naturally. Removal of hatchery broodstock from the naturally spawning species is thus not a threat to ESA-listed species. The winter steelhead program also falls into this category because it uses fish derived from the local population for broodstock. This program does not “mine” the local natural population and small numbers of natural-origin fish encountered during broodstock collection are returned unharmed to Cedar Creek to spawn naturally. Hatchery broodstock collection is beneficial because it acts as a safety-net (i.e., it supplements natural spawning) and reduces demographic risk when the steelhead return to Cedar Creek falls below a critical threshold.</td>
</tr>
<tr>
<td>Hatchery broodstock collection when broodstock do not originate from same ESU or DPS</td>
<td>Neutral to harmful</td>
<td>The summer steelhead hatchery program falls into this category because it uses broodstock that do not originate from the same DPS. Hatchery broodstock collection is not a threat because the small number of natural-origin fish encountered at Foster Dam during broodstock collection are returned to the river unharmed to spawn naturally.</td>
</tr>
<tr>
<td>Interactions on the spawning grounds with hatchery returns and the progeny of naturally spawning hatchery fish that are included in the same ESU or DPS</td>
<td>Beneficial to harmful</td>
<td>Interactions on the spawning grounds are not a threat because these program must comply with strict standards for limiting the proportion of natural spawners comprised of hatchery-origin fish (pHOS). The pHOS standard is 0.10 for the spring Chinook and coho salmon hatchery programs. The pHOS standard for the winter steelhead program is also 0.10, unless natural-origin steelhead returns to Cedar Creek fall below critical thresholds triggering hatchery supplementation. In this event, NMFS believes demographic risk outweighs risks to population productivity and diversity posed by hatchery supplementation. Monitoring and annual reporting are required to validate compliance with these pHOS standards.</td>
</tr>
<tr>
<td>Interactions on the spawning grounds with hatchery returns and the progeny of naturally spawning hatchery fish when hatchery fish do not originate from the same ESU or DPS</td>
<td>Neutral to harmful</td>
<td>Interactions on the spawning grounds are not a threat because these program must comply with strict standards for limiting the proportion of natural spawners comprised of hatchery-origin fish (pHOS). The pHOS standard is 0.05 for the summer steelhead program. Monitoring and annual reporting are required to validate compliance with these pHOS standards.</td>
</tr>
<tr>
<td>Interactions in juvenile rearing</td>
<td>Neutral to harmful</td>
<td>Juvenile hatchery fish and the progeny of naturally spawning hatchery fish are not a threat. Fish are released after they are not killed or harmed.</td>
</tr>
<tr>
<td>Factors</td>
<td>Range in Effects</td>
<td>Assigned Effects Category and Mitigation</td>
</tr>
<tr>
<td>------------------------------------------------------------------------</td>
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</tr>
<tr>
<td>areas with the progeny of naturally spawning hatchery fish and hatchery releases</td>
<td>exhibit physiological conditions preparing them for emigration and ocean entry. Fish are released downstream, and away from the major juvenile rearing areas. ODFW will validate that hatchery fish behave as expected and that competition with listed species is not a threat. ODFW will monitor the incidence of non-migratory smolts (residuals) after release from the hatchery and adjust rearing strategies, release location, and timing of hatchery fish releases if competition with ESA-listed juveniles is documented or if predation on ESA-listed species is determined to be a threat. Emigrating hatchery smolts are not expected to influence the natural emigration of Chinook and coho salmon or steelhead because they are not in close proximity and because hatchery releases are expected leave the Sandy Basin within a matter of hours or at most days from the time of release.</td>
<td></td>
</tr>
<tr>
<td>Interactions in the migration corridor, estuary, and ocean with hatchery releases and the progeny of naturally spawning hatchery fish</td>
<td>Neutral to harmful</td>
<td>Uncertain threat</td>
</tr>
<tr>
<td>Hatchery research, monitoring, and evaluation</td>
<td>Beneficial to harmful</td>
<td>Not a threat</td>
</tr>
<tr>
<td>Masking</td>
<td>Neutral to harmful</td>
<td>Not a threat</td>
</tr>
<tr>
<td>Construction, operation, and maintenance of hatchery facilities</td>
<td>Neutral to harmful</td>
<td>The installation of temporary weirs is not a threat. Little or no disturbance to aquatic or riparian habitats is expected. On the other hand, operation of the weirs will result in the handling of substantial numbers of natural-origin ESA-listed species and poses an uncertain threat. Mitigating circumstances include very few fish will be handled before the middle of August and the weirs will be checked multiple times every day to reduce stress. Even so, new monitoring and reporting will be required to determine if spawner distribution or pre-spawn mortality changes. Hatchery facilities in Cedar Creek are not a threat. Improvements at the facility during 2012 will eliminate dewatering of the bypass reach. Spatial distribution of juveniles and adults should not be effected. The 900 foot bypass reach is not prime habitat for spawning or rearing</td>
</tr>
</tbody>
</table>

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NMFS016956
Factors | Range in Effects | Assigned Effects Category and Mitigation
--- | --- | ---
Fisheries | N/A | Terminal fisheries targeting Chinook salmon and steelhead produced by these programs have been evaluated and authorized in a separate opinion (NMFS 2008d) and are therefore included in the environmental baseline.

**Broodstock collection**

NMFS evaluated broodstock collection activities proposed in the HGMPs and found that this factor is not a threat to ESA-listed species. The important considerations here are affects from sorting or handling listed fish and from actually removing fish from a natural population and using them instead for hatchery broodstock.

These hatchery programs do not use natural-origin fish for broodstock at the expense of natural population viability. For example, the winter steelhead hatchery program stopped using out-of-basin (i.e., Big Creek steelhead) fish for broodstock in 2004 and stopped using ESA-listed natural-origin fish for broodstock beginning in 2011. In 2002, the spring Chinook salmon hatchery stopped importing broodstock from the Clackamas River (Oregon stock 19) and from 2002 to 2007, only natural-origin fish of known Sandy River origin were used for hatchery broodstock. Taking natural-origin fish for broodstock, at the expense of the natural population, was phased-out beginning in 2008 and in 2011 only hatchery spring Chinook salmon were used for broodstock. The program continues to evolve and the new HGMP identifies when it would be advisable (i.e., when the local natural population is more viable and at less risk) to infuse some natural-origin fish into the hatchery broodstock and avoid a situation where hatchery fish diverge from the local Sandy River population. ODFW will resubmit an amended HGMP at that time.

**Only hatchery fish are used for broodstock.** One benefit is that no hatchery fish volunteering into the hatchery ladder will be returned to the river. This will minimize the potential for hatchery fish to compete with or interbreed with fish from natural populations. NMFS therefore concludes that broodstock collection proposed in the HGMPs is not a threat to ESA-listed salmon and steelhead.

**Interactions on the spawning grounds from hatchery returns and returns from naturally spawning hatchery fish**

NMFS evaluated the benefits and risks from interactions on the spawning grounds between fish derived from hatchery production and fish from natural populations and concluded that this factor is not a threat to ESA-listed salmon and steelhead. The relevant considerations here are gene-flow and competition on the spawning grounds between hatchery fish and fish from natural populations, demographic risk, and pathogen...
transmission. Gene-flow and competition on the spawning grounds is not a threat because the HGMPs impose strict limits on pHOS. The hatchery programs using broodstocks derived from local natural populations (the spring Chinook salmon, coho salmon, and winter steelhead hatchery programs) require that pHOS may not exceed 0.10. Changes in the Hatchery Program: For comparison purposes, the HSRG recommendation for this situation is 0.30. The summer steelhead hatchery program imposes even stricter limits on pHOS, 0.05, because it uses fish that are not derived from a local population or even the LCR steelhead DPS. What also helps is that the summer steelhead program has terminated juvenile releases in the upper Sandy basin and this means it should be easier to accomplish the pHOS standard. Accepting responsibility for hatchery returns, the spring Chinook program has established high standards for limiting pHOS and has implemented new and aggressive measures to comply with these standards. Between 2002 and 2007, returning hatchery spring Chinook salmon were trapped and removed at Marmot Dam. After Marmot Dam was removed in 2007, the hatchery program experimented with various techniques to collect hatchery broodstock and to prevent hatchery fish from spawning naturally and those techniques were further refined in 2012. Annual monitoring and reporting is required to ensure that these performance standards are complied with.

Steelhead in Cedar Creek have been at low abundance and for that reason the winter steelhead hatchery program also acts as a safety-net. In the event that returns of natural-origin steelhead fall below critical thresholds, the program stands ready to supplement natural spawners and reduce demographic risk.

**Interactions in juvenile rearing areas with hatchery releases and the progeny of naturally spawning hatchery fish**

NMFS evaluated the HGMPs for interactions between juvenile fish derived from hatchery releases and natural-origin juveniles and concluded that this factor is not a threat to ESA-listed salmon and steelhead.

The most important considerations here are competition and predation by juvenile hatchery fish and premature emigration of natural-origin fish caused by hatchery fish. Competition can occur when hatchery fish compete for rearing areas with fish from the local population(s) but in this case there is little or no spatial or temporal overlap in the distribution of hatchery and natural-origin fish in the Sandy River basin. Hatchery fish, including spring Chinook salmon, coho, salmon, and winter and summer steelhead are released into Cedar Creek, a tributary whose confluence with the Sandy River is miles downstream from primary production areas for Sandy River Chinook and coho salmon and for Sandy River steelhead. It also helps that annual production/releases of hatchery coho have declined by more than thirty percent from an average of 737,000 smolts (for broodyears 2002 through 2006) to 500,000. Production levels have also been slashed for the spring Chinook salmon program to better fit the production capacity of the Sandy River basin and annual release numbers have declined from 430,000 to 300,000. Overall, hatchery production in the Sandy basin has declined by more than 25 percent in recent years.

Natural-origin Chinook and coho salmon and steelhead do not smolt and head for the ocean all at once – they instead have a more protracted emigration leaving rearing areas far upstream in the Sandy Basin over the course of several months. This is in stark contrast to hatchery fish that are relatively uniform in size and behavior and leave the hatchery in masse, and likely will spend
only hours or days in the lower Sandy River before they reach the Columbia River and join more than a hundred million natural-origin and hatchery smolts bound for the Pacific Ocean.

Generally speaking, en-masse hatchery salmon smolt releases may cause the displacement of naturally produced juvenile salmonids leading to the abandonment of advantageous feeding stations or premature out-migration (Pearsons et al. 1994). Displacement and premature out-migration constitutes take and would be expected to reduce population spatial structure and abundance. Here, this possibility was considered but rejected because Chinook and coho salmon and steelhead are already actively migrating to the ocean by the time they reach areas in the Sandy River where hatchery fish are released.

Predation is dependent upon two factors: the predatory fish and their prey must overlap temporally and spatially, and the prey should be less than 1/3 the length of the predatory fish. Because there is thought to be little temporal or spatial overlap between hatchery smolts and natural-origin fish, there is no known threat from predation or competition. It is also unlikely that any hatchery-origin fish that do not migrate to the ocean and instead become residuals pose any threat to population of Chinook and coho salmon and steelhead population in the Sandy River. These fish would be expected to reside in the vicinity of where they were released, miles downstream from the most important salmon and steelhead production areas. Because there is limited information upon which to base these expectations, NMFS is asking ODFW to monitor and report annually on the presence and absence of juvenile hatchery fish in the Sandy River and in tributaries downstream of the Sandy Hatchery.

The risk of adverse competitive interactions will be minimized by:

- Releasing hatchery smolts that are physiologically ready to migrate. Hatchery fish released as smolts emigrate seaward soon after liberation, minimizing the potential for competition with juvenile natural-origin fish in freshwater (Steward and Bjornn 1990).
- Operating the hatchery such that hatchery fish are reared to sufficient size that smoltification occurs within nearly the entire population (Bugert et al. 1991).
- Releasing hatchery smolts in lower river areas, below areas used for stream-rearing natural-origin juveniles.
- Monitoring interactions in the Sandy River Basin between juvenile hatchery and natural-origin fish.

Interactions in the migration corridor, the estuary, and in the ocean with hatchery releases and the progeny of naturally spawning hatchery fish

NMFS reviewed the scientific literature for available information describing density-dependent interactions in the Columbia River, the Columbia River estuary, and the Pacific Ocean and concluded that this factor is an uncertain threat.

Questions over whether hatchery fish exacerbate density dependent effects in the mainstem Columbia River, the Columbia River estuary and the Pacific ocean have been questioned for many years. The Proposed Recovery Plan for Snake River Salmon (NMFS 1995c), described the issue in this manner; “There is intense debate over the issues of carrying capacity and density-
dependent effects on natural populations of salmon in the Columbia River Basin. However, there is little definitive information available to directly address the effects of ecological factors on survival and growth in natural populations of Pacific salmon. Thus, many of the ecological consequences of releasing hatchery fish into the wild are poorly defined”. The proposed recovery plan called on hatchery operators and funding entities to “limit annual releases of anadromous fishes from Columbia Basin hatcheries.” In fact, releases have declined substantially. Annual hatchery releases for the entire Columbia Basin now vary between 130 and 145 million fish compared to a peak production of approximately 200 million fish.

More recently, NMFS reviewed the literature for new and emerging scientific information over the role and the consequences of density-dependent interactions. At full production, hatchery releases from the four Sandy River programs will constitute less than one percent of the total hatchery production and less than .05 percent of all juvenile salmonids in the Columbia basin. The SCA for the FCRPS opinion (NMFS 2008a) and the September 2009 FCRPS Adaptive Management Implementation Plan (AMIP) both concluded that available knowledge and research abilities are insufficient to discern any important role or contribution of hatchery fish in density dependent interactions affecting salmon and steelhead growth and survival in the mainstem Columbia River, the Columbia River estuary, and in the Pacific Ocean. From the scientific literature, the general conclusion is that the influence of density dependent interactions on growth and survival is likely small compared with the effects of large scale and regional environmental conditions and while there is evidence that hatchery production, on a scale many times larger than the proposed action, can impact salmon survival in the migration corridor, estuary, and ocean, the degree of impact or level of influence is not yet understood or predictable. Regardless, hatchery production on the scale considered in this opinion is very unlikely to substantially affect salmon survival or recovery in these life stages. NMFS will monitor emerging science and information and will reinitiate section 7 consultation in the event that new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not considered in this consultation (50 CFR 402.16).

**Research, monitoring and evaluation**

The proposed action includes RM&E to monitor compliance with this opinion and to inform future decisions over how the hatchery program can make adjustments that further reduce risks to ESA-listed salmon and steelhead. RM&E included in the HGMPs is not a threat to ESA-listed salmon and steelhead. Very minor lethal and sub-lethal effects on listed species are expected to occur from the handling of juveniles during the operation of the screw trap in Cedar Creek. ODFW will monitor and report annually on pHOS and the distribution of naturally spawning hatchery-origin fish in the Sandy River and its tributaries.

**Masking**

Masking caused by hatchery fish is not a threat to ESA-listed salmon and steelhead as a result of this proposed action. Hatchery fish from these programs will not confuse or conceal the status of a natural population or the effects of the hatchery program on any natural population. It is expected that there will be little spatial or temporal overlap in distribution between hatchery fish and fish from natural populations in the Sandy River. In addition, hatchery fish from the four programs will be 100 percent adipose fin-clipped for easy identification.
Construction, operations, and maintenance

NMFS also evaluated the construction, operation, and the maintenance of hatchery facilities associated with the four hatchery programs in the Sandy basin and concluded that this factor is an uncertain threat to ESA-listed species. What NMFS evaluates here is how the facilities themselves affect the fish and designated critical habitat. For example, what effect will handling fish at the weir have on survival and recovery, is it likely that the spatial distribution of natural spawners will change because of the placement and operation of weirs or that the survival of juvenile fish will be reduced when they encounter hatchery water diversions?

Operation of weirs at multiple locations in the Sandy Basin poses an uncertain threat to ESA-listed salmon and steelhead, primarily spring Chinook salmon. As many as 2,750 natural-origin spring Chinook salmon may be handled annually at various weir locations throughout the Sandy Basin. BMPs will be used to operate the weirs and handle the fish, including staffing the weirs to avoid overcrowding, the availability of effective resuscitation facilities, and timely passage of natural-origin fish past the weirs. With these BMPs in place, NMFS expects that effects associated with the weirs will include weir rejection, fallback, handling, and delay, but the associated impacts on the species – changes in spawning distribution and pre-spawning mortality – will occur at levels not meaningfully beyond background levels (e.g., with no weir). Weir technology has improved greatly over the previous couple of decades and the technology is now widely and effectively applied throughout the Pacific Northwest (NMFS 2010; NMFS 2011a). There have been important lessons learned and that experience is expected to guide the application of the same basic technology in the Sandy. In the beginning, there will be a steep learning curve and adjustment period and it will be particularly important to monitor and evaluate weir operation to ensure maximum performance and efficiency with minimum collateral effects on ESA-listed species. ODFW will conduct spawning ground surveys to monitor effects on naturally spawning spring Chinook salmon to determine impacts from handling, and changes in spawning distribution due to weir rejection.

The new diversion facility, completed this summer, at Sandy Hatchery is expected to improve juvenile and adult passage in the bypass reach at Sandy Hatchery. The diversion intake is screened and meets NMFS criteria for protecting anadromous salmonids, minimum flows will be required in the bypass reach to provide for juvenile migration and rearing.

Fisheries

Fisheries targeting these hatchery fish were described and evaluated in a separate opinion (NMFS 2008c). These effects are therefore incorporated into the environmental baseline.

2.5. Critical Habitat Effects

Previous sections have discussed the scope of the salmonid habitat in the action area, described the habitat’s primary constituent elements, and depicted its present condition. This opinion does not rely on the regulatory definition of “destruction or adverse modification” of critical habitat at 50 CFR 402.02. Instead, this critical habitat analysis determines whether the proposed action will destroy or adversely modify designated critical habitat for listed species by examining any change in the conservation value of the essential features of that critical habitat. This analysis
relies on statutory provisions of the ESA that define “critical habitat” and “conservation,” describe the designation process, and that set forth the substantive protections and procedural aspects of consultation. The discussion here focuses on how the primary constituent elements are likely to be affected by the proposed actions.

The only effects on critical habitat from the proposed action would occur in freshwater migration corridors. The hatchery facility itself would not require additional construction or disturbance of riparian or streambed habitat, and the any effects of water withdrawal and effluent are expected to be small and transitory. Hatchery intakes would be screened to prevent fish injury from impingement or permanent removal from streams. The operation of the adult weir and intake structure at the Sandy Hatchery on Cedar Creek would not be expected to impact natural-origin spring Chinook salmon because Cedar Creek does not contain spring Chinook salmon spawning or rearing habitat. Access to habitat in Cedar Creek above the Sandy Hatchery has been provided to coho salmon and winter steelhead.

The effects on critical habitat of pumping water for the acclimation pond at the former Bull Run Powerhouse are expected to be minor because the pump would be screened to meet NMFS criteria, the water would be returned to the same pool where it was removed, and the pond would be operated during periods of high flows in the Bull Run River.

Impacts on migration and rearing habitation for juvenile coho salmon and winter steelhead would occur when the flow in Cedar Creek is reduced to provide water to rear the coho salmon at the Sandy Hatchery. These impacts would be expected to be the greatest during September, when water flows in Cedar Creek tend to be at their lowest. The numbers affected, if any, would be expected to be small, because water temperatures in that area become elevated during the summer months, and ODFW will maintain has minimum flows that would provide for juvenile passage to meet Oregon’s Native Fish Conservation Policy (ODFW2003a). Impacts would be expected to be temporary and only last until fall rains increase flows in Cedar Creek.

Habitat impacts from the installation and operation of the weirs are expected to be limited to the weir location, and to be of a short duration. Habitat will be temporarily impacted by the placement of the weirs. Each weir is designed to be installed and removed annually, eliminating the requirement for permanent structures in the river. When the weirs are operational, they will impact the PCEs for migration as follows:

- The installation of the weirs in Cedar Creek, the Zigzag River, the Salmon River, and the Bull Run River in early June could potentially lead to the handling of the majority of natural-origin spring Chinook salmon returning to the Sandy River Basin. Monitoring associated with spawning ground surveys would be used to determine if the presence of the weirs were causing natural-origin spring Chinook salmon to spawn downstream of the weirs.
- The weirs, if installed by the first of June, may encounter winter steelhead kelts (fish that have already spawned) migrating out of the basin. The actual number of kelts encountered is unknown but expected to be low because winter steelhead spawning is usually completed by early May, reducing the potential for kelts to be present when the weirs are installed. Adult winter steelhead would not be expected to be encountered
during weir operations because they return after the weirs are removed and before the weirs are installed.

- Chum salmon have not been observed in the Sandy River, but if any do occur, their assumed return timing (in November, typical for other Columbia River chum salmon populations) is outside the period during which the weirs would be in place.
- Impacts on coho salmon would occur on that proportion of the adult returns that enters the upper Sandy River prior to the end of September and prior to the removal of the weirs. ODFW proposes to use the observed presence of coho salmon as an indicator as to when to remove the weirs for the season. Impacts are expected to be low because very few coho salmon would be handled.

Indications that the handling of natural-origin adults at the weirs could contribute to pre-spawning mortality would be observed through the evaluation of carcasses recovered during spawning ground surveys. Affects associated with weirs, such as passage delay, are expected to be mitigated through proper weir design, the use of trained personnel, and operations that minimize the time salmon and steelhead are held or delayed at the weirs.

2.6. **Cumulative Effects**

“Cumulative effects” are those effects of future state or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation (50 CFR 402.02). Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA. For the purpose of this analysis, the action area is that part of the Columbia River Basin described in section 1.4, above. Future Federal actions, including the ongoing operation of the hydropower system, hatcheries, fisheries, and land management activities will be reviewed through separate section 7 consultation processes. Some of the state and private activities that are included in the baseline for this consultation are expected to continue in the future, i.e., the City of Portland’s Bull Run municipal water supply facility and its related HCP, agricultural activities, timber harvest, as well as a variety of restoration projects. Effects of these activities at current levels are described in the Environmental Baseline (Section 2.3) and are not expected to change appreciably.

The LCR Salmon and Steelhead Recovery Plan and the LCR Conservation & Recovery Plan for Oregon populations of Salmon and Steelhead (ODFW 2010) describes, in detail, the on-going and proposed state and local government actions that are targeted to reduce known threats to listed LCR Chinook, coho, and chum salmon and to steelhead in the Sandy River Basin. It is acknowledged, however, that such future state and local government actions will likely be in the form of legislation, administrative rules, or policy initiatives, and land use and other types of permits and that government actions are subject to political, legislative and fiscal uncertainties.

2.7. **Integration and Synthesis**

The Integration and Synthesis section is the final step in our assessment of the risk posed to species and critical habitat as a result of implementing the proposed action. In this section, we will add the effects of the action (Section 2.4) to the environmental baseline (Section 2.3) and the cumulative effects (Section 2.5) to formulate the agency’s biological opinion as to whether the
proposed action is likely to: (1) reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing its numbers, reproduction, or distribution; or (2) reduce the value of designated or proposed critical habitat for the conservation of the species. These assessments are made in full consideration of the status of the species and critical habitat (Section 2.2).

2.7.1.  **LCR Chinook Salmon**

When the effects of the proposed action are added to the baseline and cumulative effects, NMFS concludes that the proposed action will not appreciably reduce the likelihood of survival and recovery in the wild of the LCR Chinook Salmon ESU, as described below.

None of the hatchery factors that NMFS analyzed for effects is a known or likely threat to the Sandy River Chinook salmon population or to the LCR Chinook Salmon ESU (see section 2.4.3). In fact, several recommendations in the recovery plan for addressing limiting factors are included in the HGMPs. The spring Chinook salmon HGMP, for example, includes a strict standard for limiting hatchery fish escaping to the spawning grounds and includes monitoring and reporting requirements to verify compliance with the standard. The standard for pHOS is 0.10 for the Chinook salmon hatchery program. One tool the HGMP plans to implement to help meet or exceed the standard are weirs operated at strategic locations throughout the Sandy Basin. Sorting and handling fish at the weirs and the potential for fish to reject the weir and migrate to a more favorable location is a threat identified in this opinion, about which there is some uncertainty. NMFS has analyzed the possible impacts based on the best available information and determined that the growing experience with use of weirs in the region shows them to be effective overall. As described in NMFS (NMFS 2010; NMFS 2011a), there are number of actions that can be taken to address the potential negative effects. Weir rejection, fallback, injury, and delay from the operation of the weir and trap can be reduced by using trained personnel, removing debris, preventing poaching, holding fish for the shortest time possible, and removing any fish not needed for broodstock to allow for recovery and release. ODFW will conduct spawning ground surveys to monitor effects on naturally spawning spring Chinook salmon to determine impacts from handling, and changes in spawning distribution due to weir rejection. NMFS concurrence with the HGMP will include the requirement to monitor and report annually on the extent of these effects.

When hatchery fish emigration is delayed, interactions that disadvantage listed species may occur in juvenile rearing areas. ODFW will implement the following BMPs so that hatchery fish move quickly out of the Sandy River Basin. These BMPs include rearing juveniles to the sizes and under conditions identified in the HGMPs, continuing to mark all hatchery juveniles, and acclimating hatchery juveniles prior to release. ODFW will verify with monitoring the presence of hatchery juveniles in the lower Sandy River (i.e., ODFW will submit an annual monitoring and evaluation plan be March 1 each year for NMFS concurrence and report results in a comprehensive annual report (see Section 2.9.4).

Another uncertain threat is density-dependent interactions in the Columbia River migration corridor, the Columbia River estuary, and in the Pacific (i.e., density-dependent effects) which are not detectable, at least at this time, based on available scientific information. As discussed above, the proposed action is unlikely to cause any density dependent effects, given the
magnitude of the corridor compared to the hatchery populations at issue. NMFS will monitor emerging science and information related to these interactions.

Regarding species recovery, the Recovery Plan (ODFW 2010) identified a number of limiting factors and threats to the recovery of the Sandy River Chinook salmon population, including water quality, sediment routing dysfunction, blocked and impaired fish passage, degraded floodplain and channel structure, and hydrologic alterations (see section 2.2). None of these factors will be affected, in any measurable way, by the proposed action. This analysis has considered recovery planning documents and the potential effects of the proposed action on the LCR Chinook salmon ESU, combined with other ongoing activities inside the Action Area, and has determined that the proposed action will not appreciably reduce the likelihood of survival and recovery in the wild by reducing the reproduction, number, or distribution of the ESU.

2.7.2  LCR Coho Salmon

When the effects of the proposed action are added to the baseline and cumulative effects of all human activities in the action area, NMFS concludes that the proposed action will not appreciably reduce the likelihood of survival and recovery in the wild of the LCR Coho Salmon ESU, as described below.

None of the hatchery factors that NMFS analyzed for effects is a known or likely threat to the Sandy River coho salmon population or to the LCR Coho Salmon ESU (see section 2.4.3). In fact, the LCR salmon and steelhead recovery plan (ODFW 2010) did not identify hatchery actions as a factor limiting coho salmon survival and recovery. Even so, the coho salmon HGMP includes a strict standard for limiting hatchery fish escaping to the spawning grounds and includes monitoring and reporting requirements to verify compliance with the standard. The standard for pHOS is 0.10 for the coho salmon hatchery program. NMFS as part of its written approval will require that ODFW monitor spawning escapements to determine if the standard is being achieved.

When hatchery fish emigration is delayed, interactions that disadvantage listed species may occur in juvenile rearing areas. ODFW will implement the following BMPs so that hatchery fish move quickly out of the Sandy River Basin. These BMPs include rearing juveniles to the sizes and under conditions identified in the HGMPs, continuing to mark all hatchery juveniles, and acclimating hatchery juveniles prior to release. ODFW will verify with monitoring the presence of hatchery juveniles in the lower Sandy River (i.e., ODFW will submit an annual monitoring and evaluation plan be March 1 each year for NMFS concurrence and report results in a comprehensive annual report (see Section 2.9.4).

Another uncertain threat is density-dependent interactions in the Columbia River migration corridor, the Columbia River estuary, and in the Pacific (i.e., density dependent effects) which are not detectable, at least at this time, based on available scientific information. As discussed above, the proposed action is unlikely to cause any density dependent effects, given the magnitude of the corridor compared to the hatchery populations at issue. NMFS will monitor emerging science and information related to these interactions.
Regarding species recovery, the Recovery Plan (ODFW 2010) also identified a number of limiting factors and threats to the Sandy River coho salmon population, including water quality, sediment routing dysfunction, blocked and impaired fish passage, degraded floodplain and channel structure, and hydrologic alterations (see section 2.2). None of these factors will be affected, in any measureable way, by the proposed action. This analysis has considered recovery planning documents and the potential effects of the proposed action on the LCR Coho Salmon ESU, combined with other ongoing activities inside the Action Area, and has determined that the proposed action will not appreciably reduce the likelihood of survival and recovery in the wild by reducing the reproduction, number, or distribution of the ESU.

2.7.3. LCR Steelhead

When the effects of the proposed action are added to the effects of all human activities in the action area, including any anticipated Federal, state or private projects, NMFS concludes that the proposed action will not appreciably reduce the likelihood of survival and recovery in the wild of the LCR Steelhead DPS, as described below.

None of the hatchery factors that NMFS analyzed for effects is a known or likely threat to the Sandy River winter steelhead population or to the LCR Steelhead DPS (see section 2.4.3). In fact, several recommendations in the recovery plan for addressing limiting factors are included in the HGMP. The winter and summer steelhead HGMPs, for example, include a strict standard for limiting hatchery fish escaping to the spawning grounds and include monitoring and reporting requirements to verify compliance with the standards. The pHOS standard for the winter steelhead hatchery program is 0.10 and the standard for the summer steelhead program is 0.05. NMFS as part of its written approval will require that ODFW monitor spawning escapements to determine if these standards are being achieved.

When hatchery fish emigration is delayed, interactions that disadvantage listed species may occur in juvenile rearing areas. ODFW will implement the following BMPs so that hatchery fish move quickly out of the Sandy River Basin. These BMPs include rearing juveniles to the sizes and under conditions identified in the HGMPs, continuing to mark all hatchery juveniles, and acclimating hatchery juveniles prior to release. ODFW will verify with monitoring the presence of hatchery juveniles in the lower Sandy River (i.e., ODFW will submit an annual monitoring and evaluation plan be March 1 each year for NMFS concurrence and report results in a comprehensive annual report (see Section 2.9.4).

Another uncertain threat is density-dependent interactions in the Columbia River migration corridor, the Columbia River estuary, and in the Pacific (i.e., density-dependent effects) which are not detectable, at least at this time, based on available scientific information. As discussed above, the proposed action is unlikely to cause any density dependent effects, given the magnitude of the corridor compared to the hatchery populations at issue. NMFS will monitor emerging science and information related to these interactions.

Regarding species recovery, the Recovery Plan (ODFW 2010) identified a number of additional limiting factors and threats to the Sandy River winter steelhead population, including water quality, sediment routing dysfunction, blocked and impaired fish passage, degraded floodplain and channel structure, and hydrologic alterations (see section 2.2). None of these factors will be
affected, in any measureable way, by the proposed action. This analysis has considered recovery planning documents and the potential effects of the proposed action on the LCR Steelhead DPS, combined with other ongoing activities inside the Action Area, and determined that the proposed action will not appreciably reduce the likelihood of survival and recovery in the wild by reducing the reproduction, number, or distribution of the DPS.

2.7.4. LCR Chum Salmon

When the effects of the proposed action are added to the effects of all human activities in the action area, including any anticipated Federal, state or private projects, NMFS concludes that the proposed action will not appreciably reduce the likelihood of survival and recovery in the wild of the Columbia River Chum Salmon ESU, as described below.

None of the hatchery factors that NMFS analyzed for effects is a known or likely threat to the Sandy River chum salmon population or to the Columbia River Chum Salmon ESU (see section 2.4.3). In fact, LCR salmon and steelhead Recovery Plan (ODFW 2010) did not identify hatchery actions as a factor limiting chum salmon survival and recovery. This analysis has considered recovery planning documents and the potential effects of the proposed action on the Columbia River Chum Salmon ESU, combined with other ongoing activities, inside the Action Area, and determined that the proposed action will not appreciably reduce the likelihood of survival and recovery in the wild by reducing the reproduction, number, or distribution of the ESU.

2.7.5. Critical Habitat

Critical habitat for ESA-listed LCR Chinook and chum salmon, and LCR steelhead is described in section 2.2.5 of this opinion. In reviewing the proposed action and after conducting the effects analysis (see section 2.5), NMFS has determined that the proposed action will not impair PCEs designated as essential for spawning, rearing, juvenile migration, and adult migration purposes.

The only effects on critical habitat from the proposed action would occur in freshwater migration corridors. The hatchery facility itself would not require additional construction or disturbance of riparian or streambed habitat, and the any effects of water withdrawal and effluent are expected to be small and transitory. Hatchery intakes would be screened to prevent fish injury from impingement or permanent removal from streams. The operation of the adult weir and intake structure at the Sandy Hatchery on Cedar Creek would not be expected to impact natural-origin spring Chinook salmon because Cedar Creek does not contain spring Chinook salmon spawning or rearing habitat. Access to habitat in Cedar Creek above the Sandy Hatchery has been provided to coho salmon and winter steelhead.

The effects on critical habitat of pumping water for the acclimation pond at the former Bull Run Powerhouse are expected to be minor because the pump would be screened to meet NMFS criteria, the water would be returned to the same pool where it was removed, and the pond would be operated during periods of high flows in the Bull Run River.

Impacts on juvenile coho salmon and winter steelhead would occur when the flow in Cedar Creek is reduced to provide water to rear the coho salmon at the Sandy Hatchery. These impacts
would be expected to be the greatest during September, when water flows in Cedar Creek tend to be at their lowest. The numbers affected, if any, would be expected to be small, because water temperatures in that area become elevated during the summer months, and ODFW would maintain minimum flows that would provide for juvenile passage. Impacts would be expected to be temporary and only last until fall rains increase flows in Cedar Creek.

Habitat impacts from the installation and operation of the weirs are expected to be limited to the weir location, and to be of a short duration. Habitat will be temporarily impacted by the placement of the weirs. Each weir is designed to be installed and removed annually, eliminating the requirement for permanent structures in the river. When the weirs are operational, they will impact the PCEs for migration as follows:

- The installation of the weirs in Cedar Creek, the Zigzag River, the Salmon River, and the Bull Run River in early June could potentially lead to the handling of the majority of natural-origin spring Chinook salmon returning to the Sandy River Basin. Monitoring associated with spawning ground surveys would be used to determine if the presence of the weirs were causing natural-origin spring Chinook salmon to spawn downstream of the weirs.
- The weirs, if installed by the first of June, may encounter winter steelhead kelts (fish that have already spawned) migrating out of the basin. The actual number of kelts encountered is unknown but expected to be low because winter steelhead spawning is usually completed by early May, reducing the potential for kelts to be present when the weirs are installed. Adult winter steelhead would not be expected to be encountered during weir operations because they return after the weirs are removed and before the weirs are installed.
- Chum salmon have not been observed in the Sandy River, but if any do occur, their assumed return timing (in November, typical for other Columbia River chum salmon populations) is outside the period during which the weirs would be in place.
- Impacts on coho salmon would occur on that proportion of the adult returns that enters the upper Sandy River prior to the end of September and prior to the removal of the weirs. ODFW proposes to use the observed presence of coho salmon as an indicator as to when to remove the weirs for the season. Impacts are expected to be low because very few coho salmon would be handled.

Indications that the handling of natural-origin adults at the weirs could contribute to pre-spawning mortality would be observed through the evaluation of carcasses recovered during spawning ground surveys. Affects associated with weirs, such as passage delay, are expected to be mitigated through proper weir design, the use of trained personnel, and operations that minimize the time salmon and steelhead are held or delayed at the weirs.

2.7.6. Climate Change

The Sandy River Chinook, coho, and chum salmon populations, and the Sandy River steelhead population, may be adversely affected by climate change (see section 2.2.4). A decrease in winter snow pack would be expected to reduce spring and summer flows and increase water temperatures throughout the Sandy River Basin. Under the proposed action, passage conditions
will be restored in Cedar Creek and ODFW and NMFS will monitor base-flow conditions during the summer and fall periods.

2.8. Conclusion

After reviewing the current status of the listed species, the environmental baseline within the action area, the effects of the proposed action, and cumulative effects, it is NMFS’ biological opinion that the proposed action is not likely to jeopardize the continued existence of the LCR Chinook and Coho Salmon ESUs, the LCR Steelhead DPS, the Columbia River Chum Salmon ESU, or adversely modify designated critical habitat for LCR Chinook, LCR steelhead, Columbia River chum.

2.9. Incidental Take Statement

Section 9 of the ESA and Federal regulation pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without a special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by regulation to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. For purposes of this consultation, we interpret “harass” to mean an intentional or negligent action that has the potential to injure an animal or disrupt its normal behaviors to a point where such behaviors are abandoned or significantly altered. Section 7(b)(4) and Section 7(o)(2) provide that taking that is incidental to an otherwise lawful agency action is not prohibited under the ESA, if that action is performed in compliance with the terms and conditions of this Incidental Take Statement (ITS).

2.9.1. Amount or Extent of Take

NMFS analyzed eight factors and identified five that are likely to result in take: (1) broodstock collection; (2) interactions on the spawning grounds; (3) interactions in juvenile rearing areas; (4) construction, operation, and maintenance of hatchery facilities (e.g., weirs); and (5) RM&E.

(1) Broodstock Collection

In the course of collecting hatchery broodstock, the proposed action authorizes the annual handling of up to 400 adult natural-origin winter steelhead, 400 natural-origin coho salmon, 100 chum salmon, and up to 2,750 adult natural-origin spring Chinook salmon. These numbers of fish represent the quantified level of expected take associated with broodstock collection. These

13 NMFS has not adopted a regulatory definition of harassment under the ESA. The World English Dictionary defines harass as “to trouble, torment, or confuse by continual persistent attacks, questions, etc.” The U.S. Fish and Wildlife Service defines “harass” in its regulations as an intentional or negligent act or omission that creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering (50 CFR 17.3). The interpretation we adopt in this consultation is consistent with our understanding of the dictionary definition of harass and is consistent with the U.S. Fish and Wildlife interpretation of the term.
are fish that volunteer to the Sandy Hatchery or are trapped at weirs located throughout the Sandy River Basin; all natural-origin salmon and steelhead must be released, unharmed, immediately upstream of the weir site. No direct lethal take associated with handling is expected and any such take would be considered to be incidental take and is exempted by this ITS. ESA-listed hatchery-origin steelhead, spring Chinook salmon, and coho salmon that volunteer at weir locations shall not be returned to the river.

(2) *Interactions on the Spawning Grounds*

When straying by hatchery fish results in interactions with listed fish on the spawning grounds, there is take of the natural populations by way of genetic introgression effects. It is not possible to ascertain the exact amount of such take, because it is not possible to meaningfully measure the number of interactions nor their precise effects. NMFS will therefore rely on a surrogate take indicator that relates to the anticipated stray rates, since those rates have a rational connection to the amount of take from spawning ground interactions. NMFS anticipates a stray rate of up to ten percent of the adult Chinook and coho salmon and winter steelhead, as well as up to five percent of the summer steelhead. Accordingly, the extent of take for spawning ground interactions is stray rates of 10 percent of the spawning population in the case of Chinook and coho salmon and winter steelhead, and five percent of the spawning population in the case of hatchery summer steelhead. ODFW will monitor the presence of hatchery fish on the spawning grounds to verify compliance with these standards.

ODFW is authorized to return stray hatchery-origin fish to their hatchery of origin or, alternatively, use the fish for human consumption, stream fertilization, or to support tribal or recreational harvest in areas not accessible to anadromous salmonids.

(3) *Interactions in juvenile rearing areas*

When hatchery fish co-occur with natural-origin fish in juvenile rearing areas, interactions can disadvantage listed species through competition and predation. Effects from interactions in juvenile rearing areas are expected to be minimal, because 60-70 percent of the rearing habitat for the listed species is above the releases locations, hatchery smolts are reared to sizes and conditions that contribute to rapid migration, and all hatchery production is acclimated prior to release (see section 2.4.3). It is not possible to quantify the take associated with interactions in rearing areas, because it is not possible to meaningfully measure the number of interactions nor their precise effects. NMFS will therefore rely on a surrogate take indicator that relates to the proportion of hatchery fish in the rearing areas, since those proportions have a rational connection to the amount of take from rearing area interactions. Specifically, the extent of take from interactions between hatchery and natural-origin juvenile salmonids in rearing areas in the lower Sandy River is as follows: the proportion of juvenile hatchery salmonids in rearing areas in the lower Sandy River cannot exceed 10 percent on or after the 21st day following any hatchery release. To verify that the hatchery juveniles are migrating out of the Sandy River Basin, ODFW shall submit to NMFS an annual monitoring plan for NMFS concurrence by March 1 of each year.
The proposed action includes the installation and operation of weirs in the upper Sandy River and the Bull Run River to collect broodstock and to prevent hatchery fish from spawning naturally. During the operation of the weirs ODFW estimates that up to 2,750 natural-origin spring Chinook salmon will be handled. Direct mortalities associated with the handling of natural-origin spring Chinook adults is expected to be low based on observations of no mortalities encountered during weir operations in 2011. All mortalities of natural-origin adults incidental to handling adults at the weir shall not exceed one percent of the total natural-origin adults handled. ODFW will be reported annually the number of adults handled and any mortalities incidental to the operation of the weir. The operation of the weirs is expected to result in take of ESA-listed Chinook, salmon, and ESA-listed steelhead due to associated factors such as weir rejection, fallback, delayed mortality after release, and migration delay. It is not possible to accurately quantify this take because meaningful measurements cannot be made of such factors or their effects. NMFS will therefore rely on a surrogate take indicator that relates to spawning distributions and pre-spawning mortality. These have a rational connection to the amount of take because they reflect pre-weir circumstances. Specifically, the surrogate take indicator is any change greater than 20 percent in spawning distribution above and below the weirs and in pre-spawning mortality from what was measured during previous spawning ground surveys prior to the installation and operation of the weirs in 2011. ODFW, as part of the spring Chinook salmon spawning ground surveys will annually monitor and report changes in spawning distribution and estimate pre-spawning mortality.

RM&E activities will handle juvenile coho salmon and steelhead during the operation of the screw trap on Cedar Creek. These activities support recolonization of Cedar Creek by coho salmon and winter steelhead. ODFW is expected to handle up to 5,000 coho salmon and 3,500 winter steelhead smolts annually, with a mortality level not to exceed one percent of the juveniles collected. Consequently, these numbers represent the expected take associated with RM&E.

2.9.2. Effect of the Take

In Section 2.8, NMFS determined that the level of anticipated take, coupled with other effects of the proposed action, is not likely to jeopardize the continued existence of the LCR Chinook and Coho Salmon ESUs, the LCR Steelhead DPS, the Columbia River Chum Salmon ESU, or adversely modify designated critical habitat for LCR Chinook, LCR steelhead, and Columbia River chum.

2.9.3. Reasonable and Prudent Measures

“Reasonable and prudent measures” are nondiscretionary measures to minimize the amount or extent of incidental take (50 CFR 402.02). “Terms and conditions” implement the reasonable
and prudent measures (50 CFR 402.14). These must be carried out for the exemption in section 7(a)(2) to apply.

NMFS concludes that the following reasonable and prudent measures are necessary and appropriate to minimize incidental take. This opinion requires that NMFS:

1. Ensure that interactions on the spawning grounds with fish produced by the Sandy Hatchery, hatchery-origin spring Chinook and coho salmon and hatchery-origin winter and summer steelhead, are kept to the lowest feasible levels.

2. Ensure that interactions in the Sandy River and in Sandy River tributaries with juvenile hatchery fish produced by the Sandy Hatchery, hatchery-origin spring Chinook and coho salmon and hatchery-origin winter and summer steelhead, are kept to the lowest feasible levels.

3. Ensure that take resulting from the operation of weirs in the Sandy Basin is inconsequential.

4. Receives annual reports on the effects of the hatchery operations on ESA-listed species that allow for the evaluation of the continued efficacy of the programs.

2.9.4. Terms and Conditions

The terms and conditions described below are non-discretionary, and NMFS must comply with them in order to implement the reasonable and prudent measures (50 CFR 402.14). NMFS has a continuing duty to monitor the impacts of incidental take and must report the progress of the action and its impact on the species as specified in this incidental take statement (50 CFR 402.14). If the following terms and conditions are not complied with, the protective coverage of section 7(o)(2) will lapse.

1a. NMFS shall include as a implementation requirement in its written approval that ODFW shall conduct surveys, annually, to determine the timing, abundance, and distribution of Sandy Hatchery spring Chinook and coho salmon and Sandy Hatchery winter and summer steelhead that spawn naturally. The operating agency shall submit protocols for annual surveys for NMFS concurrence on or before June 1 of each year. The operating agency shall submit an annual report describing survey and monitoring results on or before January 1 of each year.

1b. ODFW is authorized to return stray hatchery-origin fish to their hatchery of origin or, alternatively, use the fish for human consumption, stream fertilization, or to support tribal or recreational harvest in areas not accessible to anadromous salmonids.

2. The proportion of juvenile salmonids in rearing areas in the lower Sandy River comprised of hatchery fish cannot exceed 10 percent, 21 day post hatchery release. ODFW shall submit to NMFS an annual monitoring plan for NMFS concurrence by March 1 of each year.
3a. Report on the fish encountered at each weir including the species, origin (hatchery or natural-origin), life-stage, timing of the encounter, condition, and any mortalities.

3b. Estimate weir rejection and handling mortalities, by species, for each weir in the Sandy Basin.

4a. The SMD must be notified, in advance, of any change in hatchery program operation and implementation that potentially would result in increased take of ESA-listed species.

4b. OFDW shall provide one comprehensive annual report to the SMD that includes the RM&E described in 1, 2, 3a, and 3b. The numbers of fish released, release dates and locations, and tag/mark information shall be included in the annual report. All reports, as well as all other notifications required in the permit, shall be submitted electronically to the SMD point of contact on this program:

   Richard Turner (503-736-4737, rich.turner@noaa.gov)

Written materials may also be submitted to:

   NMFS - Salmon Management Division
   Production and Inland Fisheries Branch
   1201 N.E. Lloyd Boulevard, Suite 1100
   Portland, Oregon 97232

2.10. Conservation Recommendations

Section 7(a)(1) of the ESA directs Federal agencies to use their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of threatened and endangered species. Specifically, conservation recommendations are suggestions regarding discretionary measures to minimize or avoid adverse effects of a proposed action on listed species or critical habitat (50 CFR 402.02). NMFS has identified one conservation recommendation appropriate to the proposed action:

1. The ODFW, in cooperation with the NMFS and other entities, should continue to investigate the level of ecological interactions between hatchery-produced salmon and steelhead and ESA-listed steelhead and spring Chinook salmon within the Sandy River Basin to identify additional methods to minimize these interactions.

2.11. Reinitiation of Consultation

As provided in 50 CFR 402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded, (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion, (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in this opinion, or (4) a new species is listed or critical habitat designated that may be affected by the action.
Among other considerations, NMFS may reinitiate consultation if there is significant new information indicating that impacts on ESA-listed species, beyond those considered in this opinion, are occurring from the operation of the proposed hatchery programs, including the operation of weirs and RM&E in support of the hatchery programs, or if the specific RM&E activities listed in the terms and conditions are not implemented. New information on genetic or ecological impacts potentially leading to reinitiation of consultation could come from the Sandy River Chinook and coho salmon and winter and summer steelhead hatchery programs, monitoring efforts on other salmon or steelhead hatchery programs, or from the peer-reviewed scientific literature. NMFS will consider an increase in the proportion of hatchery-origin salmon or steelhead adults spawning naturally in the Sandy River and in tributaries to the Sandy River above a critical value as justification for reinitiation of consultation. The critical value will be 0.10 for Sandy Hatchery spring Chinook salmon, coho salmon, and winter steelhead and 0.05 for Sandy Hatchery summer steelhead. The test metric will be the three-year moving mean proportion of hatchery fish (pHOS) on the spawning grounds, beginning in 2013.

If the amount or extent of take considered in this opinion is exceeded, NMFS will reinitiate consultation. Once reinitiation begins, the Salmon Management Division will consult with the operators to determine specific actions and measures that can be implemented to address the take or, if required, implement further analysis of the impacts on listed species.

2.12. “Not Likely to Adversely Affect”

D e t e r m i n a t i o n s – P a c i f i c E u l a c h o n

On March 18, 2010, NMFS listed the southern DPS of Pacific eulachon as a threatened species (75 FR 13012). The southern DPS extends from the Skeena River in British Columbia south to the Mad River in Northern California (inclusive), and thus all eulachon found within the Action Area are considered to be part of the threatened southern eulachon DPS. Take prohibitions via section 4(d) of the ESA have not been promulgated.

Critical habitat was designated for the southern DPS (76 FR 65324, October 20, 2011); in the Sandy River Basin, the area designated as critical habitat is in the lower part of the basin, extending from the mouth of the Sandy River upstream to the confluence with Gordon Creek (RM 12.8). This area is considered to include physical and biological features essential to spawning and incubation.

Eulachon are endemic to the northeastern Pacific Ocean, ranging from northern California to southwest and south-central Alaska and into the southeastern Bering Sea. In the U.S., most eulachon production originates from the Columbia River. Within the Basin, the biggest and most consistent producers of eulachon are the mainstem Columbia and the Cowlitz River. Spawning also occurs in the Grays, Elochoman, Kalama, Lewis, and Sandy Rivers. Eulachon returns to other areas are sporadic, appearing in some years but not others, and appearing only rarely in some river systems (Hay and McCarter 2000; Willson et al. 2006; Gustafson et al. 2010).

Eulachon generally spawn in rivers fed by either glaciers or snowpack and that experience spring freshets. It has been suggested that because these freshets rapidly move eulachon eggs and larvae to estuaries, it is likely that eulachon imprint and home to an estuary into which several
rivers drain rather than to individual spawning rivers (Hay and McCarter 2000). Eulachon typically enter the Columbia River between December and May with peak entry and spawning during February and March (Gustafson et al. 2010).

Eulachon eggs, averaging 1 mm in size, and attach to a variety of substrate types, from sand to pea-sized gravel. Newly hatched young, are 4-7 mm in length and largely transparent. They are carried to the sea with the current. After the yolk sac is depleted, eulachon feed on pelagic plankton. After three to five years at sea, they return as adults to spawn. Adult eulachon weigh an average of 0.1 pounds each and are 15 to 20 cm long with a maximum recorded length of 30 cm. They are an important link in the food chain between zooplankton and larger organisms. Small salmon, lingcod and other fish feed on eulachon larvae and eulachon juveniles and adults are an important food source for a variety of species, including Pacific salmon (Gustafson et al. 2010).

There are few direct estimates of eulachon abundance anywhere in the southern DPS, including in the Sandy River. Eulachon abundance appears to be at or near historically low levels throughout all or a significant portion of the range for the southern DPS. The Columbia River and its tributaries support the largest known eulachon abundance. Although direct estimates of adult spawning abundance are unavailable, records of commercial fishery landings are available beginning in 1888 and continuing almost uninterrupted until recent times (Gustafson et al. 2010). Commercial landings occasionally exceeded 1,000 metric tons and typically exceeded 500 metric tons. Landings averaged less than five metric tons from 2005 to 2008 (Gustafson et al. 2010). Some of this pattern is due to fishery restrictions, which were put in place in response to the sharp declines in abundance. Eulachon numbers are at, or near, historically low levels throughout the range of the southern DPS, including the Sandy River (Gustafson et al. 2010). Persistent low returns prompted the States of Oregon and Washington to adopt a Joint State Eulachon Management Plan (WDFW and ODFW 2001) and all eulachon fisheries were closed in 2011.

Climate change impacts on ocean habitat are the most serious threat to the persistence of this eulachon DPS (Gustafson et al. 2010). Other threats to the species include by-catch in shrimp trawl fisheries, climate change impacts on freshwater habitat, and habitat alteration and degradation from a variety of activities. Hydroelectric dams block access to historical eulachon spawning grounds and affect the quality of spawning substrates through flow management, altered delivery of coarse sediments, and siltation. Dredging activities in the Cowlitz and Columbia Rivers, during the eulachon spawning run, may entrain and kill fish, or otherwise result in decreased spawning success. Eulachon carry high levels of chemical pollutants (EPA 2002) and, although it has not been demonstrated that high contaminant loads in eulachon have increased mortality or reduced reproductive success, such effects have been shown in other fish species (Kime 1995). These factors (and others) have negatively affected the DPS’s habitat to the extent that it was necessary to list them under the ESA.

Eulachon may be impacted by hatchery fish through competition for space, and possibly predation on eulachon by salmon and steelhead juveniles. Predation by hatchery salmon and steelhead juveniles on newly hatched juvenile eulachon is assumed to occur if hatchery salmonid juveniles overlap with juvenile eulachon emigrating from the upper areas of the Sandy River.
Basin. The actual level of predation and the effects of that predation on eulachon in the lower Sandy River Basin are unknown and were not considered substantive compared to other factors identified as limiting the recovery of eulachon in the Columbia River (Gustafson et al. 2010).

Because of the overlap in the lower Sandy River Basin between the emergence of juvenile eulachon in January through March and the release of hatchery juveniles from March through May, there would be a potential for predation on and competition with eulachon by hatchery salmonids juveniles. Presently, information regarding the predation on juvenile eulachon by juvenile salmonids is non-existent. Predation by juvenile salmonids may occur, but would be limited by hatchery actions designed to produce actively migrating smolts and by the small size and transparency of the emergent eulachon fry, the distribution of eulachon fry in the water column, and the rapid emigration of eulachon juveniles from the lower Sandy River (generally downstream of Gordon Creek at RM 12.8) (Gustafson et al. 2010) – for these same reasons, competition would not be expected.

Competition between adult eulachon and juvenile salmonids may occur when food preferences overlap in the estuary and ocean environment but impacts are expected to be very small. The potential exists for salmonids to prey on adult eulachon, but data on impacts is non-existent, and predation by salmonids was not considered to be a limiting factor (Gustafson et al. 2010).

Because eulachon life histories are typically lived out in areas of the Sandy River Basin downstream of the structures associated with the Proposed Action, eulachon habitat and migratory access would not be affected by the presence of those structures which are located upstream of designated critical habitat for the Eulachon DPS.

Considering all potential interactions between eulachon and the proposed hatchery operations in the Sandy River, effects of the proposed action would be unlikely, if any occurred at all, and therefore discountable, because of the slight temporal overlap between the species and the brief time that rapidly outmigrating salmon and steelhead smolts would co-occur with eulachon. Therefore, the proposed action is not likely to adversely affect ESA-list Pacific eulachon of the southern DPS.

3. MAGNUSON-STEvens FISHERY CONSERVATION AND MANAGEMENT ACT ESSENTIAL FISH HABITAT CONSULTATION

The consultation requirement of section 305(b) of the MSA directs Federal agencies to consult with NMFS on all actions or proposed actions that may adversely affect EFH. The MSA (section 3) defines EFH as “those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity.” Adverse effects include the direct or indirect physical, chemical, or biological alterations of the waters or substrate and loss of, or injury to, benthic organisms, prey species and their habitat, and other ecosystem components, if such modifications reduce the quality or quantity of EFH. Adverse effects on EFH may result from actions occurring within EFH or outside EFH, and may include site-specific or EFH-wide impacts, including individual, cumulative, or synergistic consequences of actions (50 CFR 600.810). Section 305(b) also requires NMFS to recommend measures that can be taken by the action agency to conserve EFH.
This analysis is based, in part, on descriptions of EFH for Pacific coast salmon (PFMC 2003) contained in the fishery management plans developed by the Pacific Fishery Management Council (PFMC) and approved by the Secretary of Commerce.

3.1. Essential Fish Habitat Affected by the Project

The proposed action is the implementation of four hatchery programs in the Sandy River, as described in detail in section 1.3, above. The action area of the proposed action includes habitat described as EFH for Chinook and coho salmon. Because EFH has not been described for steelhead, the analysis is restricted to the effects of the proposed action on EFH for Chinook and coho salmon.

The area affected by the proposed action includes the Sandy River Basin (see Figure 1, above).

As described by PFMC (2003):

“Freshwater EFH for [C]hinook and coho salmon consists of four major components, (1) spawning and incubation; (2) juvenile rearing; (3) juvenile migration corridors; and (4) adult migration corridors and adult holding habitat.”

The aspects of EFH that might be affected by the proposed action include effects of hatchery operations on ecological interactions in spawning and rearing areas.

3.2. Adverse Effects on Essential Fish Habitat

The proposed action generally does not have effects on the major components of EFH. Spawning and rearing locations and adult holding habitat are not expected to be affected by the operation of the program, as no modifications to these areas would occur, and no structures that would impede migration are included or proposed to be constructed. Potential effects on EFH by the proposed action are only likely to occur in areas that spring Chinook and coho salmon spawn naturally and in the migration corridor in the Sandy River.

As described in section 2.4.3, water withdrawal for hatchery operations can adversely affect salmon by reducing streamflow, impeding migration, or reducing other stream-dwelling organisms that could serve as prey for juvenile salmonids. Water withdrawals can also kill or injure juvenile salmonids through impingement upon inadequately designed intake screens or by entrainment of juvenile fish into the water diversion structures. The proposed hatchery program includes designs to minimize each of these effects. Criteria for surface water withdrawal are set to avoid impacts on spring Chinook salmon and steelhead spatial structure. Further, the amount of water to be removed will be largely returned to the river approximately 900 feet from the point of withdrawal and the intake is screened in compliance with NMFS criteria.

The PFMC (2003) recognized concerns regarding the “genetic and ecological interactions of hatchery and wild fish … [which have] been identified as risk factors for wild populations.” The biological opinion describes in considerable detail the impacts hatchery programs might have on natural populations (see section 2.4.3 above); greater detail on possible effects of hatchery
programs can be found in NMFS (2011b). The potential effects, in this case, are adverse effects resulting from increased competition for spawning and rearing sites. Hatchery fish returning to the Sandy River are expected to spawn and may compete for space with spring Chinook salmon or coho salmon or steelhead. Some Sandy River hatchery fish may stray into other rivers but not in numbers that would cause the carrying capacities of natural production areas to be exceeded, or that would result in increased incidence of disease or increases in predators. Predation by adult Sandy River hatchery fish on juvenile natural-origin salmonids would not occur due to timing differences and the fact that adult salmon stop feeding by the time they reach spawning areas, and predation by juvenile offspring of Sandy River hatchery fish on juvenile natural-origin salmonids would not occur for reasons discussed in section 2.4.3.

### 3.3. Essential Fish Habitat Conservation Recommendations

For each of the potential adverse effects by the proposed action on EFH for Chinook and coho salmon, NMFS believes that the proposed action, as described in in the HGMPs and the ITS (section 2.9, above) includes the best approaches to avoid or minimize those adverse effects. The Reasonable and Prudent Measures and Terms and Conditions included in the ITS constitute NMFS recommendations to address potential EFH effects. NMFS shall ensure that the ITS, including Reasonable and Prudent Measures and implementing Terms and Conditions, are carried out.

The biological opinion explicitly discusses the potential risks of hatchery fish on native fish populations and their ecosystems, and describes operation and monitoring appropriate to minimize these risks on salmon in the Sandy River Basin. As a result, NMFS has not identified any additional conservation recommendations.

### 3.4. Statutory Response Requirement

As required by section 305(b)(4)(B) of the MSA, the Federal agency must provide a detailed response in writing to NMFS within 30 days after receiving an EFH Conservation Recommendation from NMFS. Such a response must be provided at least 10 days prior to final approval of the action if the response is inconsistent with any of NMFS’ EFH Conservation Recommendations, unless NMFS and the Federal agency have agreed to use alternative time frames for the Federal agency response. The response must include a description of measures proposed by the agency for avoiding, mitigating, or offsetting the impact of the activity on EFH. In the case of a response that is inconsistent with NMFS Conservation Recommendations, the Federal agency must explain its reasons for not following the recommendations, including the scientific justification for any disagreements with NMFS over the anticipated effects of the action and the measures needed to avoid, minimize, mitigate, or offset such effects [50 CFR 600.920(k)(1)].

NMFS analyzed and determined that the effects of the action on EFH are likely within the range of effects considered in the ESA portion of the opinion, and concluded that the proposed hatchery programs are not likely to adversely affect Pacific Salmon EFH. There will be minimal disturbance of vegetation, and negligible harm to spawning and rearing habitat, and to water quantity and water quality. The small effects on EFH might occur as a result of facility
operations on habitat or transitory impacts on the migration corridor would be adequately addressed by the steps described in the HGMPs. Because NMFS has found that the action is not likely to adversely affect EFH, there is not statutory response requirement.

In response to increased oversight of overall EFH program effectiveness by the Office of Management and Budget, NMFS established a quarterly reporting requirement to determine how many conservation recommendations are provided as part of each EFH consultation and how many are adopted by the action agency. Therefore, in our statutory reply to the EFH portion of this consultation, NMFS will clearly identify the number of conservation recommendations accepted.

3.5. Supplemental Consultation

NMFS will reinitiate EFH consultation if the proposed action is substantially revised in a way that may adversely affect EFH, or if new information becomes available that affects the basis for NMFS’ EFH conservation recommendations [50 CFR 600.920(l)].

4. Data Quality Act Documentation and Pre-Dissemination Review

Section 515 of the Treasury and General Government Appropriations Act of 2001 (Public Law 106-554) (“Data Quality Act”) specifies three components contributing to the quality of a document. They are utility, integrity, and objectivity. This section of the opinion addresses these DQA components, document compliance with the Data Quality Act, and certifies that this opinion has undergone pre-dissemination review.

4.1. Utility

NMFS has determined, through this ESA section 7 consultation, that operation of the Sandy Hatchery programs as proposed will not jeopardize ESA-listed species and will not destroy or adversely modify designated critical habitat. Therefore, NMFS can issue an ITS. The intended user is ODFW. The scientific community, resource managers, and stakeholders benefit from the consultation through the anticipated increase in returns of salmonids to the Columbia and Sandy Rivers, and through the collection of data indicating the potential effects of the operation on the viability of natural populations of ESA-listed salmon and steelhead in the Sandy River Basin. This information will improve scientific understanding of hatchery salmon and steelhead effects that can be applied broadly within the Pacific Northwest area for managing benefits and risks associated with hatchery operations.

4.2. Integrity

This consultation was completed on a computer system managed by NMFS in accordance with relevant information technology security policies and standards set out in Appendix III, “Security of Automated Information Resources,” Office of Management and Budget Circular A-130; the Computer Security Act; and the Government Information Security Reform Act.
4.3. **Objectivity**

Standards: This consultation and supporting documents are clear, concise, complete, and unbiased, and were developed using commonly accepted scientific research methods. They adhere to published standards including the NMFS ESA Consultation Handbook, ESA Regulations, 50 CFR 402.01 et seq., and the MSA implementing regulations regarding EFH, 50 CFR 600.920(j).

Best Available Information: This consultation and supporting documents use the best available information, as described in the references section. The analyses in this biological opinion/EFH consultation contain more background on information sources and quality.

Referencing: All supporting materials, information, data, and analyses are properly referenced, consistent with standard scientific referencing style.

Review Process: This consultation was drafted by NMFS staff with training in ESA and MSA implementation, and reviewed in accordance with Northwest Region ESA quality control and assurance processes.

5. **References**


Jones, R. 2009a. Letter from Rob Jones to Interested Parties offering guidance and assistance to ensure hatchery programs in the Upper Columbia River are in compliance with the ESA. February 6, 2009. NMFS, Portland, Oregon. 3p. plus attachments.


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NMFS. 2007b. Endangered Species Act – Section 7 Consultation Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation on the Habitat Restoration Program submitted by the State of Washington, Governor’s Salmon Recovery Office, or ESA Section 4(d) Limit 8. NMFS, Portland, Oregon.


Walton, R. 2008. September 12, 2008, letter from Rob Walton to interested Parties regarding NMFS’ intent to conduct consultations under the ESA. NMFS, Portland, Oregon. 2p with attachments.


