UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
West Coast Region
1201 NE Lloyd Boulevard, Suite 1100
Portland, OR 97232

Refer to NMFS No:
WCR-2016-5278

February 17, 2017

Michelle Walker
Chief, Regulatory Branch
U.S. Army Corps of Engineers, Seattle District
CENSW-OD-RG
Post Office Box 3755
Seattle, Washington 98124-3755

Re: Endangered Species Act Section 7(a)(2) Biological Opinion and Letter of Concurrence and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Response for the Integrated Restoration and Permitting Program (IRPP) for Lakes Washington and Sammamish

Dear Ms. Walker:

Thank you for your letter of September 12, 2016 requesting formal consultation with NOAA's National Marine Fisheries Service (NMFS) pursuant to section 7 of the Endangered Species Act of 1973 (ESA) (16 U.S.C. 1531 et seq.) for your permitting actions for projects participating in the Integrated Restoration and Permitting Program (IRPP) for Lakes Washington and Sammamish. By agreement, NMFS is the lead federal action agency for IRPP. Thank you, also, for your request for consultation pursuant to the essential fish habitat (EFH) provisions in section 305(b) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA)(16 U.S.C. 1855(b)) for this action.

In this opinion, we conclude that the proposed action is not likely to jeopardize the continued existence of Puget Sound (PS) Chinook salmon (*Oncorhynchus tshawytscha*) and PS steelhead (*O. mykiss*) and will not result in the destruction or adverse modification of PS Chinook salmon designated critical habitat. Further, we concur with the determination that the proposed action is not likely to adversely affect southern resident killer whales (*Orcinus orca*).

As required by section 7 of the ESA, we are providing an incidental take statement with the opinion. The incidental take statement describes reasonable and prudent measures we consider necessary or appropriate to minimize incidental take associated with this action. The take statement sets forth nondiscretionary terms and conditions, including reporting requirements that the NMFS, the Corps, and any person who performs the action must comply with to carry out the reasonable and prudent measures. Incidental take from actions that meet these terms and conditions will be exempt from the ESA take prohibition.

This document also includes the results of our analysis of the action's likely effects on essential fish habitat (EFH) pursuant to section 305(b) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA), and includes two conservation recommendations to avoid, minimize, or otherwise offset potential adverse effects on EFH. One of these conservation recommendations are a subset of the ESA take statement's terms and conditions. Section 305(b) (4) (B) of the MSA requires Federal agencies to provide a detailed written response to NMFS within 30 days after receiving these recommendations.

If the response is inconsistent with the essential fish habitat conservation recommendation, the NMFS and the Corps must explain why the recommendation will not be followed, including the scientific justification for any disagreements over the effects of the action and the recommendation. In response to increased oversight of overall essential fish habitat 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 essential fish habitat consultation and how many are adopted by the action agency. Therefore, we request that, in your statutory reply to the essential fish habitat portion of this consultation, you clearly identify the conservation recommendation accepted.

Please contact Mike Lisitza of my staff at the Oregon Washington Coastal Office at (206) 526-6145, or email at mike.lisitza@noaa.gov if you have any questions concerning this consultation, or if you require additional information.

Sincerely,

Barry A. Thom
Regional Administrator

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

Integrated Restoration and Permitting Program (IRPP) for Lakes Washington and Sammamish

NMFS Consultation Number: WCR-2016-5278

Action Agencies: National Marine Fisheries Service
U.S. Army Corps of Engineers

Affected Species and NMFS' Determinations:

ESA-Listed Species	Status	Is Action Likely to Adversely Affect Species /Critical Habitat?	Is Action Likely To Jeopardize the Species?	Is Action Likely To Destroy or Adversely Modify Critical Habitat?
Puget Sound Chinook salmon	Threatened	Yes/Yes	No	No
Puget Sound steelhead	Threatened	Yes/No	No	No
Southern Resident Killer Whale	Endangered	No/No	No	No

Fishery Management Plan That Describes EFH in the Project Area	Does Action Have an Adverse Effect on EFH?	Are EFH Conservation Recommendations Provided?
Pacific Coast Salmon	Yes	Yes

Consultation Conducted By: National Marine Fisheries Service,
West Coast Region

Issued By:

Barry A. Thom
Regional Administrator

Date: February 17, 2017

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1. INTRODUCTION

This Introduction section provides information relevant to the other sections of this document and is incorporated by reference into Sections 2 and 3 below.

1.1 Background

The National Marine Fisheries Service (NMFS) prepared the biological opinion (opinion) and incidental take statement portions of this document in accordance with section 7(b) of the Endangered Species Act (ESA) of 1973 (16 USC 1531 et seq.) and implementing regulations at 50 CFR 402. We also completed an essential fish habitat (EFH) consultation on the proposed action 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.

We completed pre-dissemination review of this document using standards for utility, integrity, and objectivity in compliance with applicable guidelines issued under the Data Quality Act (section 515 of the Treasury and General Government Appropriations Act for Fiscal Year 2001, Public Law 106-554). A complete record of this consultation is on file at the Oregon Washington Coastal Area Office.

1.2 Consultation History

Over the course of the last 15 years, NMFS has conducted hundreds of consultations on the construction and maintenance of over-water structures in lakes Washington and Sammamish in King County, Washington. Because the majority of these actions were repetitive and had predictable effects, many of these past projects were covered under programmatic consultations with the US Army Corps of Engineers' Seattle District (Corps). However, all of those programmatic consultations have since expired.

On March 10, 2015, Karen Urelius, ESA Coordinator for the Corps, convened a meeting of regulatory agencies and the Muckleshoot Indian Tribe Fisheries Division (MITFD) to discuss permitting issues and mitigation for projects in lakes Washington and Sammamish. Representatives from NMFS, the Corps, the Washington State Department of Fish and Wildlife (WDFW), and the MITFD attended. We agreed that, with an integrated programmatic approach, we could both speed permit approvals and increase the conservation of fisheries resources.

Below is a chronology of meetings that took place as part of this consultation:

April 3, 2015: Karen Urelius, David Hirsh (acting NMFS Branch Chief), Sean Callahan (NMFS), and Mike Lisitza (NMFS contractor) met to further discuss a programmatic ESA consultation for lakes Washington and Sammamish.

July 22, 2015: Karen Urelius and Mike Lisitza met to kick off the programmatic ESA consultation.

August 3 and 5, 2015: Mike Lisitza met with the Corps at their office to collect data on past projects from the Corps' files to determine an appropriate scope for the program.

September 1, 2015: Mike Lisitza, Karen Urelius, Kristina Tong (Corps manager), Gail Terzi (Corps Mitigation Specialist), and Suzanne Anderson (Corps Mitigation Specialist) met to discuss King County's In-lieu Fee program.

September 24, 2015: Mike Lisitza and Sean Callahan met with representatives of WDFW to discuss the developing framework of the program and its compatibility with State laws, regulations, and policy.

September 29, 2015: Mike Lisitza met with Karen Walter (Watershed and Land Use Team Leader, MITFD) to discuss the program. Among other comments, Karen voiced opposition to covering any pier projects in the Lake Washington ship canal because, in many areas of the ship canal, docks abut the navigation channel leave no place for tribal fishing activities.

October 9, 2015: Mike Lisitza met with the Corps student intern to review data collection for the program.

October 21, 2015: Mike Lisitza met with Matthew J. Baerwalde, Water Quality Manager for the Snoqualmie Indian Tribe Environmental and Natural Resources Department (SITENRD), and other representatives of the Snoqualmie Tribe to introduce the program and solicit feedback.

December 16, 2015: Mike Lisitza met with Karen Urelius and Kristina Tong to discuss the development of the program. Mike informed the Corps that, once the new programmatic is implemented, projects that do not qualify for the program must request individual consultation. We also discussed which agency should be the lead agency for the consultation. Mike proposed that NMFS be the lead agency on the consultation.

December 31, 2015: Meeting between Mike Lisitza, Karen Urelius, and Kristina Tong to follow up on topics from December 16. Kristina conveyed the Corps' support for NMFS being the lead agency for the program.

January 15, 2016: Mike Lisitza called Matthew J. Baerwalde to follow up on concerns regarding riparian planting plans for Lake Sammamish pier and shoreline projects. At Mike's request, Matt emailed several examples from past projects.

January 21, 2016: Mike Lisitza and Karen Urelius met with Susan Buis (Corps compliance) to discuss applicant compliance with Corps permit regulations in the Lake Washington watershed.

January 21, 2016: Mike Lisitza, Karen Urelius, Gail Terzi, and Kristina Tong met with Megan McNeil (King County Mitigation Reserves Program Manager) to discuss the role of King County's Mitigation Reserves Program in the programmatic.

March 1, 2016: Mike Lisitza met with Karen Urelius to give an update on the progress of the programmatic effort.

March 14-28, 2016: Email correspondence between Mike Lisitza, Karen Urelius, and Kristina Tong regarding the Corps letter to request to join the consultation.

March 29, 2016: Mike Lisitza met with Karen Walter, Holly Coccoli (Habitat Program Manager, MITFD), Glen St. Amant (Habitat Program Manager, MITFD), and Eric Warner (Fisheries Biologist, MITFD) to discuss the developing program.

May 20, 2016: Mike Lisitza met with Megan McNeil to discuss the Memorandum of Agreement between NMFS and King County.

May 24, 2016: Mike Lisitza emailed the first draft of the Implementation Guide to King County, the Corps, the MITFD, the SITENRD, the Department of Ecology (Ecology), and WDFW for comment.

May 27, 2016: Christa Heller of WDFW emailed comments on the first draft.

June 6, 2016: Joe Bucar of the Washington State Department of Ecology (Ecology), Megan McNeil, and Karen Urelius and Kristina Tong emailed comments on the first draft.

June 10, 2016: Mike Lisitza met with Karen Urelius and Kristina Tong to discuss their comments on the draft program description and the Corps request for consultation letter.

July 7, 2016: Mike Lisitza emailed a second draft of the program description to King County, the Corps, the MITFD, SITENRD, Ecology, and WDFW for additional comment.

July 18, 2016: Mike Lisitza met with Karen Urelius and Kristina Tong to discuss their comments on the second draft program description.

July 21, 2016: Matthew J. Baerwalde emailed comments on the second draft of the Implementation Guide.

July 22, 2016: Karen Walter emailed a request to meet with NMFS and the Corps to discuss the program.

August 5, 2016: We determined the proposed action(s) may affect and is likely to adversely affect Puget Sound (PS) Chinook salmon, PS steelhead, and their critical habitat. NMFS initiated an internal formal consultation on September 2, 2016 in relation to its action in entering a Memorandum of Agreement (MOA) for the program.

September 12, 2016: The Corps mailed a letter to NMFS requesting formal consultation for its permitting activities that would fall under the program.

1.3 Proposed Action

"Action" means all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by Federal agencies (50 CFR 402.02).

This consultation involves two action agencies (NMFS and the Corps) and two separate but related proposed actions. Both proposed actions relate to the Integrated Restoration and Permitting (IRPP - rhymes with "chirp") for Lakes Washington and Sammamish.

IRPP is a voluntary program to promote shoreline habitat restoration, environmentally friendly pier and shoreline designs, and streamlined environmental permitting. IRPP will cover pier and shoreline projects that require authorization from the Corps and are located within and on the shores of lakes Washington and Sammamish. Because of the objections of the MITFD, different shoreline character, and different limiting factors for listed species, IRPP will not cover projects in the Lake Washington Ship Canal (LWSC) and Lake Union.

The program was designed in cooperation with the Corps, King County, WDFW, MITFD, and SITENRD, and Ecology. IRPP consolidates the existing minimization and restoration measures for pier and shoreline projects required by the various regulatory agencies into a single set of mandatory minimum design criteria. It also includes a conservation fee and credit schedule. Credits are given for on-site minimization and restoration measures and fees only apply if such measures are insufficient; thus, the fee and credit schedule is structured to encourage on-site restoration. Conservation fees will be paid to King County's existing Mitigation Reserves Program (MRP). More details of the program are set out below.

NMFS proposes to enter into a MOA with King County, under which NMFS and the County commit to certain responsibilities related to the administration and functioning of IRPP. Our authorities to enter into this Agreement include: the Fish and Wildlife Coordination Act, 16 U.S.C. 661, et seq.; the Endangered Species Act of 1973, 16 U.S.C. 1531 et seq.; the Magnuson-Stevens Fishery Conservation and Management Act, 16 U.S.C 1801 et seq., and other applicable laws and regulations. Under the MOA, NMFS will provide technical assistance to applicants to help them develop projects that comply with IRPP; will provide technical assistance to the Corps in determining if a project ultimately does comply with IRPP; will provide technical assistance to the County to determine if a restoration project provides benefits to listed fish and their habitats that were impacted by IRPP projects that contributed fees; and, as resources allow, will assist the County with restoration projects by providing engineering and/or design support. The MOA is a five-year agreement, however, NMFS and King County expect to renew the MOA every five years for the foreseeable future.

The Corps has requested section 7 consultation on its issuance of permits for the suite of projects that fall under IRPP. Based on their review of the draft program, the Corps anticipates they will issue up to 100 permits per year in Lake Washington and 50 permits per year in Lake Sammamish for projects covered under the IRPP. They will authorize the projects by either regional general permit, nationwide permit, letter of permission, or standard individual permit under section 10 of the Rivers and Harbors Act of 1899 and section 404 of the Clean Water Act. For permitting actions for projects within lakes Washington and Sammamish that do not meet the requirements of IRPP or are outside the geographic area of the program, the Corps will need to conduct a separate section 7 consultation, i.e., submit a Biological Assessment/ Biological Evaluation to NMFS (typically prepared and submitted to the Corps by the applicant's representative) with a request for concurrence with a not likely to adversely affect determination or a request for formal consultation pursuant to section 7 of the Endangered Species Act of 1973 (ESA) (16 U.S.C. 1531 et seq.) and its implementing regulations. This is the typical process for proposed actions that may affect listed species or critical habitat and do not qualify for coverage under a programmatic consultation.

IRPP Implementation Guide

The IRPP Implementation Guide (IG) provides information about IRPP to applicants, resources agencies, local governments, and Native American tribes. This document gives background on the need for and development of IRPP. It provides detailed instructions for applicants on how to participate in the program including the Project Notification Form. It lays out the procedures for the processing and approval of individual projects. It also includes the fee and credit schedule with instructions and examples of how to calculate the fees and credits. The IG also describes the roles of NMFS, the Corps, King County, WDFW, the MITFD, and the SITENRD in administering the program. The IG will function as the primary governing document of IRPP. NMFS will adaptively manage IRPP and will make changes to the IG as necessary to increase efficiency, increase conservation of listed species, decrease adverse effects to listed species, and to meet our tribal trust responsibilities.

Restoration Projects Funded by Conservation Fees

The conservation fees will be paid to the County's existing Mitigation Reserves Program to fund restoration projects within the two lakes. The conservation fees are designed to offset, in part, the past, present, and future impacts of in-water structures and shoreline modifications on aquatic and shoreline habitat. Funds resulting from Lake Washington impact projects will be used on projects on the Lake Washington shoreline (including the Lake Washington Ship Canal), and funds resulting from Lake Sammamish impact projects will be used on projects on the Lake Sammamish shoreline. Tributaries to the lakes, from the confluence with the lake up to and including the first road crossing, are part of the lake shorelines for the purposes of determining the appropriate geographic area for restoration projects.

Administration

Below are the steps for processing individual projects under IRPP. The Corps will provide information to interested applicants on how to participate in IRPP on their website. This information will include the project notification form (PNF) and the contact information for the NMFS staff lead. NMFS, the County, and the Corps will process individual projects covered in this Opinion using the procedures from the IG that are summarized below. As described above, NMFS may make changes to the IG as necessary to increase efficiency, increase conservation of listed species, decrease adverse effects to listed species, and to meet our tribal trust responsibilities.

1. The applicant will submit via email a draft PNF, obtained from the Corps' website, to NMFS prior to submitting the JARPA to the Corps. NMFS will provide applicants technical assistance on how to comply with the requirements of the program.

2. NMFS will also forward the draft PNF to the affected tribes. After receiving a response from the tribes, NMFS will forward their comments to the applicant along with NMFS's technical assistance. NMFS will generally request the affected tribes send their comments within two weeks.

3. The applicant will submit the revised PNF to the Corps. The PNF will contain sufficient detail about the action design and construction to ensure the proposed action is consistent with all provisions of IRPP.

4. The Corps will review the PNF to determine if it meets the requirements of IRPP. If so, the Corps will send the PNF to NMFS and request confirmation of that assessment.

5. Within 30 days, NMFS will notify the Corps via email as to whether NMFS agrees that the project meets the conditions of IRPP.

6. The Corps will condition the permit on compliance with all of the applicable conditions of IRPP, including the payment of any conservation fees to the County within 60 days of the applicant receiving the permit.

7. The Corps will notify NMFS, the County, and affected tribes if they have issued an authorization for a project covered under this program and will identify any conservation fees.

8. The County will notify NMFS, the Corps, and affected tribes when they have received the fees.

9. As a condition of the Corps permit, for every individual project covered under this Opinion, the applicant will be required to submit to NMFS and the Corps a project completion form (PCF) via email. The PCF will include the following information:

    a) The results of any monitoring required in the project approval email; and
    b) Post-construction project photographs.

In order to administer the program, NMFS, the Corps, King County, WDFW, MITFD, and SITENRD will meet by March 31 of each year at NOAA's Western Regional Center in Seattle's Sand Point neighborhood or at an alternate, mutually agreeable site. The purpose of the meeting will be to:

1. Review the projects approved during the prior calendar year;

2. Discuss any changes that will improve conservation or make the program more efficient;

3. Check for any new species listings, critical habitat designations, and changes of status of currently listed species;

4. Review the fees collected;

5. Discuss potential restoration sites; and

6. Review any implemented restoration projects.

<u>Excluded Activities</u>

One of the primary purposes of the program is to improve habitat in the lakes. In order to ensure the program as a whole will achieve this goal, some activities are excluded from the program. Another goal is to be as consistent as possible with local, State, and federal requirements. Therefore, activities that are prohibited by other agencies are excluded (e.g. impact pile driving is excluded by the US Fish and Wildlife Service's programmatic approval of piers in the lakes). The following activities are excluded from coverage under IRPP:

1. New bulkheads, bulkhead extensions or enlargements, or bulkhead repairs that encroach further waterward of the OHWM;
2. Dredging;
3. New boathouses;
4. Pier skirting;
5. Use of treated wood for any in-water structures or components (unless coated with polyvinyl chloride (PVC), or another material that the Corps and NMFS determine is effective at preventing the leaching of wood preservatives and pesticides;
6. Use of galvanized steel for any in-water components;
7. Use of piles greater than eight inches in diameter;
8. Impact pile driving and proofing;
9. Placing boulders below the OHWM; and
10. Covering grated decking.

<u>Types of Projects</u>

IRPP covers the activities described below. An individual project may involve one or more of these activities. IRPP has specific requirements for activities in the nearshore; it defines the nearshore as all areas within 30 feet of OHW ***and*** all areas less than 15 feet deep.

Piers and Floats

Pier projects are the most common type of project conducted in the two lakes. The vast majority of these projects are pier repairs. In order to anticipate the number of pier projects that could be expected under IRPP per year, data from WDFW's Hydraulic Project Approval (HPA) "Apps" database was analyzed for pier projects in the two lakes from July 2014 to October 2015 (Tables

1 and 2). Apps was used because it is the only properly functioning database maintained by any of the permitting agencies.

Table 1. New Piers between July2014-October 2015

Lake	# of New Piers	Average Size (ft^2)
Washington	4	343
Sammamish	4	464

Table 2. Pier Replacements and Repairs between July2014-October 2015

Lake	# of Projects	Average Final Size (ft^2)	Average Increase (ft^2)
Washington	75	917	7
Sammamish	25	539	33

Many replacement and repair projects reduced the area of over-water cover and many increased it. As a result, the over-water coverage in both lakes is expected to increase under the proposed action. Table 2 shows the average net change for the time period in which data was collected. Based on this analysis, the annual increase in over water structures permitted under IRPP is expected to be 525 square feet for Lake Washington and 825 square feet for Lake Sammamish.

<u>Design Criteria for New Piers and Floats</u>

All new piers must meet the following criteria:

1. The deck can be no more than four feet wide in the nearshore and total no more than 480 square feet of over-water coverage;
2. The underside of the pier must be a minimum of 18 inches above the OHWM in the nearshore;
3. Piles must be eight inches in diameter or smaller;
4. The pier deck must be 100 percent grated with grating with a minimum of 40 percent open space;
5. No floats can be placed in the nearshore;
6. The applicant must implement a riparian vegetation plan that earns at least 5 points from the *Green Shores for Homes: Credits and Ratings Guide* (Appendix A) and includes at least one Pacific or Sitka willow that will overhang the lake (unless NMFS advises that achieving 5 points is not feasible for the particular property);
7. The applicant must conduct all in-water work within the windows in Appendix B (although an extension of up to two weeks can be approved if conservation fees for associated environmental impacts are paid to King County's MRP, as described in the IG); and
8. Artificial night lighting on and from overwater structures must be minimized by focusing the light on the piers surface, and using shades that minimize illumination of the surrounding environment and reduces glare on the water surface. The visible light

emitted by an individual fixture shall not exceed 450 lumens, and the total visible light emitted by all fixtures on a pier shall not exceed 2,700 lumens.

Replacement Piers and Floats

The Shoreline Management Plans (SMPs), developed in compliance with the State of Washington's Shoreline Management Act, of local jurisdictions determine whether a project is classified as a repair or replacement. The SMPs typically require replacement piers to meet the same size requirements as new piers. However, the SMPs sometimes include language that allows for larger piers if other agencies (WFDW, the Corps, and/or NMFS) authorize the project. Each of these other agencies lack the statutory authority to deny approval of larger piers simply on the basis that they are larger. This results in many pier replacement projects where the piers exceed the SMP size requirements for new piers. For the purposes of IRPP, pier replacements will be held to the design criteria described for pier repair projects. However, approval for a project to participate in IRPP does not authorize any exemption or exception to exceed the size requirements for replacement piers in any SMP. Local jurisdictions should not interpret participation in IRPP as an authorization to exceed the size requirements in their SMPs.

Pier Repair Design Criteria

Pier repairs include the repair and replacement of the decking, the splicing or other repair of piles, etc. Pier repairs often include reconfiguring the existing dock and increasing or decreasing the area of over-water cover. All pier repair projects must meet the following criteria:

1. Remove all creosote-treated wood;
2. Remove all skirting;
3. Implement a riparian vegetation plan that earns at least 5 points from the *Green Shores for Homes: Credits and Ratings Guide* (Appendix A) and includes at least one Pacific or Sitka willow that will overhang the lake (unless NMFS certifies that achieving 5 points is not feasible for the particular property);
4. During maintenance that involves replacement of treated wood, existing treated wood must be replaced with alternative materials such as untreated wood, steel, concrete, or recycled plastic, or encased with polyvinyl chloride (PVC) or another material that is equally effective at preventing the leaching of wood preservatives and pesticides;
5. The deck must be 100 percent grated with a minimum of 40 percent open space;
6. The applicant must conduct all in-water work within the windows in Appendix B (although an extension of up to two weeks can be approved if conservation fees for associated environmental impacts are paid to King County's MRP, as described in the IG); and
7. Artificial night lighting on and from overwater structures must be minimized by focusing the light on the piers surface, and using shades that minimize illumination of the surrounding environment and reduces glare on the water surface. The visible light emitted by an individual fixture shall not exceed 450 lumens, and the total visible light emitted by all fixtures on a pier shall not exceed 2,700 lumens.

Bulkhead Repairs and Removals

IRPP does not cover new bulkheads or bulkhead extensions or enlargements, but it does include bulkhead repairs and removals. To inform an assessment of the likely number of repair and removal projects under IRPP, an analysis was done of IRWDFW's Hydraulic Project Approval (HPA) database for bulkhead repair projects in the two lakes from July 2014 to October 2015. There were 18 projects in Lake Washington and one in Lake Sammamish. Bulkhead repairs were often part of larger projects.

The conservation fee and credit schedule strongly incentivizes partial or full bulkhead removal. Partial bulkhead removal typically includes the creation of a pocket beach filled with gravel. While we cannot predict how many applicants will choose bulkhead removal over paying conservation fees, given the financial incentives, it is assumed that IRPP will result in at least a small reduction in shoreline armoring every year but past data is otherwise considered to provide a general guide to the projects expected under IRPP.

All bulkhead repairs and removals must meet the following criteria:

1. Bulkhead repairs cannot extend further along the shoreline or towards the lake than the existing shoreline protection;
2. The applicant must conduct all in-water work within the windows in Appendix B (although an extension of up to two weeks can be approved if conservation fees for associated environmental impacts are paid to King County's MRP, as described in the IG); and
3. The applicant must implement a riparian vegetation plan that earns at least 5 points from the *Green Shores for Homes: Credits and Ratings Guide* (Appendix A) and includes at least one Pacific or Sitka willow that will overhang the lake (unless NMFS certifies that achieving 5 points is not feasible for the particular property).

Boat and Personal Water Craft Lifts

To inform an assessment of the likely number of water craft life projects under IRPP, an analysis was done of WDFW's Hydraulic Project Approval (HPA) database for boat lift and personal water craft (PWC) lift projects in the two lakes from July 2014 to October 2015. There were 32 lifts projects in Lake Washington and 10 in Lake Sammamish. Boat lifts and PWCs were often, but not always, part of larger pier renovation projects. This data is considered to provide a general guide to the projects expected under IRPP.

All lift projects under IRPP must meet the following criterion:

1. The applicant must conduct all in-water work within the windows in Appendix B (although an extension of up to two weeks can be approved if conservation fees for associated environmental impacts are paid to King County's MRP, as described in the IG).

Gravel Placement and Debris Removal

Pier and bulkhead projects commonly include gravel placement and trash and in-water debris removal. Typically, 20 to 50 cubic yards of gravel is placed per project. For IRPP projects, all gravel placement and in-water debris removal must meet the following criteria:

1. The gravel must be clean (minimal fine sediments);
2. Gravel size in and near areas with documented spawning of non-native sockeye salmon must be 2-inch minus;
3. Outside of these areas, the gravel must be 1-inch minus;
4. Larger sized gravel, rocks, or boulders cannot be placed within the gravel; and
5. The applicant must conduct all in-water work within the windows in Appendix B (although an extension of up to two weeks can be approved if conservation fees for associated environmental impacts are paid to King County's MRP, as described in the IG).

"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 (50 CFR 402.02). Recreational boating is a potential interrelated or interdependent activity. However, while precise numbers are unavailable, the existence of multiple public ramps and launches and anecdotal evidence provides a reasonable basis to assume that many boats access the two lakes via public boat ramps and launches, and in the case of Lake Washington, from Puget Sound through the locks. Lake Washington has at least 10 public boat launches (e.g. Magnuson Park, which has four ramp lanes and two large parking lots reserved for vehicles with trailers).[1] Lake Sammamish has a large boat launching facility at Lake Sammamish Park offering nine 12-by-30-feet launch ramps (and parking for 250 car / boat-trailer combinations).[2] As a result, there is weak correlation between the number of overwater structures and the level of boating in the lakes. Because of the other points of access, we expect that boating in the lakes would occur in significant numbers and could increase in intensity even without additional piers. For this reason, we do not consider boating to be an activity that is interrelated or interdependent on pier projects approved under IRPP. In the environmental baseline section, we describe current boating activity and in the effects and cumulative effects sections, we describe the future effects of this activity.

1.4 Action Area

"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 for this project includes the shorelines of lakes Washington and Sammamish and aquatic areas within 250 feet of the shorelines due to the impacts from the presence, construction, and maintenance of in-water structures and all navigable areas of the two lakes due to boating activity. The action area is occupied by PS Chinook salmon and PS steelhead. The Lake Washington portion of the action areas is critical habitat for PS Chinook salmon (but not for PS steelhead). The entire action area is EFH for coho salmon and Chinook salmon (PFMC 2014).

[1] https://www.seattle.gov/parks/find/parks/magnuson-park/boat-launch
[2] http://parks.state.wa.us/533/Lake-Sammamish

2. ENDANGERED SPECIES ACT: BIOLOGICAL OPINION AND INCIDENTAL TAKE STATEMENT

The ESA establishes a national program for conserving threatened and endangered species of fish, wildlife, plants, and the habitat upon which they depend. As required by section 7(a)(2) of the ESA, Federal agencies must 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. Per the requirements of the ESA, Federal action agencies consult with NMFS and section 7(b)(3) requires that, at the conclusion of consultation, NMFS provides an opinion stating how the agency's actions would affect listed species and their critical habitat. If incidental take is expected, section 7(b)(4) requires NMFS to provide an incidental take statement (ITS) that specifies the impact of any incidental taking and includes non-discretionary reasonable and prudent measures and terms and conditions to minimize such impacts.

2.1 Analytical Approach

This biological opinion includes both a jeopardy analysis and an adverse modification analysis.

The jeopardy analysis relies upon the regulatory definition of "to jeopardize the continued existence of a listed species," which is "to engage in an action that would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species" (50 CFR 402.02). Therefore, the jeopardy analysis considers both survival and recovery of the species.

The adverse modification analysis considers the impacts of the Federal action on the conservation value of designated critical habitat. This biological opinion relies on the definition of "destruction or adverse modification", which "means a direct or indirect alteration that appreciably diminishes the value of critical habitat for the conservation of a listed species. Such alterations may include, but are not limited to, those that alter the physical or biological features essential to the conservation of a species or that preclude or significantly delay development of such features" (81 FR 7214).

The designation of critical habitat for PS Chinook salmon uses the term primary constituent element (PCE) or essential features. The new critical habitat regulations (81 FR 7414) replace this term with physical or biological features (PBFs). The shift in terminology does not change the approach used in conducting a ''destruction or adverse modification'' analysis, which is the same regardless of whether the original designation identified PCEs, PBFs, or essential features. In this biological opinion, we use the term PBF to mean PCE or essential feature, as appropriate for the specific critical habitat.

We use the following approach to determine whether a proposed action is likely to jeopardize listed species or destroy or adversely modify critical habitat:

- Identify the range wide status of the species and critical habitat likely to be adversely affected by the proposed action.

- Describe the environmental baseline in the action area.
- Analyze the effects of the proposed action on both species and their habitat using an "exposure-response-risk" approach.
- Describe any cumulative effects in the action area.
- Integrate and synthesize the above factors to assess the risk that the proposed action poses to species and critical habitat.
- Reach jeopardy and adverse modification conclusions.
- If necessary, define a reasonable and prudent alternative to the proposed action.

2.2 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 habitats throughout the designated area, evaluates the conservation value of the various watersheds and coastal and marine environments that make up the designated areas, and discusses the current function of the essential physical and biological features that help to form that conservation value.

One factor affecting the status of ESA-listed species considered in this opinion, and aquatic habitat at large, is climate change. Climate change is likely to play an increasingly important role in determining the abundance of ESA-listed species, and the conservation value of designated critical habitats, in the Pacific Northwest. Climate change is expected to make recovery targets for these listed species more difficult to achieve. During the last century, average regional air temperatures increased by 1.5°F, and increased up to 4°F in some areas. Warming is likely to continue during the next century as average temperatures increase another 3 to 10°F. Overall, about one-third of the current cold-water fish habitat in the Pacific Northwest is likely to exceed key water temperature thresholds by the end of this century (USGCRP 2009).

Precipitation trends during the next century are less certain than for temperature but more precipitation is likely to occur during October through March and less during summer months, and more of the winter precipitation is likely to fall as rain rather than snow (ISAB 2007; USGCRP 2009). Where snow occurs, a warmer climate will cause earlier runoff so stream flows in late spring, summer, and fall will be lower and water temperatures will be warmer (ISAB 2007; USGCRP 2009). The earth's oceans are also warming, with considerable inter-annual and inter-decadal variability superimposed on the longer-term trend (Bindoff et al. 2007). Historically, warm periods in the coastal Pacific Ocean have coincided with relatively low abundances of salmon and steelhead, while cooler ocean periods have coincided with relatively high abundances (Scheuerell and Williams 2005; Zabel et al. 2006; USGCRP 2009).

<u>2.2.1 Status of Puget Sound Chinook Salmon</u>

We adopted the recovery plan for Puget Sound Chinook in January 2007. The recovery plan consists of two documents: the Puget Sound salmon recovery plan (Shared Strategy for Puget

Sound 2007) and a supplement by NMFS (2006). The recovery plan adopts ESU and population level viability criteria recommended by the PSTRT (Ruckelshaus et al. 2002). The PSTRT's biological recovery criteria will be met when the following conditions are achieved: all watersheds improve from current conditions, resulting in improved status for the species; at least two to four Chinook salmon populations in each of the five biogeographical regions of Puget Sound attain a "low" risk status over the long-term; at least one or more populations from major diversity groups historically present in each of the five Puget Sound regions attain a "low" risk status; tributaries to Puget Sound not identified as primary freshwater habitat for any of the 22 identified populations are functioning in a manner that is sufficient to support an ESU-wide recovery scenario; and production of Chinook salmon from tributaries to Puget Sound not identified as primary freshwater habitat for any of the 22 identified populations occurs in a manner consistent with ESU recovery. The listing unit and status of the 22 independent populations are described in Ford et al. (2011).

Spatial Structure and Diversity. This species includes all naturally spawned populations of Chinook salmon from rivers and streams flowing into Puget Sound including the Straits of Juan De Fuca from the Elwha River, eastward, including rivers and streams flowing into Hood Canal, South Sound, North Sound and the Strait of Georgia in Washington, and progeny of 26 artificial propagation programs (USDC 2014). The Puget Sound Technical Review Team (PSTRT) identified 22 independent populations, grouped into five major geographic regions, based on consideration of historical distribution, geographic isolation, dispersal rates, genetic data, life history information, population dynamics, and environmental and ecological diversity. Indices of spatial distribution and diversity have not been developed at the population level. Based on a Shannon Diversity Index at the ESU level, diversity is declining (due primarily to the increased abundance of returns to the Whidbey Basin region) for both distribution among populations and among regions (Ford et al. 2011). Overall, the new information on abundance, productivity, spatial structure and diversity since the 2005 status review does not indicate a change in the biological risk category (Ford et al. 2011).

Abundance and Productivity. No trend was notable for the total ESU escapements; while trends vary from decreasing to increasing among populations. Natural-origin pre-harvest recruit escapements remained fairly constant from 1985-2009. Returns (pre-harvest run size) from the natural spawners were highest in 1985, declined through 1994, remained low through 1999, increased in 2000 and again in 2001, declined through 2009, with high variability from year to year. Median recruits per spawner for the last 5-year period (brood years 2002-2006) is the lowest over any of the 5-year intervals. Many of the habitat and hatchery actions identified in the Puget Sound Chinook salmon recovery plan are likely to take years or decades to be implemented and to produce significant improvements in natural population attributes, and these trends are consistent with these expectations (Ford et al. 2011).

Limiting Factors. Limiting factors for this species include:

- Degraded floodplain and in-river channel structure
- Degraded estuarine conditions and loss of estuarine habitat
- Riparian area degradation and loss of in-river large woody debris
- Excessive fine-grained sediment in spawning gravel

- Degraded water quality and temperature
- Degraded nearshore conditions
- Impaired passage for migrating fish
- Severely altered flow regime

The current status of the ESU is poor. Abundance across the ESU has generally decreased between 2010 and 2014, with only 6 small populations of 22 total populations showing a positive change in natural-origin spawner abundances. The ESU is split into five Major Population Groups (MPGs). The Lake Washington populations are within the South MPG along with the Green, White, Puyallup, and Nisqually populations. Recovery criteria for the ESU includes 2 to 4 Chinook populations in each of the MPGs within the ESU achieve viability and that the populations that do not meet the viability criteria for all 4 VSP parameters are sustained in order to provide ecological functions and preserve options for ESU recovery. Given the extensive and intense development in the Lake Washington watershed, the Lake Washington populations are the least likely in the South MPG to achieve viability (NWFSC 2015).

2.2.2 Status of Puget Sound Steelhead

A recovery plan is being developed for this species. The PS Steelhead TRT has produced viability criteria, including population viability analyses (PVAs), for 20 of 32 demographically independent populations (DIPs) and three major population groups (MPGs) in the DPS (Hard et al. 2015). It also completed a report identifying historical populations of the DPS (Myers et al. 2015). The DIPs are based on genetic, environmental, and life history characteristics. Populations display winter, summer, or summer/winter run timing (Myers et al. 2015). The TRT concludes that the DPS is currently at "very low" viability, with most of the 32 DIPs and all three MPGs at "low" viability.

The designation of the DPS as "threatened" is based upon the extinction risk of the component populations. Hard et al. (2015) identify several criteria for the viability of the DPS, including that a minimum of 40 percent of summer-run and 40 percent of winter-run populations historically present within each of the MPGs must be considered viable using the VSP-based criteria. For a DIP to be considered viable, it must have at least an 85 percent probability of meeting the viability criteria, as calculated by Hard et al. (2015).

Spatial Structure and Diversity. The PS steelhead DPS includes all naturally spawned anadromous steelhead populations in streams in the river basins of the Strait of Juan de Fuca, Puget Sound, and Hood Canal, Washington, bounded to the west by the Elwha River (inclusive) and to the north by the Nooksack River and Dakota Creek (inclusive). The listed DPS also includes six hatchery stocks that are considered no more than moderately diverged from their associated natural-origin counterparts: Green River natural winter-run; Hamma Hamma winter-run; White River winter-run; Dewatto River winter-run; Duckabush River winter-run; and Elwha River native winter-run (USDC 2014). Steelhead are the anadromous form of Oncorhynchus mykiss that occur in rivers, below natural barriers to migration, in northwestern Washington State (Ford et al. 2011). Non-anadromous ''resident'' O. mykiss occur within the range of PS steelhead but are not part of the DPS due to marked differences in physical, physiological, ecological, and behavioral characteristics (Hard et al. 2007).

DIPs can include summer steelhead only, winter steelhead only, or a combination of summer and winter run timing (e.g., winter run, summer run or summer/winter run). Most DIPs have low viability criteria scores for diversity and spatial structure, largely because of extensive hatchery influence, low breeding population sizes, and freshwater habitat fragmentation or loss (Hard et al. 2007). In the Central and South Puget Sound and Hood Canal and Strait of Juan de Fuca MPGs, nearly all DIPs are not viable (Hard et al. 2015). More information on PS steelhead spatial structure and diversity can be found in NMFS' technical report (Hard et al. 2015).

Abundance and Productivity. Since 1995, PS steelhead abundance has shown a widespread declining trend throughout the majority of the DPS (Ford et al. 2011). In the most recent comprehensive review of the status of the PS Steelhead DPS, the major risk factors facing Puget Sound steelhead were: (1) widespread declines in abundance and productivity for most natural steelhead populations in the ESU, including those in Skagit and Snohomish rivers (previously considered to be strongholds); (2) the low abundance of several summer run populations; and (3) the sharply diminishing abundance of some steelhead populations, especially in south PS, Hood Canal, and the Strait of Juan de Fuca (Hard et al. 2007).

For all but a few PS steelhead populations, estimates of mean population growth rates obtained from observed spawner or redd counts are declining (typically 3 to 10 percent annually). PS winter run steelhead abundance has continued to be low over the majority of the DPS, with a geometric mean less than 250 fish annually in seven of the 15 populations examined from 2005 to 2009 (Ford et al. 2011). Seven populations had a geometric mean greater than 500 fish—Nooksack River, Samish River, Skagit River, Pilchuck River, Snohomish River/ Skykomish River, Snoqualmie River, and Green River winter-run. All but one of these populations are in the Northern Cascades MPG (Hard et al. in press). The lowest mean abundances (fewer than 15 fish) occur in the Elwha River, Lake Washington, and South Puget Sound Tributaries winter-run populations (Ford et al. 2011). Extinction risk within 100 years for most populations in the DPS is estimated to be "moderate to high," especially for steelhead populations in the Central and Southern Cascades and Hood Canal and Strait of Juan de Fuca MPGs.

Most populations within the DPS continue downward trends in estimated abundance, a few sharply so (Ford et al. 2011). Only three winter run steelhead populations examined exhibit positive growth rate (i.e., East Hood Canal, Skokomish River, and West Hood Canal winter run) (Ford et al. 2011). The lowest growth rates occur in the Elwha River, Dungeness River, Lake Washington, Stillaguamish River, Nisqually River, and Puyallup River winter run steelhead populations (Ford et al. 2011). Trends could not be calculated for the South Puget Sound Tributaries winter-run population.

Little or no data is available on summer-run populations to evaluate extinction risk or abundance trends. Because of their small population size and the complexity of monitoring fish in headwater holding areas, summer steelhead have not been broadly monitored.

Limiting factors. In our 2013 proposed rule designating critical habitat for this species (USDC 2013c), we noted that the following factors for decline for PS steelhead persist as limiting factors:

1. The continued destruction and modification of steelhead habitat;
2. Widespread declines in adult abundance (total run size), despite significant reductions in harvest in recent years;
3. Threats to diversity posed by use of two hatchery steelhead stocks (Chambers Creek and Skamania);
4. Declining diversity in the DPS, including the uncertain but weak status of summer run fish;
5. A reduction in spatial structure;
6. Reduced habitat quality through changes in river hydrology, temperature profile, downstream gravel recruitment, and reduced movement of large woody debris;
7. In the lower reaches of many rivers and their tributaries in Puget Sound where urban development has occurred, increased flood frequency and peak flows during storms and reduced groundwater-driven summer flows, with resultant gravel scour, bank erosion, and sediment deposition; and
8. Dikes, hardening of banks with riprap, and channelization, which have reduced river braiding and sinuosity, increasing the likelihood of gravel scour and dislocation of rearing juveniles.

The Cedar River and North Lake Washington/Lake Sammamish populations are among the smallest in the DPS and are the smallest in the Central and South Puget Sound MPG. The 5-year geometric mean of raw natural spawner counts for 2010-2014 were four and zero, respectively (NWRFS 2015). The other populations in the Central and South Puget Sound MPG, the Green River, Nisqually River, Puyallup/Carbon rivers, and White River populations, are all larger and have a lower risk of extinction.

2.2.3 Status of Critical Habitat

This section describes the status of designated critical habitat relevant to the proposed action by examining the condition and trends of the essential physical and biological features of that habitat throughout the designated areas. These features are essential to the conservation of the ESA-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's critical habitat analytical review teams (CHARTs) ranked watersheds within designated critical habitat at the scale of the fifth-field hydrologic unit code in terms of the conservation value they provide to each ESA-listed species that they support (NOAA Fisheries 2005). The conservation rankings were high, medium, or low. To determine the conservation value of each watershed to species viability, the CHARTs evaluated the quantity and quality of habitat features, 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. Even if a location had poor habitat quality, it could be ranked with a high conservation value if it were essential due to factors such as limited availability, a unique contribution of the population it served, or serving another important role.

Critical habitat for PS chinook includes 1,683 miles of streams, 41 square miles of lakes, and 2,182 miles of nearshore marine habitat in PS. The PS Chinook salmon ESU has 61 freshwater and 19 marine areas within its range. Of the freshwater watersheds, 41 are rated high conservation value, 12 low conservation value, and eight received a medium rating. Of the marine areas, all 19 are ranked with high conservation value.

We excluded the action area from our designation of PS steelhead critical habitat due to economic impacts. For PS Chinook salmon, we designated critical habitat in Lake Washington and excluded Lake Sammamish. We rated the conservation value of critical habitat in Lake Washington as "medium." The following are the primary constituent elements (PCEs) we identified for PS Chinook salmon critical habitat:

PCE 1--Freshwater spawning sites with water quantity and quality conditions and substrate that support spawning, incubation, and larval development;

PCE 2--Freshwater rearing sites with (1) water quantity and floodplain connectivity to form and maintain physical habitat conditions and support juvenile growth and mobility, (2) water quality and forage that support juvenile development, and (3) natural cover such as shade, submerged and overhanging large wood, logjams and beaver dams, aquatic vegetation, large rocks and boulders, side channels, and undercut banks;

PCE 3--Freshwater migration corridors free of obstruction and excessive predation with water quantity and quality conditions and natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, side channels, and undercut banks that support juvenile and adult mobility and survival;

PCE 4--Estuarine areas free of obstruction and excessive predation with (1) water quality, water quantity, and salinity conditions that support juvenile and adult physiological transitions between fresh water and salt water, (2) natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, and side channels, and (3) juvenile and adult foraging opportunities, including aquatic invertebrates and prey fish, supporting growth and maturation;

PCE 5--Nearshore marine areas free of obstruction and excessive predation with (1) water quality and quantity conditions and foraging opportunities, including aquatic invertebrates and fishes, supporting growth and maturation, and (2) natural cover including submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, and side channels;

PCE 6--Offshore marine areas with water quality conditions and forage, including aquatic invertebrates and fishes, supporting growth and maturation.
We have promulgated regulations that changed the terminology from "primary constituent elements" to "physical or biological features (PBFs)." This shift does not change the approach used in conducting a ''destruction or adverse modification'' analysis, which is the same regardless of whether the original designation identified primary constituent elements, physical or biological features, or both.

The proposed action will not affect PS steelhead critical habitat because we did not designate any areas within the action area as critical habitat for PS steelhead.

2.3 Environmental Baseline

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 section 7 consultation, and the impact of state or private actions which are contemporaneous with the consultation in process (50 CFR 402.02).

The 692-square-mile Lake Washington watershed is located in western Washington. It includes two major river systems, the Cedar and Sammamish rivers, and three major lakes, Lake Washington, Lake Sammamish, and Lake Union. The watershed drains to central Puget Sound through the City of Seattle. With a surface area of 34.6 square miles, Lake Washington is the largest lake in Washington State west of the Cascades. The lake is 18.6 miles long and 1.5 miles wide with an average depth of 108 feet and a maximum depth of 220 feet. The Lake Washington watershed is home to Chinook, coho, and sockeye salmon, steelhead, rainbow, cutthroat, and bull trout. We designated Lake Washington and the Cedar River watershed as critical habitat for PS Chinook salmon. For PS steelhead, we designated the Cedar River watershed as critical habitat and excluded Lake Washington.

Historically, the Lake Washington watershed drained south into the Black and Duwamish rivers. In 1916, the Corps constructed the locks and excavated the Ship Canal, connecting the Union Bay area in Lake Washington with Salmon Bay in Puget Sound. These hydrologic changes lowered the lake level 9 feet, dried up lake shoreline wetlands, and disconnected Lake Washington from its historical outlet, the Black River. Salmon populations were forced to find a new route back to their natal streams. Since 1916, shoreline and watershed development has further altered habitat conditions in the Lake Washington system.

The locks represent a highly complex passageway for migrating salmon and steelhead. The structure itself contains roughly six different routes fish can move through: the large lock chamber and associated filling culverts, small lock chamber and associated filling culverts, the saltwater drain, the fish ladder, the spillway, and the smolt flumes. The structure also creates physical, biological, and chemical conditions that can affect salmon, such as water temperature and salinity gradients. The locks are also a key societal component in regulating water levels and providing navigation.

A survey of 1991 aerial photographs of Lake Washington estimated that 4 percent of the shallow water habitat within 100 feet of the shore was covered by residential piers (excluding coverage by commercial structures and vessels) (USFWS 2008). Later studies report that about 2,700 docks are present in Lake Washington and approximately 80 percent of the shoreline is armored (Warner and Fresh 1999; City of Seattle 2000). These docks cover approximately 57 acres of the lake. The density of docks and shoreline modifications throughout the Ship Canal, Portage Bay, and Lake Union approaches 100 percent (City of Seattle 1999; Weitkamp and Ruggerone 2000). Based on our analysis of aerial photos, there are 873 residential piers, 19 small marinas, and five structures associated with boat launches on Lake Sammamish. These structures cover approximately 12 acres of the lake.

Recreational boating is a popular activity on both lakes. In addition to the residential piers and private marinas, there are also heavily used public boat launches on both lakes. For much of the year, boating activity is light. After the 4th of July holiday, boat traffic increases dramatically, then drops off again when cool weather returns in the fall. Boating activity peaks on Lake Washington during Seafair and the hydroplane (thunder boat) races.

The baseline conditions have affected PS Chinook salmon, PS steelhead, and PS Chinook salmon critical habitat. The Lake Washington PS Chinook salmon are fall-run stocks. The adults first appear at the lock complex in mid-June. In general, peak returns occur in mid- to late-August and the adult run is completed by early October. Lake Washington PS Chinook salmon have declined since peak returns during the mid-1980s (Weitkamp and Ruggerone 2000). Two populations of the PS Chinook salmon ESU are present in the Lake Washington basin, the north Lake Washington Tributaries population and the Cedar River population. Most natural production of juvenile Chinook salmon in Lake Washington originates in the Cedar River. For the north Lake Washington Tributaries population, most natural production is from Bear Creek. The 5-year geometric mean of raw wild spawner counts between 2010 and 2014 was 160 for the north Lake Washington tributaries population and 881 for the Cedar River population. Small numbers of Chinook salmon also spawn in other tributaries to Lake Washington and Lake Sammamish, but no information is available for the production from these streams (Celedonia et al. 2008a). Hatchery production in the basin occurs at the Issaquah Creek State Hatchery. Chinook salmon from this hatchery are part of the ESU. The University of Washington (UW) ended its hatchery program in 2010, however, adults from past smolt releases will still return over the next several years. These Chinook salmon are not included in the ESU.

Most juvenile Lake Washington Chinook salmon migrate to the ocean in their first year. DeVries et al. (2005; 2007; 2008) documented juvenile outmigration through the Lake Washington Ship Canal (Ship Canal) from May to August with peak out-migration from late May to early June. Less than one percent of Chinook salmon spend a year or more in the lake prior to emigrating, however there are no data on their actual numbers or densities within Lake Washington or the Ship canal. (Devries et al. 2005). In Lake Washington, juvenile Chinook salmon use lentic habitat as a migratory corridor from late May through July and for rearing from January-June (Celedonia et al. 2008a). Chinook salmon juveniles either enter Lake Washington shortly after emergence (mid-January to March) and rear in the Lake for three to five months, or they rear in their natal tributaries and enter Lake Washington between April and late June (Celedonia et al. 2008a; Seiler et al. 2003).

Juvenile Chinook salmon from the Cedar River enter Lake Washington and rear in the south end of the Lake from January to May (Tabor and Piaskowski 2002; Tabor et al. 2006). During this time, they inhabit shallow areas (0.1 to 1.3 m deep) with a sandy substrate and gentle sloping gradient. Juvenile Chinook salmon will also rear in non-natal tributaries (Tabor et al. 2006). Over-water structures can provide cover for small juvenile Chinook salmon in February and March but, as they grow larger and predators such as smallmouth bass move inshore, Chinook salmon avoid structures. Fresh (2000) found juvenile Chinook salmon in Lake Washington are primarily restricted to the littoral zone until mid-May when they are large enough to move offshore. From May to July, juvenile Chinook salmon are located throughout the Lake (Celedonia et al. 2008a).

Juvenile Chinook salmon from the Cedar River migrate north along the western shoreline of the lake during the day in shallow water three to eight feet deep. Migrating smolts do not avoid milfoil (Tabor and Piaskowski 2002; Tabor et al. 2006; Celedonia et al. 2008), but rather the milfoil serves as a false-bottom which juvenile Chinook salmon migrate above. Celedonia et al. (2008; 2009) observed juvenile Chinook salmon in deeper water (up to 16 feet deep) in areas of dense milfoil. Migrating Chinook salmon smolts avoid over-water structures (Tabor and Piaskowski 2002; Tabor et al. 2006). They either move into deeper water to pass beneath the structure or move around the perimeter of the structure (Celedonia et al. 2008a).

The Lake Washington portion of the action area contains PBFs 2 (freshwater rearing) and 3 (freshwater migratory corridor) of PS Chinook salmon critical habitat. The re-routing of the Cedar River forced juvenile Chinook to use Lake Washington for rearing and migration. Juvenile Chinook are dependent on shallow nearshore habitat for predator avoidance. The shoreline modifications described above have substantially degraded the function of these PBFs.

Lake Washington steelhead have undergone steep declines in abundance. Abundance trends over the most recent decade were strongly negative and alarmingly low. Estimates were computed from 10 years of data (1995-2004). Between 2000 and 2004, escapement averaged 38 fish (WDFW 2002). From 2005 to 2008, escapement continued to decline. The average escapement was 11 with a low of four in 2008 (Figure 1). Since 2008, returns have been less than 10 fish each year (Friends of the Ballard Locks in litt.).

WDFW operates smolt traps in Bear Creek and the Cedar River to estimate the production of juvenile Chinook salmon, coho salmon, and steelhead. Between 2007 and 2009, WDFW captured one smolt per year in the Cedar River. In Bear Creek, WDFW capture one smolt in 2007 and 2008 and none in 2009 (Kiyohara and Volkhardt 2008; Kiyohara and Zimmerman 2009; 2011). There has been a loss of connectivity between the Duwamish (Green) and Snohomish rivers due to the virtual extirpation of steelhead in the Lake Washington basin.

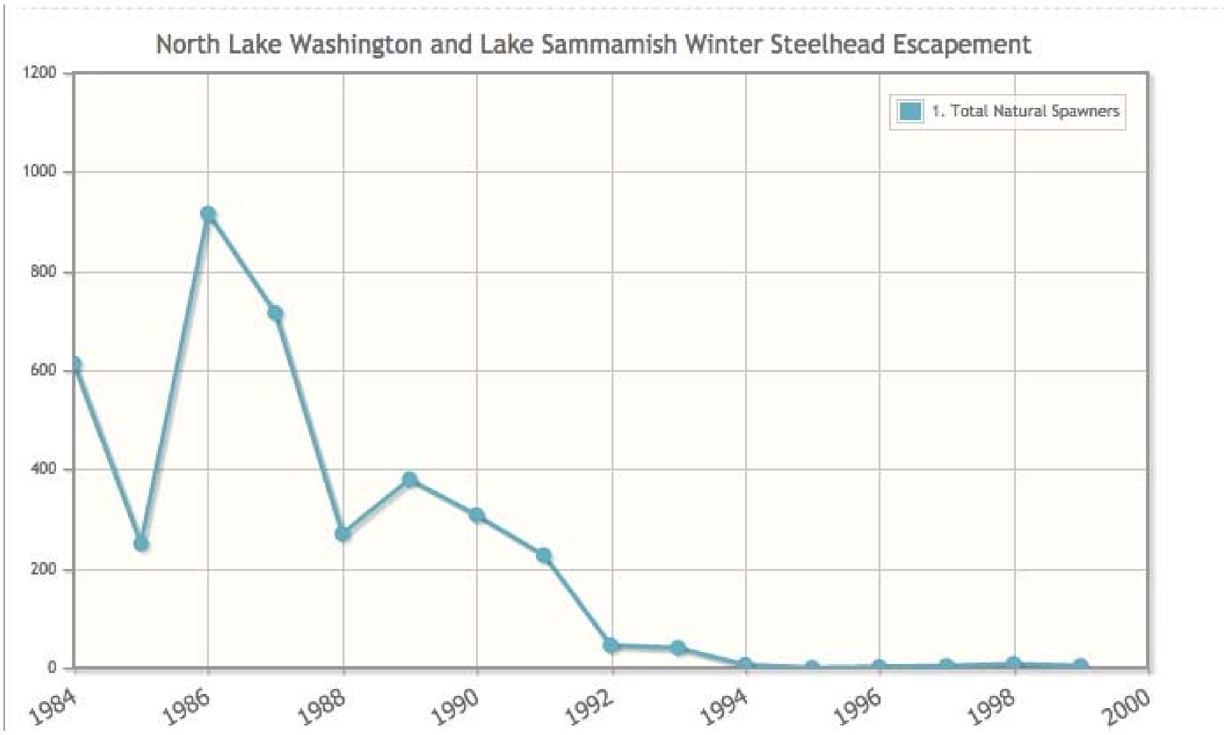

Figure 1. North Lake Washington Steelhead Total Natural Spawners

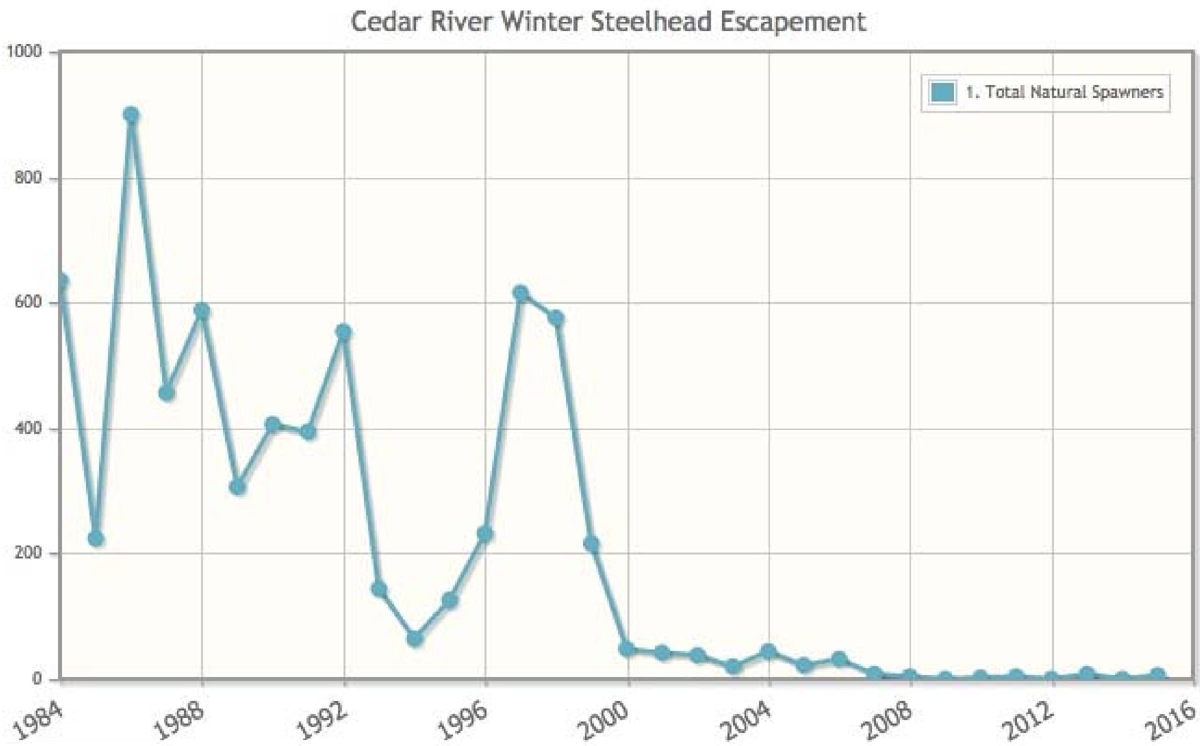

Figure 2. Cedar River Natural Spawners

In the Cedar River, wild steelhead are closely related to resident *O. mykiss*. Resident *O. mykiss* are abundant below Landsberg dam and are a native wild population. Marshall et al. (2004) found that resident Cedar River *O. mykiss* produce out-migrating smolts and speculated that steelhead could produce adult resident *O. mykiss*. They concluded that the conservation of resident *O. mykiss* is likely an important aspect of reducing extinction risk for steelhead.

2.4 Effects of the Action

Under the ESA, "effects of the action" means the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action, 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.

The proposed actions will together ensure the functioning of IRPP and result in the construction, reconstruction, or expansion of shoreline-friendly over-water structures in Lake Washington and Lake Sammamish. Given the expectation that the MOA will be renewed for the foreseeable future, and that the Corps will continue to issue permits for IRPP projects while the MOA is in place, this section analyzes the effects of the proposed action beyond the initial five year term of the MOA and assumes it will continue on an ongoing basis. The IRPP structures must comply with the criteria described in Section 1.3 of this document. Our jeopardy and adverse modification analysis considers the effects from the construction and use of these structures.

However, it does not consider any beneficial effects of the proposed conservation fees and associated restoration projects because there is significant uncertainty regarding these future projects. We do not know how much money in fees will be collected per year, what sites will be chosen for restoration, or what specific restoration actions will be taken at those sites. Because of this uncertainty, we do not consider any potential beneficial effects. We do, however, generally anticipate that there will be some short-term and minor adverse effects associated with construction of restoration projects, e.g. turbidity; however, based on past experience (e.g. the South Lake Washington Shoreline Restoration project) and the criteria in the IRPP, we anticipate these effects will be more than offset by permanent habitat improvements. This approach is conservative in that it considers negative effects on species and critical habitat but does not rely on any speculative beneficial effects resulting from the proposed restoration actions

2.4.1 Effects on Species

Lighting

Despite the minimization measures described in the proposed action, we expect lighting from in-waters structures to affect the behavior of juvenile Chinook salmon in the two lakes. Tabor and Piaskowski (2002) investigated patterns of habitat use by out-migrating juvenile Chinook salmon and found that fish were inactive at night, residing at the bottom of shallow waters, even near sources of artificial light. Fish became active, moved off the bottom, and began schooling as light intensity increased at dawn. Mazur and Beauchamp (2003) investigated prey detection and reaction distance in piscivorous salmonids. Reaction distances for cutthroat and rainbow trout increased as light levels increased. However, Tabor et al. (1998) found that juvenile sockeye salmon's predator avoidance ability increased with increased light intensity. Petersen and Gadomski (1994), in a similar finding, observed that the rate of capture of juvenile Chinook salmon by northern squawfish was inversely related to light intensity. Beauchamp also found that ambient nighttime light in Lake Washington is above the threshold for juvenile Chinook salmon predators to forage (Beauchamp pers. comm.).

We expect that artificial lighting will influence juvenile Chinook salmon behavior in the areas of the lakes adjacent to pier lights. However, because ambient light conditions at night already allow predators to forage, we do not expect artificial lighting to increase the predation risk to juvenile Chinook salmon. Also, juvenile Chinook salmon in Lake Washington typically migrate during the day and are inactive at night (Celedonia et al. 2008a; Tabor and Piaskowski 2002), therefore, the attraction of lighting at night is unlikely to delay their migration.

We do not expect lighting to have any effect on adult Chinook salmon or juvenile or adult steelhead. Adult Chinook salmon and steelhead are too large to be preyed upon by piscivorous fish in lakes Washington and Sammamish. Juvenile steelhead smolts are larger and better able to avoid predation and are less likely than juvenile Chinook salmon to change their behavior due to artificial lighting (Newcomb and Coon 1997; McComas et al. 2008).

Suspended Sediment

Salmonids typically avoid areas of higher suspended sediment which can displace them from their preferred habitats. Fish unable to avoid suspended sediment can experience adverse effects. The severity of effect of suspended sediment increases as a function of the sediment concentration and exposure time, or dose (Newcombe and Jensen 1996; Bash et al. 2001). Suspended sediments can cause sublethal effects such as elevated blood sugars and cough rates (Servizi and Martens 1991), physiological stress, and reduced growth rates. Elevated turbidity levels can reduce the ability of salmonids to detect prey, cause gill damage (Sigler et al. 1984; Lloyd et al. 1987; Bash et al. 2001), and cause juvenile steelhead to leave rearing areas (Sigler et al. 1984). Additionally, short-term pulses of suspended sediment influence territorial, gill-flaring, and feeding behavior of salmon under laboratory conditions (Berg and Northcote 1985). Adult and larger juvenile salmonids appear to be little affected by the high concentrations of suspended sediments that occur during storm and snowmelt runoff episodes (Bjornn and Reiser 1991). However, research indicates that chronic exposure can cause physiological stress responses that can increase maintenance energy and reduce feeding and growth (Lloyd et al. 1987; Servizi and Martens 1991).

Monitoring turbidity, a measurement of water clarity, is a surrogate for monitoring the concentration of suspended sediment in a water sample. A nephelometric turbidity unit (NTU) is a measurement of turbidity. For in-water project activities in the lakes, we expect turbidity levels will not exceed five nephelometric turbidity units (NTUs) over background at 150 feet from the in-water activity. This is the State water quality standard that projects must meet (WAC 173-201A-200).

Many activities covered under IRPP may temporarily increase suspended sediment. These activities include:

1. pile removal and installation;
2. lift removal and installation;
3. bulkhead repairs and removals;
4. gravel placement; and
5. trash and debris removal.

As part of a test pile project for the State Route (SR) 520 bridge project, WSDOT monitored turbidity during the installation and removal of hollow, round 30-inch steel piles in Lake Washington (Bloch 2010). Monitoring data demonstrated that elevated turbidity was typically constrained to within approximately 100 feet of the construction activity, with turbidity levels beyond that distance rarely exceeding 3 NTU above background, and not exceeding 3 NTU above background at 150 feet. Monitoring data also showed removing piles caused the greatest increases in turbidity. Underwater video of the pile removal shows sediment falling out of the hollow pile as it is removed. Pile installation did not create measureable increases in turbidity.

We expect the increases in turbidity from any individual project covered under IRPP to be equal to or less than those from the 520 test pile project. The vast majority of piles removed under IRPP will be small diameter (less than 12 inches) solid wood piles. These will generate less turbidity than the test piles both because of their smaller size and because sediment would only cling to the outside of the pile rather than filling the hollow core. Similarly, other in-water elements to be installed or removed will be smaller than the 30-inch test piles described above.

IRPP will cover up to 100 projects per year in Lake Washington and up to 50 projects in Lake Sammamish per year. Assuming a conservative maximum distance of 150 linear feet for elevated levels of suspended sediment, the program will result in a maximum area subjected to elevated suspended sediment of 0.81 acre per project and 81.0 acres per year in Lake Washington and a maximum of 0.41 acre per project, 40.5 acres per year Lake Sammamish.

All of these activities will occur during the work windows in Appendix B plus a two-week extension for some projects. These windows overlap with the tail end of juvenile Chinook salmon outmigration, the adult Chinook salmon migration, and adult steelhead migration. While most juvenile Chinook salmon will have left the lakes before the start of in-water work, we expect small numbers of juvenile Chinook salmon to be present and experience sublethal harm from elevated suspended sediment including significantly altered behaviors patterns from displacement from preferred habitats and injury from physiological stress. Elevated suspended sediment will not affect juvenile steelhead. Juvenile steelhead outmigration spans April to May and peaks in early May. This is outside of the in-water work window for IRPP. Juvenile steelhead will not be exposed to this stressor.

We do not expect adult Chinook salmon or adult steelhead to be harmed by turbidity because these larger fish can tolerate short term increases in suspended sediment (Bjornn and Reiser 1991). These larger fish are unlikely to be affected by short-term exposure to elevated turbidity. Furthermore, they are not shoreline-oriented and will not be displaced from their preferred habitat if they avoid areas of higher turbidity.

Contaminants

Creosote-treated piles contaminate the surrounding sediment up to two meters away with PAHs (Evans et al. 2009). The removal of the creosote-treated piles mobilizes these PAHs into the surrounding water and sediments (Smith et al. 2008; Parametrix 2011). PAHs can also be released directly from creosote-treated timber during the demolition of creosote-treated timber or if any of the piles break during removal (Parametrix 2011). The concentration of PAHs released into surface water rapidly dilutes. Smith et al. (2008) reported concentrations of total PAHs of 101.8 µg/l 30 seconds after creosote-pile removal and 22.7 µg/l 60 seconds after. However, PAH levels in the sediment after pile removal can remain high for six months or more (Smith et al. 2008). Romberg (2005) found a major reduction in sediment PAH levels three years after pile removal contaminated an adjacent sediment cap.

There are two pathways for PAH exposure to listed fish species in the action area, direct uptake through the gills and dietary exposure (Lee and Dobbs 1972; Neff et al. 1996; Karrow et al. 1999; Varanasi et al. 1993; Meador et al. 2006; McCain et al. 1990; Roubal et al. 1977). Fish rapidly uptake PAHs through their gills and food but also efficiently remove them from their body tissues (Lee and Dobbs 1972; Neff et al. 1976). Juvenile Chinook salmon prey, including amphipods and copepods, uptake PAHs from contaminated sediments (Landrum and Scavia

1983; Landrum et al. 1984; Neff 1982). Varanasi et al. (1993) found high levels of PAHs in the stomach contents of juvenile Chinook salmon in the Duwamish estuary.

The primary effects of PAHs on salmonids from both uptake through their gills and dietary exposure are immunosuppression and reduced growth. Karrow et al. (1999) characterized the immunotoxicity of creosote to rainbow trout (Oncorhynchus mykiss) and reported a lowest observable effect concentration for total PAHs of 17 µg/l. Varanasi et al. (1993) found greater immune dysfunction, reduced growth, and increased mortality compared to control fish. In order to isolate the effects of dietary exposure of PAHs on juvenile Chinook salmon, Meador et al. (2006) fed a mixture of PAHs intended to mimic those found by Varanasi et al. (1993) in the stomach contents of field-collected fish. These fish showed reduced growth compared to the control fish.

While creosote-treated timber is not as prevalent in the lakes as it is in marine environments, and data on the number of existing structures with creosote-treated timber on the two lakes is not available, based on historical practices and our experience in other settings, it is reasonable to assume that many of the pier repair projects will involve the removal of creosote-treated timber.

Any Chinook salmon or steelhead present during the removal of creosote-treated timber structures are likely to be exposed to PAHs. NMFS expects increased PAHs in the water column and sediments will remain within the area of increased suspended sediment caused by IRPP-projects involving creosote removal. Therefore, the water and substrate within 150 feet of any creosote-treated timber removal could have increased levels of PAHs. Some of the listed fish exposed to PAHs from the proposed action will experience immunosuppression and reduced growth which, in some cases will increase the risk of death. Within three years, the PAHs in the surrounding sediments of an individual project will return to background levels. Because creosote-treated timber releases PAHs throughout its life, the removal of the creosote-treated timber will reduce listed-fish exposure to PAHs in the long-term.

Because they are shoreline-oriented and spend a greater amount of time within the action area, juvenile Chinook salmon will have the highest probability of exposure to PAHs. However, NMFS cannot discount the probability of adult Chinook salmon exposure. Adult and juvenile steelhead will not be directly exposed to PAHs because they will not be present during the in-water work windows (including the two extensions). Because juvenile steelhead migrate rapidly out of the system, they are unlikely to be exposed to PAHs from IRPP projects through dietary uptake.

Over-water Structure

Prior to 2001, most evidence for over-water structure effects on juvenile salmon migration was observational (Simenstad et al. 1999). The two primary concerns with over-water structures for juvenile Chinook salmon are migration delays and increased vulnerability to predators. In 2001, the USFWS began a series of studies to characterize the movement and habitat use of juvenile Chinook salmon and two of their predators in Lake Washington and the Ship Canal (Celedonia et al. 2008a). These studies represent the best available data on the effects of over-water structures on salmonids in lakes Washington and Sammamish. These studies included acoustic tracking of tagged juvenile Chinook salmon. Between 2003 and 2008, the USFWS studied the movement and habitat use of juvenile Chinook salmon, smallmouth bass, and northern pike minnow in the Ship Canal and at the SR 520 bridge (the bridge) west approach (east of Foster Island) using acoustic tracking (Celedonia et al. 2008a; 2008b; 2009). Below are summaries of the findings of these studies.

Celedonia et al. (2008a) reported findings from tracking studies performed in Lake Washington and the Ship Canal during May, June, and July of 2004 and 2005:

1. Juvenile Chinook salmon movement patterns varied within each site, from site to site, and from year to year. Each site was used differently by juvenile Chinook salmon, and the behavior of individual fish varied considerably.

2. Juvenile Chinook salmon showed two predominant migratory behaviors: active migration, where they swam rapidly toward Puget Sound; and holding, where they appeared paused in their migration.

3. At the one site studied in both years (Portage Bay), juvenile Chinook salmon movement patterns were different in the two sample years. In 2004, most fish spent several hours to several days at the site, whereas in 2005 most fish actively migrated spending less than one hour at the site. Differences in timing of moon apogee relative to tagged fish release appeared to be the primary contributing factor to these differences.

4. Distinct diel patterns were observed. In Lake Washington, juvenile Chinook salmon were close to shore in shallow water (1 to 5 m) during the day, and far offshore in limnetic areas at night.

5. Over-water structures and macrophyte beds appeared to influence movement patterns and depth selection. Actively migrating juvenile Chinook salmon appeared to change course as they approached and moved around structures. Fish appeared less hesitant to pass beneath narrow structures. Fish also sometimes moved into deeper water to travel beneath or around structures.

6. When macrophytes were present, juvenile Chinook salmon appeared to use deeper water, moving above the macrophyte canopy rather than avoiding macrophytes altogether. Macrophytes appear to function as a false bottom.

7. Smallmouth bass, a predator of juvenile salmonids, were generally close to shore in water that was less than four meters deep. Smallmouth bass were usually closely associated with over-water structure, steep sloping shoreline, and the offshore edge of aquatic macrophytes. Overlap in habitat between smallmouth bass and juvenile Chinook salmon occurs within each of these habitat types.

8. Prickly sculpin were primarily active at night, especially in shallow water. Nighttime patterns of prickly sculpin behavior may help explain the distribution of juvenile Chinook salmon (nighttime selection of offshore limnetic areas).

Celedonia et al. (2008b) reported findings from tracking studies performed in Lake Washington at the State Route (SR) 520 bridge during May to August of 2007:

1. Behaviors of juvenile Chinook salmon were similar within release groups, but varied considerably between release groups. June 1 smolts exhibited an active migration pattern, rapidly migrating through the study site. June 14 and 28 smolts exhibited holding behaviors at or near the study site. Differences in migration cues (moon apogee), physiological status, water temperature and clarity, and prey availability may have contributed to the observed differences in behavior between release groups.

2. There was no evidence that the bridge at any time presented a complete barrier to juvenile Chinook salmon migration. Common behaviors included: 1) fish passing beneath the bridge with no apparent delay; 2) fish passing beneath the bridge after delays of a few seconds up to 46 minutes; and 3) fish passing beneath the bridge on multiple occasions.

3. Among actively migrating juvenile Chinook salmon, slightly more than one-third were delayed 3 to 46 minutes (median 15 minutes). Slightly less than one-third were delayed for less than one minute, and one-third appeared completely unhindered by the presence of the bridge.

4. Behavior may have been influenced by water depth, height of the bridge above the water surface, location of the bridge shadow at time of encounter, degree of contrast at the light-shadow edge, light intensity at time of crossing, and presence and variation in macrophyte density. Many of these factors varied together, and thus could not be isolated for their individual influence on behavior.

5. Holding juvenile Chinook salmon often crossed beneath the bridge to the north and were later observed returning to and holding in areas around the bridge. Holding smolts selected for areas near the bridge (5 to 20 meters from bridge edge), as well as areas of dense macrophytes away from the bridge. When near the bridge, smolts selected deeper water.

6. Holding behaviors may be triggered by an inhibition to enter the Montlake Cut arising from one or more ecological barriers, such as high water clarity, lack of directional flow, and/or elevated water temperatures. Inhibitions may also arise from a decrease in migration urge associated with desmoltification caused by prolonged exposure to elevated water temperatures.

7. Smallmouth bass previously captured in the Ship Canal were observed at the study site. Small bass overwhelmingly selected for nearshore over-water structures, and made no notable use of the bridge. Larger bass selected for both nearshore over-water structures and the bridge. Some bass were closely associated with bridge columns.

Celedonia et al. (2009) reported findings from tracking studies performed in Lake Washington at the SR 520 bridge during May to August of 2008:

1. Patterns in juvenile Chinook salmon behavior were similar to those observed in 2007, generally similar within release groups, but varied considerably between release groups. Three release groups primarily exhibited holding behaviors.

2. As in 2007, response to the bridge was at least partially dependent upon whether fish were actively migrating or holding. Behaviors of actively migrating fish were similar in both years, although few independent observations were obtained in 2008. Combining both years, 35 percent of actively migrating smolts showed minimal or no response to the bridge, 42 percent paralleled the bridge before passing underneath, and 23 percent paralleled the bridge and milled near the bridge before passing underneath. Median delay was 63 seconds (range 6 seconds to 19 minutes) for paralleling fish, and 22 minutes (range 3 to 46 minutes) for milling fish.

3. Holding juvenile Chinook salmon commonly selected for areas near the bridge (within 20 m) or condominium on the south side of the site. During the day, fish selected for deeper water when near the bridge or condominium than when they were not near either structure. Similar observations were made in 2007.

4. At night, juvenile Chinook salmon were attracted to areas where street lamps cast light into the water. A reevaluation of 2007 data found a similar pattern. Bridge lighting may be partially responsible for nighttime selection of the bridge area by juvenile Chinook salmon. However, neither smallmouth bass nor northern pikeminnow were attracted to the lights.

5. Results for northern pikeminnow and smallmouth bass were similar to 2007, and therefore data from both years were combined to provide more robust analyses. Northern pikeminnow concentrated in moderately dense vegetation, with no strong affinity for the bridge. Smallmouth bass did show a strong affinity for over-water structures, including the bridge. Smallmouth bass were also often closely associated with bridge columns.

6. Juvenile salmonids made up 35 percent of the northern pikeminnow diet. Approximately half of the smallmouth bass diet was composed of juvenile salmonids.

7. The authors suggest, with regard to holding behaviors and daytime attraction to the bridge, that the proposed bridge should lessen attraction. Consequences could include shorter area residence times. The proposed new bridge would reduce the quality of habitat for smallmouth bass.

IRPP is likely to increase over-water cover by up to 525 square feet per year in Lake Washington and 825 square feet per year for Lake Sammamish. It will also allow for the maintenance of approximately one acre of over-water cover per year in Lake Washington and approximately one-half acre of over-water cover per year in Lake Sammamish (Table 3).

Table 3. Existing and Projected Over-water Cover

Lake	Increase/year (ft^2)	Maintenance/ year (acres)	Existing (acres)	% increase /year
Washington	525	1	57	0.02
Sammamish	825	0.5	12	0.1

Because the over-water cover studies were conducted in the same watershed as IRPP, NMFS expects the piers covered under IRPP will have similar effects to those described above. The over-water cover from IRPP projects will shade the nearshore and cause migration delays. The in-water piles supporting the structures will provide habitat for predators such as smallmouth bass and, therefore, increase the risk of predation for juvenile Chinook salmon. The primary effect of the proposed action will to maintain these existing effects of over-water structures into the future. The increases in Table 5 are extremely small relative to the total amount of existing over-water cover. They will not significantly increase either the migration timing or predation risk for any individual juvenile Chinook salmon, and will therefore, not have measurable effects at the population scale. Because IRPP will allow for the persistence of over-water structures in the two lakes, we expect IRPP to help maintain the existing migration delay and predation effects to juvenile Chinook into the future.

We do not expect over-water cover to affect PS steelhead or adult Chinook salmon because these fish are larger and not shoreline dependent. They are therefore unlikely to experience migration delays or predation associated with over-water structures.

Bulkheads

The armoring of the shoreline can reduce or eliminate shallow water habitats through the disruption of sediment sources and sediment transport. Shoreline hardening cuts off the input of sediment and LWD. The impoundment of shoreline sediment can have indirect long-term effects on the physical structure of the beach, including coarsening of the substrate, beach lowering, and increased erosion of beaches located in front of, and down drift from shoreline armoring (Dean 1986; Everts 1985). Evidence collected by the Corps suggests that shoreline armoring results in a coarsening of the beach material in front of the armor (Macdonald et al. 1994). As wave action and littoral drift continue to remove the finer sediment from a beach and there is no bank erosion to replenish this finer material, the sediment in front of, and down drift from, the armoring will become coarser. The beach profile is also likely to lower and narrow (Galster and Schwartz 1990). Thus, the loss of material, over time, can affect the migration of juvenile Chinook salmon by reducing the amount of available shallow habitat they rely on for food and cover.

NMFS expects up to 20 bulkhead projects per year in the two lakes. The short-term effects of increased turbidity are analyzed above. Because IRPP does not allow any increase in shoreline armoring and promotes the removal of armoring, we expect it to reduce the amount of shoreline armoring in the two lakes to some degree. This will result in modest improvements for juvenile Chinook salmon habitat. IRPP will also result in the maintenance of up to 20 existing bulkheads per year which will maintain the degraded shoreline habitats associated with those projects. The continued presence of bulkheads will maintain the steep beaches which lack the shallow water habitat upon which juvenile Chinook salmon depend for predator avoidance. We do not expect any effects to steelhead or adult Chinook salmon because they are not shoreline dependent.

Boating

Graham and Cooke (2008) studied the effects of three boat noise disturbances (canoe paddling, trolling motor, and combustion engine) on the cardiac physiology of largemouth bass. They found that exposure to each of the treatments resulted in an increase in cardiac output in all fish, associated with a dramatic increase in heart rate and a slight decrease in stroke volume, with the most extreme response being to that of the combustion engine treatment. Recovery times were the least with canoe paddling (15 minutes) and the longest with the power engine (40 minutes). They postulate that this demonstrates that fish experienced sublethal physiological disturbances in response to the noise propagated from recreational boating activities.

As described in the baseline section, boating activity picks up after the July fourth holiday and continues in to the fall. This timing avoids the peak juvenile Chinook outmigration, but lands squarely on top of the adult Chinook salmon migration. We expect that the late-migrating juvenile Chinook and most adult Chinook will be exposed to boating and experience sublethal physiological stress. Peak boating season does not overlap with either juvenile or adult steelhead migration through the lakes. Given the very low numbers of steelhead and the limited boating activity during their presence in the lakes, we do not expect any measurable impacts to steelhead.

As described in the baseline section, there are other access points to the lakes for boats other than piers. NMFS cannot determine what proportion of the boating is from boats moored at piers in the lakes versus boats accessing the lakes in other ways. Of the boats moored in the lakes, an unknown proportion of the boats engaged in this activity will be moored at piers approved under IRPP. While the proportion cannot be quantified, IRPP will, to some extent, help maintain the existing levels of boating activity. Because there will be very few new piers under IRPP (less than 10 per year) compared to the thousands of boats that use the lakes, we not expect any measurable increases in the level of boating activity.

2.4.2 Effects on Critical Habitat

Freshwater Rearing Sites and Freshwater Migration Corridors (PBFs 2 and 3)

The in-water work overlaps with the tail end of juvenile Chinook salmon outmigration. In-water work will also occur during the adult Chinook salmon migration. As described above, IRPP-covered in-water projects will cause elevated suspended sediment and will temporarily degraded water quality. This will cause short-term and localized impairment of PBFs 2 and 3 in Lake Washington. There will be no permanent impacts to these PBFs from the elevated turbidity because the suspended sediment will rapidly settle, and water quality will return to pre-activity conditions.

Over-water structures and their supporting piles and columns will also impact PBFs 2 and 3 within the Lake Washington. Lack of excessive predation is a component of PBF 3. The increase in in-water pile and columns during construction will increase the availability of smallmouth bass habitat in the action area and degrade PBF 3 (juvenile migration). For the reasons set out above, shading from the over-water structures will not affect migrating adults or rearing/holding juveniles. Shading will cause short term delays for a portion of actively migrating juveniles and degrade PBF 3 for the reasons outlined above. As shown in Table 5 above, the increases in over-water cover (and therefore the increase in the number of piles that support over-water cover) will be extremely small relative to the amount of habitat available in the lake. The increases will not meaningfully change the conservation value of PBFs 2 and 3 at the scale of Lake Washington because they will not significantly change the habitat conditions in the two lakes.

2.5 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. We searched the websites of State and local agencies' websites with jurisdiction in the action area. These agencies included the cities of Bellevue, Hunts Point, Kenmore, Kirkland, Seattle, Medina, Mercer Island, Redmond, Renton, Sammamish, and Yarrow point, King County, and the State of Washington (Departments of Transportation, Natural Resources, and Fish and Wildlife).

We did not find any future development activities that were both within the action area and did not involve Federal activities. Ongoing activities from the baseline, including recreational boating, will continue into the future. The effects section above describes the effects of boating on listed species in the lakes and the difficulty separating how much of the activity is do to boats originating at piers associated with IRPP. Effects from boating not associated with IRPP or other federal activities in the two lakes are cumulative effects. These effects likely contribute, in a minor way, to the low abundance of PS Chinook salmon in the Lake Washington watershed.

2.6 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 add the effects of the action (Section 2.4) to the environmental baseline (Section 2.3) and the cumulative effects (Section 2.5), taking into account the status of the species and critical habitat (section 2.2), 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) appreciably diminishes the value of designated or proposed critical habitat for the conservation of the species.

Puget Sound Chinook Salmon ESU

The current status of the ESU is poor. Abundance across the ESU has generally decreased between 2010 and 2014, with only 6 small populations of 22 total populations showing a positive change in natural-origin spawner abundances. Climate change is expected to make recovery targets for PS Chinook salmon more difficult to achieve. The ESU is split into five Major Population Groups (MPGs). The Lake Washington populations are within the South MPG along with the Green, White, Puyallup, and Nisqually populations. Recovery criteria for the ESU includes 2 to 4 Chinook populations in each of the MPGs within the ESU achieve viability and that the populations that do not meet the viability criteria for all 4 VSP parameters are sustained in order to provide ecological functions and preserve options for ESU recovery. Given the extensive and intense development in the Lake Washington watershed, the Lake Washington populations are the least likely in the South MPG to achieve viability (NWFSC 2015).

Within the action area, the shoreline modifications have degraded the environmental baseline for shoreline-dependent juvenile Chinook salmon. Recreational boating has contributed to the low abundance of the Lake Washington populations of PS Chinook salmon and will likely continue to have these effects into the future as described above. In addition, the locks represent a highly complex passageway for migrating fish and also creates physical, biological, and chemical conditions that can affect salmon.

The timing of in-water construction associated with the proposed action will help avoid exposure of juvenile Chinook salmon to some project effects. Effects during construction of individual projects will include sublethal effects from elevated suspended. While we cannot predict the number of fish or the precise percentage of the population that will be affected by elevated suspended sediment, we can conclude that it will be a very small proportion of the populations because the majority of juvenile Chinook migrate out of the lakes prior to the start of in-water work and each area of elevated suspended sediment will be small and ephemeral. These short-term sublethal effects to a small proportion of the Lake Washington populations will not have an observable effect on the spatial structure, productivity, long-term abundance, or diversity of the PS Chinook salmon ESU.

Juvenile Chinook salmon will be exposed to increased shading and predation risk from new, existing, and expanded piers. The response to the shading from each structure will range from no response to a delay in migration of up to a few hours. The vast majority of actively migrating juvenile Chinook salmon will experience delays of less than an hour (Celedonia et al. 2009). Migration times from the Sammamish and Cedar Rivers to the locks in the Ship Canal averages between 13 and 16 days. Because the increase in over-water cover from IRPP is very minor compared to the available habitat in the lakes and the existing area of over-water cover, we do not expect the migration times or predation rates to be measurably changed. Similarly, the increase in in-water piles will not meaningfully increase predation risk at the population level because the increase will not significantly increase the predation risk for any individual juvenile Chinook salmon. While the increases in over-water cover will not be significant, IRPP will maintain the existing baseline conditions for PS Chinook salmon. The effects of the proposed action and the cumulative effects, when added to the environmental baseline, are likely to maintain the Lake Washington Chinook salmon populations at their current levels. Sustaining these populations will meet the recovery plan’s goal of preserving options for ESU recovery.

Puget Sound Steelhead DPS

NMFS identified 32 demographically independent populations (DIPs) and three MPGs within the PS steelhead DPS (Myers et al. 2015). Since 1980, only half of the 22 populations show evidence of a neutral or increasing trend, and most of these are in the Hood Canal & Strait of Juan de Fuca MPG. Several of the neutral trends are influenced by low estimated abundance in the early 1980s; nearly half of the 8 populations showing neutral trends since 1980 show declining trends between the late 1980s-early 1990s and about 2009, when increasing trends are often apparent (NWFSC 2015). Climate change is expected to make recovery targets for PS steelhead more difficult to achieve.

The Cedar River and North Lake Washington/Lake Sammamish populations are among the smallest in the DPS and are the smallest in the Central and South Puget Sound MPG. The 5-year geometric mean of raw natural spawner counts for 2010-2014 were four and zero, respectively (NWFSC 2015). The other populations in the Central and South Puget Sound MPG, the Green River, Nisqually River, Puyallup/Carbon rivers, and White River populations, are all larger and have a lower risk of extinction.

In the action area, the environmental baseline for PS steelhead is extremely poor. Lake Washington Basin steelhead are virtually extirpated (less than 10 adult fish per year). Pinniped predation on adult steelhead at the Ballard locks decimated the population. Since 2007, WDFW has not been able to estimate the production of steelhead in the Cedar River because the number of steelhead smolts trapped is so low (Kiyohara 2015). Given the developed nature of the Lake Washington watershed and their extremely low abundance and productivity, the Lake Washington steelhead populations are unlikely to meaningfully contribute to the recovery of the Central and South Puget Sound MPG or the DPS in the near-term. IRPP is likely to continue and in some respects improve protective measures that work in favor of abundance and productivity of the DPS.

Puget Sound Chinook Salmon Critical Habitat

The poor condition of critical habitat is the primary reason for the current status of the PS Chinook salmon ESU. PBFs 2 and 3 are present in the action area. The environmental baseline of the PBFs is degraded due to shoreline development. The CHART rated the conservation value of critical habitat in Lake Washington as “medium.” We did not designate critical habitat in Lake Sammamish. The proposed action will temporarily affect PBFs 2 and 3 due to elevated suspended sediment. This effect is unlikely to cause a reduction in the conservation value of PBFs 2 and 3 because of the short duration and limited extent of each plume. Furthermore, the effects to PBFs 2 and 3 will be timed to avoid most juvenile Chinook salmon. Over-water structures will permanently impact critical habitat by increasing predation and delaying migration. There will be small increases in shading from over-water structures. However, the effects to critical habitat from these increases will not appreciably affect the current function of critical habitat because the increases are tiny relative to the current amount of habitat in Lake Washington. Overall, critical habitat will remain functional, will retain the current ability for PBFs to serve the intended conservation role for the species, and will not affect the likelihood of recovery of the ESU. Therefore, IRPP will not significantly reduce the conservation value of critical habitat at the ESU scale.

2.7 Conclusion

After reviewing and analyzing the current status of the listed species and critical habitat, the environmental baseline within the action area, the effects of the proposed action, any effects of interrelated and interdependent activities, and cumulative effects, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of PS Chinook salmon or PS steelhead or destroy or adversely modify PS Chinook salmon designated critical habitat.

2.8 Incidental Take Statement

Section 9 of the ESA and Federal regulations 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 actually kills or injures fish or wildlife by significantly impairing essential behavioral patterns, including breeding, spawning, rearing, migrating, feeding, or sheltering (50 CFR 222.102). “Incidental take” is defined by regulation as takings that result from, but are not the purpose of, carrying out an otherwise lawful activity conducted by the Federal agency or applicant (50 CFR 402.02). Section 7(b)(4) and section 7(o)(2) provide that taking that is incidental to an otherwise lawful agency action is not considered to be prohibited taking under the ESA if that action is performed in compliance with the terms and conditions of this incidental take statement.

2.8.1 Amount or Extent of Take

In the biological opinion, we determined that the projects falling under the IRPP will cause incidental take of juvenile PS Chinook salmon by elevated suspended sediment, PAH exposure, and over-water structures. Accurately quantifying the number of fish taken as a result of elevated suspended sediment levels and PAH exposure is not possible. There are no methods available to monitor this harm since it will occur over a large area and over many years. In such cases, we use a take surrogate or take indicator that rationally reflects the incidental take caused by the proposed activities.

For increased suspended sediments and PAH exposure, the best available indicator for the extent of take is the extent of visible increased turbidity. Based on past projects (e.g. Bloch 2010), the observed extent of turbidity is a reliable indicator of the extent of elevated suspended sediment, and therefore, the extent of exposure of to listed species. Because PAHs will be released during activities that increase suspended sediment, the observed extent of turbidity is a reliable indicator of the extent of PAH exposure.

For increased suspended sediments, the extent of take will be exceeded and the reinitiation provisions of this opinion will be triggered if elevated turbidity levels are observable beyond 150 feet of individual projects sites. For projects removing creosote-treated timber, the extent of take will be also be exceeded and the reinitiation provisions of this opinion will be triggered if elevated turbidity levels are observable beyond 150 feet of individual projects sites.

For take resulting from the creation of overwater structure, we use the net increase of overwater cover as a habitat surrogate. This surrogate is proportional to the amount of take as we expect migration delays and additional vulnerability to predators with increasing coverage of the lakes' surfaces. The take represented by this surrogate is equivalent to the maximum amount of take considered in our jeopardy analysis. Therefore, if the surrogate is exceeded, reinitiation of consultation will be required. This surrogate will function as an effective reinitiation trigger because, the area of overwater structure can and will be measured and reported on an annual basis. Take of juvenile PS Chinook salmon due to an increase in over-water cover is exempted for:

1. a net increase of 525 square feet per year in Lake Washington; and
2. a net increase of 825 square feet per year in Lake Sammamish.

2.8.2 Effect of the Take

In the biological opinion, we determined that the amount or extent of anticipated take, coupled with other effects of the proposed action, is not likely to result in jeopardy to the species or destruction or adverse modification of critical habitat.

2.8.3 Reasonable and Prudent Measures

"Reasonable and prudent measures" are nondiscretionary measures that are necessary or appropriate to minimize the impact of the amount or extent of incidental take (50 CFR 402.02). These reasonable and prudent measures are necessary and appropriate to minimize the take of PS Chinook salmon:

1. Minimize incidental take from elevated suspended sediment and PAHs; and

2. Minimize incidental take from over-water structures.

2.8.4 Terms and Conditions

The terms and conditions described below are non-discretionary, and action agencies or any applicant must comply with them in order to implement the reasonable and prudent measures (50 CFR 402.14). The action agencies have 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).

1. The following term and condition implements reasonable and prudent measure 1:

   As a condition of their permit, the Corps shall require applicants to visually monitor for turbidity and report the results of the monitoring to NMFS to insure that observable increased turbidity does not extend beyond 150 feet from any individual project covered by IRPP.

2. The following term and condition implements reasonable and prudent measure 2:

The Corps shall track and report to NMFS the net change in over-water cover and ensure that it does not exceed a net increase of 525 square feet per year in Lake Washington or 825 square feet per year in Lake Sammamish.

2.9 Reinitiation of Consultation

This concludes formal consultation for the proposed actions related to the IRPP. As 50 CFR 402.16 states, 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 taking specified in the incidental take statement 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.

2.10 "Not Likely to Adversely Affect" Determinations

The proposed action will not have any direct effects on Southern Resident killer whales (SRKWs) or their critical habitat. However, the project may indirectly affect the quantity of prey available to Southern Residents. Any salmonid take up to the aforementioned maximum extent and amount would result in an insignificant reduction in adult equivalent prey resources for SRKWs that may intercept these species within their range. The Lake Washington populations of Chinook salmon are an extremely small proportion of the total number of fish available to SRKWs. IRPP will not significantly reduce the abundance of these populations. Therefore, we concur with the determination that the proposed action may affect, but is not likely to adversely affect SRKWs.

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

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 effect means any impact that reduces quality or quantity of EFH, and may include direct or indirect physical, chemical, or biological alteration 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 of it 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 the descriptions of EFH for Pacific coast salmon (PFMC 2014) contained in the fishery management plans developed by the Pacific Fishery Management Council and approved by the Secretary of Commerce.

3.1 Essential Fish Habitat Affected by the Project

The proposed action and action area for this consultation are described in the Introduction to this document. The action area includes areas designated as EFH for various life-history stages of Chinook salmon (*O. tshawytscha*) and coho salmon (*O. kisutch*), but does not occur within a Habitat Area of Particular Concern.

3.2 Adverse Effects on Essential Fish Habitat

We determined that the proposed action will have adverse effects to EFH designated for Chinook salmon and coho salmon, based on the analysis of effects presented in the ESA portion of this document. The proposed action will adversely affect EFH by temporarily elevating suspended sediment levels and increasing over-water cover.

Elevated suspended sediment will adversely affect the following amount of EFH:

1. 81.0 acres per year in Lake Washington; and
2. 40.5 acres per year in Lake Sammamish.

The amount of EFH that will be adversely by shading from over-water structures

1. 525 square feet per year in Lake Washington; and
2. 825 square feet per year in Lake Sammamish.

3.3 Essential Fish Habitat Conservation Recommendations

We expect full implementation of these EFH conservation recommendations would protect, by avoiding or minimizing the adverse effects described in Section 3.2 above, approximately 120.5 acres per year of designated EFH for Pacific coast salmon. We recommend that we and the Corps:

1. Track the number of IRPP projects to ensure that they do not exceed 81.0 acres per year in Lake Washington and 40.5 acres per year in Lake Sammamish; and

2. Track the net change in over-water cover and ensure that it does not exceed a net increase of 525 square feet per year in Lake Washington or 825 square feet per year in Lake Sammamish.

3.4 Statutory Response Requirement

As required by section 305(b)(4)(B) of the MSA, we and the Corps must provide a detailed response in writing to us within 30 days after receiving an EFH Conservation Recommendation.

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 our EFH Conservation Recommendations unless we 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 the Conservation Recommendations, the Federal agency must explain its reasons for not following the recommendations, including the scientific justification for any disagreements with us 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)).

In response to increased oversight of overall EFH program effectiveness by the Office of Management and Budget, we 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, we ask that in your statutory reply to the EFH portion of this consultation, you clearly identify the number of conservation recommendations accepted.

3.5 Supplemental Consultation

The we and the Corps must reinitiate EFH consultation with us 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 our EFH Conservation Recommendations (50 CFR 600.920(l)).

4. DATA QUALITY ACT DOCUMENTATION AND PRE-DISSEMINATION REVIEW

The Data Quality Act (DQA) 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, documents compliance with the DQA, and certifies that this opinion has undergone pre-dissemination review.

4.1 Utility

Utility principally refers to ensuring that the information contained in this consultation is helpful, serviceable, and beneficial to the intended users. The intended users of this opinion are the US Army Corps of Engineers' Seattle District (Corps) and the National Marine Fisheries Service (NMFS). Other interested users could King County, the Washington State Department of Fish and Wildlife (WDFW), the Muckleshoot Indian Tribe Fisheries Division (MITFD), and the Snoqualmie Indian Tribe Environmental and Natural Resources Department (SITENRD), the Washington State Department of Ecology (Ecology), King County municipalities, and lake front property owners. Individual copies of this opinion were provided to NMFS and the Corps. The format and naming adheres to conventional standards for style.

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

Information Product Category: Natural Resource Plan

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.

Best Available Information: This consultation and supporting documents use the best available information, as referenced in the References section. The analyses in this opinion and 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 our staff with training in ESA and MSA implementation and reviewed in accordance with West Coast Region ESA quality control and assurance processes.

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APPENDIX A: Green Shores for Homes Credits and Ratings Guide (SeaGrant 2015)

"Riparian buffer" (RB) is the shoreline area that lies within the minimum riparian buffer or setback required by the local jurisdiction OR within 35 feet of the OHWM (measured as the horizontal distance landward of the OHWM), whichever is greater.

Riparian vegetation	*For lots <¼ acre	*For lots >¼ acre	Base points
Maintain and/or plant native vegetation in -	75-100% of the RB	90-100% of the RB	7
Maintain and/or plant native vegetation in -	50-74% of the RB	70-89% of the RB	5
Maintain and/or plant native vegetation in -	30-49% of the RB	50-69% of the RB	2
Retain or plant overhanging and/or emergent vegetation along >50% of the shoreline length			3
Retain or plant overhanging and/or emergent vegetation along >25-49% of the shoreline length			2
Retain or plant overhanging and/or emergent vegetation along >10-24% of the shoreline length			1
Bonus (available once one or more base conditions have been met)			Bonus points
Maintain and/or plant native vegetation in additional 10 feet width inland from the riparian buffer for the length of the shoreline, or equivalent. Equivalency may be measured as greater than 10 feet additional width over less than the entire shoreline.			1 bonus point per 10 feet of additional width of riparian vegetation, up to a maximum of 3 bonus points (i.e., 30 feet of additional riparian vegetation width)
Provide and implement a plan for monitoring and maintaining your riparian plantings			2

*%RB criteria are greater for larger lots because there is more capacity to locate buildings and infrastructure outside the RB on large lots.

APPENDIX B: In-Water Work Windows for the Lake Washington System

Specific Area	Work Window (when work is allowed)
Lake Washington Ship Canal (from the Chittenden Locks to the east end of the Mountlake Cut)	October 1 -April 15
Lake Washington	
• South of I-90	
----within one mile of Mercer Slough or Cedar River	July 16-July 31 ***and*** November 16-December 31
----further than one mile from Mercer Slough or Cedar River	July 16-December 31
• Between I-90 & SR 520	July 16-April 30
• North of SR 520	
----Between SR 520 & a line drawn due west from Arrowhead Point	July 16-March 15
----North of a line drawn due west from Arrowhead Point	July 16-July 31 ***and*** November 16- February 1
Sammamish River	July 16-July 31 ***and*** November 16-February 1
Lake Sammamish	
--further than 1/2 mile from Issaquah Creek	July 16-December 31
--within 1/2 mile of Issaquah Creek	July 16-July 31 ***and*** November 16-December 31

*Any proposed project in or within 100 feet of a documented sockeye spawning area would be limited for in-water work to the period between July 16 and September 30. Contact the WDFW Area Habitat Biologist to determine if the project is subject to the sockeye window.