Review of Lewis River Hydroelectric Project fish passage alternatives and recommendation of Utilities

Prepared by PacifiCorp and Cowlitz Public Utility District No. 1

May 25, 2018

1.0 Introduction

This document has been prepared by PacifiCorp and the Public Utility District No. 1 of Cowlitz County, Washington ("Cowlitz PUD") (together, "the Utilities") for consideration by the National Marine Fisheries Service ("NMFS") and the U.S. Fish and Wildlife Service ("FWS") (together, the "Services"), under articles 4.1.9 *Review of New Information Regarding Fish Transport into Lake Merwin and Yale Lake* and 7.6 *In Lieu Fund* of the Lewis River Settlement Agreement ("Settlement Agreement").

The Utilities are submitting this document to help clarify their fish passage and mitigation commitments and to inform the Services' respective final Federal Power Act Section 18 prescriptions for the Swift No. 1 (FERC No. 2 111), Swift No. 2 (FERC No. 2213) Yale (FERC No. 2071) and Merwin (FERC No. 935) hydropower projects. The Services final decision on this matter is due for submission to the Federal Energy Regulatory Commission ("FERC") on or by August 23, 2018.

1.1 Background

Located on the North Fork of the Lewis River in southwestern Washington, the Lewis River Hydroelectric System consists of four operationally coordinated projects (**Figure 1**). PacifiCorp owns the Swift No. 1, Yale, and Merwin hydropower projects which together generate 536 MW of electricity at full capacity. Cowlitz PUD owns the 73 MW Swift No. 2 Project (FERC No. 2213) which lies between the Swift No. 1 and Yale projects. Currently, PacifiCorp operates Swift No. 2 for Cowlitz PUD under contract.

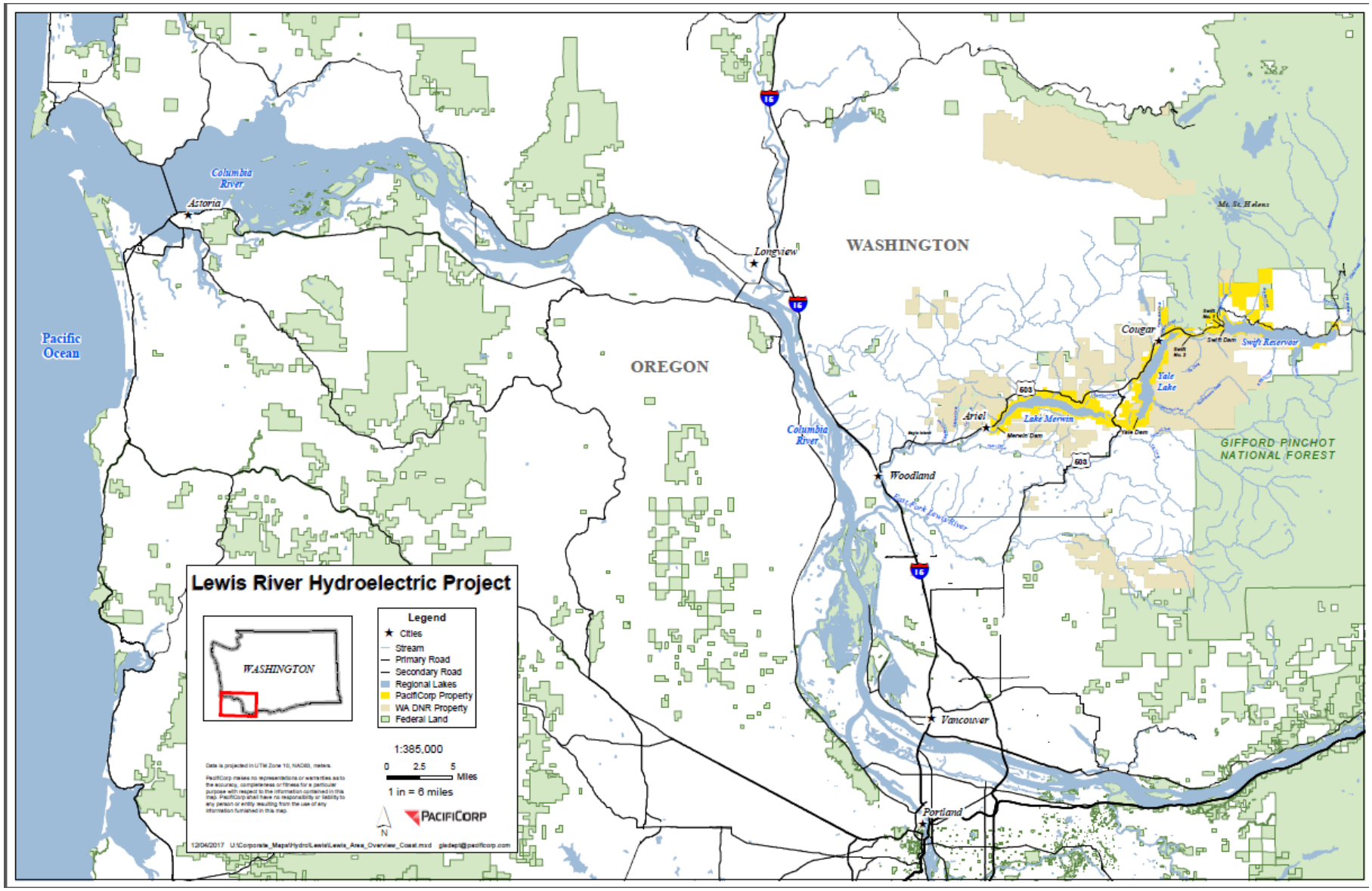
1.1.1 Lewis River Settlement Agreement

In response to the FERC relicensing process of the hydroelectric projects, interested parties collaborated on establishing a settlement agreement concerning future operations and responsive protection, enhancement and mitigation measures. On November 30, 2004, 26 Parties, including two Licensees, five federal agencies, two state agencies, eight local/county agencies, two tribes, two citizens-at-large, and five non-governmental organizations, signed the Lewis River Settlement Agreement (PacifiCorp and Cowlitz PUD 2004). In December 2004, the Licensees filed with the FERC the Lewis River Settlement Agreement along with a Joint Explanatory Statement and Supplemental Preliminary Draft Environmental Assessment (PacifiCorp and Cowlitz PUD 2004). The Settlement Agreement reflects the interests of all Parties; provides significant investments in fish and aquatic resources, wildlife and recreation; includes monitoring and evaluation and adaptive management; and includes ongoing coordination with the Parties through the Aquatics and Terrestrial Coordination Committees. The Settlement Agreement provides the basis for 50-year operating licenses to allow the projects to continue to provide benefits to the Utilities' customers while making these important mitigation investments.

1.1.2 Agency Terms and Conditions

The U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS) filed Federal Power Act Section 18 fishway prescriptions on February 22, 2006 and February 14, 2006, respectively, adopting the specific terms of the Settlement Agreement.

Figure 1 – Lewis River Area Overview



1.1.3 Endangered Species Act Consultations

In January 2005, Cowlitz PUD and PacifiCorp filed with the FERC Biological Evaluations (BEs) covering federally listed fish and wildlife species in the Lewis River Basin (PacifiCorp and Cowlitz PUD 2005a, PacifiCorp and Cowlitz PUD 2005b). The FERC modified the BEs, included them in the Final Environmental Impact Statement, and submitted the documents to the Services. The Proposed Action in the BEs incorporates the Settlement Agreement.

On September 15, 2006, the USFWS issued a Biological Opinion covering bull trout, northern spotted owls and bald eagles. The NMFS issued its Biological Opinion covering their respective listed species on August 27, 2007.

1.1.4 New FERC Licenses

On June 26, 2008, the FERC provided the utilities with new operating licenses for the projects. The license periods are 50 years for each project, starting June 1, 2008. Each license includes the respective conditions of the Services biological opinions and respective conditions of the Washington Department of Ecology 401 certificates. In general, the licenses include terms of the Settlement Agreement with few exceptions. Parties to the Settlement Agreement continue to abide by the Settlement Agreement terms including those terms outside the FERC requirements.

1.2 Lewis River Settlement Agreement conditions relative to reintroduction of anadromous salmonids into Yale and Merwin Reservoirs

As noted in Section 3.1 of the Settlement Agreement, the anadromous fish reintroduction outcome goal within the project area "is to achieve genetically viable, self-sustaining, naturally reproducing, harvestable populations above Merwin dam greater than minimum viable populations."

Under the Settlement Agreement, the Utilities have made, and will continue to make, significant investments into a salmon and Steelhead reintroduction program. These measures include a suite of anadromous fish protection and restoration measures and actions implemented with a phased approach. To date, constructed facilities include the Merwin Upstream Fish Collector, three upper basin juvenile fish acclimation ponds, the Swift Downstream Fish Collector and a juvenile fish release facility located in Woodland, Washington. Additional program phases identified in the Settlement Agreement and subsequent FERC licenses require the construction and operation of the following future fish passage facilities:

Downstream Passage at Yale Dam (Settlement Agreement article 4.5)

Downstream Passage at Merwin Dam (article 4.6)

Upstream Passage at Yale Dam (article 4.7)

Upstream Passage at Swift Projects (article 4.8)

There is also the specific opportunity to consider an In Lieu Fund as an alternative to permanent future fish passage facilities (Yale downstream, Merwin downstream, Yale upstream and Swift upstream). This provision is contained in Section 4.1.9 of the Settlement Agreement as follows:

4.1.9 Review of New Information Regarding Fish Transport into Lake Merwin and Yale Lake.

a. The Licensees shall construct and provide for the operation and maintenance of both upstream and downstream fish collection and transport facilities at each of Merwin Dam, Yale Dam, and the Swift Projects as provided in the schedule in this Agreement unless otherwise directed by the Services pursuant to this Section. New Information (defined below) relevant to reintroduction and fish passage into Yale Lake or Lake Merwin may be available to the Services that may influence the implementation of fish passage into and out of these reservoirs, or that could result in the Services determining that reintroduction or fish passage for anadromous fish is inappropriate. If the Services conclude upon review of the New Information that one or more of the passage facilities should not be constructed, in lieu of designing, permitting, constructing, and operating the passage facility, PacifiCorp shall provide additional funds for projects in lieu of fish passage, as set forth in Section 7.6. In this event, the Licensees shall also implement the bull trout passage measures as set forth in Section 4.10. The adult upstream fish passage facility at Merwin and juvenile downstream collector at Swift No. 1 are not subject to this review.

b. Upon receipt and review of New Information relevant to reintroduction and fish passage from any party, the members of the ACC may provide written comments to the Services regarding such New Information. Such comments shall be provided to the Services no later than five years prior to the date that PacifiCorp and/or Cowlitz PUD is to begin operating the relevant passage facility. If any New Information and comments are submitted to the Services, then approximately four and a half years prior to the date that PacifiCorp and/or Cowlitz PUD is to begin operating the relevant passage facility, the Licensees shall convene a meeting of the ACC for the purpose of discussing the New Information and comments. At such meeting, the Licensees shall solicit and obtain the Services' response to the New Information and related comments, unless the Services have provided the results of their review to the ACC earlier. If the Services have concluded that one or more of the passage facilities should not be constructed, then within 60 days after the meeting of the ACC, the Services shall advise the ACC in writing of such conclusion.

c. For purposes of this section, "New Information" is defined as information relevant to anadromous fish reintroduction and fish passage, including that presented by any Party, and provided to the Services and the Licensees. The Licensees must provide copies of such New Information to all the members of the ACC. This information may include, but is not limited to:

(1) Experience with upstream fish collection and transport facilities at other sites, including Merwin Dam.

(2) Experience with downstream fish collection facilities at other sites, including Swift No. 1 Dam.

(3) Experience with the reintroduction efforts of spring Chinook, coho, and steelhead above Swift No. 1 Dam.

(4) Consideration of broader contextual information beyond the Lewis River Basin, including regional anadromous fish recovery efforts.

d. The Licensees shall inform the Commission of any determination by the Services that one or more of the fish collection and transport facilities should not be constructed. In this event, PacifiCorp shall provide additional funds for projects in lieu of fish passage, as set forth in Section 7.6.

As expressed in Section 4.1.9 (d) above, in the event the Services determine fish collection and transport facilities should not be constructed, the following Section 7.6 of the Lewis River Settlement Agreement would apply.

7.6 In Lieu Fund. If NOAA Fisheries and USFWS determine, pursuant to Section 4.1.9, that reintroduction of anadromous salmonids into Yale Lake or Lake Merwin is not required, and if as a result of such determination one or more of the Merwin Downstream Facility, Swift Upstream Facility, and the Yale Upstream and Downstream Facilities are not designed, permitted, constructed, and operated, then PacifiCorp shall establish the "In Lieu Fund" to support mitigation measures for anadromous salmonids in lieu of passage. The In Lieu Fund shall be a Tracking Account maintained by the Licensees, with all accrued interest being credited to the In Lieu Fund. PacifiCorp shall provide funds according to the schedule set forth below.

7.6.1 PacifiCorp's Contributions.

a. PacifiCorp shall provide the following sums to the In Lieu Fund: $10 million in lieu of a juvenile surface collector at Yale Dam; $10 million in lieu of a juvenile surface collector at Merwin Dam; $5 million in lieu of an upstream adult fish passage facility at Yale; and $5 million in lieu of an upstream adult fish passage facility in the vicinity of the Swift Projects.

b. PacifiCorp shall allocate funds in lieu of the Yale Downstream Facility as follows: $3 million on each of the 11th and 12th anniversaries of the Issuance of the New License for the Yale Project, and $4 million on the 13th anniversary of the Issuance of the New License for the Yale Project. PacifiCorp shall allocate funds in lieu of the Merwin Downstream Facility as follows: $2.5 million on each of the 14th through the 17th anniversaries of the Issuance of the New License for the Merwin Project. PacifiCorp shall allocate funds in lieu of the Swift Upstream Facility as follows: $1.25 million on each of the 14th through the 17th anniversaries of the Issuance of the New License for the Swift No. 1 Project. PacifiCorp shall allocate funds in lieu of the Yale Upstream Facility as follows: $1.25 million on each of the 14th through the 17th anniversaries of the Issuance of the New License for the Yale Project. Funds shall be available for expenditure as soon as the decisions not to

build the respective facilities are final and not subject to further review; provided that if any review delays the expenditure of In Lieu Fund monies for an extended period, the ACC will consult to discuss the delay and whether to propose an alternate course of action. PacifiCorp shall not be obligated to both spend In Lieu Funds and build the respective facilities.

Context for the related sections is best provided through language in the Settlement Agreement Joint Explanatory Statement Section 3.2.6 Funding In Lieu of Passage.

The Parties recognize that new information may become available to the Services prior to implementing the passage of anadromous fish into Yale Lake and/or Lake Merwin. This information could lead the Services to determine that fish reintroduction at one or both of these reservoirs is inappropriate. In that event, the Settlement Agreement calls for PacifiCorp to provide funding up to $30 million in lieu of construction of the respective passage facilities for use in achieving equivalent or greater benefits to anadromous fish populations as would have occurred if passage through Yale Lake and/or Lake Merwin had been provided. Emphasis for the use of these funds would be first placed on benefiting anadromous fish of the North Fork Lewis River, and if those opportunities are exhausted, then would be used to benefit other populations in the applicable ESUs. The list of potential projects in Schedule 7.6.2 of the Settlement Agreement illustrates projects in both the North Fork and East Fork of the Lewis River that would qualify as mitigation measures under the In Lieu Fund, for example:

Improve fish passage through identification and removal of diversions on Cedar Creek and other tributaries;

Increase functional Large Woody Debris structures in appropriate stream reaches;

Reconnect, enhance and restore degraded habitat and wetland areas;

Fence livestock and control farm run-off.

Through this provision of the Agreement, the projects' impacts on anadromous fish migration in the basin will continue to be mitigated to achieve the Parties' overarching biological and ecological goals of restoring and enhancing fish populations to achieve viable, sustainable and harvestable levels of fish.

Should the In Lieu Fund be selected, the Settlement Agreement sets forth requirements for the development of a strategic plan and administrative procedures to guide implementation of the In Lieu Fund (see Lewis River Settlement Agreement Sections 7.6.2 and 7.6.3); fund management (Section 7.7); reporting of fund activities and expenditures (Section 7.7.1); cost associated with management of Fund (Section 7.7.2); escalation of costs (Section 7.7.3); and execution of projects and mitigation measures (Section 7.8). Section 4.10 of the Settlement Agreement regarding additional bull trout measures, would also be placed into effect.

4.10.1 <u>Yale and Merwin Downstream Bull Trout Facilities</u>. If, pursuant to Section 4.1.9, PacifiCorp does not build the Yale Downstream Facility described in Section 4.5,

then PacifiCorp, on or before the 13th anniversary of the Issuance of the New License for the Yale Project, shall construct and provide for the operation of a downstream bull trout collection and transport facility in the Yale forebay (the "Yale Downstream Bull Trout Facility").

If, pursuant to Section 4.1.9, PacifiCorp does not build the Merwin Downstream Facility described in Section 4.6, then when USFWS determines that bull trout populations have increased sufficiently in Lake Merwin, but not sooner than the 17th anniversary of the Issuance of the New License for the Merwin Project, PacifiCorp shall construct and provide for the operation of a passage facility similar to the Yale Downstream Bull Trout Facility at Merwin Dam (the "Merwin Downstream Bull Trout Facility").

The Yale and Merwin Downstream Bull Trout Facilities shall be similar in magnitude and scale to modular floating Merwin-type collectors and are not intended to be passage facilities of the same magnitude and expense as the Yale Downstream Facility and the Merwin Downstream Facility described in Sections 4.5 and 4.6 (recognizing that monies shall be contributed to the In Lieu Fund described in Section 7 below in lieu of constructing those passage facilities). PacifiCorp shall provide for monitoring of performance as provided in Section 9, and make necessary and appropriate Facility Adjustments and Facility Modifications to the Yale and Merwin Downstream Bull Trout Facilities, in Consultation with the ACC and with approval of USFWS, to achieve relevant performance standards as provided in Section 4.1.4 above, provided that such modifications shall not require installation of a different type of passage facility. PacifiCorp shall provide preliminary (30%) designs to the ACC for the Yale and Merwin Downstream Bull Trout Facilities within 12 months after the Services' determination under Section 4.1.9. PacifiCorp shall follow the provisions in Sections 4.1.1 through 4.1.3 when developing designs for the facilities. Pursuant to Section 15.14, PacifiCorp shall submit final designs to the Commission upon approval by USFWS, subject to Section 15.14, but not later than 60 days after submission of the final design to USFWS.

4.10.2 <u>Yale and Swift Upstream Bull Trout Facilities</u>. If (1) pursuant to Section 4.1.9, the Licensees do not build the Swift Upstream Facility, and (2) USFWS determines on or before the 13th anniversary of the Issuance of the New License for the Swift No. 1 Project or the Swift No. 2 Project, whichever is later, that collect-and-haul methods established under Section 4.9.1 or 4.9.2 are not meeting bull trout performance standards provided in Section 4.1.4, then on or before the 17th anniversary of the Issuance of the New License for the Swift No. 1 Project or the Swift No. 2 Project, whichever is later, the Licensees shall complete construction of and provide for the operation of alternate passage facilities (the "Swift Upstream Bull Trout Facility").

If (1) pursuant to Section 4.1.9, PacifiCorp does not build the Yale Upstream Facility, and (2) USFWS determines on or before the 17th anniversary of the Issuance of the New License for the Yale Project that collect-and-haul methods established under Section 4.9.1 or 4.9.2 are not meeting bull trout performance standards provided in Section 4.1.4,

then on or before the 17th anniversary of the Issuance of the New License for the Yale Project PacifiCorp shall complete construction of and provide for the operation of alternate passage facilities (the "Yale Upstream Bull Trout Facility").

The Yale and Swift Upstream Bull Trout Facilities are not intended to be passage facilities of the same magnitude and expense as the Yale Upstream Facility and the Swift Upstream Facility described in Sections 4.7 and 4.8 (recognizing that monies shall be contributed to the In Lieu Fund described in Section 7 below in lieu of constructing those passage facilities). PacifiCorp (for Yale) and the Licensees (for Swift No. 2) shall select an alternative passage facility design for the Yale and Swift Upstream Bull Trout Facilities, in Consultation with the ACC and with the approval of USFWS, and PacifiCorp (for Yale) and the Licensees (for Swift No. 2) shall construct and provide for the operation of such passage facilities for the remaining term of the respective New Licenses. The Licensees shall follow the provisions of Sections 4.1 through 4.1.3 as applicable when developing designs for the facilities.

PacifiCorp shall monitor performance of the Yale Upstream Bull Trout Facility as provided in Section 9, and make necessary and appropriate Facility Adjustments and Facility Modifications to the Yale Upstream Bull Trout Facility pursuant to Section 4.1.6. The Licensees shall monitor performance of the Swift Upstream Bull Trout Facility as provided in Section 9 and make Facility Adjustments and Facility Modifications pursuant to Section 4.1.6 to the Swift Upstream Bull Trout Facility.

1.3 Development of New Information – Consultation with Lewis River Aquatic Coordination Committee

The following is a summary of interactions between PacifiCorp and the Lewis River Aquatic Coordination Committee ("ACC") to develop and inform questions concerning fish passage at the various projects.

In November 2011, PacifiCorp gave notice to the ACC representatives that the Utilities would be taking steps to collect new information that would inform the Services' determination if additional fish passage facilities are warranted. In October 2012, PacifiCorp notified the ACC that PacifiCorp had contracted the U.S. Geological Survey Northern Rocky Mountain Science Center to conduct the following:

1. Review information regarding fish transport into Lake Merwin and Yale Lake
2. Conduct habitat assessment of tributaries to Swift Reservoir, Yale Lake and Lake Merwin
3. Assess adult potential for spawning success
4. Assess juvenile production potential and emigration success
5. Evaluate Lake Merwin predator impacts

6. Assess anadromous/resident fish interactions

These work tasks were vetted by the ACC prior to implementation, and results were reported to the ACC on June 5, 2014, March 12, 2015, July 9, 2015, August 13, 2015, October 8, 2015, and April 14, 2016.

In May 2015, PacifiCorp informed the ACC that it had contracted Kevin Malone (DJ Warren and Associates) and Dr. Chip McConnaha and Karl Dickman (ICF International) to develop a new Ecosystem Diagnostics Treatment (EDT) model benchmark for the lower Lewis River. This effort would complement the new model benchmark for tributaries to Lake Merwin, Yale Lake and Swift Reservoir.

On December 24, 2015, PacifiCorp invited interested ACC representatives to a meeting to review the inputs and assumptions to be used in development of the Lewis River EDT3 fish production model. Thereafter known as the ACC EDT subgroup, the subgroup conducted three separate meetings (January 21, 2016, February 19, 2016 and March 18, 2016). As an outcome of the first subgroup meeting and in support of the EDT3 for the lower Lewis River, PacifiCorp contracted Mason, Bruce and Girard to conduct a review of known aquatic restoration projects completed in the lower Lewis River basin.

On February 11, 2016, PacifiCorp informed the ACC that it had contracted Dr. Phil Roni (Cramer Fish Sciences) to take a larger look at the North Fork Lewis River watershed. Specifically, Dr. Roni addressed issues and opportunities related to fish habitat and fish production; limiting factors by life stage and habitat type and opportunities for restoration. At the same ACC meeting, Dr. Roni provided a presentation on his study objectives and tasks. ACC meeting notes and Dr. Roni's presentation are available at the following links:

ACC Meeting Notes (**Attachment A-1**):
http://www.pacificorp.com/content/dam/pacificorp/doc/Energy_Sources/Hydro/Hydro_Licensing/Lewis_River/li/acc/02112016_ACC_MN.pdf

Dr. Roni's Presentation (**Attachment A-2**):
http://www.pacificorp.com/content/dam/pacificorp/doc/Energy_Sources/Hydro/Hydro_Licensing/Lewis_River/li/acc/LR_ACC_EDT_presen.pdf

On April 14, 2016, new information presentations were given by Dr. Robert Al -Chokhacy (USGS), Mike Bonoff (Mason, Bruce and Girard), Kevin Malone (DJ Warren and Associates), Dr. Phil Roni (Cramer Fish Sciences), and Jeremiah Doyle (PacifiCorp) to the ACC. ACC meeting notes and presentations are available at the following links (**Attachment A-3**):
http://www.pacificorp.com/content/dam/pacificorp/doc/Energy_Sources/Hydro/Hydro_Licensing/Lewis_River/li/acc/4142016_ACC_MN.pdf

On April 26, 2016, PacifiCorp distributed to the ACC for a 30-day review and comment period, a draft of the document entitled "New Information Regarding Fish Transport into Lake Merwin and Yale Lake." The document was a collection of study reports prepared by the U.S. Geological

Survey and the various environmental consultants. Only the Lower Columbia Fish Recovery Board responded providing comments on this information.

On June 24, 2016, the Utilities submitted the final New Information report to the Services and the ACC. Following the distribution of the New Information report, the Services expressed a desire to engage the ACC in discussions. To that end, PacifiCorp contracted PDSA Consulting and Mason, Bruce and Girard to facilitate collaborative discussions of the additional information with the intention to reach agreement on a recommendation to inform the Services' decision.

On September 8, 2016, the first of several meetings were conducted with the ACC Fish Passage Decision Group, a subset of the Lewis River ACC. Group discussions ended on May 11, 2017. A report of discussions and outcomes was prepared by the facilitators and is available at the following link (**Attachment A-4**):
http://www.pacificorp.com/content/dam/pacificorp/doc/Energy_Sources/Hydro/Hydro_Licensing/Lewis_River/li/acc/Final_Decision_Support_July_28_2017%20(website).pdf

For the period of May 2017 through March 2018, PacifiCorp conducted individual meetings with certain ACC member organizations.

On April 12, 2018, at the request of the ACC, PacifiCorp introduced the National Fish and Wildlife Foundation ("NFWF") to the ACC. NFWF then provided a presentation concerning a proposed partnership opportunity between the Utilities and NFWF. PacifiCorp also provided time for discussion of the draft full in-lieu fund implementation plan. Published notes from the meeting, the NFWF presentation, and the draft implementation plan are available at the following links (**Attachment A-5**):
http://www.pacificorp.com/content/dam/pacificorp/doc/Energy_Sources/Hydro/Hydro_Licensing/Lewis_River/li/acc/04122018_ACC_MN.pdf

Extensions of Time

Given the requirement for the Services to consider the New Information and fish passage decision alternatives, additional time has been needed for the Services to complete their decision process. To accommodate this review, PacifiCorp has requested from FERC several extensions of time (EOT) for the Services to make their fish passage decisions. FERC has granted those requests.

On January 3, 2017, PacifiCorp submitted an EOT request proposing a new decision date for the Services of August 24, 2017. On February 9, 2017, the FERC issued the requested EOT.

On August 4, 2017 a second extension of time request was submitted on behalf of the Services proposing a decision date of no later than February 23, 2018.

On September 12, 2017, FERC issued the requested EOT. On January 30, 2018, the Services determined six months of additional time was needed to make their decision. The Services then requested PacifiCorp submit an EOT request to the FERC.

The Services' new notice of decision date would be no later than August 23, 2018. PacifiCorp filed the request to the Commission on February 15, 2018. On April 3, 2018, FERC issued the requested EOT, making the new deadline for the Services' decision August 23, 2018.

2.0 Relevant Scientific Information

In the process of seeking new federal licenses for the projects, the Utilities conducted a number of aquatic studies from 1996 through 2004. Reports of these studies are available on PacifiCorp's Lewis River website at http://www.pacificorp.com/es/hydro/hl/lr.html# under Relicensing Reports and Aquatics.

In addition to relicensing studies and per requirements of the new FERC licenses, PacifiCorp has and continues to implement a number of aquatic resource programs. Each year since 2005, PacifiCorp and the Cowlitz PUD have prepared an Annual Summary of Settlement Agreement Implementation: Aquatic and Terrestrial Resources which presents the annual results of ongoing monitoring and evaluation of Lewis River aquatic resources. The 2017 annual report is available on PacifiCorp's Lewis River website at http://www.pacificorp.com/es/hydro/hl/lr.html# under License Implementation and Reports.

3.0 New Information

As previously noted above, a number of New Information studies were identified and completed to inform the Services regarding the decision of whether additional fish passage facilities should be built and operated at the Lewis River hydroelectric projects or should, and in lieu of new facilities, a fund be established to complete "mitigation measures' (Settlement Agreement section 7.6) (e.g., aquatic habitat restoration, etc.) to achieve benefits of the anadromous fish reintroduction outcome goal. The following identifies each study completed and provides a short study abstract. Complete individual study reports are available at (**Attachment A-6**):
http://www.pacificorp.com/content/dam/pacificorp/doc/Energy_Sources/Hydro/Hydro_Licensing/Lewis_River/li/ar/06242016_LR%20In%20Lieu%20Reports.pdf

3.1 Review information regarding fish transport into Lake Merwin and Yale Lake, US Geological Survey

Study purpose and methods:

Researchers conducted an extensive literature review to assess the effects of smolt acclimation facilities on salmon performance, the effectiveness of downstream and upstream fish collection and passage facilities, the interspecific effects of salmon reintroduction and supplementation on salmonid communities, and the potential effects of native and non-native taxa on anadromous fish reintroduction efforts.

Study results:

Contrasting the juvenile and adult collection operations across locations is challenging given different collection designs, hydrologic conditions, and reservoir bathymetry. Existing studies indicate the benefits of acclimation facilities (survival, stray rates, and residualization) are highly variable. Furthermore, acclimation facilities may not improve overall reintroduction success, particularly as no clear patterns in fitness have been observed.

The success of downstream collection facilities varies by metric and location. Downstream collection injury rates tend to be primarily descaling and mortality rates for target and non-target species are consistently low, a pattern consistent with data collected during the early stages of reintroduction in Swift Reservoir. Collection efficiency, however, is highly variable across species and locations. The variable collection efficiencies are likely driven by ambient abiotic conditions, bathymetric conditions within the reservoir and near the collector, and how fish are guided to the collectors. In Swift Reservoir, the proportion of juvenile salmon collected at the Swift Downstream Collector appears to be relatively low. Juvenile behavior near collection sites often drives such patterns. Recent studies in Swift Reservoir suggest modifications to the netting placement are likely to substantially increase the proportion of juveniles collected, highlighting the need to continue to adaptively modify and reevaluate designs and operations which can yield substantial increases in collections of juveniles and, consequently, the overall numbers of adult returns.

Adult collection facilities commonly report high survival and low injury rates, a pattern consistent with results from the Merwin upstream adult trap. Upstream collection efficiencies are rarely reported in the literature. Overall, collection efficiencies of adults were generally low at the Merwin upstream adult trap (9-62%), but the higher proportion of fish at the trap entrance (22-90%) suggests trap operations may explain the differences with collection efficiency. However, such data are preliminary and may be driven by the anomalous climatic conditions observed in 2015. Continued studies and modifications are needed and planned to improve collection efficiencies.

Additional information:

Annual estimates of juvenile salmonid collection efficiencies reported at the Swift Reservoir Floating Surface Collector (FSC) have remained consistently low among key transport species from 2015 through 2017 (ranging from 10 to 30%). However, from recent behavioral data (Anchor Environmental), it appears that the majority of smolts are successfully transitioning through the reservoir and locating the entrance of the FSC (see Lewis River Fish Passage Program 2017 Annual Report). Smolts are spending a large amount of time at the entrance of the FSC, and either ultimately passing into the collector or eventually transitioning back into the reservoir. PacifiCorp is currently working on better understanding how smolts interface with and behave at the entrance of the FSC. From this information, adjustments will be made to improve conditions at the entrance with the goal of increasing juvenile collection efficiency, and consequently, the overall number of returning adults.

PacifiCorp has continued to monitor adult collection efficiency at the Merwin Dam Adult Collection Facility since 2015. Initially, estimates of collection efficiency were less than 70%; however this was largely attributed to fish having the ability to volitionally exit the trap once initially passing through the entrance. In 2017, PacifiCorp installed a one-directional fyke structure at the entrance of the trap that prevented fish from exiting. This substantially increased collection efficiency. PacifiCorp is now evaluating the effect of using hatchery reared fish and fish previously trapped at the facility as test fish for collection efficiency. It is thought that behaviorally these fish may perform differently than wild fish from the upper basin and/or fish that had not already passed through the facility.

3.2 Habitat assessment of tributaries to Swift Reservoir, Yale Lake and Lake Merwin, US Geological Survey

Study purpose and methods:

Researchers assessed the habitat of tributaries to Swift Reservoir, Yale Lake, and Lake Merwin. In Swift Reservoir, assessments were targeted towards updating habitat information where recent surveys (within the last decade) were not available and/or in tributaries where coho salmon have been observed during recent reintroductions. In tributaries to Lake Merwin and Yale Lake, researchers conducted surveys to quantify the extent and status of available habitat for potential salmon and steelhead reintroductions. Information regarding the extent and quality of habitat was subsequently integrated with the Ecosystem Diagnosis and Treatment model for species-specific estimates of production potential in the Swift Reservoir, Yale Lake, and Lake Merwin basins (see study report "Ecosystem Diagnostics Treatment (EDT) model benchmark for the Lewis River", DJ Warren and Associates and ICF International).

Study results:

Tributaries to Lake Merwin contain a limited amount of available spawning and rearing habitat for anadromous salmon (8.2 km/5.1 mi). The strong correlation between habitat availability and salmon population size coupled with extensive predation potential (see study report 3.5 Evaluate Lake Merwin predator impact studies, US Geological Survey) together suggest available habitat may limit the likelihood of developing self-sustaining populations within Lake Merwin.

Limitations of the available habitat in tributaries to Lake Merwin appear to be largely natural (i.e., natural geologic features) suggesting opportunities to enhance the capacity in Lake Merwin are limited and suggests little potential for establishing and maintaining viable populations of anadromous fishes in this reservoir. In general, and for most tributaries surveyed, empirical habitat data suggest little evidence that habitat quality will limit anadromous salmon reintroduction. Evidence of habitat degradation appear to be location specific and includes sediment degradation, some thermal constraints during the summer months in tributaries to Lake Merwin and Yale Lake, and riparian degradation.

Information from this study along with other available data can be used to specifically identify factors limiting salmonids in the Swift Reservoir, Yale Lake and Lake Merwin areas and to help

quantify potential effectiveness of restoration. Ultimately, assessing the potential for viable populations will require consideration not only of habitat availability, but also biotic interactions between anadromous fishes and extant species.

3.3 Assessment of adult potential for spawning success, US Geological Survey

Study purpose and methods:
Understanding the ability of reintroduced anadromous species to successfully reproduce in the tributaries to Yale Lake and Lake Merwin is an essential component of the complete anadromous fish reintroduction program. Under current obligations, anadromous adults will be released into the reservoir systems, and with this, there remains considerable uncertainty in how these fish will sort and utilize available stream habitat. Here, researchers employed a test, releasing adult coho salmon in the fall of 2014 into Lake Merwin (based on availability of surplus salmon) to evaluate tributary use and potential for recruitment.

Study results:

Researchers observed coho spawning activity during surveys in Cape Horn Creek, Jim Creek, Indian George Creek, and Brooks Creek. No spawning activity was observed in Buncombe Hollow. However, coho use of existing tributaries is likely to vary considerably given the lack of natal homing in the test fish used in this study. During 2015 sampling surveys, no juvenile coho were observed in Jim Creek and Indian George Creeks, but low densities of coho were observed in Cape Horn Creek and in Brooks Creek. The low densities of juvenile coho in the tributaries may also be a function of the location of observed redds and the amount of existing habitat. Downstream emigration of coho fry can be common in streams with limited habitat and locations proximate to larger water bodies. Coho emigration at the fry stage appears to be relatively common in Swift Reservoir as over 18% of the coho captured at the Swift floating surface collector in 2015 were fry. As such, the low densities of juvenile coho may not be strong indicators of spawning capacity.

Other research suggests that coho salmon can utilize a variety of habitats, albeit to varying densities. Such results are supported by the variability of habitats and tributaries utilized by adult coho in Swift Reservoir (see "Assess anadromous/resident interactions", US Geological Survey). Furthermore, the colonization of spatially diverse tributaries indicates finding and accessing habitat is unlikely a limiting factor. Results suggest coho adults will be capable of finding and accessing a range of habitats in tributaries to Lake Merwin and Yale Lake.

Ultimately, the distribution of spawning coupled with the extent and condition of tributary habitat may lead to increased use of reservoir habitat by juveniles. Early emigration to the reservoir environments may have profound influences on the potential predation of juvenile salmon by existing predators (see "Evaluate Lake Merwin predator impacts", US Geological Survey) and reservoir capacity throughout a year (see "Assess anadromous/resident interactions", US Geological Survey).

3.4 Assess juvenile production potential and emigration success, US Geological Survey

Study purpose and methods:

Given the differences in habitat and resident fishes in each of the Lewis River reservoirs, an important step of anadromous fish reintroduction is to evaluate the survival and behavior of smolts in both stream and reservoir environments. Furthermore, understanding the timing of anadromous species outmigration to reservoirs, particularly as it relates to ambient conditions (e.g., streamflow), will provide critical insight into the strength of these factors relative to intra-annual cycles (i.e., seasons). Due to the lack of anadromous fish currently present in Yale Lake and Lake Merwin, it was necessary to thoroughly evaluate these tasks via assessments in Swift Reservoir in combination with data collected from test smolts in Yale Lake.

Study results:

Data from this study's hydroacoustic surveys in Yale Lake with coho salmon, previous radio telemetry studies in Swift Reservoir with spring Chinook and other studies suggest reservoir travel times to be relatively rapid. Concomitantly, researchers have consistently found considerably longer residence times for wild coho and acclimation program spring Chinook in Swift Reservoir than observed in study test releases. Study results together with previous movement data suggest difficulties of fish "finding" the entrance to the Swift Floating Surface Collector (FSC), a pattern supported by recent test studies in other systems.

The influence of water temperature on juvenile salmon behavior and collection in trap and haul operations suggest temperatures during July through early September in Swift reservoir may act as a thermal barrier during these months. However, the relatively short duration of warm surface temperatures is unlikely to disproportionately explain the low collection rates of juvenile salmon at the FSC. Together, these results highlight the need to consider alternative measures to enhance collection efficiency of the collector, particularly given the lack of understanding of the effects of residualized populations of coho and Chinook on recovery efforts.

Quantifying how delays in capture at the FSC influence juvenile mortality and factors influencing such delays/capture rates are likely to be important in understanding the anadromous fish reintroduction success. Such information may be particularly important as the proportion of juvenile fish collected at the FSC (across species and data sources-PIT-tags, screw trap, etc.) is generally low when compared to data from similar trap and haul operations (see study report "Review information regarding fish transport into Lake Merwin and Yale Lake", US Geological Survey).

Additional information:

Behavioral data collected in 2017 by Anchor Environmental found that most acoustically tagged smolts passed through the reservoir within 7 days, and appeared to find the entrance of the Swift FSC (see Lewis River Fish Passage Program 2017 Annual Report). Results of this study also found that smolts are spending a large amount of time at the entrance of the FSC before either passing into the collector or eventually transitioning back into the reservoir.

PacifiCorp is currently working on better understanding how smolts interface with and behave at the entrance of the FSC. From this information, adjustments will be made to improve conditions at the entrance with the goal of increasing juvenile collection efficiency. Possible adjustments include changing the orientation and velocity of attraction flow, further abatement of hydro acoustic noise, adding additional illumination to the entrance, and/or reducing debris accumulation.

3.5 Evaluate Lake Merwin predator impacts, US Geological Survey

Study purpose and methods:

Northern Pikeminnow (*Ptychocheilus oregonensis)* was identified as an abundant predator of juvenile salmon in Lake Merwin in the 1950s and 1960s. The abundance of predatory sized Northern Pikeminnow (≥200 mm) was estimated around 350,000 fish in 1961; however, the population has not since been assessed. Additionally, the Washington Department of Fish and Wildlife began stocking approximately 1,000 Tiger Muskellunge (*Esox masquinongy* x *E. lucius*) annually in 1995 to limit the population of Northern Pikeminnow, but the efficacy of this program has not been formally evaluated.

In this study, researchers evaluate the contemporary abundance, diet, growth, and temporal-spatial distribution of Northern Pikeminnow, Kokanee and Tiger Muskellunge to gauge how Northern Pikeminnow might affect populations of reintroduced anadromous salmonids. To achieve this objective, researchers characterized the temporal-spatial dimensions of the thermal environment, food supply, and the distribution, size, age, and diet of key predators and prey, and mapped the overall trophic structure of the food web through stable isotope analysis. Researchers then used these empirical data to inform bioenergetics simulations to estimate the seasonal and size-specific consumption rates and predation impact of Northern Pikeminnow on salmonids and alternative prey fish species.

Study results:

Northern Pikeminnow represent a substantial predation threat to anadromous smolts in Lake Merwin. Size distribution information suggests predation by large Northern Pikeminnow and Tiger Muskellunge on smaller Northern Pikeminnow resulted in an attenuated size structure that likely reduces the overall predation pressure on salmonids. Study simulations indicate that yearly consumption by a population of 1,000 large Northern Pikeminnow would be approximately 16,000–40,000 age–0 Spring Chinook salmon rearing in the reservoir based on their current feeding rate, consumption of resident salmonids, and the size distribution of the population. With a population of over 11,000 adult piscivorous Northern Pikeminnow the overall predation potential appears to be relatively high.

The study's estimate of consumption varies by month, a pattern consistent with previous studies of Northern Pikeminnow predation rates. Study researchers acknowledge, however, that their reported estimates of salmonid consumption may vary as a function of migration timing and reservoir thermal regimes. In Swift Reservoir, hatchery-reared spring Chinook smolts rapidly emigrate to the reservoir environment (see study report "Assess juvenile production potential and emigration success," U.S. Geological Survey) and the median rearing time in the reservoir is approximately two months, but considerable variability in rearing time is possible.

For coho salmon, rearing in Swift reservoir environment has been approximately four months. Despite the longer period of rearing for coho smolts, estimates of predation by month suggest predation on spring Chinook is likely to be higher given overlap during the periods of relatively high predation (e.g., spring-early summer). Further, the fact that nearly 30 percent of Chinook are rearing in the reservoir for more than nine months suggest the exposure to Northern Pikeminnow predation may be relatively high. Continued monitoring of reservoir rearing as FSC collection efficiencies improve will ultimately provide further insight into the likelihood of predation for fish with varying periods of reservoir rearing. Ultimately, considering such predation rates in the context of robust productivity measures will provide key insights into the ramifications of different predation levels on long-term persistence of reintroduced anadromous species into Lake Merwin.

Additional information:

In review of annual Passive Interrogated Tag (PIT) information since 2015, there is a wide range of variability in reservoir residence times from juvenile salmonids tagged at the head of Swift Reservoir and those eventually detected at the downstream Swift FSC (see Lewis River Fish Passage Program 2017 Annual Report). Reservoir duration periods have range from a few days to just over a year. This variability can also be seen in the wide ranges of size classes of out-migrants collected at the FSC – particularly for juvenile steelhead and coho.

Protracted rearing times currently observed in Swift Reservoir are, in part, associated with low collection efficiencies at the FSC and smolt inability to successfully pass downstream. However, a wide size range of juvenile salmonids has also been documented at the screw trap located at the head of Swift Reservoir (including a large portion of fry), which suggests that some level of movement downstream does occur at all life-stages and that reservoir rearing plays a large role in an adaptive life history. Limited information on natural residency time exists for juvenile spring Chinook in Swift Reservoir as only hatchery releases of acclimation smolts into the upper basin have been evaluated to date.

3.6 Assess anadromous/resident interactions, U.S. Geological Survey

Study purpose and methods:

The intent of this study is to assess the effects of anadromous fish introduction on resident fish species, and, conversely, assess the effects of resident fish on the reintroduced anadromous fish. Understanding interspecific interactions and likely risks of such interactions is considered an important component in anadromous salmon reintroductions.

Researchers focused on evaluating interactions between newly reintroduced salmon and resident fishes in tributary and reservoir environments. To address this study, researchers specifically evaluated the distribution, behavior and community interactions of anadromous salmon and resident fishes at different life stages. Within the reservoir environment, researchers also assessed the forage base and capacity of reservoirs to support juvenile salmon.

Study results:

Reintroduced juvenile spring Chinook have demonstrated rapid downstream emigration patterns where monitored in the Swift basin. These results suggest overlap and potential impacts to heterospecifics in tributaries is likely to be minimal. The low proportion of juvenile spring Chinook collected at the Swift Floating Surface Collector and low collection efficiencies suggest relatively high densities of residualized fish are possible within the reservoir environment. It is unclear how such changes in fish densities may affect reservoir carrying capacity.

Coho salmon demonstrate considerable overlap with bull trout at multiple life stages. The later timing of coho spawning and similar habitat use (e.g., substrate) suggest coho redd superimposition may be possible, particularly during the period where large numbers of hatchery adults are released in areas with extant bull trout populations. Coho redds were documented as superimposed on bull trout redds. Upon hatching, juvenile coho demonstrate extensive spatial overlap and moderate-high diet overlap with juvenile bull trout. Where coho densities are high, changes in bull trout behavior were not documented, but are possible. Within the reservoir environment, food web interaction studies indicated bull trout do not appear to be utilizing juvenile salmon (coho or Chinook) as a food resource. Such results are likely driven by bull trout gape limitations and the size of salmon within the reservoir. It is uncertain, however if residualized salmon may act as competitors with bull trout.

Forage and distribution information coupled with depth-temperature profiles indicated carrying capacity of juvenile salmon above existing populations of salmonids is likely to vary across Lake Merwin (130,000), Yale Lake (330,000), and Swift Reservoir (150,000). Capacity estimates are likely to vary based on the timing and duration of reservoir rearing. Prolonged reservoir rearing either through earlier emigration to the reservoir environment or through residualization is likely to reduce these totals considerably.

Using models to evaluate the potential effects of salmon reintroductions suggested potential reductions in bull trout reservoir survival and/or changes in the carrying capacity of bull trout rearing habitat would have considerable, negative effects on extant bull trout populations. Such results appear possible given observed diet data, distribution information, and the density-dependent mechanisms observed in previous bull trout studies. Given the relatively small size of the extant bull trout populations, continued monitoring of bull trout populations and community dynamics is warranted.

Additional information:

Since the conclusion of the U.S. Geological Survey New Information Studies and subsequent Final Report, monitoring of the bull trout populations as well as their interactions with reintroduced anadromous species upstream of Yale and Swift dams has continued annually per the FERC project licenses. Additional information specific to resident/anadromous interactions over and above that conducted by the U.S. Geological Survey was collected by PacifiCorp during the 2016 bull trout monitoring field season.

New information on this subject was presented to the ACC at the November 2016 ACC meeting. Information was presented indicating that late-stock coho adults transported and released into

Swift Reservoir in late 2015 had inadvertently been passed down into Yale Reservoir. This most likely occurred via spill over Swift Dam during a high flow event in December 2015. During the spill event it was unknown that fecund pre-spawn coho were being passed downstream. This movement of adult coho was not identified until juvenile coho turned up in the bycatch during a Cougar Creek juvenile bull trout electrofishing survey on June 28, 2016. It is unknown the exact number of coho adults that were spilled during the 2015 high flow event, as well as the exact number that spawned within the confines of Cougar Creek.

During monitoring, Cougar Creek was surveyed in its entirety and coho juveniles were only encountered in the lower 1000 meters of available habitat. During the survey 300 coho juveniles were captured, along with 33 juvenile bull trout. Coho and bull trout juveniles were located in similar off-channel, slow water habitat, with captured bull trout averaging marginally greater fork lengths. Electrofishing surveys in Cougar Creek for juvenile bull trout have occurred annually since 2012. To date, 2016 is the only year coho fry have been encountered within this stream.

Cougar Creek is the only known bull trout spawning tributary within Yale Reservoir. The population found there is genetically distinct and one of three local populations residing within the Lewis River Basin. Two other local populations are found upstream of Swift Dam in Pine and Rush creeks. Abundance estimates of the Cougar Creek local population are derived via redd surveys that have been conducted annually since 2007. The total number of redds constructed by year within the study time-frame (2007-2017) has ranged from a low of 19 to a high of 30. Cougar Creek has approximately 2700 meters of available fish habitat, with bull trout redds observed only in the upper 1200 meters.

PacifiCorp reports each year on bull trout monitoring efforts which are required per the FERC licenses. The 2017 report can be found at the following links (**Attachment A-7**):
http://www.pacificorp.com/content/dam/pacificorp/doc/Energy_Sources/Hydro/Hydro_Licensing/Lewis_River/li/ar/bulltrout17_RPT_draft.pdf

3.7 Ecosystem Diagnostics Treatment (EDT) model benchmark for the Lewis River, DJ Warren and Associates and ICF International

Study purpose and methods:

As part of the FERC relicensing of the projects, an Ecosystem Diagnosis and Treatment (EDT) model was developed in 2004. During the current development of new information, the model was updated with new environmental data from the USGS habitat surveys (see "Habitat assessment of tributaries to Swift Reservoir, Yale Lake and Lake Merwin", U.S. Geological Survey), relevant biological data from other research, and model assumptions as determined by a subgroup of the Lewis River Aquatic Coordination Committee. Modeling was conducted to describe the "best case scenario" for coho, spring Chinook and steelhead production in river reaches upstream of Merwin Dam. Two types of analysis were completed as part of this report:

1. Salmon Production- The EDT model was used to estimate theoretical salmon adult and juvenile production originating from the three geographic analysis areas (Merwin, Yale and Swift). Estimates of salmon productivity, capacity, abundance and life history diversity were developed for adult and juvenile coho, spring Chinook and steelhead.

2. Habitat Limiting Factors- The model was used to identify stream habitat related factors that currently limit salmon and steelhead production in individual streams located in each geographic area of the basin.

Study results:

Model results showed that the majority of fish production originates from the Swift geographic area (78 percent), followed by Yale (18 percent) and Merwin (4 percent) areas. Total EDT estimates for the combined three geographic areas (i.e., Lewis River and tributaries upstream of Merwin) for adult coho, spring Chinook and steelhead are 9,888 fish, 717 fish and 2,095, fish, respectively.

Fish passage currently in operation that transports adult fish from Merwin Dam to upstream of Swift Dam and juveniles from Swift Dam to downstream of Merwin Dam has made available the Swift area for re-establishment of salmon and Steelhead. The estimated production for this area is 7,589 coho, 1,670 steelhead, and 673 spring Chinook adults.

The construction of fish passage facilities at Yale Dam (makes available Yale reservoir and associated tributaries habitat) is estimated to produce an additional 1,873 coho, 362 steelhead and 44 spring Chinook adults.

Constructing fish passage facilities at Merwin Dam (makes available Merwin reservoir and associated tributaries habitat) increases coho and steelhead production by 427 and 63 adults, respectively. Because the only possible spring Chinook producing stream associated with Merwin (lower Speelyai Creek) is reserved for hatchery production, construction of fish passage facilities at Merwin did not produce any spring Chinook.

The habitat limiting factors analysis indicated that adult production can be increased up to 1.54 percent per kilometer of stream restored. The streams showing the highest percent increase in adult production per kilometer of stream are upstream of Swift and include Clear Creek (coho), Muddy River (spring Chinook) and Pine Creek (steelhead). With full restoration of all stream habitat in the three geographic areas, not including reservoirs, total salmon production may be increased by about 54 percent.

Additional Information:

Following submission of the New Information study reports, DJ Warren and Associates remained engaged with the ACC and Fish Passage Decision Group, a subgroup of the ACC further developing the Lewis River EDT modeling effort. The subgroup completed additional model runs. These efforts are reported in a February 13, 2017 memo from Kevin Malone of DJ Warren and Associates (**Attachment A-8**):
http://www.pacificorp.com/content/dam/pacificorp/doc/Energy_Sources/Hydro/Hydro_Licensing/Lewis_River/li/ar/02132017_Lewis_River_EDT_Memo.pdf

Later, in the late fall of 2017, the USFWS found an error in the modeled length of Cougar Creek[1], a tributary to Yale reservoir. The reach length was corrected in EDT and new model runs were then completed. Results of the action were report to the ACC by Mike Bonoff on December 7, 2017 (**Attachment A-9**): http://www.pacificorp.com/content/dam/pacificorp/doc/Energy_Sources/Hydro/Hydro_Licensing/Lewis_River/li/ar/12072017_Bonoff_memo.pdf

To provide current EDT modeling information, the previous New Information – Study results section above has been revised by DJ Warren and Associates with results presented below (Table 1 (Table 3.1-4 from Bonoff December 7, 2017 memo).

Table 1. Revised EDT model results following length change for Cougar Creek.

Table 3.1-4. February 2, 2017 EDT model run results, Scenario 2 – *revised per 1.6 miles Cougar Creek available habitat*.

	Spring Chinook				Coho				Winter Steelhead				
Alternative	Abundance	Spatial	Productivity	Diversity	Abundance	Spatial	Productivity	Diversity	Abundance	Spatial	Productivity	Diversity	Total Abundance All Species
1A1	3,701	100%	5.76	86%	11,645	95%	7.59	80%	2,399	94%	12.81	82%	17,745
1A2	3,686	93%	6.40	86%	11,121	80%	8.18	86%	2,210	78%	14.51	85%	17,017
1B	3,483	100%	5.43	85%	10,782	95%	6.60	81%	2,160	94%	12.03	80%	16,425
2	2,761	100%	4.83	75%	8,310	100%	5.21	70%	1,910	100%	8.64	73%	12,981
3	3,911	93%	6.38	89%	12,153	80%	8.76	88%	2,280	78%	15.51	87%	18,344
Percent difference between alternatives and Alternative 2 (Full Passage No Habitat)													
	Spring Chinook				Coho				Winter Steelhead				
Alternative	Abundance	Spatial	Productivity	Diversity	Abundance	Spatial	Productivity	Diversity	Abundance	Spatial	Productivity	Diversity	Total Abundance All Species
1A1	34%	0%	19%	15%	40%	-5%	46%	15%	26%	-6%	48%	12%	37%
1A2	33%	-7%	33%	15%	34%	-20%	57%	23%	16%	-22%	68%	16%	31%
1B	26%	0%	12%	13%	30%	-5%	27%	17%	13%	-6%	39%	9%	27%
2	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
3	42%	-7%	32%	19%	46%	-20%	68%	27%	19%	-22%	79%	19%	41%

Current fish passage operations that transports adult fish from Merwin Dam to upstream of Swift Dam and juveniles from Swift Dam to downstream of Merwin Dam have made available the Swift area for re-establishment of salmon and steelhead. The estimated production for this now accessible area is 6,770 coho, 1,583 steelhead, and 2,532 spring Chinook adults. Total fish production is 10,885 adults. Constructing fish passage facilities at Merwin Dam (opening Merwin reservoir and associated tributaries habitat) would increase coho and steelhead production by 447 and 66 (513 total) adults, respectively.

Since the only possible spring Chinook producing stream associated with Merwin (lower Speelyai Creek) is reserved for hatchery production, construction of fish passage facilities at Merwin did not produce any additional spring Chinook. Construction of fish passage facilities at Yale Dam and opening Yale reservoir and associated tributaries habitat, is estimated to produce an additional 1,093 coho, 261 steelhead and 229 spring Chinook adults, or some 1,583 total adults. Providing these fish passage facilities at each dam is collectively noted as Alternative 2 in Table 1.

Model results for Alternative 2 showed that the majority of fish production originates from the Swift geographic area (83.9 percent), followed by Yale (12.2 percent) and Merwin (4.0 percent) areas. Total EDT estimates for the combined three geographic areas (i.e., Lewis River and

[1] The change in reach length reduced habitat in Cougar from 3.0 miles to 1.6 miles.

tributaries upstream of Merwin) for adult coho, spring Chinook and steelhead are 8,310 fish, 2,761 fish and 1,910, fish, respectively. Total fish production is 12,981 (Table 1).

Alternative 3 which does not provide fish passage into Yale or Merwin, but instead uses the Full In-lieu Fund for habitat enhancement produces 3,911 spring Chinook, 12,153 coho and 2,280 steelhead. All production comes from upstream of Swift Dam. Total fish production is 18,344 (Table 1).

Alternative 1B, wherein fish passage is provided only at Yale and Swift with Merwin in-lieu monies spent on habitat enhancement, produces 3,483 spring Chinook, 10,782 coho and 2,160 steelhead (Tables 1 and 2). In this alternative 90.4% and 9.6% of the anadromous fish production originates from Swift and Yale, respectively. Total fish production is 16,425. Since downstream fish passage facilities are not provided at Merwin, fish production from this area is zero.

Table 2. Number of spring Chinook, coho and steelhead produced by geographic area for Alternative 1B (fish passage at Yale and Swift with habitat improvement)

	Geographic Area		
Species	Swift	Yale	Total
Spring Chinook	3,253	230	3,483
Coho	9,704	1,079	10,782
Steelhead	1,899	261	2,160
Total	14,855	1,570	16,425
Percent of Total	90.4%	9.6%	

Fish production for Alternatives 1A1 and 1A2 are also presented in Table 1. Both alternatives produce more fish than Alternative 2 and 1B but less fish than Alternative 3. Total fish production for these two alternatives ranges from 17,000 to 17,800 fish.

3.8 Review Aquatic Restoration Projects in the Lower Lewis River Basin, Mason, Bruce and Girard

Study purpose and methods:

This report summarizes work completed to support the development of the revised Ecosystem Diagnosis and Treatment (EDT) model for the Lower Lewis River, and subsequent model evaluation of potential or identified stream enhancement projects. Objectives were to 1) identify and confirm existing presence of restoration projects that have been completed since 2007 that have yet to be incorporated into the Lewis River EDT model, 2) parameterize those projects to provide input to the model, 3) develop conceptual models to link effectiveness of restoration strategies (e.g., riparian restoration) to EDT attributes and, 4) identify sources of information on culvert and passage barriers in the Lewis River that can be incorporated into the Lewis River EDT model.

Study results:

A total of 20 aquatic restoration projects located in the lower Lewis River basin (downstream of Merwin Dam) are described and results of project parameterization provided through individual project summaries. Outcomes of the project parameterizations have been incorporated into the EDT3 model benchmark (see study report "Ecosystem Diagnostics Treatment (EDT) model benchmark for the Lewis River", DJ Warren and Associates and ICF International). With few exceptions, observed restoration projects were consistent with published descriptions and warranted positive change to key EDT attributes, reflecting increased habitat potential within applicable areas.

3.9 Identification of Restoration Alternatives in North Fork of Lewis River, Cramer Fish Sciences

Study purpose and methods:

This study conducted a limiting factors analysis to help identify limiting habitat and life stages for Lewis River spring Chinook, coho and steelhead and to identify potential habitat restoration measures. Researchers reviewed existing habitat and environmental assessment data for the Lewis Basin and Lewis River coho (*Oncorhynchus kisutch*), winter steelhead (*O. mykiss*) and spring Chinook (*O. tshawytscha*). More than 50 relevant publications were located that provided information to assist with identifying limiting factors and with identifying restoration opportunities. These include physical habitat data for the entire basin from Ecosystem Diagnosis and Treatment (EDT) models, watershed assessment and process (e.g., sediment, hydrology, riparian conditions, and channel type) data and model outputs from NOAA, and habitat data upstream of Merwin Dam which were recently collected by the U.S. Geological Survey. To identify restoration opportunities researchers combined diverse GIS data sets from NOAA and EDT, and applied them to areas draining into the 26 reaches identified by EDT as the highest priority for restoration in the North Fork of Lewis basin.

Study results:

Limiting factors analysis indicated that summer habitat is limiting the production of coho in most subbasins except Merwin, which is limited by adequate spawning habitat. For steelhead, summer or winter rearing habitat is limiting in all of the subbasins. In contrast, spawning habitat is limiting for Chinook salmon in Yale basin and summer rearing habitat is limiting in the Swift basin. Results for Chinook and coho salmon, are largely driven by the definition of littoral zone (<3 meter deep) or suitable rearing habitat in the reservoirs; changing these depth criteria by as little as one or two meters can make spawning habitat limiting in the Merwin, Yale or Swift basins. Using outputs from the GIS data sets and EDT and a suite of watershed process and habitat metrics, researchers made initial recommendations for restoration measures in each of the 26 reaches. Additionally, recommendations on data and analysis needed to refine potential restoration actions and translate them into specific on–the–ground restoration actions are included in the report.

4.0 Synthesis and Conclusions

In consideration of the possible outcomes of the fish passage or in-lieu of alternatives, the Utilities have identified the following goals and objectives to achieve maximum environmental benefits under the Settlement Agreement:

1. **Lewis River Settlement Agreement Outcome Goal:** Achieve genetically viable, self-sustaining, naturally reproducing, harvestable populations above Merwin dam greater than minimum viable populations.

2. **Lower Columbia River Salmon and Steelhead ESA Recovery Plan – June 2013:** The goal of this plan is for the Lower Columbia River Coho salmon ESU, Lower Columbia River Chinook salmon ESU, Lower Columbia River Steelhead DPS, and Columbia River Chum salmon ESU to reach the point at which they no longer need the protection of the Endangered Species Act and can be delisted. To meet Recovery Plan target goals ("minimum"):

    a. **SPCH restored to abundance of 1,500 adults**
    b. **WSTH restored to abundance of 400 adults**
    c. **Coho restored to abundance of 500 adults**

3. **Bull Trout Recovery Goals, Objectives and Criteria:** The ultimate goal of this recovery strategy is to manage threats and ensure sufficient distribution and abundance to improve the status of bull trout throughout their extant range in the coterminous United States so that protection under the Act is no longer necessary. When this is achieved, it is expect that:

    • Bull trout will be geographically widespread across representative habitats and demographically stable in each recovery unit;
    • The genetic diversity and diverse life history forms of bull trout will be conserved to the maximum extent possible; and
    • Cold water habitats essential to bull trout will be conserved and connected

4. **WDFW Columbia River Basin Salmon Management Policy:** The objectives of this policy are to promote orderly fisheries (particularly in waters in which the states of Washington and Oregon have concurrent jurisdiction), advance the conservation and recovery of wild salmon and steelhead, and maintain or enhance the economic well-being and stability of the fishing industry in the state.

5. **Lower Columbia Conservation and Sustainable Fisheries Plan:** The goal of this plan is to support efforts to return natural origin lower Columbia salmon and steelhead to healthy, harvestable levels while sustaining important fisheries (commercial and recreational).

4.1 Synthesis of Information Supporting Full In-Lieu Fund

The Utilities conclude that the best available scientific information supports selection of the Full In-Lieu Fund as the appropriate Alternative. The following information supports this conclusion:

a. Merwin reservoir only has 5.1 miles of available tributary spawning habitat for coho and steelhead, and 0 miles for spring Chinook. In comparison, Yale reservoir has 18.4 miles and Swift reservoir over 82 miles of associated suitable habitat.

b. With fish passage, the majority of returning adult fish will be required to swim through the approximately 14-mile long Merwin reservoir to reach the next upstream passage facility. Given no spring Chinook spawning habitat in Merwin, all of these fish must swim through the reservoir. Any spring Chinook that stay in the reservoir will not be able to contribute to future production given that no preferred spawning habitat is available. The same can be expected for any coho and steelhead destined for upstream habitat but electing to stay in Merwin if, for example, that habitat gets overpopulated.

c. For fish that do successfully spawn in Merwin tributaries, their offspring will face "… a substantial predation threat…" (USGS, New Information Report, June 24, 2016). The U.S. Geologic Survey estimates that Merwin Reservoir holds 11,240 Northern Pikeminnow greater than 300mm in length (large), and 544,259 Northern Pikeminnow of size 200 – 299 mm (sub adults). Assessing the yearly consumption of this population on juvenile fish, the Northern Pikeminnow in Merwin reservoir could easily consume all juvenile salmonids produced in this area.

d. The Yale bull trout population appears to be small and geographically isolated. Spawning use is limited to the upper 1,700 meters of available habitat within Cougar Creek, a tributary to Yale reservoir. Recent annual redd counts in 2015 and 2016 recorded fewer than 20 redds. In 2017, a total of 22 redds were observed. The highest redd count since 2007 is 28 redds observed in 2008. The expectation is that introduced adult coho (1,595 adult fish destined for Yale tributaries) will reach and spawn in upper Cougar Creek. A significant concern is the potentially detrimental timing of coho spawning, which follows bull trout spawning. There is a high risk of redd imposition, whereby coho could dig up and destroy bull trout redds. Should bull trout eggs survive to juvenile fish, they would have to compete with juvenile salmon and steelhead for rearing areas, and sheer numbers of these anadromous fish could push bull trout out of prime rearing habitat. All species would also compete for the same food resources in the available habitat. And, depending on the size of the fish, each can become predators of the other.

e. While Yale reservoir has 18.4 miles of available tributary spawning habitat, the spring Chinook, coho and winter steelhead production value of the habitat is modeled to be less than that available with implementation of the Full In-Lieu Fund habitat restoration alternative (see Table 1).

f. Information contained in technical studies indicates that substantially greater fish production will occur under the Full In-Lieu Fund Alternative compared to constructing fish passage into Merwin and Yale reservoirs (Table 3). Important considerations include:

i. The Full In-Lieu Alternative meets or exceeds the NMFS minimum population abundance goals for spring Chinook, coho and winter steelhead in the Lewis River;
ii. Unlike the fish passage alternatives, the Full In-Lieu Alternative has the added benefit of avoiding adverse effects on federally-listed bull trout - a small and important subpopulation of which resides in Yale reservoir;
iii. The Full In-Lieu Alternative provides the greatest opportunity to increase adult returns of native spring Chinook, and coho to the Lewis River Basin;
iv. The Full In-Lieu Alternative is a more cost-effective use of customer/ratepayer dollars as compared to the fish passage alternatives; and
v. The Full In-Lieu Alternative provides an opportunity to partner with the National Fish and Wildlife Foundation (NFWF) which can provide matching dollars to the Utilities funding (potentially expanding the overall effort from $40 million to $80+ million) yielding substantial habitat benefits to the Lower Columbia River and increased survival to all Columbia River fish.

Table 3. Comparison of modeled salmon production under three alternatives.

	Full Fish Passage Alternative	Full In-Lieu Fund Alternative	Yale Fish Passage Alternative
Species	Modeled estimates of adult abundance following construction of fish passage projects	Modeled estimates of adult abundance following $40 million of In-Lieu Fund habitat projects	Modeled estimates of adult abundance following Yale fish passage and $20 million of In-Lieu Fund habitat projects
Spring Chinook	2,761	3,911 (+30% higher than full fish passage alternative)	3,483 (+21%)
Coho	8,310	12,153 (+42 %)	10,782 (+33%)
Winter Steelhead	1,910	2,280 (+16%)	2,160 (+12%)

4.2 Other Benefits Supporting the Full In-Lieu Fund

Beyond creating self-sustaining populations of fish, the Settlement Agreement recognizes a goal of achieving harvestable populations of salmon and steelhead upstream of Merwin dam. In defining harvest, the agreement includes without limitation, Tribal, commercial, and recreational harvest. This goal is important to achieve for cultural and economic reasons. Tribal and recreational harvest are important to the local community, and provide important economic benefits within the Lewis River basin.

Currently, in the Lewis River, limited sportfishing opportunities are provided for the harvest of hatchery origin coho, winter steelhead and spring Chinook if annual adult fish returns are expected to be near hatchery escapement goals. No fishery is currently available on these stocks upstream

of Merwin dam. Downstream of Merwin dam, PacifiCorp provides sportfishing access facilities at five locations, three of which have boat ramps. In the future, recreational facilities upstream of Swift dam would be supported by bank fishing access at Swift dam and boat access at PacifiCorp's existing Swift Forest Campground.

As outlined above, based on modeling results, the Full In-Lieu Alternative has the greatest probability of meeting or exceeding the Settlement Agreement outcome goal of providing harvestable populations based on modeling results. A partnership with the National Fish and Wildlife Foundation can be expected to add further benefit to all Columbia River basin stocks. As a result, the alternative will provide greater Tribal, commercial, and sportfishing opportunities than the passage alternatives, and among other things, results in larger financial benefits for local businesses involved in tourism and the sportfishing industry.

In summary, the Utilities consider the Full In-Lieu Alternative to be the appropriate alternative, and fish passage into Merwin and Yale reservoirs inappropriate given the details below.

Merwin

With full upstream passage, EDT modeling estimates up to 18,344 adult salmon and steelhead could be placed into Merwin reservoir and 12,469 of these fish will need to swim through the 12 mile long reservoir to reach the Yale upstream trap. During this upstream migration, adult fish will stray into Merwin tributaries. If any spring Chinook do this, it is likely their production will be very minimal if any as Merwin has no associated spring Chinook spawning habitat.

Given limitations in spawning and rearing habitat, if more than 447 coho or 66 winter steelhead (EDT adult abundance estimates for Merwin tributaries) go into the tributaries, production will likely be self-limiting due to the carrying capacity of the habitat. Essentially, fish passage into Merwin reservoir places a large number of adults into an area with limited habitat and production potential. Such straying may also be increased given that fish have been previously trapped. Recent observations from the ongoing Merwin trap collection efficiency study suggests that fish naïve to the trap enter the trap at a higher percentage than non-naïve fish that have been trapped once before (pers. comm. Chris Karchesky, PacifiCorp).

A concern is that fish that have been trapped and transported around Merwin Dam will not fully ascend the reservoir to enter the next adult fish trap at Yale Dam. Such occurrence will lead to migration delays and straying opportunity, and overall loss of adults. If the delay is significant, spring Chinook adults would be exposed to water temperatures in Merwin greater than 20 C in August (see 2017 ACC/TCC Annual Report, Attachment I). Unlike the Swift area, Merwin has very limited cold water tributaries that could serve as refugial areas. The exception is the Yale tailrace where temperatures in the area fluctuate depending on powerhouse operations, and Brooks Creek which has an August flow of approximately 1 to 4 cfs dependent on water year.

Juveniles produced in the Merwin reservoir tributaries will also be exposed to intense predation by northern pikeminnow once juveniles enter Merwin reservoir; survival to a downstream fish collector is expected to be very low. The timing of juvenile fish in the reservoir is not seasonal, but most likely year around. As noted in section 3.5, ongoing studies in Swift reservoir have

observed that juvenile fish enter the reservoir at various life-stages (ranging from fry to smolt) and sizes.

Resident time in the reservoir may be as short as a few days or as long as greater than one year. For example, over 75% of the coho smolts tagged and released at the head of Swift reservoir in spring 2015, were subsequently detected the following spring (2016) at the Swift reservoir Floating Surface Collector. Similar observations were made for juvenile steelhead, with more than 30% of smolts tagged in 2015 being subsequently detected the following year. In addition to long residency times in the reservoir, juvenile out-migrant have been observed in the upper water column and actively out-migrating from Swift Reservoir until water temperature reaches approximately 18 ^{o}C. These temperatures are well within the range of feeding temperatures of northern pikeminnow.

The U.S. Geological Survey noted that "we found Northern Pikeminnow represent a substantial predation threat to anadromous smolts in Lake Merwin" (New Information Study Report, June 24, 2016). USGS estimates Merwin Reservoir holds 11,240 northern pikeminnow > 300mm (large) and 544,259 northern pikeminnow of size 200 – 299 mm (Sub adults). Size distribution information suggests predation by large northern pikeminnow and tiger muskellunge on smaller northern pikeminnow resulted in an attenuated size structure that likely reduces the overall pressure on salmonids – i.e., that cannibalism is occurring. Simulations indicate that yearly consumption by a population of 1,000 large (> 300 mm and fully piscivorous) northern pikeminnow would be approximately 16,000 – 40,000 age-0 juvenile fish (40-60 mm).

Using the most conservative estimate of 3,370 large northern pikeminnow and the lowest yearly consumption of 16,000 age-0 fish per 1,000 large adults, predation could be 53,920 juvenile fish. This value is twice the size of the Merwin area EDT Juvenile Abundance of coho and steelhead combined (22,398 fish). With more available food (e.g. smolts), the population of larger northern pikeminnow could increase in size (See USGS Table 10, page 237 of New Information Report, June 2016 for size distribution). Fish less than 300 mm feed on invertebrates, benthic fish and crayfish, but then switch to pelagic and benthic fish and crayfish once larger than 300 mm. While northern pikeminnow reduction efforts have been in place on the Columbia River for an extended period, results have been mixed. If fish passage is provided into and out of Merwin reservoir, any formal predation control will likely fall to the fishery management agencies and not the Utilities.

Fish passage into Merwin reservoir adds spatial structure; expanding the geographic range of coho, spring Chinook and winter steelhead, but at a cost to population abundance and productivity when compared to the other alternatives. To reach the Lewis River Settlement Agreement outcome goal, fish populations must increase. Spatial distribution is not likely the limiting factor in the recovery of the species.

In summary, the Utilities find it inappropriate to place ESA-listed fish into an area with limited or no production potential, where the production potential at full capacity will minimally contribute towards the Settlement Agreement outcome goal and other recovery goals, and where juvenile fish

will inhabit an area where a high level of predation and mortality will likely occur. The utilities also maintain it is in appropriate to expend significant ratepayer resources (tens of millions of dollars) to construct and operate measures that will have very little value, and perhaps even a negative impact for spring Chinook, assuming they are not successful in Merwin. This is especially a concern when other more beneficial alternatives are available.

Yale

Providing anadromous fish passage into Yale reservoir and associated tributaries, most importantly Cougar Creek, is likely to have detrimental impacts to the small ESA listed Yale bull trout subpopulation. Given the nature of the habitat and the water quality of the area, Cougar Creek will become a preferred habitat for anadromous fish. Cougar Creek is the only Yale tributary in which bull trout spawn and is the only tributary with temperatures likely suitable to sustain bull trout. Average annual bull trout redd counts ranging from 18 to 29 redds indicate the subpopulation is likely small. Introduced anadromous fish will spawn in Cougar Creek. Spring Chinook spawning timing suggests there is a chance for competitive interactions for spawning sites. Coho spawn later in the year after bull trout, so redd superimposition is expected to occur. Superimposition is likely to increase as densities of these anadromous fish increase. Species interaction at other life stages can also be expected. Juvenile bull trout and salmon/steelhead offspring will spend time in Cougar Creek; each competing for rearing habitat and food. As fish grow, each has the ability to prey on other species. In consideration of these factors, the influencing variable is numbers of competing fish. If anadromous fish production in Cougar Creek is significant, one could expect bull trout to be pushed out of their preferred habitat.

In light of the above, consideration has been given to controlling fish access into Cougar Creek via a weir in the lower stream reach. During the spawning period, adult bull trout attempting to access Cougar Creek could be collected at the weir and placed upstream of the barrier. Other fish could be denied access. While productive in limiting access, this method does not account for the bull trout's propensity to move between the stream and Yale reservoir. Previous monitoring via passive PIT antennae stationed near the confluence of the stream with the reservoir has observed bull trout adults entering and then leaving the stream over five times during the annual spawning period (Doyle 2011). Barrier delays may impact fish behavior and ultimately spawning success.

In summary, the Utilities conclude that it is not appropriate to risk extinction of the ESA-listed bull trout subpopulation in order to marginally promote recovery of other ESA listed fish, particularly when another alternative is readily available – an alternative that eliminates the risk to bull trout while increasing the overall production of coho, spring Chinook and winter steelhead. The Utilities also conclude that it is inappropriate to expend significant ratepayer resources (tens of millions of dollars) to construct and operate measures that will have less value towards the recovery of ESA fish than habitat improvement actions in areas currently accessible to anadromous fish.

Merwin and Yale

Currently, coho, spring Chinook, winter steelhead, and bull trout are listed under the ESA. Each fish and the potential for progeny from that fish is critical to the continued existence and recovery

of the listed species. Each fish should be given the greatest opportunity for survival and reproduction. Requiring fish to complete multiple fish passage encounters add stress and fatigue to migrating fish.

The future habitat value of Merwin and Yale tributaries may be reduced with climate change. Smaller streams lower in the watershed are at greatest risk to flow reduction and related temperature increase. Upper watershed streams are likely at less risk given location at higher elevations and their proximity to water sources from Mt. St. Helens and Mt. Adams.

In summary, the Utilities conclude it inappropriate to expose ESA-listed fish to multiple passage requirements and current habitat conditions when the Full In-Lieu Fund alternative would eliminate these fish passage difficulties and improves existing habitat in ways more resilient to the impacts of climate change.

5.0 Utility Commitment to Implementation of the Full In-Lieu Fund

To implement the Full In-Lieu Fund in a cost-effective, efficient manner, the Utilities propose to partner with the National Fish and Wildlife Foundation (NFWF) to administer and grant fund monies matching those provided by the Utilities. The general implementation approach is provided below. A more detailed annotated implementation plan outline is provided in **Attachment 1**. Upon selection of the Full In-Lieu Fund alternative, the Utilities and NFWF will engage interested parties of the ACC in the implementation of this alternative.

NFWF is an independent 501(c)(3) nonprofit organization that is governed by a Board of Directors appointed by the Secretary of the Interior. NFWF works with the public and private sector to protect and restore fish, wildlife, plants and habitats. NFWF has a long history of working to protect and restore fish and wildlife and their habitats in the Columbia River and on the West Coast. NFWF presently implements a program in the upper Columbia River where it acquires water rights and commits these water rights to instream uses, including salmonid enhancement. Involving NFWF in the Lewis River process presents a unique opportunity to connect upriver conservation projects with lower-river projects, resulting in a more coordinated conservation planning effort with basinwide implications.

The Utilities will deposit In-Lieu Funds with NFWF for management on the schedule provided in the Settlement Agreement. As per the agreement, $4 million would be available in June, 2019. Subsequent transfers will occur on the schedule provided in the Settlement Agreement. NFWF will maintain In-Lieu Funds in a segregated, interest-earning account. NFWF will provide annual reports and accounting summaries to the Settlement Agreement parties outlining how funding has been spent, the availability of matching funds, and the status of projects implemented pursuant to the In-Lieu Fund.

Prior to making any funding transfers to NFWF, the Utilities and NFWF will execute a Memorandum of Agreement (MOA). This MOA will guide NFWF's involvement in the implementation of the In-Lieu Fund consistent with the requirements of the Agreement. Under the MOA, NFWF will directly manage and administer the In-Lieu Fund using its internal technical

staff. Funding will be released from the NFWF-managed account at the direction of ACC, and as provided by the Agreement.

The Utilities will separately pay NFWF's administrative costs so that no NFWF costs will reduce the amount of the In-Lieu Fund, or its related mitigation benefits.

Comprehensive Restoration Plan

Under this proposal, the Utilities and NFWF will jointly develop, in consultation with the Services, Tribes and interested ACC representatives a Comprehensive Restoration Plan commencing in October of 2018, after formal approval of the In-Lieu Alternative (Table 2). The Comprehensive Restoration Plan will be presented to the ACC in December, 2019, for review and approval. Thereafter, restoration actions will commence in spring of 2020.

The Comprehensive Restoration Plan will contain a detailed project schedule for identifying, developing and conducting restoration activities. This Plan will also identify specific criteria and monitoring requirements that each restoration action will meet prior to its presentation to the ACC in annual meetings for review and approval. The Plan may be modified on an annual basis based on the results of effectiveness monitoring conducted as a part of the restoration action. Results from the planning process will be shared with upper- and lower Columbia River entities to help inform selection and implementation of effective habitat enhancement actions that result in demonstrable benefits to anadromous fish species, including spring Chinook, coho, and steelhead.

Projects identified through the Comprehensive Restoration Planning process will be provided to the Services, Tribal governments and interested ACC representatives for review and approval. Expertise will be employed to develop comprehensive subbasin restoration strategies to ensure that restoration actions and projects address the key limiting factors to salmon and steelhead in these areas. These activities will focus, among other things, on habitat improvements, nutrient enhancement, and protection of key aquatic habitats in the Lewis River. Project criteria will include consistency with the Washington Lower Columbia Salmon Recovery and Fish and Wildlife Subbasin Plan (Lower Columbia fish Recovery Board, May 2010), and the ESA Recovery Plan for Lower Columbia River Coho, Lower Columbia River Chinook Salmon, Columbia River Chum Salmon and Lower Columbia River Steelhead (NMFS, June 2013). Each project selected will include firm cost estimates and project criteria. Contracts will be executed by NFWF and parties undertaking the work.

Matching Restoration Funds

As a part of its implementation of the In-Lieu Fund, NFWF will endeavor to match money provided by the Utilities with other funding sources, such as private donations, federal appropriations, and other contributions. The Utilities' contribution will be treated as a private party contribution under its rules, thus qualifying for matching funds. These matching funds may increase the overall amount of In-Lieu Fund by an additional $40 million or more, potentially making the total enhancement fund over $80 million. This would result in even greater habitat benefits and corresponding fish production increases than were evaluated in technical studies.

The $40 million value of the Full In-Lieu Fund is significant. In conducting fish production modeling of the Lewis River basin upstream of Swift dam, 56.5 miles of stream length have been identified for improvement. Assuming a cost of $500,000 per mile of habitat restoration cost, all of this stream length could be improved and approximately $9.7 million would be available for habitat improvements downstream of Merwin dam. An additional $40 million dollars made available through matching money could be prioritized for use in the lower Columbia River, immediately downstream from the Lewis River and in the Columbia River estuary.

These additional matching funds and associated habitat work are expected to make a substantial contribution towards the survivability of all salmon and steelhead smolts migrating through the Columbia River estuary.

Beyond the relationship with NFWF outlined above, the Utilities will work with other partners, including the Bonneville Power Administration, to identify, coordinate, and leverage mitigation funding to help ensure such projects are closely coordinated, resulting in greater benefits to the region.

Implementation Schedule

Table 4 provides a preliminary implementation schedule for the Full In-Lieu Fund alternative. Funding amounts and the funding schedule outlined below are consistent with the Agreement.

Table 4. Implementation schedule for Full In-Lieu Alternative.

Action	Schedule	Utilities Funding Amount (Approximate)
Selection of Full In-Lieu Fund Alternative by Services	August, 2018	
ACC approves Foundation's role to administer/manage Full In-Lieu Fund	October, 2018	
Development of Comprehensive Restoration Strategy by Utilities and NFWF	October, 2018 to December, 2019	
Year 1 funding available from Utilities as per the Lewis River Settlement Agreement	June 2019	$4,000,000
Comprehensive restoration strategy is provided to ACC for review and approval	December, 2019	
Year 1 restoration project plan recommended to ACC for review and approval	May, 2020	

Year 1 project Request for Proposals are announced	June 2020	
Year 1 project contractors selected and contracts issued	August 2020	
Year 1 projects obtain necessary permits	May 2021	
Year 1 project work is initiated	June 2021	
Project activities noted above will repeat on an annual basis until the In-Lieu Fund and related matching funds are committed for use		
Funding available from Utilities as per the Lewis River Settlement Agreement	June 2020	$4,100,000
	June 2021	$5,600,000
	June 2022	$5,400,000
	June 2023	$5,500,000
	June 2024	$5,700,000
	June 2025	$5,800,000

Bull Trout Fish Passage Facilities

Under the terms of the Lewis River Settlement Agreement, upon selection of the Full In-Lieu Alternative, the Utilities are required to provide downstream bull trout passage from Yale reservoir, and upon a further determination by USFWS, upstream bull trout passage from Yale reservoir into Swift reservoir. The Yale Downstream Bull Trout Facility must be similar in magnitude and scale to modular floating Merwin-type collectors.

The Utilities are prepared to initiate the bull trout fish passage design process and invite engagement from the Services, Tribal governments and other ACC representatives. The Utilities will be providing information and discussing the need for such a facility with the USFWS as the agency makes the determinations on these facilities.

ATTACHMENT 1

Outline of Draft Lewis River Full In-Lieu Fund Implementation Plan

Introduction:

- Reference to fish passage in-lieu decision process in Settlement Agreement
- Identification of Services decision
- Purpose of this document – and how the elements described within will be used in future documentation
- Identify the intent to be consistent with and supportive of the Lower Columbia Salmon Recovery Plan
- Introduction of the National Fish and Wildlife Foundation (NFWF)

Roles and Responsibilities of interested parties:

Utilities -

- "Ownership" of program. Assure actions are completed per FERC license (including, Settlement Agreement, biological opinions, clean water act certificate, etc.).
- Provide funding to the program as defined in the Lewis River Settlement Agreement.
- Contract/fund NFWF to administer the program. (*Note: this is funded by utilities – and will not be provided out of the Full In-Lieu Fund*)
- Annual reporting to FERC
- Promote goals and objectives of program to local counties and communities

NFWF –

- Administer the program.
- Facilitate and manage efforts to implement program developed by interested parties and as approved by ACC.
- Report on program status and outcomes.
- Obtain matching funding to that provided by Utilities.

ACC –

- Various levels of engagement with NFWF.
- Use of sub-group of habitat experts to develop Comprehensive Habitat Restoration Plan (Plan) including specific habitat improvement actions, and be involved with project identification and contractor selection.
- Final Plan to be approved by ACC.
- As desired[2], participate on annual project review/award team.
- Annual project identification and individual selected contractors to be approved by ACC.
- Support Plan actions within respective ACC representative's organization.

[2] ACC members may not have time or technical experience to review projects – each entity will have discretion in staffing these efforts.

Regulatory Process:

- Upon selection of the Full In-Lieu Alternative, the Utilities will notify FERC that PacifiCorp and Cowlitz PUD will be submitting application for license amendments to formalize the outcome of the Services decision.
- Utilities will prepare applications for license amendments and submit those to the Lewis River Settlement Agreement parties for 60 day review.
- Following review, Utilities will address any comments, then submit applications to FERC.
- FERC will respond to application request.

Goal:

Support re-establishment and improvement of the form and function of aquatic habitats of the Lower Columbia River[3] which collectively promote large-scale environmental benefits, substantial increases in numbers of ESA listed salmon and steelhead, and achievement of the Lewis River Settlement Agreement Outcome Goal.

Objectives:

a) Develop Comprehensive Habitat Restoration Plan through collaboration and in consultation with interested representatives of the Lewis River Aquatic Coordination Committee. Final Plan will have support of these entities and be approved by the Federal Energy Regulatory Commission (as required by Lewis River hydroelectric project licenses).
b) Planning, to extent possible, will be integrated with strategies developed under other processes to recover salmon, steelhead and bull trout which are listed under the federal Endangered Species Act (ESA). Consistency with the Lower Columbia Salmon Recovery Plan (Recovery Plan) will be considered in developing the Plan.
c) Planning will be based on existing laws, rules, or ordinances created for the purpose of protecting, restoring, or enhancing fish habitat, including the Shoreline Management Act, Chapter 90.58 RCW, the Growth Management Act, Chapter 36.70A RCW, and the Forest Practices Act, Chapter 76.09 RCW.
d) Planning will consider habitat projects which have previously been identified and have great expected benefit, but have not been implemented ("low hanging fruit").
e) Plan will be implemented by the ACC, facilitated by the NFWF through a process defined by the ACC.
f) Acquire additional funding for habitat restoration/protection efforts in the Lower Columbia River area.
g) Include an Adaptive Management cycle to integrate new information as it becomes available.

[3] Areas under the purview of the Lower Columbia River Fish Recovery Board

Guiding Principles:

- Focus efforts on identifying and prioritizing actions that achieve multiple objectives;
- Consider without prejudice, available actions that benefit aquatic habitat form and function (e.g., nutrient enhancement);
- Consider actions that provide resilient habitat over changing conditions;
- Achieve goals and objectives in a cost-effective and efficient manner;
- Strive to ensure that overlap and duplication of efforts is avoided;
- Ensure actions are coordinated and integrated with other planning efforts in the watershed and other activities adjacent to the planning area;
- Facilitate and promote active participation by those entities affected by actions and key decisions;
- Keep affected entities informed of key decisions and outcomes;
- Work cooperatively to achieve the goal and all objectives of the plan;
- Strive to ensure planning actions are integrated into federal, state and local decision-making processes;
- Work to broaden public awareness and support of the plan; demonstrate positive outcomes.

Timeframe:

- Comprehensive Habitat Restoration Plan development is estimated to take 12 – 18 months.
- Plan implementation period is estimated to be 10+ years, but will continue until all In-Lieu Funds have been spent.
- Per Lewis River Settlement Agreement, Utilities will begin funding program in calendar year 2019 and conclude specific contributions in 2025 (see attachment A for schedule). Funds will exist within an interest bearing account and annually withdrawn as necessary to promote Plan actions supported by the ACC. Funds do not have a time limit in which they may be spent.
- Annual Plan activities and schedule will be identified in the Final Plan.

Comprehensive Habitat Restoration Plan Recommendations and Action Schedules:

- Intent of the Plan is to identify areas that can benefit the most from focused habitat improvements, and for then each area, identify corresponding actions specifically designed to re-establish and improve the form and function of that area.
- Working with the ACC and designated subgroup (TBD), NFWF will:
    - use existing/available data to characterize the current condition of habitat,
    - solicit site expertise for Plan areas,
    - conduct site reviews to verify conditions, and
    - recommend to the ACC site-specific project actions
- Recommended actions will be submitted to the ACC for review, approval and inclusion into the Plan.
- NFWF will encourage engagement with the ACC throughout this process.

A valuable planning component found in other watershed planning documents is the development of "Action Schedules" for each of the recommendations presented in the Plan (See Lower Columbia River Fish Recovery Board, WRIA 29A Watershed Planning Detailed Implementation Plan, November 2015). Using a template prepared by the Lower Columbia River Fish Recovery Board, Action Schedules describe the following information:

- Title and description
- Status
- Goals
- Expected Outcomes
- Supporting Tasks
- Supporting Strategy and Policies
- Oversight Responsibility
- Cooperating Partners
- Cost and Funding Outlook
- Constraints and Uncertainties

Collectively, these Action Schedules are intended to serve as the framework to achieve the Plan goal and objects and recommendations in an integrated, coordinated and efficient manner. Action Schedules are designed to provide specific restoration concept and habitat targets for their associated actions, and to identify the basic steps necessary to achieve them. Action Schedules are intended to be specific enough to identify a clear pathway for project implementation, yet general enough to permit flexibility in carrying them out.

Technical Advisory Committee (*move up to Roles and Responsibilities?*)

- Facilitated/administered by NFWF
- Committee is comprised of experienced technical experts with knowledge of geographic environment (*Discussion needed; require certain level of qualifications?*)
- Establish annual program priorities consistent with the Comprehensive Habitat Restoration Plan (e.g., identify the specific habitat work to be completed)
- Conduct outreach to prospective project contractors
- Review project bids and provide recommendations to ACC
- Members do not have conflict of interest. (*Discussion needed: intent is that committee member has no conflict or bias towards considered projects*).

Disseminate Request for Proposal (RFP) and related outreach:

- Facilitated/administered by NFWF
- Develop list of prospective project applicants
- Announcement of RFPs
- NFWF will assist applicants in application process

Review and select project proposals:

- Facilitated/administered by NFWF

- Project review process with Technical Advisory Committee
- Annually rank and select project bids that best achieve goals and outcomes (adaptive management)
- Recommend projects to ACC
- NFWF will be contact for all project Request for Proposals regarding status of application and questions of Technical Advisory Committee
- Following ACC approval, NFWF to assist preparation of annual report to FERC

Announce Request for Proposals for identified habitat projects:

- Facilitated/administered by NFWF
- Inform contractor recipients of selection
- Promote individual projects through press releases and other media

Administer contractor awards:

- Facilitated/administered by NFWF
- Carry out all financial, administrative and contractual aspects of awards
- Monitor progress of all projects to ensure they successfully reach stated objectives
- Provide periodic financial reports to ACC

Permitting:

- Look for ways to expedite project permitting (Engage a subgroup of permitting agencies?)
- Programmatic approach?
- Completed by grant recipient?
- Use of subcontractor to complete permit applications and manage applications through process?
- Subcontractor to work on behalf of agencies to complete/meet NEPA, and other requirements?

Provide technical assistance:

- As appropriate, NFWF and Technical Advisory Committee will provide necessary technical assistance to ensure successful project implementation

Monitoring and evaluation of success:

- Determine level of need:
    - Project implementation (Did it get done?)
    - Additive value (What is it providing to surrounding environment?)
- Timing of monitoring and associated reporting
    - Project construction report due within 90 days of completion

- Set aside $ for programmatic level assessment of completed projects in year 8? Are projects still in place and functioning?
- Use results of PacifiCorp's M&E to provide high-level review of response to habitat projects??

Reporting:

- NFWF business plan tracking?
- Grant recipient 6 month reports
- Grant recipient final report – how they satisfied specific objectives
- NFWF project report
  - Evaluation
  - Project accomplishments
  - Partnership accomplishments
  - Financial record
- PacifiCorp to submit annual reports to FERC

Community Outreach – Media:

- Identify objectives
- Identify relevant audiences
- Identify methods (i.e., presentations, media releases, website postings, tours, etc.)