Northwest **Power** and **Conservation** Council

July 7, 2015

MEMORANDUM

TO: **Fish and Wildlife Committee members**

FROM: **Laura Robinson, Program Implementation and Liaison Specialist**
Tony Grover, Fish and Wildlife Division Director

SUBJECT: **Highlights of the Baker Dam reintroduction facility tour and other reintroduction topics**

BACKGROUND:

Presenter: Laura Robinson and Tony Grover

Summary: On June 17th, Council members and staff along with representatives from the Corps of Engineers, Bureau of Reclamation, Bonneville Power Administration, NOAA Fisheries, Washington Department of Fish and Wildlife, the Upper Columbia United Tribes, Columbia River Inter-Tribal Fish Commission, and utility agencies, went on a day-long tour of the Baker Dam fish passage facilities provided by Puget Sound Energy, the operator of the dam and facilities. At the July Council meeting staff will brief the Fish and Wildlife Committee on the tour. This agenda item will also provide time for open dialogue on questions posed by Council members regarding reintroduction of anadromous fish above Chief Joseph and Grand Coulee dams (see attachment 1).

Relevance: 2014 Fish and Wildlife Program priority #4: Investigate blocked area mitigation options through reintroduction, passage and habitat improvement, and implement if warranted.

The 2014 Fish and Wildlife Program calls for a science-based, phased approach to investigating reintroduction of anadromous fish above Chief Joseph and Grand Coulee dams to mainstem reaches and tributaries of the Columbia River in the United States.

Workplan: Workplan item 2.B – Promote regional fish and wildlife recovery - Implement new 2014 fish and Wildlife Program: Assist Phase I feasibility study for reintroduction above CJ/GC

Background: The Baker River, a tributary to the Skagit River in Western Washington, was impounded by Lower Baker Dam in 1925, and Upper Baker Dam in 1959. The Baker Dam facilities are owned and operated by Puget Sound Energy (PSE) and also include a sockeye hatchery at Upper Baker Dam operated by the Washington Department of Fish and Wildlife. Starting in 1959, the Baker complex used a fish collection barge, also known as a gulper, to collect fish for transportation around the dams. The gulper was used, with improvements made over the years, until a floating surface collector was installed at both Upper Baker in 2008 and Lower Baker in 2013, and an improved adult upstream fish trap at Lower Baker in 2010. Juveniles collected at the floating surface collectors are released in the Skagit River. Adults collected at the upstream trap, located downstream of Lower Baker Dam, are collected and transported to spawn in the Baker Basin above the dams.

Since installing the floating surface collectors, PSE has successfully captured and transported record numbers of juvenile sockeye and coho and have seen smolt-to-adult rates that are well above average. However, the Baker Dam passage project was not without hurdles. In the 1980s during the use of the gulper, sockeye runs plummeted unexpectedly with returns as low as 99 fish in 1985. This signaled that the original gulper needed various updates such as a deep-reservoir guide-net system. After years of successful passage with the gulper and net system, further evaluation determined that new floating surface collectors and associated guide nets would work in place of the gulper. This was due to both the gulper becoming worn out and a greater understanding of juvenile sockeye biology and their response to various hydrological conditions. The floating surface collectors, guide nets, and net transition systems have resulted in juvenile runs of outmigrants nearly two orders of magnitude higher than the numbers observed in the late 1980s. 8,828 juvenile outmigrants were recorded in 1987, while in 2010 there were 525,230. Additionally, three of the four highest sockeye returns to the adult-salmon upstream trap have occurred since the new trap began operating in 2010. In 2012 the trap collected 28,410 sockeye with an estimated 48,014 total sockeye returns to the Skagit/Baker River system.

Many advancements in net material, structure, and operation have been made since the inception of the Baker Dam passage project. The full-exclusion guide nets at the Baker facilities were designed for extreme pool fluctuations of 50-70 feet, are anchored by side-shore embedments, and have floats at the surface that allow for reservoir fluctuations. The floats are high-density polyethylene booms that can be sunk and refloated at any time if the net needs to be let down. These same nets have been

installed at Swift, Cushman, in the Great Lakes, and elsewhere, and have shown to work effectively.

More Info: Videos of the Baker Dam passage facilities can be viewed via the following links:
To learn more about the net transition structure and floating surface collector: https://vimeo.com/132356523
To learn more about what occurs once fish enter the floating surface collector (i.e., sorting, tagging, transporting below Lower Baker): https://vimeo.com/132356527
To view a time lapse video of the Upper Baker Dam floating surface collector construction: https://vimeo.com/132356524

Attachment 1

The Council's program language calls for a science-based phased approach to determine whether reintroduction above Chief Joseph and Grand Coulee dams is feasible. Part of phase 1 calls for an evaluation of information from other passage studies and projects. Below are a list a questions posed by Member Booth. The answers provided are based on both discussions with and data provided by biologists and others involved in the projects.

At this point, before a feasibility assessment has begun, it is uncertain whether dam-adjacent collection of juveniles is an option at Grand Coulee. Part of the task for an Upper Columbia project sponsor concerned with fish passage issues around the dams is to define the range of options or strategies available. To do so, regional stakeholders will collaborate as part of Phase 1 to determine what outcomes they hope to achieve. Outcomes from the feasibility study may range, but before doing any work those remain to be undetermined.

Throughout this process, Council members, Council staff, and the region's fish and wildlife managers are learning a lot that will facilitate smart decisions as the process continues. Exploring other projects is a great way to better understand the challenges and make sure they are addressed in the assessment of Grand Coulee, but it is also wise to note that no two projects are the same and technology continues to change. The assessment in the Upper Columbia will benefit from the time and efforts placed in passage in other areas. Lessons learned and advancements in technology can be brought into the Upper Columbia process.

(1) Grand Coulee is the primary peaking project used to meet the region's daily load fluctuations. During April, when fish are migrating out of the system, flows out of Grand Coulee vary by approx. 100 kcfs from day to night. Could the screening and sorting facilities used at Baker be adapted to such rapid changes in flow?

Flows at Grand Coulee during that time of the year can be in the 200 kcfs range, while average flows are 110 kcfs, showing that flows can almost double in the spring; however, 200 kcfs is very uncommon and has only happened once in April in the last decade. Based on Grand Coulee flow data provided by the USACE website, the biggest fluctuations since 2010 were: 120 kcfs over a 10 day period in April 2013; 60 kcfs drop on April 1 in 2012; and a rise of 35 kcfs over 3 days in 2010.

Major flow fluctuations at Baker occur with the fall freshet, when the floating surface collector is not running. At times the lake elevation can change based on a really warm period in the late spring which provides a lot of melt off and causes the reservoir to rise, but that is less common. Since the Baker facilities do not run during the time of major fluctuations it is uncertain how the screening and sorting facilities operations would change.

(2)Grand Coulee is an important flood control project and it is frequently drafted up to 80 feet from full pool at the end of April. Could the fish collection facility at Baker operate with such a large fluctuation in reservoir elevations?

Lake Roosevelt can be drafted up to 82 feet for flood control but that act is dependent on the water levels to the north based on snow pack. In a big water year, the reservoir will be drafted lower, and conversely in a year with less precipitation it may only be drafted 30-40 feet. The April 30 date for reservoir drafting is simply a target, and not a required draft-by date. This target is set by the FCRPS BiOp, which states that by April 30 the reservoir should be evacuated as much as needed to make room for the spring runoff. Some years the low point is met a week early, and sometimes up to two weeks into the month of May. This practice is dependent on that year's weather. Based on data on the Bureau of Reclamation website, since 2000 the biggest draws have been 74 feet below full pool in 2001 and 73 feet in 2011. All others have been as low as 20 feet and up to 63 feet, with an average of 47.7 feet over the 16 years.

The Baker floating surface collector operates March 1 – July 31 as fish migration is very low in the winter. Baker Lake draws down 50 feet or more in January/February when fish are not migrating. The floating surface collector's mooring lines have weights to keep everything afloat so the floating surface collector stays in place no matter the change in reservoir elevations. At the peak of the run the lake level is high but that has not shown a huge bearing on the migration of the fish.

(3) Upper Baker's reservoir is 9 miles long. Grand Coulee's is over 150 miles long. How can juvenile screening and collection be implemented successfully over such a large distance and huge reservoir volume?

The water travel time in Lake Roosevelt is surprisingly quick – approximately 9 days. Should a floating surface collector be installed near the dam, the fish would not be in the reservoir for long. Currently the third powerhouse at Grand Coulee is having improvements made to it. The area of the 3rd powerhouse is smaller in scale to Baker, although the flows are higher. While this analysis will need to be done by an engineer in the feasibility study, there could be a way to install a floating surface collector near the 3rd powerhouse and net the fish towards the collector, like the set-up at Baker.

Another option could be trapping the juveniles at the tributaries, but this will also need to be evaluated in a feasibility study. There are 13 tributaries that drain into Lake Roosevelt including the Spokane River. While installing floating surface collectors at all 13 is likely not cost-effective, the use of weirs and screw traps could be.

(4) Puget Sound Energy has designed a barrier net that they describe as "shore-to-shore, surface-to-lake bed guide nets covering five acres of surface area". This was the basic approach Idaho Power tried at Brownlee and it failed. Why would it be likely that a barrier net would work at Lake Roosevelt which is nearly three times larger than Brownlee's reservoir?

At this point, without having done a feasibility study, we are not certain that a barrier net is the way to go with Grand Coulee. More work is needed to determine the best route of collection. Additionally, the barrier net at Brownlee was installed in 1958, almost 60 years ago. Many advancements in net material, structure, and operation have been made in that time. The full-exclusion guide nets at the Baker facilities were designed for extreme pool fluctuations of 50-70 feet, are anchored by side-shore embedments, and have floats at the surface that allow for reservoir fluctuations. The floats are high-density polyethylene booms that can be sunk and refloated at any time if the net needs to be let down. These same nets have been installed at Swift, Cushman, in the Great Lakes, and elsewhere, and have shown to work effectively.

(5) The cost of the total fisheries facilities at the Baker projects was approx. $250 million. If the costs were to scale up for Grand Coulee in proportion to its size how could it be economically and politically feasible to secure billions of dollars of new funding?

At Baker each floating surface collector cost $50-53 million, the upstream fish trap was $20 million, and the hatchery was $20 million, bringing the total to about $150 million. A 4th powerhouse is currently being built at Baker to control flows; however, the powerhouse is being installed to benefit downstream fish, not those passing at the Baker facilities. *Costs are approximate.*

(6) In 2010 Portland General Electric invested approx. $100 million in a juvenile collection facility at Billy Chinook. Successful reintroduction has not yet been demonstrated and there have been problems with successfully collecting juveniles. In addition, PGE has had problems with changes in water quality in the Deschutes river below the dam. Lake Roosevelt has nearly 20 times greater volume than Billy Chinook, so why would collection be feasible in Lake Roosevelt when it is proving so difficult for PGE?

Pelton Round Butte began their reintroduction efforts in December 2009 and at this early stage they are still learning what works best for that area. The main issue PGE is encountering in collecting juveniles is due to the fact that the passage facility is located at the confluence of the Metolius and Crooked rivers. The Metolius is snow-fed and therefore cold, while the Crooked comes from the warmer areas to the east. The waters mix just above the collector and the fish coming from the cold Metolius swim back into the Metolius when they feel the hot Crooked River waters. The fish are having a hard time reaching and finding the fish collection site. This is a very unique situation particular to this area, and may not be the best predictor of fish/facility interactions at Grand Coulee.