

<b>Project Name</b>	2020 CFNSC Evaluation Recommendations
<b>Date Proposal Submitted</b>	1/7/2020
<b>Date of Requested Decision</b>	2/4/2020
<b>Date Final</b>	2/4/2020
<b>Proposed By</b>	Matt Bleich

**FTC Decision and Justification**  
 Decision to implement the 2020 evaluation year at the CFNSC was supported by FTC members present 2/4/2020 as follows: Paul Sparks - TU, Bryce Glaser – WDFW, Travis Nelson – TPU, Carol Serdar – ECY, James Archibald – NOAA.

**Proposed Decision or Consideration**

As part of the 2020 evaluation year at the Cowlitz Falls North Shore Collector (CFNSC), Tacoma proposes implementing five actions intended to evaluate life history strategies of Upper Cowlitz River spring Chinook Salmon and test hypotheses regarding salmon and steelhead collection efficiency in relation to collector configuration. Specifically, Tacoma will:

- 1) Lengthen the collection season at Cowlitz Falls by operating the CFNSC beginning in February and continuing through November;
- 2) Develop a study design to evaluate adult spring Chinook Salmon returning to the separator at Barrier Dam to identify the relative contribution of different life history strategies to the Upper Cowlitz River spring Chinook Salmon population;
- 3) Opportunistically evaluate increasing flow within the collector from 500 cfs to 750 cfs during spring freshets and any resultant effect on steelhead and Coho Salmon collection efficiency;
- 4) Evaluate the effect on steelhead retention efficiency of modified floor geometry in the Capture Zone region of the CFNSC;
- 5) Evaluate Chinook Salmon Entrance Efficiency in response to ‘Entrance Directed Flow’ Pumpback Diffuser Structure operations.

## Background

As part of the Cowlitz Hydroelectric Project Federal Energy Regulatory Commission operating license requirements, Tacoma Power is engaged in restoration efforts of anadromous salmonid populations in the Upper Cowlitz River basin. These efforts include ensuring the effective passage of juvenile salmonids during their migration downstream from the Upper Cowlitz and Cispus rivers, through collection in the fish collection system at Cowlitz Falls Dam and transport around Tacoma hydroelectric facilities, until they are returned to the Cowlitz river at the Cowlitz Salmon Hatchery.

The Cowlitz Falls North Shore Collector was added to the existing fish collection system at Cowlitz Falls Dam in 2017 and has been subject to annual performance evaluations since commissioning. Annual evaluations of the fish collection system include estimates of Fish Passage Survival (FPS) and Fish Collection Efficiency (FCE). FPS is defined in the Cowlitz Settlement Agreement (SA) as the percentage of smolts entering the upstream end of Lake Scanewa, and (adjusted for natural mortality), collected at Cowlitz Falls Dam, that are transported downstream to the stress relief ponds, and subsequently leave the stress relief ponds at Barrier Dam as healthy migrants. The SA describes a FPS performance goal of 95%, with a minimum of 75%, using the best available technology. Estimates of FPS are derived in part from FCE, defined as the percentage of marked fish released at the upstream end of Lake Scanewa that are subsequently collected alive at the Cowlitz Falls Fish Facility (CFFF). FCE for steelhead, Coho Salmon, and Chinook Salmon has been measured annually at Cowlitz Falls since 1996. FCE measures, and the derived FPS estimates, have yet to reach performance goals, although values for all three monitored species have improved significantly with the commissioning of the CFNSC. Active telemetry techniques used to evaluate FCE also allow for monitoring fish behavior and additional fine-scale metrics near and within the collector. These include:

- Discovery Efficiency (DE), measured as the percentage of fish released subsequently detected near the collector;
- Entrance Efficiency (EE), measured as the percentage of fish detected near the collector that subsequently enter the collector;
- Retention Efficiency (RE), measured as the percentage of fish detected entering the CFNSC and subsequently detected in the CFFF;
- Capture Zone Efficiency (CZE), measured as the percentage of fish detected entering the capture velocity region and subsequently detected in the CFFF.

The CFNSC allows the opportunity to evaluate for different life history strategies of spring Chinook Salmon. Historically, due to constraints related to dam operation, fish collection efforts at Cowlitz Falls spanned from April 1 through August 31. Spring Chinook salmon outmigration at Cowlitz Falls typically peaks in July and August. However, based on migration timing observed in similar systems, it is likely that there is a second component of the outmigration with more typical run timing in early spring or late fall. The CFNSC is capable of operating during these periods, and offers the potential of detecting these outmigration signals. In addition, it is currently unclear to what degree each component of the Spring Chinook juvenile outmigration contributes to the adult return and overall population. An evaluation of adult salmon returning to the separator at Barrier Dam can provide insight into the most successful life history strategies. Information collected from returning adults (e.g., scales and otolith) can help determine which strategies should be prioritized during the outmigration.

Despite overall passage improvements realized with operation of the CFNSC, annual monitoring has identified several issues recommended for further evaluation, and the collector was designed

with the ability to adjust operating configurations to allow for such evaluations. A principle area of interest is collection of fish on the leading edge of a spring freshet event and the relationship to FCE. While the CFNSC is currently operating at 500 cfs of flow, the tailrace discharge structure allows collected water to be discharged directly in to the tailrace, while still maintaining fish collection activities. During spring spill events, the CFNSC can be configured to operate at 750 cfs, providing an opportunity to test fish collection performance at higher than normal flows. This collection above 500 cfs would occur outside of NMFS screen criteria.

Other areas for further evaluation involve testing fish response to modifications to the collector structure. Preliminary results from the 2019 telemetry evaluations suggest that steelhead smolts are able to exit against the high velocity flow of the capture zone, resulting in low Capture Zone Efficiency (39 – 78%) and low overall Retention Efficiency (48 – 77%) across weekly release groups. The floor of the Capture Zone was designed to be adjustable and can be modified to potentially improve hydraulic conditions and increase steelhead Retention Efficiency in the CFNSC.

During summer months, the CFNSC is typically operated in pumpback mode, where water drawn by the collector is pumped back into the dam forebay using the Pumpback Diffuser Structure (PDS), rather than discharged into the tailrace. Acoustic telemetry results from the 2019 evaluation reveal that weekly estimates of Chinook smolt Entrance Efficiency varies widely by release group (30 – 85%), and the season-wide value is lower than desired (71%). The PDS has been set to operate in the “no eddy” configuration since the collector was commissioned, but was designed with alternate configurations to address low Entrance Efficiency. One configuration, “Entrance Directed Flow”, allows the PDS baffles to be set in such a way as to direct discharge directly towards the CFNSC entrance, encouraging fish to find and enter the collector. It is recommended that this configuration be used to test the effectiveness to improve Entrance Efficiency for late migrating Spring Chinook.

**Coordination Need**

Continued information sharing with FTC of data collected at CFNSC.

**Summary of Potential Impacts**

The Cowlitz Falls North Shore Collector will operate on an extended schedule, starting in February and continuing through November. This is intended to improve overall collection efficiency, but also may expose other populations and life stages to fallback/collection, which will require a disposition strategy.

A study design will be developed to evaluate successful Spring Chinook Salmon life history strategies and will be evaluated through analysis of adult returns to Barrier Dam. The study may not be implemented in 2020.

Tacoma will develop study designs and analyses to evaluate the following:

Opportunistic evaluation of Cowlitz Falls North Shore Collector collection performance while operating at 750 cfs during spring spill events. This would expose fish collected during 750 cfs to screens outside of NOAA criteria.