

## Exploring Ecosystem Improvements through the Columbia River Treaty

### Info Sheet – Restoring Natural River Functions June 2022

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#### Background

This Info Sheet provides an overview of the Indigenous-led research and assessments underway to determine how reservoir and river operations might be modified through the Columbia River Treaty to improve aquatic and riparian ecosystems in the B.C. portion of the Columbia Basin.

See the [Background Info Sheet](#) for more information about the overall process. This Info Sheet provides a summary of this research study and the current performance measures for functional flows for riverine portions of the mainstem Canadian Columbia River and the Kootenay River downstream of Libby Dam.

To fulfill the objectives of flood control and hydropower generation, the four Treaty reservoirs are storage reservoirs with extensive drawdown over the winter followed by refill during the spring freshet. The operational regime has resulted in substantial changes to river flows downstream of the dams in the Columbia and Kootenay systems. Spring streamflow has been dramatically reduced, while late season streamflow is higher and more variable than a natural regime. These changes can affect aquatic ecosystems that are well-adapted to natural streamflow regimes and dependent on these regimes for several life cycle stages. Even in highly regulated river systems, flow regimes can be established that meet ecosystem function needs without re-establishing natural flow regimes.

#### Ecosystem Goal and Objective

This study was undertaken to quantify how the streamflow regime has changed relative to natural streamflow and determine components of the streamflow regime that could be restored through changes in the timing of flows from the Treaty dams. The overall goal of this work is to increase and improve functional, free-flowing riverine mainstem habitats, including seasonal availability of critical species-specific, life history dependent habitats. The objectives are to: 1) manage dam discharges to maximize functional, free-flowing riverine mainstem and side channel habitats and 2) minimize the difference from pre-dam flows downstream of Treaty dams.

#### Study Description

The study used two species that are dependent on specific streamflow regimes to meet their life history needs: 1) Black Cottonwoods (*Populus trichocarpa*); and 2) White Sturgeon (*Acipenser transmontanus*). These species and their streamflow requirements are viewed as indicators of functioning free-flowing river systems. High spring streamflow to promote sediment redistribution within the river channels followed by relatively stable streamflow conditions throughout the low flow periods are required for these two species to thrive. The study used these characteristics and compared naturalized (pre dam) streamflow conditions to regulated streamflow conditions. An erosion model and statistical analyses were used to define flow levels that meet the characteristics required by Black Cottonwood and White Sturgeon and to establish performance measures that could be evaluated in response to changes in dam operations.

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#### Study Findings

The study found that streamflow regimes have been highly altered relative to pre-dam conditions downstream of CRT dams. The study quantified the streamflow regime in this regulated system that would best meet the life history requirements of the two indicator species. This study suggests these flow characteristics can be re-established with targeted and opportunistic dam operations to meet the specific performance measures described below.

#### Performance Measure Description

The study defined three performance measures (PMs) that could be used to evaluate functional flows:

- 1) Effective discharge - the high flows that helps move sediment, providing suitable habitat for cottonwood recruitment and for sturgeon spawning;
- 2) Ramping rate - provides a measure of how fast streamflow recedes post-spring, which helps determine how well cottonwoods can establish and sturgeon recruitment success; and
- 3) Low flow variability - provides a measure of how stable streamflow is during the late summer, which is an important period for several species.

#### Further Work

This study and methods used are limited by the available input data, including information on sediment distributions and channel morphology downstream of the CRT dams. In addition, the methods applied are theoretical and meant to provide a high-level understanding of functional streamflow regimes for key species. More detailed studies at local scales downstream of each CRT dam would need to be conducted to verify the accuracy of the PMs resulting from this work.

#### Feedback Invited

Your feedback on this work is appreciated. You are encouraged to provide your input through the [online survey](#) or contact [columbiarivertreaty@gov.bc.ca](mailto:columbiarivertreaty@gov.bc.ca) to receive a digital or paper copy. We hope to hear from you by 4 PM Pacific Time on July 11, 2022.