To:	**WEI Technical Working Group members**
From:	Jayson Kurtz, TWG Coordinator, Ecofish
Date:	April 14, 2021
Re:	**Summary of TWG meeting held Wednesday, April 14, 2021, 9:00 am to 12:00 am**

Attendees:

- Dan Sneep (DFO)
- Andrea Byrne (City of PG)
- Andy Lecuyer (RT)
- Alec Mercier (RT)
- Duncan McColl (FLNRORD)
- Rahul Ray (EDI)
- Jayson Kurtz (Ecofish Research Ltd.)
- Jennifer Carter (Ecofish Research Ltd.)
- Katie Healey (Ecofish Research Ltd.)
- Nikolaus Gantner (FLNRORD)
- Phillip Krauskopf (FLNRORD)
- Wayne Salewski Nechako Environment and Water Stewardship Society

Meeting Objective: to brainstorm remaining interests regarding reservoir fish and river fish, and revisit wildlife interests.

Agenda:

- Debrief of MT meeting
- Summary of information assessments: wetland assessment, wildlife assessment, caribou summary, and brief update on entrainment and ramping assessments.
- Discuss remaining interests, Objectives and PMs.
    - River fish (remaining interests)
    - Reservoir fish (remaining interests)
    - Wildlife (revisiting beaver and bird issues)

MT Meeting Debrief

- Overall good conversation and engagement, and confirmation that the work we are doing is being endorsed by the MT.
- Good debate about objectives and how they represent MT interests.

SSWG

- First meeting showed people are ready to start work on solving problems (i.e., addressing site specific issues).

Information Summaries:

Ecofish presented an information summary of three action items, and provided an update on two action items, assigned during the TWG and Main Table meetings:

- Nechako Reservoir Wetland Assessment;
- Nechako Reservoir Wildlife Assessment;
- Caribou Summary;
- Entrainment Assessment – update only; and
- Ramping Assessment – update only.

The summaries are provided below and will be forwarded under separate cover when complete.

TWG Discussion

Wetland Assessment comments and considerations:

- Need to be clear on where the data come from:
    - Need to be careful when we describe operations, max operating level to ensure it accurately describes Ootsa Lake.
    - Provide clarity around elevation range (especially max). Based on Triton DEM, and considers other impounded waterbodies (i.e., Tetachuk).
- Consider re-doing assessment based on actual operational range.

Wildlife Assessment

- Consider showing a risk matrix table to describe how we evaluated risk categories
- Consider having a compact table showing categorical assessment to quantitatively show how interim conclusions are made

Entrainment Study

- Provided a brief overview of approach and also highlighted that we will need to discuss assumptions with the TWG in the future.

Ramping Study

- Provided a brief overview of preliminary results, which show low stranding risk in Nechako River, and high risk below SLS.
- Not evaluating at Fraser confluence, which is critical habitat for sturgeon, but results show attenuation by Isle Pierre, so likely not a ramping concern; however:
    - Topography could play role and we should note there is uncertainty here.
    - Nikolaus to follow up to determine specific sites of concern for sturgeon (where and when).
    - Need to consider habitat availability and isolation for sturgeon over the winter – this is not part of the ramping assessment but would be part of an instream habitat assessment (discussed below).
- Other than stranding, WUW of river has decreased causing loss of habitat.

Action Item - Nikolaus to follow up with colleagues to a) confirm no previous reports of stranding, and b) to identify any specific areas of concern for Upper Fraser sturgeon rearing at the Nechako fan.

General Fish Discussion

- Will continue to assess modeling to determine how best to represent instream habitat: HSI, area, index sites etc.
- If we are unable to model good PM, what is TWG general preference? Estimate? Proxy? Ignore? Defer decisions pending more data?
    - Agreement that instream habitat suitability data are critical because we would rather have good data to inform model predictions than lots of uncertainty but we understand the desire to have something to model now. Also, these data are important to collect even if a release facility were built because it would determine release flows.
        - In the short-term, we could identify key sites to use as proxies or complete flow trials under an adaptive framework, but there is risk that changing flows without all the information could inadvertently negatively affect other species/components of the river as adaptation to the current regime has been taking place over the last 60 years.
        - Agreement that a long-term plan to collect the data is needed and an adaptive approach should be taken as more information is known. It is important to have a clear recommendation and timeline for whatever we propose (data gaps and how we propose to fill gaps – design, what data are collected – and when this data would be available)
        - Specifically, with regards to sturgeon, we need to consider whether there are stranding concerns at Nechako/Fraser confluence (this is designated critical habitat for Upper Fraser Sturgeon), how does flow affect overwintering habitat throughout the Nechako River? We know:
            - Early life sturgeon (<1 year, 25cm) in Vanderhoof core area (Vanderhoof to 30km downstream).

- Juvenile sturgeon distributes throughout river, but concentrate in few deep pools for winter (intraspecific competition concerns).
- There is a current study to consider overwintering attributes.
- Our knowledge about juvenile sturgeon relies on hatchery programs. We don't have natural recruitment so can't study wild fish. But a caution is we don't know that wild fish will perform the same.
- Formal request: can WEI present update to NWSRI.

Information Summaries

Wetland Assessment

A wetland specialist reviewed available spatial data to determine the presence, amount (number and area), and type of wetlands adjacent to the Nechako Reservoir and whether the wetlands may be affected by reservoir operations.

- The primary source for publicly available hydrological information is the Freshwater Atlas (FWA), which is a standardized dataset of hydrological features in British Columbia, including watershed boundaries, streams, lakes, and wetlands.
    - To determine the area of wetlands potentially affected by operations, a digital elevation model (DEM) of the Nechako Reservoir was created from contour data provided by Triton Environmental Consultants
        - DEM resolution is 5 m grid cell
        - FWA wetland shapefiles were overlayed on the DEM, and the number and area of wetlands affected by reservoir elevation changes were calculated for the following scenarios:
            - maximum operation elevation;
            - minimum operating elevation for the Main Reservoir and Tahtsa Lake; and
            - the average, minimum and maximum normal operating level calculated from the past 20 years (2001-2020) of operational data.
- The FWA Wetlands data shows that there are 13,736 wetlands that occur within the Nechako Reservoir watershed, and 76 of these wetlands directly intersect the Nechako Reservoir.
    - Of the wetlands that overlap with the reservoir, 46 were classified by FWA data as marsh and 30 as swamp.
- No wetlands are affected by the minimum operating levels or minimum normal operating levels (based on the past 20 years of operational data).
- A small number of wetlands overlap with the reservoir during average and maximum normal operating levels (2 marshes, and 3 marshes and 2 swamps, respectively); but the overall area of overlap compared with the size of the wetlands is relatively small (0.0008% to 27%).
- At maximum operating elevation, which has not occurred in the last 20 years, 69 wetlands overlap with the reservoir, representing 61-62.6% of the total area of these wetlands.
- The results of this desktop exercise show few wetlands, 7 in total, are affected by normal operating levels (since 2001), and the area of wetland affected relative to the total area of these 7 wetlands is relatively small (<28%). The results indicate that minimum operating levels have no affect on wetlands.
- We will review the results to ensure we are capturing the reservoir actual operating range.

Wildlife Assessment

Overview

A spreadsheet was developed to summarize wildlife issues. This included identification of wildlife species groups potentially affected by reservoir operations, the habitat of these species (which is related to the potential for operational effects), the habitat category, and the pathway of effect (i.e., how reservoir operations could affect the species group). Interaction risk was categorically evaluated based on information obtained during the review to date, and recommendations were made for next steps in identifying and evaluating issues and for addressing potential effects. The review involved reviewing information and documents available online and seeking input from local resource professionals. Local resource professionals that have provided input to date are:

- Anne-Marie Roberts and Duncan McColl (FLNRORD); and
- Scott McMillan and Darren Fillier (BC Parks)

Local resource professionals contacted but from which input has not been received include:

- Deb Cichowski (Caribou Ecological Consulting); and
- Heidi Schindler (FLNRORD, team lead for local Moose research)

Assessment:

- Species and species/groups with the potential for life history characteristics to interact with reservoir operations potentially present in the area, along with habitat, were identified from the literature, professional experience, and discussion with local resource professionals; habitat category differentiated aquatic habitat as occurring within the reservoir or in wetlands adjacent to the reservoir (these differ in their potential to be influenced by reservoir water level fluctuations)
- Pathways of effect were evaluated from professional experience, discussion with local resource professionals, and the literature.
- Risk was categorically evaluated (low, moderate, or high) based on the following considerations, based on the literature, discussion with local resource professionals, and/or professional experience:
    - certainty (regarding species presence and operational effects);
    - likely magnitude of impacts;
    - conservation concern of species/species groups;
    - results of other assessments (e.g., wetlands assessment done by Ecofish for the current project, existing assessments such as Osprey nesting assessment);
    - identified management concern (e.g., caribou movement obstruction); and
    - existing management action (e.g., Osprey nest platform program, ongoing management for fish).

- Species of low risk include:
    - Cavity nesting waterfowl (Barrow's Goldeneye, Common Goldeneye, bufflehead, Wood Duck, Hooded Merganser)
        - Nest sites are typically a greater distance off the ground than reservoir water levels rise (cavity nesting may be decreasing because of wildfires, beetle kill, and therefore cavity opportunity comes largely from reservoir).
    - Osprey
        - Osprey nests have been identified as a management concern in the reservoir in the past and inventory has been conducted and a nest platform program implemented to offset loss of nest trees.
    - Piscivorous birds
        - Piscivorous birds are known to occur in the area (e.g., Brown et al. 1995); however, management of prey (fish) is being encompassed by management for fish.
    - There are no recommendations due to low risk potential.
- Most species have a moderate risk including:
    - Toads, frogs, and salamanders (e.g., Western Toad, Long-toed Salamander, Columbia Spotted Frog, Wood Frog).
        - Amphibians are likely to be breeding in wetlands hydrologically connected to the reservoir and these would be affected by reservoir water level fluctuations; however, the wetlands assessment documented that few wetlands are hydrologically connected to the reservoir at normal operating levels, and that a relatively small portion of those wetlands would be affected by water level fluctuations at normal operating levels.
        - One species that potentially breeds in the area is the Western Toad, which is federally of Special Concern.
        - Recommendations include:
            - to address data gaps – identify potentially suitable habitats for amphibian breeding in wetlands hydrologically connected to the reservoir and determine which amphibian species are present; this could be done through review of existing information and/or field surveys.
            - evaluate potential impacts of reservoir water level fluctuations on amphibian breeding habitat and breeding success.
            - predict the types of interactions that are likely to occur between amphibians and annual and seasonal reservoir water level fluctuations based on amphibian life history characteristics.
    - Waterbirds (Grebes, waders, loons, swans, geese, ground-nesting ducks, mergansers, gulls, shorebirds
        - Few data were found to evaluate which of the species potentially present breed in the reservoir or in hydrologically connected wetlands and where any such breeding occurs.
        - relatively little potential for reservoir operations to impact wetlands at normal operating levels; however, some avian species are likely to breed within the reservoir itself where water level changes could be more of an issue. Further, during years when water level

fluctuations are greater than normal, impacts to nesting birds are also likely to be greater.
        - A number of species potentially breeding in the area are provincially or federally at risk (e.g., Eared Grebe, Horned Grebe, American Bittern).
        - Recommendations include:
            - To address data gaps, identify bird species that nest in the reservoir or adjacent to it in hydrologically connected wetlands, and identify locations where interactions between active bird nests and reservoir operations could occur; this could be done through review of existing information, and/or field surveys.
            - To evaluate potential impacts of reservoir water level fluctuations on bird breeding success.
    - Aquatic mammal (beaver, muskrat, river otter) and riparian-associated species (fisher, western screetch-owl, bat species)
        - Few data were found to determine if species, other than American Beaver, are of management concern.
        - Aquatic fur-bearers have been identified as a focal species group for water management; however, water management is already occurring to mimic normal spring conditions to address concerns.
        - results of the wetlands assessment indicate that there is relatively little potential for reservoir operations to impact wetlands at normal operating levels; thus management concern would be largely focused on potential reservoir habitat.
        - Recommendations for aquatic mammals include:
            - Address data gaps by compiling existing information on status and distribution of aquatic mammals to evaluate species presence and distribution and to identify potential interactions with reservoir operations.
        - Recommendations for riparian associated species include:
            - To improve our understanding of the potential for improving the value of riparian habitat (bank and vegetation characteristics) for a variety of wildlife species, investigate the potential to enhance habitat along drawdown zone shorelines through physical works and/or water level management.
    - High risk is associated for caribou only:
        - Restoration of Caribou habitat impacted by reservoir operations has been identified as a priority by the province and Indigenous groups.
        - All populations are at risk.
        - The rate of accumulation of log debris has accelerated in recent years and the risk that the caribou migration route through Whitesail Lake could be abandoned due to movement obstruction is considered high, and the loss of access to calving islands has the potential to impact calf survival.
        - Recommendations include:
            - Collaborate in restoration of Caribou habitat and monitoring as per recommendations and priorities developed by BC FLNRORD.

- Investigate the extent to which reservoir drawdown affects access to the reservoir for caribou by evaluating drawdown zone bank characteristics within caribou movement pathways during caribou movement time periods and evaluating potential options and benefits of shoreline and riparian enhancements.
- Investigate whether the magnitude and timing of current and potential future reservoir drawdown has the potential to create land links to calving islands and include this potential impact within the water use planning framework in case potential future alterations of the water management regime are considered that might reduce water levels at critical calving times.

- Currently no data were found to assess moose, we have reached out to folks for more information.
  - Recommendations include:
    - Investigate the extent to which reservoir drawdown affects access to the reservoir for moose by evaluating drawdown zone bank characteristics within moose movement pathways during the time periods when moose are likely to be present.
    - Evaluate potential options and benefits of shoreline and riparian enhancements for moose.

Caribou Summary

Background:

A review was conducted to identify potential effects of reservoir operations on caribou along with potential management actions that would address these effects.

- The caribou population inhabiting the Nechako Reservoir area is the Tweedsmuir-Entiako caribou (TEC) population, which is a local population of the Northern Mountain Caribou population
  - listed as Threatened by COSEWIC, appears on Schedule 1 of the federal *Species at Risk Act* (SARA), is blue listed in BC and is included in the provincial Identified Wildlife Management Strategy (IWMS) under the provincial *Forest and Range Practices Act* (FRPA)
- Caribou in this local population migrate seasonally; however, flooding of low elevation habitat during impoundment of the Nechako Reservoir is believed to have changed the patterns of land use by the TEC population, and may have contributed to abandonment of winter ranges north of Ootsa and Whitesail lakes

<u>Methods:</u>

- A review of publicly available information online on potential effects to caribou related to Nechako Reservoir operations was conducted and information was summarized with the objective of determining if there are actions that the Nechako WEI could take to address any identified effects.

- Meeting with Anne-Marie Roberts and Duncan McColl of BC MFLNRORD to discuss issues surrounding caribou relevant to Nechako Reservoir operation.

Results:

Two kinds of potential effects associated with the reservoir were identified during the review.

1) Woody debris has been documented to be obstructing movement of caribou as they migrate seasonally and when they attempt to access calving islands in Whitesail Lake. It has been observed that the rate of accumulation of log debris has accelerated in recent years and the risk that the caribou migration route through Whitesail Lake could be abandoned due to movement obstruction is considered high.
    - Although reservoir operation (water level management) is unlikely to be able to address this effect directly, physical works could be implemented, in collaboration with other partners, to remove and manage debris accumulations:
        - Tactical Restoration Plan has identified some actions (physical works) that could be undertaken to mitigate the impacts of movement obstruction caused by log debris around the shorelines of the reservoir and calving islands; and
        - BC MFLNRORD is currently working on establishing a Wildlife Habitat Area (WHA) that will include the Whitesail Priority Restoration Area and this will incorporate an order to protect caribou calving habitat.
        - A pilot project has been implemented through SERNBC (Society for Ecosystem Restoration in Northern British Columbia)[1] that has begun shoreline restoration at select treatment sites and will allow evaluation of success of the works through monitoring, and additional works could be implemented following a similar approach (results outstanding). Physical works included:
            - Site reconnaissance;
            - Clearing and grubbing (designated sites for clearing and grubbing selected, such as creation of sites for burn piles and timber storage and piling);
            - Mechanized clearing of submerged and emergent standing timber (salvage of timber from nearshore and foreshore of the treatment sites);
            - Installation of log booms for long-term debris management (intended to prevent future build-up of debris);
            - Transport of merchantable timber and woody debris (transport to ancillary sites via barge);
            - Disposal of woody debris (piling, burning, chipping, composting, and/or distribution to local businesses); and

[1] https://sernbc.ca/projects/Whitesail-Reach-Woodland-Caribou-Habitat-Restoration-Project

- Conducting effectiveness monitoring (this was to include vegetation monitoring to provide baseline vegetation information that may correlate with caribou use, wildlife monitoring intended primarily to document use by caribou, and debris monitoring to track debris accumulation following treatment).

    - Additional physical works (removal of woody debris) would ideally be implemented at additional treatment areas to allow evaluation of the success and effectiveness of the implemented methods prior to applying treatments more widely

2) Reservoir drawdown may have adverse effects on caribou if the shoreline banks within the drawdown zone are difficult to access due to steepness and lack of vegetation, where such shorelines occur within caribou movement pathways and when low water levels coincide with periods when caribou access shorelines. One study also identified drawdowns as having the potential to affect the isolation of calving islands because complete or partial land links could form between the mainland and islands at low reservoir water levels if these coincide with use of the islands; however, it is uncertain if water levels would get low enough to create land links during the current operational regime (email sent to author of study to determine if this is a true concern).
    - To our knowledge, enhancements/modifications of drawdown zone shorelines have not been considered or implemented.
        - Riparian habitat enhancement is occurring at other BC Hydro reservoir systems in BC, and approaches similar to those could be implemented to improve bank and riparian habitat characteristics within the drawdown zone.
    - Investigation of the effects of reservoir drawdown on the accessibility of shorelines would improve our understanding of the extent to which drawdown may affect caribou movement.
    - Although there may not currently be risk of creating land links to calving islands (complete or partial links), this potential impact should be included within the water use planning framework in case potential future alterations of the water management regime are considered that might reduce water levels at critical calving times.