Columbia River Project Water Use Plan

Monitoring Program Terms of Reference

COLUMBIA RIVER WHITE STURGEON MANAGEMENT PLAN

- CLBMON-19 Kinbasket Reservoir White Sturgeon Inventory and Habitat Use Assessment

22 February 2008
TERMS OF REFERENCE FOR THE COLUMBIA RIVER
PROJECT WATER USE PLAN

COLUMBIA RIVER WHITE STURGEON
MANAGEMENT PLAN

1.0 OVERVIEW

This document presents Terms of Reference for white sturgeon monitoring studies being delivered under the Columbia River White Sturgeon Management Plan. These programs will monitor sturgeon populations and their habitats in the upper, mid and lower Columbia River. To the extent possible, these programs will also aim to address concerns related to the potential effects of five-unit operations at Revelstoke Dam on sturgeon habitat.

This document provides detailed Terms of Reference for the following programs:

1) CLBMON-19 Kinbasket Reservoir White Sturgeon Inventory and Habitat Use Assessment: a 3-year investigation into the status and habitat use of white sturgeon in Kinbasket Reservoir and the Columbia River upstream. The study is descriptive in nature, and will include surveys at key locations to capture adult and/or juvenile sturgeon and record habitat characteristics important to the white sturgeon life cycle.

1) CLBMON-20 Mid Columbia River White Sturgeon Spawning Habitat Assessment: a 2-year study to assess hydraulic and substrate conditions in locations of known sturgeon spawning immediately below Revelstoke Dam, relate hydraulic condition to discharge from the dam and water elevation of Arrow Lakes Reservoir, and assess operations in providing suitable spawning conditions and incubation for white sturgeon.

2) CLBMON-28 Lower Columbia River Adult Sturgeon Monitoring and Broodstock Collection: a 10-year program to describe changes in age structure and population estimates, provide information on movements, habitat use, and population interactions through telemetry, provide periodic spawn monitoring to measure trends in the numbers of spawning events, population demographics and reproductive potential, and provide an annual broodstock contribution to the conservation culture program.
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<th>Previously Submitted To CWR</th>
<th>Submission Date</th>
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Monitoring Study No. CLBMON-19
Kinbasket Reservoir White Sturgeon Inventory
and Habitat Use Assessment

1.0 MONITORING PROGRAM RATIONALE

During the Columbia River Water Use Plan process, the Consultative Committee (CC) identified fish species of management priority to help focus discussions around which ecological functions were most critical with respect to water management issues. Selection of these management priorities was based on a number of criteria, including the extent to which the species is endangered, whether it can be restored, and whether it is affected by operational changes. The Committee agreed that a focus of fish management in the Columbia River mainstem should be on white sturgeon (*Acipenser transmontanus*). White sturgeon in the Canadian Columbia River is listed as endangered under the Species at Risk Act (SARA).

The upper Canadian Columbia River white sturgeon population is most abundant downstream of Hugh L. Keenleyside Dam where there are an estimated 900 to 1400 individuals (UCWSRI 2005). Upstream of the dam, there are about 50 sturgeon in Arrow Lakes Reservoir and remnant populations possibly exist in Revelstoke and Kinbasket reservoirs. The only confirmed spawning locations for white sturgeon in the Canadian portion of the upper Columbia River are Waneta Eddy below Keenleyside Dam and a small riverine section below Revelstoke Dam. The capture of a single sturgeon larva below Kinnaird Bridge at Castlegar in 2007 suggests a third spawning location upstream.

Anecdotal evidence indicates that white sturgeon were present in the upper Columbia at least as far upstream as the original (i.e., pre-flooded) Kinbasket Lake prior to dam construction (Prince 2001). In 1995, the BC Government funded a directed investigation of white sturgeon in Revelstoke and Kinbasket reservoirs to confirm the presence of sturgeon (RL&L Environmental Services Ltd. 1996). The investigation failed to capture or observe white sturgeon in either reservoir. This result was not entirely unexpected given the large size of the reservoirs and the limited effort of the study. However, anecdotal sightings of white sturgeon in both reservoir systems suggest that some sturgeon may still be present (RL&L Environmental Services Ltd. 1996).

There is some interest in focusing on Kinbasket Reservoir (Figure CLBMON-19-1) as a potential recovery or failsafe area\(^1\) for upper Columbia River white sturgeon, either by supporting extant sturgeon if they are already present, or by stocking sturgeon into the reservoir. Some feasibility studies have already occurred in the form of ecological risk assessments and public discussions to gauge the level of support for

\(^1\) *Recovery* — Refers to a population level that ensures the persistence and viability of naturally-producing populations of white sturgeon and provides opportunities for beneficial use if feasible.

*Failsafe population* — Refers to a sturgeon population established separate from the population units being recovered to provide a hedge for unforeseen circumstances. Failsafe populations are not expected to reproduce naturally and may be established in areas that historically produced sturgeon or in other areas where sturgeon are not present.
Figure CLBMON-19-1: Kinbasket Reservoir
the activities (e.g., CCRIFC 2005a, 2000b; Westslope Fisheries and CCRIFC 2005).
As part of the planning process, there was broad interest in determining whether
sturgeon are currently in the reservoir, and if so, determining the status of this
population and most significantly whether there is evidence of natural recruitment as
indicated by the presence of year classes established since the building of the
Columbia River Treaty dams.

This monitoring program is a 3 year investigation into the status and habitat use of
white sturgeon in Kinbasket Reservoir and the Columbia River upstream. The study
is descriptive in nature, and will include surveys at key locations to capture adult
and/or juvenile sturgeon and record habitat characteristics important to the white
sturgeon life cycle.

1.1 Management Questions

At present, there is only limited anecdotal evidence of white sturgeon presence in
Kinbasket Reservoir. The primary purpose of this study is not to investigate
operational impacts per se, but rather to establish if sturgeon are present in the
reservoir and whether or not recruitment is occurring. This information, along with the
Kinbasket Sturgeon Recolonization Risk Assessment and Habitat Suitability study
(CLBMON#26) will be used to aid in determining the utility of Kinbasket Reservoir as
a potential recovery or failsafe area for white sturgeon. Ultimately, there may be
questions regarding whether reservoir operations can be adjusted to improve or
enhance spawning and rearing conditions, or whether physical works can be
implemented to improve conditions. However, at present, the key management
questions are related to the current status of the white sturgeon population in the
reservoir and whether any recruitment is occurring.

The fundamental management questions to be addressed through this monitoring
program are:

• Are white sturgeon present in Kinbasket Reservoir?
• If white sturgeon are present in Kinbasket Reservoir, is it a remnant population or
is natural recruitment occurring?
• If white sturgeon are present in Kinbasket Reservoir or within habitats of the
Columbia River upstream of the reservoir, what are the habitat associations for
this population?

1.2 Management Hypotheses

This study uses a descriptive rather than experimental approach and, as such, is
designed to provide baseline information rather than test specific management
hypotheses or measure biological response to different treatments. The study is
nevertheless expected to contribute to decisions regarding stocking and
enhancement of white sturgeon in Kinbasket Reservoir. It is possible that the study
could also inform decisions related to changes in reservoir operations with respect to
white sturgeon spawning and incubation habitat.
1.3 Key Water Use Decision Affected

During development of the Columbia River Water Use Plan, efforts were made to explore the effects of operations on white sturgeon habitat throughout the Columbia River system. The WUP Fish Technical Subcommittee noted that so little is known about white sturgeon in Kinbasket Reservoir and the potential for this water body to function as a recovery or failsafe area, that collection of additional baseline data was justified. It was envisioned that information would be collected during the first few years of implementation of the Water Use Plan, which would be used to select an appropriate water management schedule or physical works alternatives during future reviews of the plan. This information would contribute to decisions on where to focus recovery efforts in the mid- or upper Columbia which will be made during scheduled mid-Columbia management plan reviews (2011, 2014 and 2017).

This study will assess the presence and habitat use of white sturgeon in Kinbasket Reservoir and potentially useable habitats in the Columbia River upstream. If it is determined that the reservoir offers a viable recovery or failsafe area for white sturgeon, it may be possible to explore trade-offs between management of this reservoir and downstream facilities. Since the upper Columbia area includes an extensive lacustrine foraging habitat (Kinbasket Reservoir), access to a free flowing reach of the Columbia River with an unregulated hydrograph and thermal regime, and possible suitable substrate for this obligate stream spawning fish, it is thought to have potential for maintenance or establishment of a self-sustaining population of white sturgeon.

2.0 MONITORING PROGRAM PROPOSAL

2.1 Objective and Scope

The primary objectives of this monitoring program are to assess:

• the presence of white sturgeon in Kinbasket Reservoir,
• whether natural recruitment has occurred, and
• the habitat associations of white sturgeon in Kinbasket Reservoir.

The scope of the program is limited to empirical studies of white sturgeon in Kinbasket Reservoir, and the Columbia River upstream. The study will be undertaken over 3 years to allow collection and analysis of data. Information will feed into a subsequent or concurrent evaluation of Kinbasket Reservoir as a recovery/failsafe area for white sturgeon included as part of the Mid Columbia River White Sturgeon Monitoring Plan.

2.2 Approach

The general approach of this monitoring program will be to undertake surveys for juvenile and adult white sturgeon in potentially high use habitats in Kinbasket Reservoir and the Columbia River upstream to assess the presence or absence of white sturgeon, and habitat use. While standard techniques for capturing sturgeon will be used, recommendations from the public will also be sought to help direct sampling effort. Initially, emphasis may be placed on determining presence or
absence of juvenile sturgeon. To assess evidence of recruitment and to allow comparison with other sturgeon populations, the characteristics of these fish (age, size, growth and condition etc.) will be sampled.

2.3 Tasks

2.3.1 Task 1: Project Coordination

Project coordination will involve the general administrative and technical oversight of the monitoring program. This will include but not be limited to 1) budget management, 2) study team selection, 3) logistic coordination, 4) technical oversight in field and analysis components, and 5) facilitation of data transfer among relevant projects.

A safety plan must be developed and submitted to the BC Hydro Sturgeon Coordinator for all aspects of the study involving field work, in accordance with BC Hydro procedures and guidelines. Specific safety training may be required. It should be noted that conditions on and around Kinbasket Reservoir can be dangerous and unpredictable and the sampling program may be altered, interrupted or curtailed in any given year as a result.

2.3.2 Task 2: Study Design

The study design should maximize spatial and temporal coverage within the allocated budget. Establishment of sampling protocols and study design will require discussion with sturgeon experts, particularly those with local knowledge, to ensure that the study design meets the objectives of the program. Input from local anglers and other resource users will also be sought, probably by soliciting reports of sightings and incidental angling through newspaper advertisements and sign placement at reservoir and river access points, to assist with directing sampling efforts.

Ideally, the methods will be repeated in each of 3 years, which will provide opportunity for repeat observations. Preferably three sampling periods are recommended for each year. A late winter or spring sampling period would allow sampling during periods of reservoir low pool and sturgeon overwintering aggregations, while autumn sampling would allow sampling during the kokanee spawning and aggregation period. Another sampling period between these two would permit sampling during the period of sturgeon spawning and summer feeding forays. To assist with determining the timing of field work and locations/techniques for gear deployment, a review of Arrow Lakes Reservoir and Kootenay Lake setline survey catch rates should be undertaken.

2.3.3 Task 3: Field Surveys

Since white sturgeon in the Columbia River are listed as endangered under SARA, care must be taken to protect sturgeon from injury or mortality related to sampling. Planned injury for data collection, such as fin-ray sampling or acoustic tagging, must be pre-approved and permitted by the Fisheries and Oceans Canada (DFO) under SARA. Unexpected mortalities must be reported promptly to the responsible
authorities and to BC Hydro project management. The causal activity may be suspended pending review with the DFO and approval to recommence.

Sampling methods should seek to be as benign as possible and minimize incidental harm. The aim will be to release all sturgeon and by-catch unharmed following handling and health assessment protocols already established for the Lower Columbia (BC Ministry of Environment 2003). That said, sampling does need to be conducted to address the objectives of determining relative abundance and evidence for post-dam construction recruitment. Capture will be provided by the use of baited hooks on a set line, or possibly short-term gillnet soaks. Handling will occur in accordance with the UCWSRI Fish Handling manual (UCWSRI 2006), and data collection will meet the protocol provide by the initiative and regulators. Sturgeon will be sampled for length, weight, age and other morphometric measures. Age sampling should be directed at all sturgeon captured unless large numbers are taken, in which case efforts can concentrate on those fish likely to be younger than 35 years, which would correspond with construction of Mica Dam in 1973. Morphometric sampling would be used to allow for comparison with other populations. External body condition must be recorded according to the accepted protocols (B. C. Ministry of Environment 2003).

Without causing undue harm, sturgeon captured should be marked with scute removal (as directed by the TWG) and tagged with a Passive Integrated Transponder (PIT) tag to allow population estimation, if recaptures occur. A DNA sample will be required, consisting of a sliver of tissue taken from a fin tip, stored in alcohol in an appropriate container and well labeled for future analyses.

Ultrasonic tags (Vemco pingers) will be applied via surgical insertion to sturgeon of a suitable size unless otherwise directed. Acoustic receiver/loggers to track movements should be positioned at the outlet of the river and at constrictions and potential habitat use areas in the reservoir. The units will be installed as part of the first field trip each year, information will be downloaded at the end of each field trip, and the units withdrawn on completion of the field work.

Measurements of a number of physical parameters will be collected at the same time as the capture surveys. These parameters will, at a minimum, include (a) water temperature, (b) reservoir level (available from BC Hydro), (c) water depth, (d) turbidity, (e) substrate, (f) water surface conditions (e.g. wave action), and (g) weather. Velocity data allowing for site comparison will be measured if fish are located in flowing water. All sites should be located and identified by GPS. Correlation between different habitat variables and the relative abundance of sturgeon observed in the study will be assessed qualitatively in an effort to understand whether specific habitat variables are correlated with sturgeon presence and abundance.

The field study program is expected to be conducted over three years. However, the program may need to be altered (or possibly cancelled) depending on the study results (i.e., unacceptable by-catch rates, incidental harm to captured sturgeon, or zero or very low sturgeon catch rates).
2.3.4 Task 4: Data Analysis and Reporting

Details of data analysis will depend on the type and extent of data obtained from the field program design and execution. The primary aims of the surveys are to assess the presence of white sturgeon in Kinbasket Reservoir, and to determine whether recruitment may be occurring. If sturgeon, including year classes since construction of Mica Dam, are present, there will be a number of additional questions posed, including growth and age structure, and habitat use. Any conclusions from the study will need to be judged in the context of sample size. DNA samples will be collected but since analysis does not align with the objectives of this project, the samples will be archived.

Project reporting will consist of one data report each of the first 2 years, and a final technical report at the conclusion of the 3 years of study. The annual data report will include descriptions of methods, a summary of results to date, and recommendations for any changes to the sampling plan or methods for the upcoming year.

The final technical report will provide:
1) an executive summary;
2) a description of the methods employed;
3) a data summary and preliminary data analysis;
4) a comparison of results between years and with other sturgeon populations;
5) a detailed summary of the findings as they relate to the key management questions; and
6) recommendations with regard to potential next steps.

Decisions on next steps will follow consultation with the regulatory agencies and TWG. Draft versions of reports should be submitted in Microsoft Word for ease of editing.

Reports will follow the standard format that is being developed for WUP monitoring programs. All reports will be provided in hard-copy and as Microsoft Word and Adobe Acrobat (*.pdf) format, and all maps and figures will be provided either as embedded objects in the Word file or as separate files.

2.4 Interpretation of Monitoring Program Results

As previously noted, this study is descriptive rather than experimental, and as such is intended to provide baseline information rather than test specific management hypotheses or measure biological response to different treatments. Results will be used to describe the presence of and habitat characteristics used by white sturgeon in Kinbasket Reservoir. The study will not explicitly test hypotheses, but should allow an evaluation of relative importance of habitats and the possible sensitivity of these habitats to reservoir operations. The strength of the evaluation should be tempered by the strength of the data and, where possible, statistical power analysis should be used to help set this context. Alternative explanations for study results should be explored.
2.5 Schedule

This study will be conducted during calendar years 2008 to 2010 of the Columbia River Water Use Plan. Project preparations will occur as early as September with collection of bait, and completion the month before field work begins. Field trips will take place during periods corresponding to low reservoir levels and over-wintering (likely March), river dispersal and spawning (July), and autumn feeding and kokanee spawning (September). Data analyses and report preparation should occur prior to the next year of field work with a draft report submitted by mid-January, and a final report complete by the end of February.

2.6 Budget

The total annual budget for this monitoring program is estimated at $152,628 (in 2004 dollars). The estimated budget breakdown by task and year (including 2 % rate of inflation and 5 % contingency) is provided below in Table CLBMON-19-1.

3.0 REFERENCES


Golder Associates Ltd. 2001. White sturgeon investigations in Arrow Reservoir and the Columbia River, B.C., 2001 study results. Data report prepared for BC Hydro, Castlegar, B.C.


Westslope Fisheries Ltd. 2001. Local knowledge of Columbia River fisheries in British Columbia, Canada. Prepared for: Columbia-Kootenay Fisheries Renewal Partnership, Cranbrook, BC.