JANUARY 2023

PERFORMANCE MEASURE INFORMATION SHEET

KOOTENAY LAKE - CRESTON VALLEY FLOODPLAIN: DIKE MANAGEMENT OPERATIONS

SUMMARY

Goal: Support farming and wetland protection by minimizing pumping costs during critical times.

Interim recommended performance measures:

The new Creston Valley Floodplain Management Partnership has not been available to review these performance measures so they are considered interim.

Objective / Location	Performance Measure	Units	Description
Farming and wetland protection, water pumping / Creston Valley Floodplain	Preferred operational days	# of days per year	# Days per year below 1750ft (533.4m) in Kootenay Lake during Jan 1 – June 15. Higher is better.
	Spring dry days	# of days per year	# Days per year below 1739.32ft (530.1m) in Kootenay Lake during March 1 – April 30. Higher is better.

Introduction

Prior to diking and impoundment, the Creston Valley, along the Kootenay River before it enters the south end of Kootenay Lake, was a very large wetland with a healthy and large kokanee population (Goat Creek) and other fish species (sturgeon, burbot, etc). The area is currently managed for farming and ecosystems. It includes portions of the Yaqan Nukiy/Lower Kootenay Reserve and the Creston Valley Wildlife Management Area (CVWMA).

In farmed areas, the key is to drain fields in June so farmers can plant crops. The Yaqan Nukiy have been restoring ecosystems within their reserve and areas in the CVWMA are managed for different species (e.g. Duck Lake for waterfowl and leopard frog). Inundation of these diked-off floodplain areas is controlled by gravity drainage when the Kootenay River level is low enough, and by pumping when the river levels are higher.

Kootenay River elevations adjacent to these areas are controlled by the combined backwater effect of Kootenay Lake (which depends on lake elevation) and flow in the Kootenay River. In some years when water elevations are low these areas can be drained mostly by gravity, with little pumping cost. High water elevations in Kootenay River and/or Kootenay Lake in June and July make it more costly, difficult, or impossible to drain diked-off areas of floodplain that are inundated by local inflows. In years with higher river levels or greater local inflows these areas may be drained using pumps, but this increases costs and not all areas currently have the infrastructure to do this. As well, in very high water years such as 2012, some diked-off areas such as Leach Lake could not be drained due to concerns about dike integrity (must limit the extent of head differences between the river and diked-off areas or the dikes could fail).

Past Performance Measures

BC Hydro developed performance measures for this interest for the CRT Review Technical Studies in 2013. They noted that CBT (2004) found that a wide range of recreational, commercial and ecological interests would be captured by the preferred elevation levels of 1744ft (531.6m) to 1746ft (532.2m) measured at Duck Lake (Figure 1).

Figure 1 - Aerial view of Kootenai River and Creston Valley Flood Plain.

Estimating elevations at Duck Lake was beyond the scope of the CRT Review Technical Studies, for two reasons:

- If unregulated, Duck Lake levels are a function of both Kootenay River flows and Kootenay Lake levels. Although estimates for both of these parameters are available, a detailed hydrological model would be required to calculate elevations at Duck Lake from these inputs. It may be possible to adapt models from other processes (e.g. a recent Creston Valley Floodplain Management Plan.
- Duck Lake levels are controlled by a gate between the Duck Lake outlet and Kootenay River. Predictions of Duck Lake levels would also need to assume management responses.

Following a technical meeting including floodplain operators, it was agreed that the number of days with Kootenay Lake level below 1750ft (533.4m) prior to mid-June each year would be a coarse indicator of the implications of Kootenay system water management choices on floodplain operations. Generally, whenever the Kootenay Lake level is above 1750ft (533.4m), the floodplains' system of dikes, gates and pumps becomes more complex and costly to manage.

A second operational performance measure concerns the need for relatively dry farmland during March and April in order to move farming equipment to desired locations. Although pumps may help mitigate the effects of high water levels to some extent, there are costs associated with doing so. Kootenay Lake levels below 1739.32ft (530.1m) from March 1 to April 30 was set for this performance measure.

New information

The CRT Socio-Economic Team has been awaiting an opportunity to meet with the new Creston Valley Floodplain Management Partnership (CVFMP) to review this performance measure. This group has not been able to set a date to meet with the team yet. In the interim the team has discussed the performance measure with a local provincial agency representative who is familiar with the Creston Valley diking operations. The team is not aware of any new information on this topic at this time.

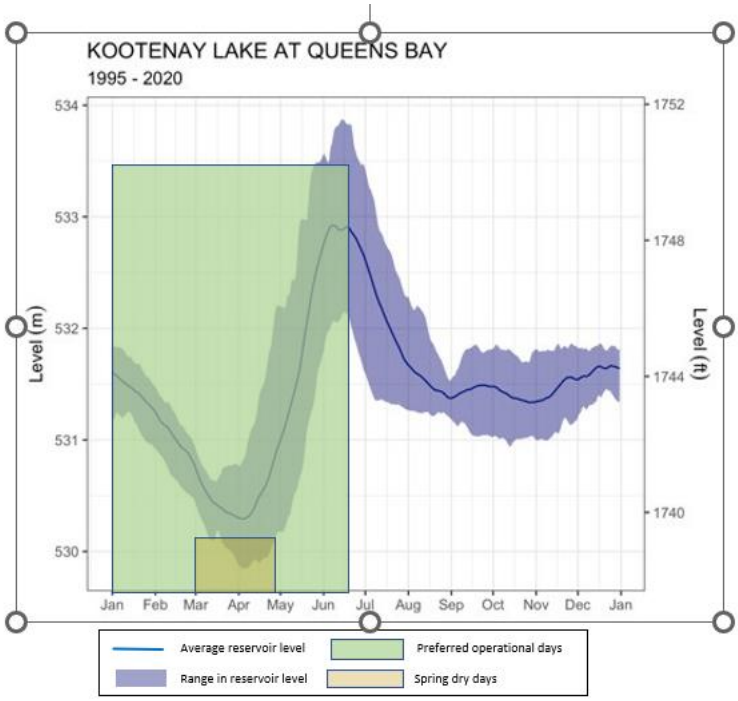
Interim Recommended Performance Measures

Until the CVFMP is available to meet with the team, the team recommends the previous performance measures be used:

Objective / Location	Performance Measure	Units	Description
Farming and wetland protection, water pumping / Creston Valley Floodplain	Preferred operational days	# of days per year	# Days per year below 1750ft (533.4m), Jan 1 - June 15. Higher is better.
	Spring dry days	# of days per year	# Days per year below 1739.32ft (530.1m) in Kootenay Lake, March 1 – April 30. Higher is better

Comparison of Proposed Performance Measure with Historical Operations

As shown in the figure below, the performance measure for preferred operational days has been met from 1995-2020, except in late May to mid-June in some years when the lake levels have risen to very high levels. The spring dry days performance measure has not been met in early March, as the lake levels are not that low at that time of the year and are met in some years from mid-March through the end of April, when the lake levels are very low.



Calculations

For each alternative:

1. Assemble the simulated results for Kootenay Lake elevations over the years of the simulation.

2. Count the number of days:

    - between January 1 and June 15 that the reservoir is at or below the 1750ft (533.4m) for each year; and
    - between March 1 and April 30 that the reservoir is at or below 1739.32ft (530.1m) for each year.

3. Summarize all statistics.

Key Assumptions and Uncertainties

- Each scenario is simulated using the same set of system constraints, input assumptions (e.g., load forecasts) and historic basin inflows.

References

Columbia Basin Trust (2004) A Stakeholders Summary of Preferred and Potential Negative Reservoir Levels and River Stages on the Kootenay River System in Canada - Interest Group Response Summary to proposed VarQ Alternative Flood Control Operation.

BC Hydro (2013) CRT Review Technical Studies
https://engage.gov.bc.ca/app/uploads/sites/6/2012/07/Columbia-River-Treaty-Review-Technical-Studies-Report-FINAL.pdf