

Cowichan Lake Weir Operation – Rule Curve vs Rule Band

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During the wet fall/winter period when inflow to Cowichan Lake is high, the gates and boat lock are left open and the weir does not control river flow or lake levels. When inflow to lake begins to drop in the spring, the boat lock is closed and the gates are operated to maintain lake level near the crest of the weir. Operation of the weir usually starts April 1st and runs until the return of the rains which replenish the lake storage, usually in September or October. During this period the weir is "on control", and is operated to store water in the lake to maintain a flow rate in Cowichan River at a minimum of 7 cubic metres per second (m^3/s).

Maintaining the minimum flow is essential to ensure that sufficient water is available in the river later in summer for:

- maintenance of good water quality,
- ecological needs of fish, particularly Chinook,
- economic and sustainable needs of the community i.e the Crofton mill and other users.

It has become increasingly challenging to maintain summer river flows at 7 m^3/s , due to diminished summer inflows over recent years.

As timing and magnitude of the inflow to the lake varies from year to year, the weir operator requires a set of tools to help guide release of water and maintenance of storage in the lake to reduce the likelihood of running out of water at the end of the summer period. Two types of tools that can be used.

Rule Curve

A rule curve is the tool that is currently used. It is a graph showing the ideal lake levels through the summer control period, which if followed would allow the minimum 7 m^3/s discharge until the end of October. The curve was calculated based on historical average inflow to the lake. Therefore, when actual lake inflow is above or below average, river flows must be increased or reduced to bring lake levels back onto the curve. For instance when inflow to the lake is low and lake levels drop below the rule curve, river flows must be reduced below 7 cms to reduce how quickly storage in the lake is being used. This is done to prevent possible drastic flow reductions towards the end of the dry season as a result of running out of storage in the lake. Conversely when inflows are high and lake level rises above the rule curve, the river flows are increased to

bring lake levels back down to the curve. This is done to reduce the likelihood of having high lake levels at the end of the control season which could lead to higher than normal lake levels during the first fall rains.

A rule curve is limited in that it only considers average inflow conditions for the lake and does not provide any guidance on how to operate the weir during wetter or drier summers. It also does not account for changes in climate or changes in the runoff patterns from the watershed.

Rule Band

A rule band is similar to a rule curve, except that rather than a single curve it defines a lake level operating zone or a band created between an upper and lower curve. The upper curve is based on a typical wet year condition while the lower band is based on a typical dry year condition. The rule band allows lake level to rise and fall within the operating zone while still maintaining the minimum flow release of $7 \text{ m}^3/\text{s}$. It is only when lake level either rises or falls below the band that flows to the river are adjusted. A rule band provides the operator with better guidance on when and by how much to adjust river flows as the band considers a range of inflows rather than just the average. It allows for more flexibility in the operation of the weir depending on the inflow condition, while still balancing the needs to maintain storage for downstream water use and the need to draw down lake levels by the end of the control season. Finally, a rule band provides a clear set of operating rules that the weir operator, the provincial water regulators, and the public can understand.