

## Operational Guidelines

On April 24, 2018 the International Joint Commission (the Commission) issued a Supplementary Order for Emergency Regulation of Rainy Lake and of other Boundary Waters in the Rainy River Watershed, thereby removing the earlier requirement to target the middle portions of the rule curves. The Commission issued a Supplementary Directive to the International Rainy-Lake of the Woods Watershed Board Water Levels Committee. The Water Levels Committee was directed to develop and maintain Operational Guidelines for maintaining water levels throughout the year within the established rule curves, to maximize the benefits to stakeholders.

The following Operational Guidelines were drafted as part of the International Rainy and Namakan Lakes Rule Curves Study Board's final report to the Commission. The intent of this document is to summarize best practices and considerations for managing water levels throughout the year within the established rule curves, when conditions allow. The Water Levels Committee may therefore amend these Guidelines as new information becomes available, including input from resource agencies, the public, stakeholders, and indigenous communities.

### **1. Year-round Considerations**

- a. In general practice, it is prudent to target the middle portion of the Rule Curve bands (25 -75 percent) under normal inflow conditions as this provides a buffer in case inflow conditions rise or decline sharply. In some seasons, other targets within the Rule Curve bands may be more suitable depending on the risk of Emergency Conditions, as described below.
- b. The general public has an interest in how outflows from the dams at Namakan and Rainy Lakes are managed. The dam operators and Water Levels Committee should provide information on changes to outflows that is timely and relevant. This includes status of dam sluices/gates, maintenance and planned outflow changes when available.
- c. Compared to Rainy Lake, water level changes on Rainy River are more rapid and have a greater range. Large, quick fluctuations may contribute to shoreline erosion, harm ecological interests, cause issues with docks (damage, limit accessibility) and may limit recreational activities on the river. Large flow changes during spawning periods can also be detrimental to fish eggs and larvae in the river. Changes in the rate of outflow from Rainy Lake, regulated by the dam at Fort Frances-International Falls, contribute to these fluctuations, as do local natural inflows from tributaries to the river (*e.g.* Little Fork and Big Fork rivers). The relative contribution of each varies.

Provided that emergency conditions due to low or high water are not anticipated, consideration should be given to limiting outflow increases or decreases from Rainy Lake to no more than 150 m<sup>3</sup>/s (5297 ft<sup>3</sup>/s) in a 24-hour period for the purposes of managing the lake level.

## **2. Winter Considerations**

- a. The winter period for the purposes of this document is from lake freeze-up to the start of freshet, normally from mid-November to April.
- b. During the winter period, the risk of developing Emergency Conditions due to high or low water is low.
- c. During the winter period, flow changes that involve log operations at the Namakan Lake dams or gate operations at the Rainy Lake dam can be difficult to execute due to ice and the challenges of working in an extremely cold environment.
- d. Large fluctuations in Rainy Lake outflow, up or down, following freeze-up of Rainy River can cause problems during the winter period, including ice-damming, break-up of ice cover used for recreational purposes and erosion and damage to shoreline infrastructure due to ice movement.
- e. For the reasons outlined in 2a-d above, it is prudent to allow for the levels of the Namakan Chain of Lakes and Rainy Lake to fluctuate within the full range of the Rule Curve bands during the winter as gradual changes in inflow to the lakes develop. This requires less frequent changes in outflow than would be needed to maintain lake levels within the middle 25-75 percent of the Rule Curve bands. Targets in the late winter may need to be adjusted to reflect spring risks in advance.
- f. Rainy Lake and the Namakan Chain of Lakes support several fall and winter spawning fish species, including Lake Whitefish, Cisco and Burbot. Lake Whitefish typically spawn between late October to mid-November and hatching occurs in March to April. Cisco usually spawn a week or two after the Lake Whitefish, also in shallow water (1 -3 m, 3.3-9.8 ft). Lake Whitefish spawning and egg incubation is generally unaffected by water level variation of less than 50 cm (1.6 ft) above or below the water level at the time of egg deposition. Egg survival declines as water level variation, whether higher or lower, exceeds 50 cm (1.6 ft). At 125 cm (4.1 ft) variation, the probability of egg survival drops to 50 percent, at 200 cm (6.6 ft), the probability of survival is zero. Decisions on over-winter drawdown within the Rule Curves for these lakes should consider the effects on Lake Whitefish and Cisco eggs.
- g. Muskrats begin to build lodges during fall, up until lake freeze-up. Lake level changes over the winter following lodge establishment are normally tolerated by Muskrats up to

15 cm (5.9 in), but become increasingly problematic for survival as water level changes increase past this. Water level increases of more than 30 cm (11.8 in) or decreases of more than 60 cm (2.0 ft) are likely to prevent Muskrat survival over the winter.

### **3. Spring Considerations**

- a. The spring period for the purposes of this document is from the onset of freshet (typically start of April) to the end of June.
- b. The spring period has the highest frequency of Emergency Conditions due to high water. Most high water events follow above-normal rainfall when the basin conditions are wet and are driven by inflow to the lakes exceeding the limits of outflow imposed by the natural outlet features of the lakes.
- c. Early in March of each year, the Water Levels Committee shall review basin conditions and forecasts for the spring period and adjust the lake level targets for the spring accordingly. Based on historic data, Emergency Conditions due to high water are most common following winters with a *La Niña* climate pattern from December through February, with high snowpack in early March and colder-than-normal winters.
- d. During the spring period, to reduce the risk of Emergency Conditions due to high water, it is prudent to target the lower portion of the Rule Curve band on Rainy Lake and the Namakan Chain of Lakes if inflow to the lakes is, or is forecast to be, above the normal range (25<sup>th</sup> to 75<sup>th</sup> percentile based on Water Levels Committee inflow statistics). Where the risk of high spring flows is deemed to be high, targeting the Flood Risk Reduction curve should be evaluated. The evaluation of its use should consider potential flood risk, as well as potential negative effects to other categories of interests (e.g. fish spawning, wildlife, effects on the river).
- e. During the spring period, to reduce the risk of Emergency Conditions due to lower water, it is prudent to target the upper portion of the Rule Curve band on Rainy Lake and the Namakan Chain of Lakes if inflow to these lakes is, or is forecast to be, below the normal range.
- f. Sudden, large increases in Rainy River flow early in the spring period can create ice-damming and related flooding. Break-up of river ice cover due to high flows can also create problems for recreational interests along the river, such as ice fishing, and contribute to shoreline erosion. Rising spring flows may also be due to natural increases in flow from tributaries to the Rainy River, due to large increases in Rainy Lake outflow, or a combination of these. Increasing Rainy Lake outflow gradually during the spring period, in balance with conditions on Rainy Lake, reduces the risk of the ice-related issues.

- g. Walleye in Rainy Lake and the Namakan Chain of Lakes spawn soon after lake ice-out, peaking when the water temperature is near 8 °C (46° F). Water level fluctuations are related to the survival of walleye eggs, which usually hatch after about three weeks. Eggs are not considered vulnerable if fluctuation in water level is between a 10 cm (3.9 in) decline and a 50 cm (1.6 ft) rise during this period. Declines below 10 cm (3.9 in) decrease the probability of egg survival with nearly all eggs being lost at a 1.0 m (3.3 ft) drop. Rising water levels beyond 50 cm (1.6 ft) also decrease survival probability, with complete loss likely at 2.5 m (8.2 ft).

Walleye reproduction in the Rainy River is favored by moderate and stable river discharge during the spawning and egg incubation period which usually occurs between April and early June. Walleye generally spawn on clean gravel substrates in shallow waters (0.1 to 1.5 m, 3.9 to 59 in) with water velocities between 0.1 to 1.4 m/sec (3.9 to 55 ft/s). To help provide suitable spawning conditions, the WLC may request that dam operators voluntarily suspend daily peaking operations during the spawning period in coordination with the state and provincial resource agencies.

- h. Northern Pike in Rainy Lake and the Namakan Chain of Lakes spawn in the spring shortly after ice-out, generally in shallow areas with vegetation. Higher water levels increase the available spawning and nursery areas by submerging a larger area of suitable habitat, and support recruitment. Declining water levels after spawning risk desiccation of eggs, while rapidly rising levels can also be damaging to larvae. Very good water level conditions (high water level soon after ice-out remaining stable for five to six quarter-months) occurring every three to five years should be sufficient to sustain the Northern Pike population.
- i. The Common Loon builds nests close to water, generally within 0.5 m of the water's edge and between 7 and 10 cm (2.8 to 3.9 in) above the water surface. Eggs are laid roughly six to seven weeks after ice-out, with incubation for approximately 30 days, followed by a nesting period of a few days. The nests are vulnerable to rising water levels, whether due to natural fluctuation or reservoir regulation. Loons can adapt their nests to slow and moderate water level increases, but not to rapid or large increases. Water level declines beyond 30 cm (11.8 in) also decrease nesting success due to the poor walking ability of the loons: it increases distance to the water and increases vulnerability to predators. Reducing water level variability during the incubation and nesting period could improve loon productivity across a large area. Loons may attempt to re-nest if the first nest fails, which can result in eggs being incubated well into August. To limit the negative effects of water level increases during the reproductive season, the peak lake water level should occur generally before the nest initiation period, roughly six to seven weeks following ice-out. During the nesting period, it is ideal to limit water level changes to increases of no more than 20 cm (7.9 in) and decreases of no greater than 40 cm (15.7 in).

- j. In the Rainy River, Lake Sturgeon typically spawn once the water temperature has reached 12 °C (54 °F) for two consecutive days. Spawning takes place preferentially in areas of high flow velocity at various locations between Lake of the Woods and the tailrace of the Fort Frances-International Falls dam. Once spawning has occurred, the eggs are susceptible to exposure to air due to declining river levels, therefore stable or rising water levels are preferred. The Water Levels Committee is engaged with resource agencies, Rainy River First Nations, the dam operators and community organizations to monitor water level temperatures and spawning activity each spring with the intent of avoiding, where feasible, Rainy Lake outflow decreases that would result in egg dewatering. This arrangement is known as the Sturgeon Protocol.
- k. Wild Rice germinates from late April to early May, generally following ice-out. The submerged leaf phase of early growth lasts until late May or early June, when the leaves reach the water surface. Rapid water level rise during this period can diminish light penetration. If the plant is unable to grow to the surface, it is lost. The plant is vulnerable as well during the floating leaf stage (mid-June), as a water level rise of only a few inches can be sufficient to uproot the plant. Conversely, a water level drop can kill the plant during this period, as it has insufficient structural strength to remain standing out of the water.

Wild Rice on Rainy Lake tends to do best in years with spring water levels in the lower portion of the Rule Curves. Water level increases of up to 0.5 m (1.6 ft) after germination can generally be tolerated, but plant survival drops sharply with additional water level rise. If conditions allow for the emergence of a promising crop, consideration could be given to adjust lake level targets within the Rule Curve range to allow for stable levels through late spring into summer.

#### **4. Summer Considerations**

- a. The summer period for the purposes of this document is from the start of July to the end of August.
- b. Emergency Conditions due to high water occur less frequently during the summer period than during the spring period. However, above normal inflows during the summer period increase the risk. As in the spring period, it is prudent to target the lower portion of the Rule Curve bands on Rainy Lake and the Namakan Chain of Lakes if inflow to the lake is, or is forecast to be, above the normal range.
- c. Low inflows are more common during the summer period than during the spring period. To reduce the risk of Emergency Conditions due to lower water, it is prudent to target the upper portion of the Rule Curve bands on Rainy Lake and the Namakan Chain of Lakes if inflow to the lake is, or is forecast to be, below the normal range.

- d. The summer period is the primary tourist season in the region. Recreational uses of the Namakan Chain of Lakes, Rainy Lake, and Rainy River are affected by water levels. Both extremely high and extremely low water levels can be problematic for recreational users, affecting access to boats from docks and creating navigational hazards. Levels within the Rule Curve ranges for both lakes are generally satisfactory for most users.
- e. The lower end of the Rule Curve ranges for Rainy Lake and the Namakan Chain of Lakes allow for a larger area of beaches than at higher water levels.
- f. Based on information from the Rendezvous Yacht Club, Rainy Lake elevations below 337.27 m (1106.5 ft) limit launch access for keel-boats with draughts of 1.5 m (5 ft) or greater.
- g. In years where Wild Rice is performing well by early summer, stable or gradually declining levels are beneficial through the summer period.
- h. Hydroelectric rates are normally the highest in the summer. Higher Rainy Lake levels within the Rule Curve band typically allow for greater hydroelectric power generation.
- i. Stable water levels during the summer present the highest risk of erosion to archaeologically-important shoreline sites. Gradually changing water levels over this period affords less time at a given elevation for waves to cause erosion.
- j. Gradually declining water levels for Rainy Lake and the Namakan Chain of Lakes increase the likelihood of shoreline substrate washing through wave action. This improves the spawning habitat for walleye and other species the following year. The summer drawdown may also expand the area of aquatic vegetation that Northern Pike can use for spawning the following spring.

## **5. Fall Considerations**

- a. The fall period for the purposes of this document is from the beginning of September to lake freeze-up, typically in November or early December.
- b. Fall water levels within the Rule Curve ranges for Rainy Lake and the Namakan Chain of Lakes are generally acceptable for recreational interests.
- c. In years with promising wild rice crops, stable or gradually declining levels in the early fall period until harvest are preferred.

- d. Lake Whitefish and Cisco typically spawn in the fall at relatively shallow depths. Thus, winter drawdown may result in dewatering of the spawning areas and desiccation of their eggs.
- e. Muskrats build houses in the late fall in advance of lake freeze-up. The closer late fall water levels are to end-of-winter target levels, the lower the risk to Muskrat survival.