

Arrow Lakes Reservoir at Deer Park

# Columbia River operations summary

# Fall 2024

This publication provides an overview of BC Hydro's operations in the Columbia basin, including Kinbasket Reservoir, Revelstoke Reservoir, Arrow Lakes Reservoir, Duncan Reservoir, and Columbia River flows. This summary also offers information about the current operating conditions in the Columbia basin, as well as the Columbia River Treaty ("the Treaty").

## SNOWPACK AND RUNOFF

Due to low precipitation in the fall and winter of 2023-2024, snowpack in the Columbia basin in the spring was well below average, particularly in the Canadian portion of the basin. The total runoff for April to September is low at 75% of normal for the Canadian portion of the basin and 74% of normal for the entire Columbia basin. By comparison, the observed runoff in the Canadian basin in 2023 was 78% of normal and the overall runoff in the Columbia basin was 83% of normal. The two-year average of combined low inflows in 2023 and 2024 represents the driest on record since the 1950s for the Canadian portion of the Columbia basin and the third driest on record for the entire Columbia basin.

## **KINBASKET RESERVOIR**

Kinbasket Reservoir is created by Mica Dam and provides 12 million-acre-feet (MAF) of storage over a possible operating range up to approximately 47 metres (155 feet). This reservoir regulates discharges and generation for both Mica and Revelstoke dams. Combined, Mica and Revelstoke provide approximately 27% of BC Hydro's annual average generation.

On October 23, 2023, Kinbasket Reservoir refilled to a maximum level of 747.18 metres (2,451.4 feet). This is about 3.8 metres (12.6 feet) below average for this date. The low refill last year was related to the summer's severe drought conditions in the Columbia basin and across British Columbia. In the Upper and Lower Columbia basins, drought levels ranged from 3 to 5 for most of the summer, which were similar to conditions across much of the province.

Precipitation was below average for most of the fall and winter of 2023-2024. The cumulative precipitation at Mica from October 1, 2023, to August 16, 2024, amounts to only 77% of the year-to-date average and is the driest year on record. With low precipitation in the basin, snowpack in the Upper Columbia basin was trailing at record low for much of the accumulation period and was much lower than the 2022-2023 snowpack.





Kinbasket Reservoir

The total observed runoff for Kinbasket from February to September is 83% of normal. Due to two consecutive years of below average inflows, the reservoir has been managed to near average levels prior to this fall. This ensures that there is sufficient water in storage for the fall, so that electricity demand can be met over the upcoming winter and next spring from Mica and Revelstoke generating stations.

On May 4, 2024, Kinbasket Reservoir reached a minimum level for the year at 725.16 metres (2,379.1 feet). Kinbasket Reservoir reached a maximum elevation for the year at 750.3 metres (2,461.9 feet) on September 15, 2024, which is about average for this date.

The normal licensed range for Kinbasket Reservoir is between 754.4 metres (2,475 feet) and 706.96 metres (2,319.42 feet) respectively. The reservoir can be operated up to two feet above its normal maximum level, if approved by the Comptroller of Water Rights. Kinbasket Reservoir provides 7 MAF of Treaty storage and 5 MAF of non-Treaty storage.

## **REVELSTOKE RESERVOIR**

Revelstoke Reservoir is created by Revelstoke Dam and provides 1.5 MAF of storage. Unlike Arrow Lakes Reservoir or Kinbasket Reservoir, Revelstoke Reservoir has limited storage and is usually operated within the top 1.5 metres (5 feet) of full pool. Revelstoke Reservoir water levels may fluctuate in response to weather patterns, inflow levels, and electricity demand. It is common to have daily fluctuations of the reservoir within 1.5 metres (5 feet) of full pool during the spring freshet and winter peak load periods. Periodically, the reservoir is drafted (lowered) below its normal minimum level of 571.5 metres (1,875 feet) to meet increasing system needs for short-term generating capacity. The reservoir may fill to near full pool during periods of high reservoir inflows. Water is occasionally released over the Revelstoke Dam spillway during low demand and high inflow periods to maintain minimum flows or to maintain the reservoir water level.



Revelstoke Reservoir

The licensed range for Revelstoke Reservoir is between 573 metres (1,880 feet) and 554.7 metres (1,820 feet). Most of the time, Revelstoke Reservoir is maintained at or above 571.5 metres (1,875 feet).

## **ARROW LAKES RESERVOIR**

Arrow Lakes Reservoir is created by the Hugh L. Keenleyside Dam and provides 7.1 MAF of storage over a possible operating range of approximately 20 metres (66 feet). Water releases from Arrow Lakes Reservoir are regulated under the Treaty and its supplemental operating agreements. The Treaty requires Canada to hold back water during wet years and release more water during dry years.



Hugh L. Keenleyside Dam

### Actual runoff from April to September 2023 in the

Canadian portion of the Columbia basin was the fifth driest year on record, and 2024 is forecasted to be the fourth driest on record. The total observed runoff for Arrow is 81% of normal for February to September 2024. Two consecutive low inflow years combined with the required Treaty increased releases under dry conditions, and the need to hold water in Kinbasket Reservoir for winter generation, resulted in further reduction of Arrow Lakes Reservoir over the summer and winter. The reservoir reached a minimum level of 422.7 metres (1,386.98 feet) on January 11, 2024.

Arrow Lakes Reservoir refilled to a maximum level of 436.78 metres (1,433 feet) on June 29, 2024, which is about average for this date. As freshet ended and drier conditions resumed in the summer, Arrow Lakes Reservoir drafted across July and August to reach about 429.5 metres (1,409 feet) on September 1, 2024. Although this level was below average, it is 2.4 metres (8 feet) higher than that time last year. BC Hydro is very aware of the impacts associated with low Arrow Lakes Reservoir levels over each season. We continue to consider options, when available, to support higher Arrow Lakes Reservoir levels, while ensuring that operations will remain within the water licence limits and Treaty requirements.

The normal licensed range for Arrow Lakes Reservoir is between 440.1 metres (1,444 feet) and 419.9 metres (1,377.9 feet). The reservoir can be operated up to two feet above its normal maximum level (to 440.7 metres or 1,446 feet) if approved by the Comptroller of Water Rights. Arrow Lakes Reservoir provides 7.1 MAF of Treaty storage.

## **DUNCAN RESERVOIR**

Duncan Reservoir is created by Duncan Dam and provides 1.4 MAF of storage. The dam's operations help meet Treaty flood control requirements, help minimize flood risk on Kootenay Lake, and provide minimum fish flows year-round as required by the Duncan Dam Water Use Plan.



Duncan Dam and Duncan Reservoir

Duncan Reservoir is normally drafted across the fall and winter to provide flows for fish and to meet system Treaty flood control requirements. Every year, Duncan Reservoir is drafted to its licensed minimum level of 546.9 metres (1,794.2 feet) by April, or before the start of freshet, for local flood risk management. Duncan Reservoir reached a minimum level of 547.3 metres (1,795.6 feet) on April 26, 2024. By comparison, the minimum level reached in 2023 was 547.2 metres (1,795.3 feet) on April 29, 2023.

The total observed runoff for Duncan is 82% of normal for February to September 2024, which is similar to last year. To manage the integrated Columbia system under drought conditions and to support higher Arrow Lakes Reservoir levels in the summer, Duncan flows

were increased to help offset the required Treaty releases from Arrow Lakes Reservoir in August. As a result, levels on Duncan Reservoir deviated from the Duncan Reservoir Water Use Plan recreation target elevation of 575.5 metres ±0.3 metres (1,888.1 feet ±1 foot) until Labour Day.

In 2024, Duncan refilled to a maximum of 572.69 metres (1,878.9 feet) on August 4, 2024, which is about 2.1 metres (7 feet) lower than the 2023 maximum level. The reservoir then drafted across the summer months to reach an elevation of 571.3 metres (1874.3 feet) on September 2, 2024 (Labour Day).

The normal operating range for Duncan Reservoir is between 576.7 metres (1,892 feet) and 546.9 metres (1,794.2 feet). Duncan Reservoir can be operated up to 1.2 feet above its normal maximum level (577 metres or 1,893.2 feet) if approved by the Comptroller of Water Rights. Duncan Reservoir provides 1.4 MAF of Treaty storage.

## **COLUMBIA RIVER FLOWS**

Columbia River flows, downstream of the Kootenay River confluence at Castlegar, are the result of flow regulation at Hugh L. Keenleyside and other dams on the mainstem Columbia, as well as dams on the Kootenay River system. Actual discharges depend on many factors, including upstream runoff and storage operations and Treaty discharge requirements.

Columbia River flows are measured at the Birchbank flow measuring station downstream of the Kootenay River confluence between Castlegar and Trail. Flooding conditions on the Columbia River are not anticipated this year based on the current forecast conditions associated with the below average snowpack.

On July 7, 2024, Columbia River flows at Birchbank peaked at about 2,931 cubic metres per second ( $m^3/s$ ) or 103,500 cubic feet per second ( $ft^3/s$ ). This flow is well below the peak regulated flow experienced in 2012 of 6,090  $m^3/s$  (215,000 ft<sup>3</sup>/s), and the peak predam flow of 10,590  $m^3/s$  (374,000 ft<sup>3</sup>/s) in 1961.



Columbia River in Castlegar

BC Hydro's water licence has no minimum discharge requirements for the Columbia River downstream of the Hugh L. Keenleyside Dam. However, BC Hydro can be obliged (per the Treaty) to reduce flows to a minimum weekly average flow of 141.5 m<sup>3</sup>/s or 5,000 ft<sup>3</sup>/s under certain water conditions. Please note that although this is the lowest possible flow rate under the Treaty, the required weekly discharges are largely based on inflows. The Treaty requires Canada to hold back water during wet conditions and release more water during dry conditions.

## **KOOCANUSA RESERVOIR**

Koocanusa Reservoir on the Kootenay River is controlled by Libby Dam in Libby, Montana, and is operated by the U.S. Army Corps of Engineers (USACE). The reservoir backs into Canada and provides approximately 5 MAF of storage.

Koocanusa Reservoir is typically drafted during the winter for Treaty flood risk management. The total observed runoff for Koocanusa from February to September 2024 is 80% of normal. Due to well below average inflow forecast, lesser draft was required to manage flood risk this year. The reservoir reached a minimum level of 736.2 metres (2,415.45 feet) on March 18, 2024, about 13.4 metres (44 feet) above average for this date. By comparison, the reservoir reached a minimum of 732 metres (2,401.5 feet) on April 10, 2023, about 9 metres (30 feet) above average for that date.



Koocanusa Reservoir

Libby Dam continues to be operated under VarQ1

procedures for U.S. fisheries interests and flood control. Libby refilled to a maximum of 748.6 metres (2456.14 feet) on July 21, 2024. By comparison, Libby reached a maximum of 747.48 metres (2452.36 feet) on July 14, 2023.

Information regarding the operation of Libby Dam and Koocanusa Reservoir water levels is available from USACE at **nwd.usace.army.mil or** by calling **206 764 6702**.

The normal operating range for Koocanusa Reservoir is between 749.5 metres (2,459 feet) and 697.1 metres (2,287 feet). During periods of high downstream flood risk, the Treaty Entities may coordinate additional storage in Koocanusa Reservoir.

## **KOOTENAY LAKE**

Information regarding Kootenay Lake is available from FortisBC at fortisbc.com or by calling 1 866 436 7847.

<sup>&</sup>lt;sup>1</sup> VarQ was developed to improve the multi-purpose operation of Libby and Hungry Horse while maintaining the current level of system flood control protection in the Columbia River. VarQ reduces the contribution of reservoir space at Libby and Hungry Horse for system flood control of spring runoff in the Columbia River in years with low to moderate potential for flooding. For more information, please visit: https://www.nwd-wc.usace.army.mil/cafe/forecast/VARQ/varg.htm.

## About the Columbia basin

At 2,000 kilometres long, the Columbia River is the fourth largest river in North America. The headwaters of the Columbia River are in Canal Flats, British Columbia (B.C.). The river then flows northwest through the Rocky Mountain trench before heading south through B.C. and Washington, emptying into the Pacific Ocean at Astoria, Oregon. Other major tributaries of the Columbia River in Canada include the Kootenay River and Pend d'Oreille River.

Only 15% of the Columbia River basin lies in Canada. The Canadian portion of the basin is mountainous, accumulates a lot of snow and produces an average of 30% to 35% of the runoff for Canada and the U.S. combined. The river's large annual discharge and relatively steep gradient gives it tremendous potential for generating electricity. Hydroelectric dams on the Columbia's mainstem and its many tributaries produce more hydroelectric power than on any other North American river.

BC Hydro's facilities in the Columbia basin include 13 hydroelectric dams, two water storage dams, and a system of reservoirs. Four of the larger reservoirs within Canada are operated according to the Treaty and other agreements signed between Canada and the U.S.

For more information, visit bchydro.com/energy-inbc/operations/our-facilities/columbia.html.

## **Columbia Basin Operations**

BC Hydro





Arrow Lakes Reservoir at the Shelter Bay boat ramp

## COLUMBIA BASIN RESERVOIR OPERATIONS AND STORAGE

In an average operating year, the overall draft of each reservoir is not expected to use its entire operating range. In years of severe low inflows or high inflows the full extent of the reservoir may be expected to be used. As these challenging years do not occur every year, most years will see the overall seasonal draft to a much lesser extent.

The licensed operating range for Kinbasket Reservoir is 47.5 metres (156 feet), which is twice as much as Arrow Lakes Reservoir, and Duncan Reservoir drafts 30.4 metres (98 feet) annually. The water licence operating ranges for the Canadian Columbia River basin reservoirs are shown on the graph below on the left.

While Revelstoke Reservoir is normally operated within 1.5 metres (5 feet) of full pool, change to drafts below may be used in challenging circumstances, such as meeting demand during a winter cold snap. Revelstoke has very little available storage and drafting the reservoir does not significantly impact Arrow Lakes Reservoir levels. The water storage volumes for the Canadian Columbia River basin reservoirs are shown in the graph below on the right.



# **BC Hydro's operating agreements**

## **COLUMBIA RIVER TREATY**

Ratified in 1964, the Treaty agreement between Canada in the US resulted in the construction of the Duncan, Hugh L. Keenleyside, and Mica dams in BC, the Libby Dam in the US, and the Koocanusa reservoir which crosses the Canada-US border. The dams were constructed for flood control and to increase power generating potential in both countries.

On Thursday, July 11, 2024, Canada and the United States announced that they have reached an agreement-in-principle (AIP) to modernize the Columbia River Treaty. Under the AIP, the countries have agreed that a modernized Treaty will provide some level of assured pre-planned flood control and continued co-operation on hydropower for the Columbia River. The countries have also agreed to incorporate new provisions not considered in the original agreement, including those for increased unilateral flexibility for how B.C. operates its Treaty dams, ecosystem health, restoring and strengthening salmon populations, Indigenous cultural values, adaptive management, and new collaborative engagement on Libby Dam operations. For more information about the AIP and future engagement opportunities, visit https://engage.gov.bc.ca/columbiarivertreaty/agreement-in-principle/.

Arrow

Duncan

# **Stay informed**

## **REGIONAL OPERATIONS UPDATE MEETINGS**

BC Hydro periodically hosts meetings to provide updates on our Columbia and Kootenay system operations to:

- listen to and learn from local residents, stakeholders, First Nations and community representatives who have an interest in the operation of the Treaty facilities and BC Hydro facilities in the Southern Interior; and
- o provide information on BC Hydro's activities and facility operations in the Columbia basin.

To request information about these meetings and presentations, please contact us by emailing southern-interior.info@bchydro.com.

## **RESERVOIR LEVEL UPDATES**

You can receive regular updates about BC Hydro reservoir levels in a variety of ways:

- o Go online to view near real-time water level information for various locations around our reservoirs .
- o Sign up to receive weekly water level forecasts by emailing southern-interior.info@bchydro.com.
- Listen to river flow and reservoir level information by phoning our toll-free reservoir information line at **1 877 924 2444**. These recorded messages are updated every Monday, Wednesday, and Friday, and include:
  - Current elevation levels: Arrow Lakes Reservoir, Duncan Dam Reservoir, Kinbasket Reservoir, Koocanusa Reservoir, Kootenay Lake, Revelstoke Reservoir, Sugar Lake Reservoir, and Whatshan Lake Reservoir.
  - Current flows: Columbia River at Birchbank, Duncan River at the Lardeau Confluence, Shuswap River, and the flow downstream from Wilsey Dam at Shuswap Falls.

## **VISIT BCHYDRO.COM**

- o Information on how we are managing drought conditions across the province and in the Columbia River basin.
- o Real-time water level information for various locations around our reservoirs.
- O Our Spring 2024 Columbia River Operations Summary.
- o Details about our Columbia basin facilities and Revelstoke Dam Visitor Centre.
- o Information and updates on the Columbia River Water Use Plan and Duncan Dam Water Use Plan.
- o Report an outage, find current and planned outages, and tips on how to prepare for outages at bchydro.com/outages.

## REACH OUT TO THE SOUTHERN INTERIOR COMMUNITY RELATIONS TEAM

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