

COLUMBIA RIVER OPERATIONS SUMMARY

APRIL 2015

Mica Creek Camp

The purpose of this publication is to provide an overview of BC Hydro's operations on the Columbia River. The Columbia River is the fourth largest river in North America. At 2,000 kilometres long the Columbia River starts near its headwaters in Canal Flats south of Invermere, British Columbia, flows northwest through the Rocky Mountain trench, then heads south through B.C., Washington, and Oregon until it empties into the Pacific Ocean at Astoria, Oregon. Other major tributaries of the Columbia River in Canada include the Kootenay and Pend d'Oreille rivers. Canada has only about 15 per cent of the Columbia River basin area but the Canadian portion of the basin is mountainous and receives a lot of snow, producing, on average, 30 to 35 per cent of the runoff for the entire basin. The river's heavy flow and relatively steep gradient give it tremendous potential for the generation of electricity. The 14 hydroelectric dams on the Columbia's main stem and many more on its tributaries produce more hydroelectric power than those of any other North American river. BC Hydro's facilities in the Columbia basin include 11 generating plants, 14 storage dams and a system of reservoirs. Four of the larger reservoirs within Canada are operated according to the Columbia River Treaty and other agreements signed between Canada and the United States.

BC HYDRO'S OPERATIONS COLUMBIA RIVER TREATY

The Columbia River Treaty between Canada and the United States was ratified in 1964. The Treaty resulted in the construction of three dams in British Columbia (the Duncan, Hugh L. Keenleyside and Mica dams) for flood control and to increase hydroelectric generating potential in both countries. The Treaty also provided for the construction of Libby Dam in the United States and the resulting Kootenay Reservoir, which straddles the Canada-U.S. border.

Water stored, and then released, by Canadian reservoirs provides the U.S. with flood risk mitigation and the potential to generate additional electricity. Under the terms of the Treaty, Canada receives a one-half share of the extra power generation potential in the U.S. This is called the Canadian Entitlement to Downstream Benefits and is owned

by the Province of British Columbia. The Canadian Entitlement varies from year to year, but is currently about 4,428 gigawatt hours (GWh) per year of energy and 1,336 megawatts (MW) of capacity. The earliest termination date for the Treaty is September 16, 2024. The Treaty can be terminated by either country with ten years' notice.

After extensive consultation with Basin residents, the Province decided to continue with the Columbia River Treaty and to seek improvements within the existing Treaty framework. More information, including the Final Consultation report and the Provincial government news releases can be found at <http://blog.gov.bc.ca/columbiarivertreaty>.



OTHER AGREEMENTS

The Treaty Entities (BC Hydro, Bonneville Power Administration (BPA), and the US Army Corps of Engineers) periodically negotiate and sign supplemental operating agreements when there is mutual benefit to modify the water releases specified by the Columbia River Treaty.

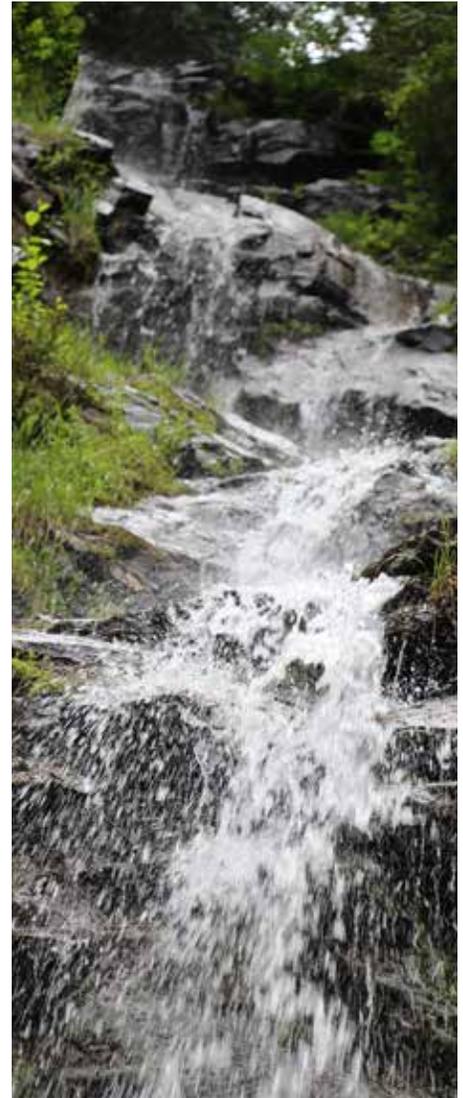
In September 2013, the Treaty Entities signed a short-term agreement to address some of Canada's concerns about the timing of water releases from the Libby Dam (VarQ operating regime). This agreement will be in effect until August 2015 and is supplemental to the Libby Coordination Agreement (signed in 2000). Under the new agreement, the US has committed to continued coordination with Canada to consider alternative reservoir operations to reduce flood risk in both countries (similar to the good collaboration that occurred during the 2012 high water event). In addition, BC Hydro will be compensated for energy losses at its Kootenay Canal operations that result from the timing of water releases from the Libby Dam. The Entities have also agreed to continue working together to reach a long-term agreement.

In late 2014, the Treaty Operating Committee signed the 2015 Non-Power Uses Agreement. This annual operating agreement allows Arrow Reservoir releases to be reshaped between January and July 2015 to protect Canadian whitefish and rainbow trout eggs and to provide flow-shaping benefits for endangered U.S. salmon.

NON-TREATY STORAGE AGREEMENT (NTSA)

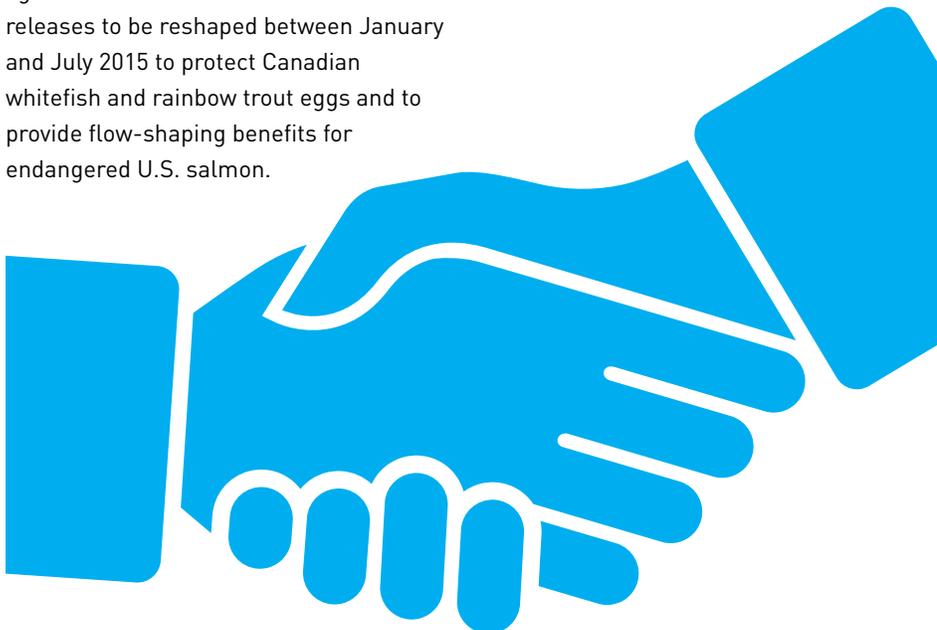
The Kinbasket (Mica) Reservoir is licensed for more storage than was required by the terms of the Columbia River Treaty. This additional water is called Non-Treaty Storage and the water can be released across the Canada-U.S. border only under agreement between BC Hydro and its U.S. partners. The original Non-Treaty Storage Agreement (NTSA) expired in 2004 and all storage under this agreement was refilled by January 2011.

BC Hydro and BPA signed a new long-term NTSA in April 2012. The new NTSA gives BC Hydro more control over reservoir levels, provides more energy benefits to B.C. and gives BC Hydro more operating flexibility to better balance the competing non-power interests on the Columbia system, including recreational activities, wildlife habitat, and fisheries. Since the agreement was signed, BC Hydro and BPA have made good use of NTSA flexibility to reduce high-water impacts downstream of Arrow Reservoir and to improve power and non-power benefits for both countries.



SNOWPACK AND EXPECTED RUNOFF

Much of the region's generating potential depends on snowpack levels. This year, snowpack levels throughout the Canadian portion of the Columbia basin vary, with below normal levels in the south, and near normal levels in the central and north parts of the basin. Based on April 1 snowpack measurements, the runoff between February and September 2015 for the Canadian Columbia/Kootenay basin is forecasted to be between 96 and 106 per cent of average. In the U.S. portion of the Columbia, snowpack conditions this year are generally well below normal. For the overall Columbia basin (Canada and U.S. combined), the resulting seasonal runoff forecasted from April to August 2015 is currently 81 per cent of average.

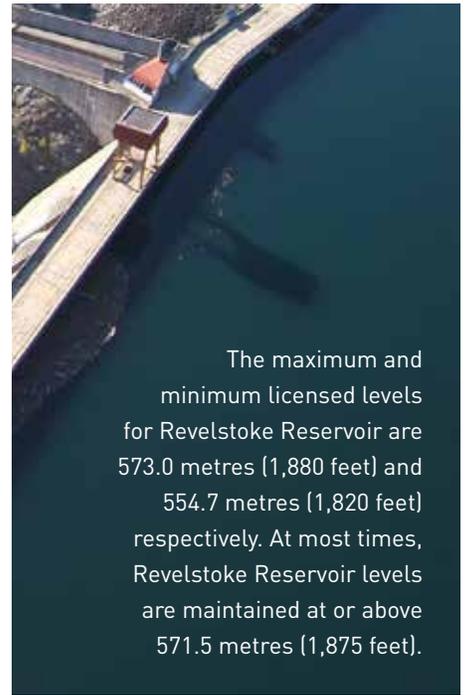


KINBASKET (MICA) RESERVOIR

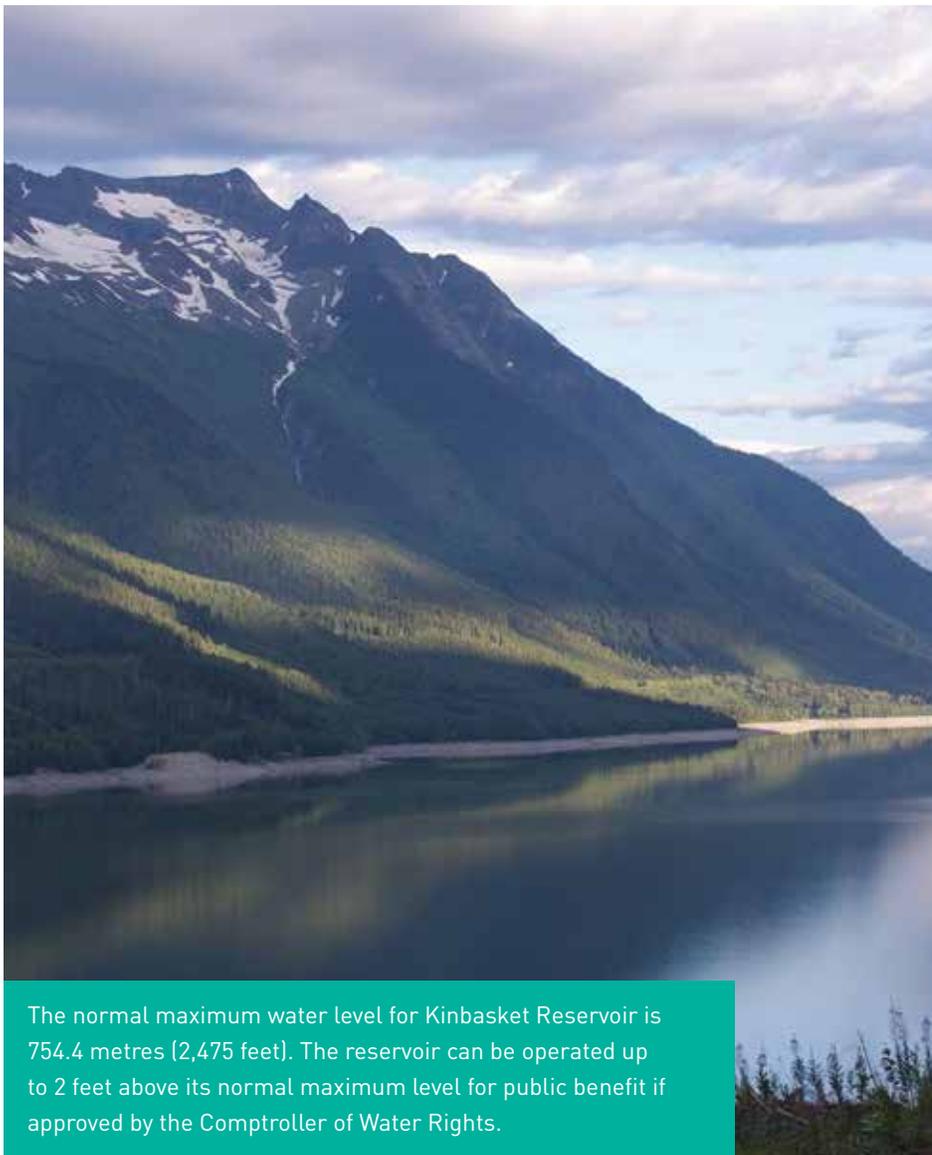
Kinbasket Reservoir regulates discharges for both the Mica and Revelstoke Generating Stations as well as for power plants further downstream. In 2014, the Kinbasket Reservoir water level reached a peak of 754 metres (2,473.7 feet) in early November, 0.4 metres (1.3 feet) below normal full pool.

Through the unusually warm 2014/2015 fall and winter, Kinbasket Reservoir water levels were well above normal due to low electricity demand and higher than normal inflows. Levels are currently about 14 metres (47 feet) above average. As a result, Kinbasket Reservoir is projected to only drop to a minimum level between 737.6 and 740.7 metres (2,420 to 2,428 feet) in late April 2015. This is well above the minimum level in 2014, which was 724.8 metres (2,377.9 feet).

Reservoir inflows during the spring-summer of 2015 are currently projected to be about 97 per cent of average. Based on current snowpack and runoff patterns, the reservoir is expected to refill to within 1.5 metres (5 feet) of normal full pool (754.4 metres or 2,475 feet) as early as mid-July. The water level is expected to remain roughly at this level until early September. Long-term forecasting is inherently uncertain due to the unpredictability of future events. Actual reservoir levels will depend on runoff volumes and patterns, system electricity demands, and Treaty discharge requirements.



The maximum and minimum licensed levels for Revelstoke Reservoir are 573.0 metres (1,880 feet) and 554.7 metres (1,820 feet) respectively. At most times, Revelstoke Reservoir levels are maintained at or above 571.5 metres (1,875 feet).



The normal maximum water level for Kinbasket Reservoir is 754.4 metres (2,475 feet). The reservoir can be operated up to 2 feet above its normal maximum level for public benefit if approved by the Comptroller of Water Rights.

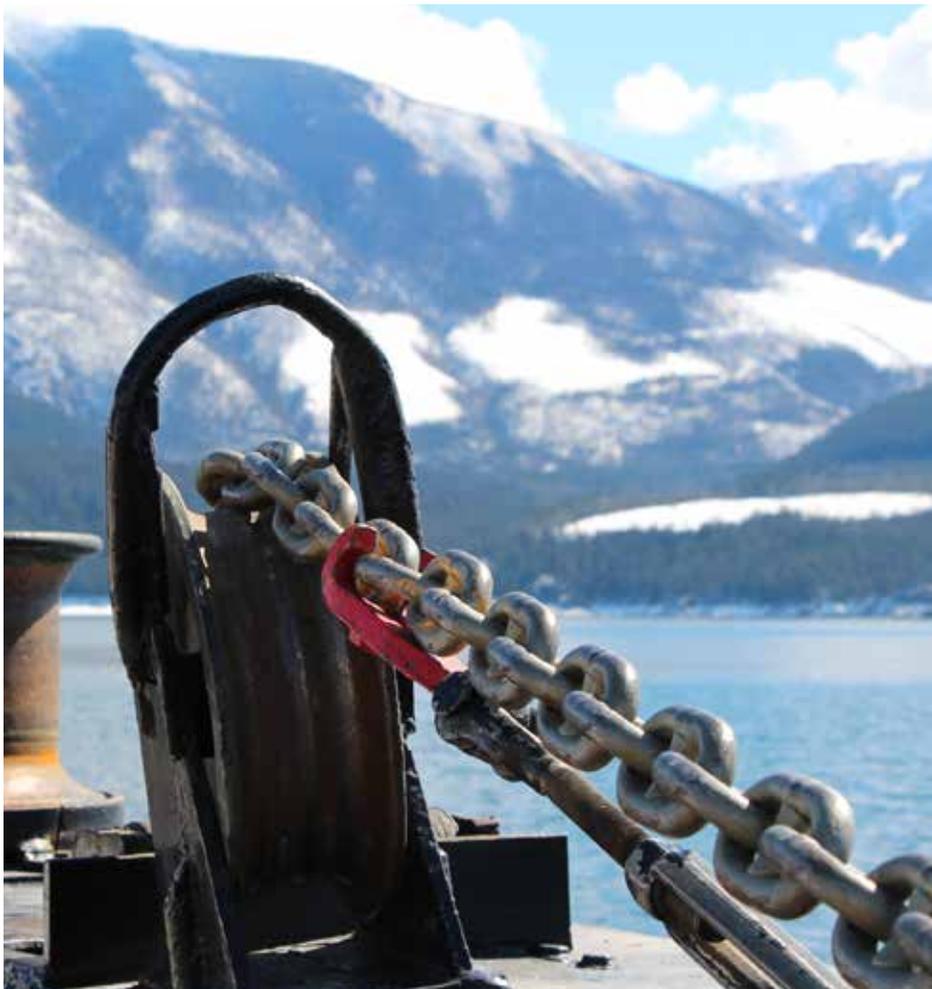
REVELSTOKE RESERVOIR

Revelstoke Reservoir levels fluctuate throughout the day in response to a number of factors, including system electricity demand. Revelstoke Reservoir is normally operated between 571.5 metres (1,875 feet) and 573 metres (1,880 feet), but may be operated lower for brief periods during unusual conditions. During the spring freshet and winter peak load periods, it is common to have frequent daily fluctuations of the reservoir within about 1.5 metres (5 feet) of full pool in response to weather patterns and inflow levels. During the winter of 2014/2015, Revelstoke Reservoir remained within its normal operating range. However, BC Hydro expects that in future years the reservoir may be periodically drafted below its normal minimum level of 571.5 metres (1,875 feet) due to increasing system needs for generating capacity and flow-shaping.

ARROW LAKES RESERVOIR

Arrow Lakes Reservoir was created by the Hugh L. Keenleyside Dam. During 2014, the Arrow Lakes Reservoir reached a maximum level of 439.1 metres (1,440.6 feet), or 1.0 metres (3.4 feet) below normal full pool, on July 3, 2014. Due to the higher than normal Columbia River Treaty discharge from Arrow combined with below normal discharges from Mica because of low electricity demand, the Arrow Reservoir drafted quickly during the summer months, reaching 433.6 metres (1,422.5 feet) on Labour Day (September 1, 2014). As in other years, BC Hydro made efforts to support the Arrow Lakes Reservoir level during the summer period for recreation needs while balancing multiple, and sometimes conflicting, water use objectives. During the fall and winter, the reservoir was drawn down under the coordination provisions of the Columbia River Treaty.

Arrow Reservoir reached its minimum level on March 29, 2015, at 423.8 metres (1,390.5 feet), well below the minimum level in 2014, which was 427.2 metres (1,410.6 feet) on February 1, 2014. Based on current inflow projections and expected discharge requirements, the Arrow Reservoir is expected to refill to within the top 2.4 m (8 feet) of normal full pool, or 437.7 to 440.1 metres (1,436 to 1,444 feet), by the end of June. Summer levels (July and August) this year are expected to be similar to slightly higher than in 2014, but will depend on inflow conditions, upstream storage operations and Treaty discharge requirements.



The normal maximum water level for Arrow Lakes Reservoir is 440.1 metres (1,444 feet). The reservoir can be operated up to 2 feet above its normal maximum level (to 440.7 metres or 1,446 feet) for public benefit if approved by the Comptroller of Water Rights.

COLUMBIA RIVER FLOWS

Columbia River flows downstream of the Kootenay River confluence at Castlegar are the result of flow regulation at Keenleyside and other dams on the main-stem Columbia, as well as dams on the Kootenay River system. Based on the current snowpack and runoff conditions, Columbia River flows are expected to follow a fairly typical pattern in 2015. Actual discharges will depend on many factors, including upstream runoff and storage operations, and Treaty discharge requirements. Last year, the Columbia River discharge at Birchbank (flow measuring station between Castlegar and Trail) peaked at 3,680 cubic metres per second (m^3/s) or 130 thousand cubic feet per second (kcfs) on July 8, 2014. While the 2014 peak flow was slightly higher than normal, this flow was well below the peak regulated flow experienced in 2012 of 6,090 m^3/s (215 kcfs) and prior to dam construction of 10,590 m^3/s (374 kcfs) in 1961.

DUNCAN RESERVOIR

In 2014, the Duncan Reservoir reached a maximum level of 576.5 metres (1,891.5 feet), or 0.15 metres (0.5 feet) below full pool on August 13, 2014. The Duncan River discharge (at the "Duncan below Lardeau" gauging station) reached a peak of 299 m^3/s (10.6 kcfs) on May 18, 2014. Duncan Dam is normally operated to meet Treaty flood control requirements and fish flows stipulated under the Water Use Plan. Duncan Dam outflows were increased in August and September to about 200 m^3/s (7 kcfs) to facilitate drafting of the reservoir prior to the start of the kokanee and whitefish spawning downstream of Duncan Dam. Flows were then reduced during the first three weeks of October to protect fish spawning activity. Flows were later increased between late December and through the end of February to draft the reservoir for Treaty flood control and help support whitefish spawning downstream of the Keenleyside Dam.

As in most years, the reservoir is projected to continue to draft to its minimum pool level (546.9 metres, or 1,794.2 feet) in late April or early May. Reservoir discharges will be reduced to 2.8 m³/s (0.1 kcfs) between mid-May and early June and held there to allow the reservoir to refill to within the top 0.3 metres (1 foot) by late July or early August.

KOOCANUSA (LIBBY) RESERVOIR

The Kooconusa Reservoir reached a maximum level of 747.7 metres (2,453.1 feet) on July 23, 2014, 1.8 metres (5.9 feet) below the normal full pool level. The Libby Dam continues to be operated under VarQ flood control procedures in 2015. Based on the latest Libby Operating Plan, the dam will:

- Release flows as needed during March-April to meet the April 30 Flood Control target;
- During May and June, release at least the minimum flow necessary to meet the flow rates and sturgeon volume objectives in the US Fish & Wildlife Service Biological Opinion (BiOp) for sturgeon spawning and recruitment;
- Meet the minimum bull trout flows as outlined in the BiOp; and
- Augment downstream flows for salmon after the sturgeon flow operation is complete.

The April runoff forecast for the Libby Dam, published by the U.S. Army Corps of Engineers, is 92 per cent of normal for the April-August 2015 period. Based on the current forecast, the reservoir is expected to reach near full pool (749.5 metres or 2459 feet) in July. The amount of draft at Libby across August and September depends on inflows within the US Columbia. If dry conditions persist, the Kooconusa water level could drop to about 743.4 metres (2,439 feet) by the end of September. If a wetter spring/summer develops, water levels are expected to be about 746.5 metres (2,449 feet).

Information regarding the operation of Libby Dam and Kooconusa Reservoir levels is available through the U.S. Army Corps of Engineers.

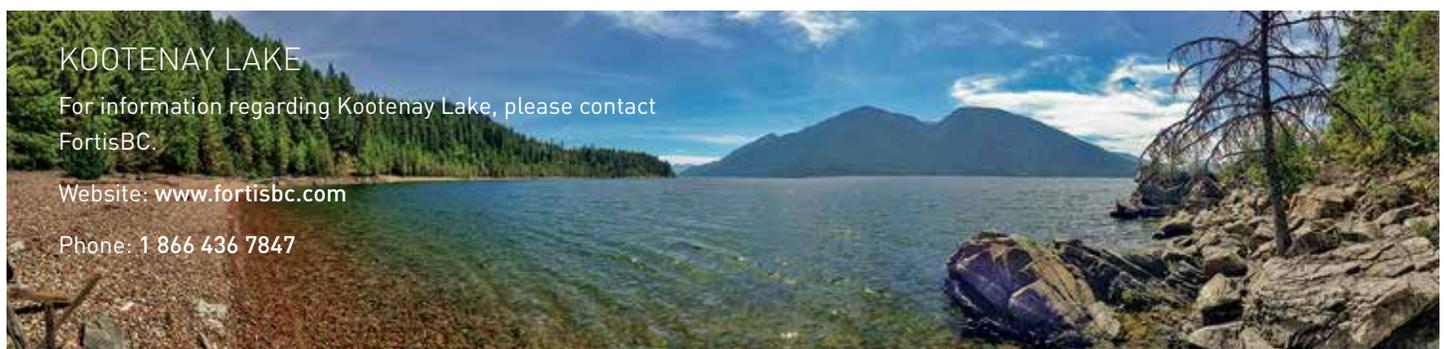
Website: <http://www.nws.usace.army.mil/>
Phone: 406-293-3421



The normal maximum water level for Duncan Reservoir is 576.7 metres (1,892 feet). The reservoir can be operated up to two feet above its normal maximum level (577.3 metres or 1,894 feet) for public benefit if approved by the Comptroller of Water Rights.



The normal maximum and minimum operating levels for Kooconusa Reservoir are 749.5 metres (2,459 feet) and 697.1 metres (2,287 feet), respectively. During periods of high downstream flood risk, the Treaty Entities may coordinate additional storage in Kooconusa Reservoir.



KOOTENAY LAKE

For information regarding Kootenay Lake, please contact FortisBC.

Website: www.fortisbc.com

Phone: 1 866 436 7847

WANT TO LEARN ABOUT BC HYDRO OPERATIONS?

BC Hydro is committed to providing information on the operations of Columbia River Treaty facilities in Canada and other facilities that are operated in a coordinated manner on the Columbia and Kootenay systems.

BC Hydro hosts meetings each year to provide updates on our operations and listen to, and learn from, local residents, stakeholders, First Nations, and community representatives.

REGIONAL OPERATIONS UPDATE PUBLIC MEETINGS

[Creston – May 26](#)

[Cranbrook – May 27](#)

[Wardner – May 27](#)

[Castlegar – June 8](#)

[Meadow Creek – June 9](#)

[Nakusp – June 10](#)

[Revelstoke – June 11](#)

[Golden – June 12](#)

CONDITIONS CHANGE. HOW YOU CAN STAY INFORMED

Long-term forecasting is inherently uncertain due to the unpredictability of future events.

Actual reservoir levels will depend on weather, electricity demands, Treaty requirements, and other factors.

OPERATIONS UPDATE CONFERENCE CALLS

BC Hydro periodically hosts conference calls to provide updates on our Columbia and Kootenay system operations.

WEEKLY COLUMBIA RESERVOIR UPDATES BY EMAIL

BC Hydro provides short term forecasts for its Columbia and Kootenay system reservoirs every Friday by email.

BC HYDRO'S TOLL-FREE RESERVOIR INFORMATION LINE 1 877 924 2444

BC Hydro's toll-free reservoir information line provides up-to-date reservoir water level and river flow information every Monday, Wednesday, and Friday plus current status of the Hugh L. Keenleyside Dam deck access.



SIGN ME UP

If you would like to sign up to receive weekly reservoir updates and/or notifications of upcoming operations update meetings and conference calls, please contact Dayle Hopp at dayle.hopp@bchydro.com.

FOR FURTHER INFORMATION, PLEASE CONTACT:

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