

International Columbia River Board of Control

2021 Annual Report to the International Joint Commission



Cover photo (U.S. Bureau of Reclamation): Grand Coulee Dam in Washington State. Grand Coulee Dam was completed in 1941 and created Franklin D. Roosevelt Lake. The lake is about 150 miles (240 km) long and extends to within about 15 miles (24 km) south of the international boundary, with a transitional reach that extends upstream of the boundary due to backwater effects. The lake covers an area of about 80,000 acres (320 km²) and is the largest lake in Washington State.

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The Order of the International Joint Commission (IJC) dated December 15, 1941, in the matter of the application of the United States for approval of the construction and operation of the Grand Coulee Dam and reservoir (Franklin D. Roosevelt Lake) provided for the creation of an engineering board to be known as the International Columbia River Board of Control. The Order provides that the Board shall conduct studies under the supervision of the Commission as to the effect of the operation of Grand Coulee Dam and Franklin D. Roosevelt Lake on water levels at and upstream of the international boundary and shall submit a report to the Commission annually. The Board's studies are currently limited to the monitoring and reporting of the lake elevation at Grand Coulee Dam and discharge and backwater of the Columbia River at the international boundary.

The monitoring function of the Board is intended to ensure compliance with the terms of the IJC Order, which specifies that the operation of Grand Coulee Dam must comply with the following conditions with respect to the backwater effect across the international boundary:

- When the lake elevation at Grand Coulee Dam is 1,290 feet (393 m) above mean sea level, the increase in water level at the boundary due to backwater must not exceed about 2.5 feet (0.76 m) when Columbia River discharge at the boundary is 20,000 cubic feet per second (cfs) (570 cubic meters per second [cms]), or about 1.0 feet (0.31 m) when the discharge is 50,000 cfs (1,400 cms), and there must be no effect on the water level at the boundary when Columbia River discharge at the boundary is 400,000 cfs (11,000 cms).
- There must be no appreciable or measurable increase in the water level at Columbia Gardens, British Columbia (located 4.5 miles [7.2 km] from the boundary), when Columbia River discharge at the boundary is less than 50,000 cfs (1,400 cms), and no appreciable or measurable increase in water level at Trail, British Columbia (located 10.5 miles [16.9 km] from the boundary), regardless of Columbia River discharge or lake elevation at Grand Coulee Dam up to 1,290 feet (393 m) above mean sea level.

ACTIVITIES OF THE BOARD IN 2021

The Board determined that the Applicant was in compliance with the IJC Order in 2021.

The Board presented a progress report over teleconference during the spring semi-annual IJC meeting on April 22, 2021, but not at the semi-annual IJC meeting on October 20, 2021 in Ottawa. The April meeting was attended by the Canadian and U.S. section Co-chairs Dave Hutchinson and Cindi Barton, respectively, and was supported by the secretary of the Canadian and U.S. sections. Both Co-chairs and secretaries attended remotely via teleconference.

The Board website (<https://ijc.org/en/crbc>) was updated to include the Board's 2020 annual report to the IJC submitted April 6, 2021.

HYDROLOGIC CONDITIONS IN 2021

During 2021, the U.S. Geological Survey continued the collection of information concerning the water level of Franklin D. Roosevelt Lake at Grand Coulee Dam (USGS gaging station 12436000), the Columbia River at Grand Coulee Dam (USGS gaging station 12436500) and, in cooperation with the Water Survey of Canada (Environment and Climate Change Canada), the water level and discharge of the Columbia River at the international boundary (USGS gaging station 12399500). Discharge is computed for the Columbia River at the international boundary using a stage-discharge rating during non-backwater conditions. During backwater conditions, discharge is computed using a slope rating from the water-surface slope measured between the base and auxiliary gages. Backwater at the international boundary was estimated by the U.S. Geological Survey by computing the difference between the gage height measured at the Columbia River at the international boundary and the equivalent gage height using the stage-discharge rating for the reported discharge.

The annual flow of the Columbia River at Grand Coulee Dam for calendar year 2021 totaled 68.5 million acre-feet (84.3 cubic kilometers), or 88 percent of the mean annual volume for the 93-year period of record of 77.6 million acre-feet (95.5 cubic kilometers). The instantaneous maximum (peak) discharge of the Columbia River at the international boundary was 186,000 cfs (5,300 cms) on June 6, which is 72 percent of the mean annual peak discharge for the 85-year period of record of 259,000 cfs (7,300 cms). Daily mean discharge for the Columbia River at the international boundary for 2021 is shown in Figure 1, while discharge for the period 2017-2021 is shown in Figure 2A.

Extremes of instantaneous stage recorded on Lake Roosevelt in 2021 varied between elevations 1,268.65 feet (386.67 m) between 19:00 and 21:00 PDT on May 14 and 1,289.52 feet (393.03 m) between 09:00 and 10:00 PDT on July 12. Elevations reported are above mean sea level, with respect to a U.S. Bureau of Reclamation datum adjusted in 1937. This datum is 1.425 feet (0.434 m) above the U.S. National Geodetic Vertical Datum of 1929 (NGVD 29). The stage at midnight on January 1, 2022, was 1,286.15 feet (392.00 m). Water-level elevation in Franklin D. Roosevelt Lake for 2021 is shown in Figure 3, while Figure 2B shows elevation for the period 2017-2021.

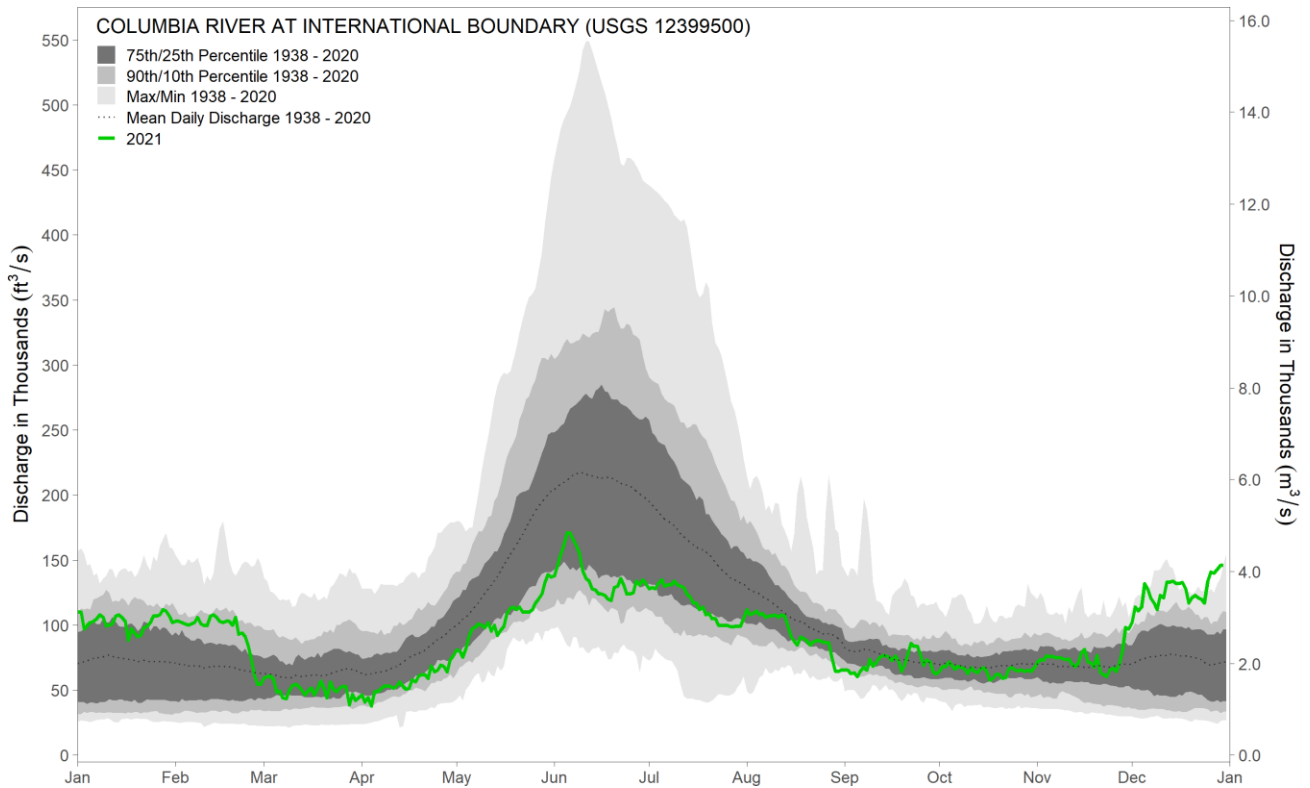


Figure 1. Columbia River at the International Boundary (USGS Station 12399500). Historical range (1938 - 2020): maximum, 90th/10th, 75th/25th percentiles, minimum, and 2021 daily mean discharge (USGS, 2021).

An analysis of the data computed that backwater at the international boundary varied during the year between 0.00 feet (0.00 m) and 0.23 feet (0.070 m). The discharge at the international boundary was 114,000 cfs (3,200 cms) when backwater was 0.23 feet (0.070 m) on July 18, 2021. Backwater on December 31, 2021 was 0.02 feet (0.01 m). Backwater that occurred at the international boundary during 2017-2021 is plotted in Figure 2C. Backwater since the time of filling of Franklin D. Roosevelt Lake in June 1942 to December 31, 2020, is plotted on the charts submitted with previous annual reports.

COLUMBIA RIVER TREATY REVIEW

Grand Coulee Dam (subject of the 1941 IJC Order of Approval) was completed in 1942 and pre-dates the Columbia River Treaty. It is not a Treaty Dam in this context, but it operates as part of the Columbia River System, in coordination with other hydro-electric dams, some of which were constructed as part of the Columbia River Treaty. The 1964 Columbia River Treaty is an agreement between Canada and the United States for the cooperative development and operation of water resource regulation for the upper Columbia River. The Treaty has no specified termination date; however, either Canada or the United States can terminate the Treaty any time on or after September 16, 2024, with a minimum 10 years written notice. Because either country may give notice to terminate the Treaty, government

agencies in Canada and the United States have been in the process of evaluating future options regarding the Treaty, with respective Canadian and U.S. Entities having provided recommendations to their respective governments prior to September 2014 (earliest date for 10-year termination notice). The respective recommendations did not promote Treaty termination. Through 2021 there was no announcement by either country of intent to terminate or seek changes to the Treaty; however, Treaty modernization discussions between the two countries have been taking place virtually.

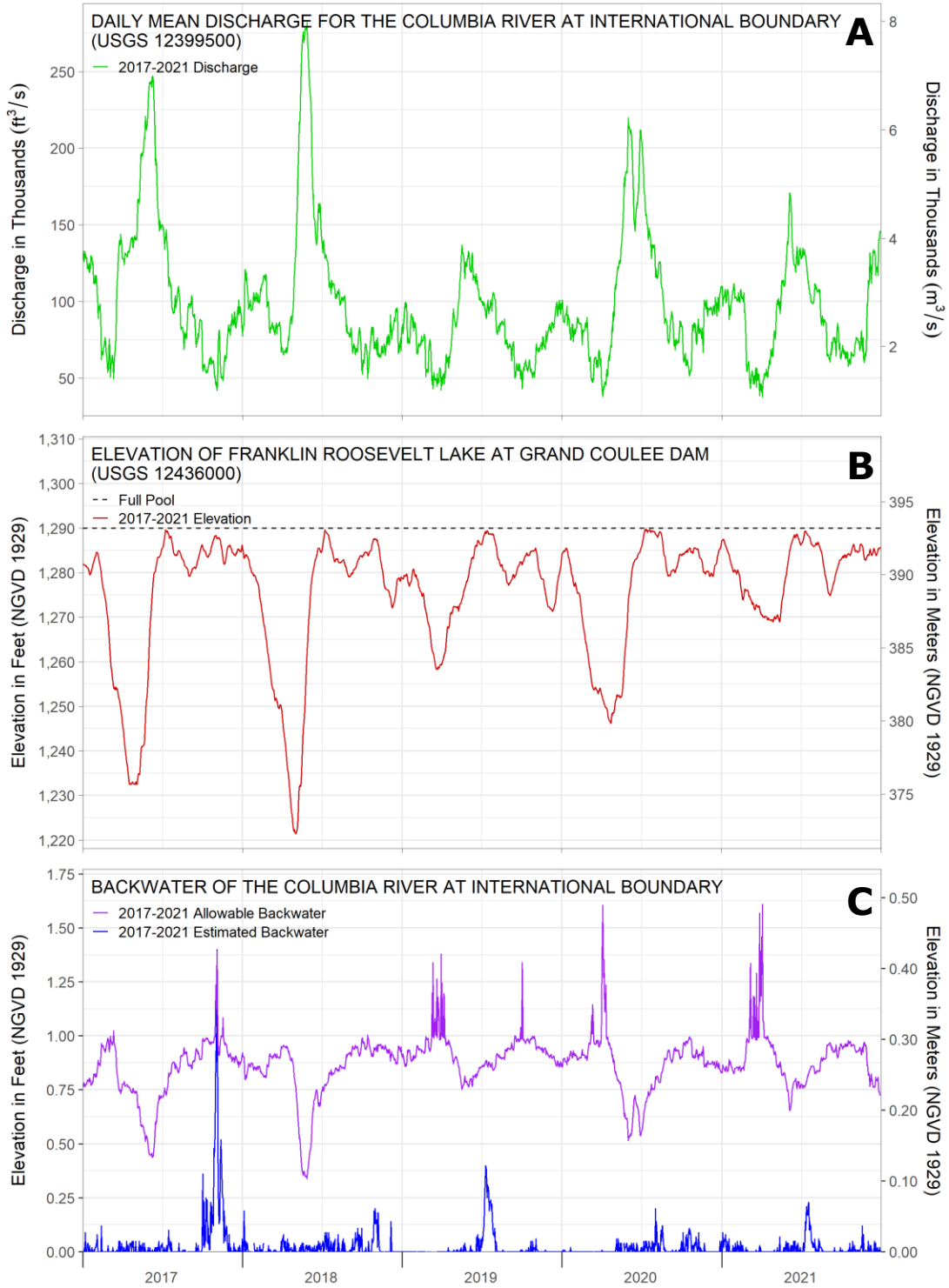


Figure 2. Hydrographs of A) daily mean discharge for the Columbia River at the international boundary, B) elevation of Franklin D. Roosevelt Lake, and C) backwater in the Columbia River at the international boundary.

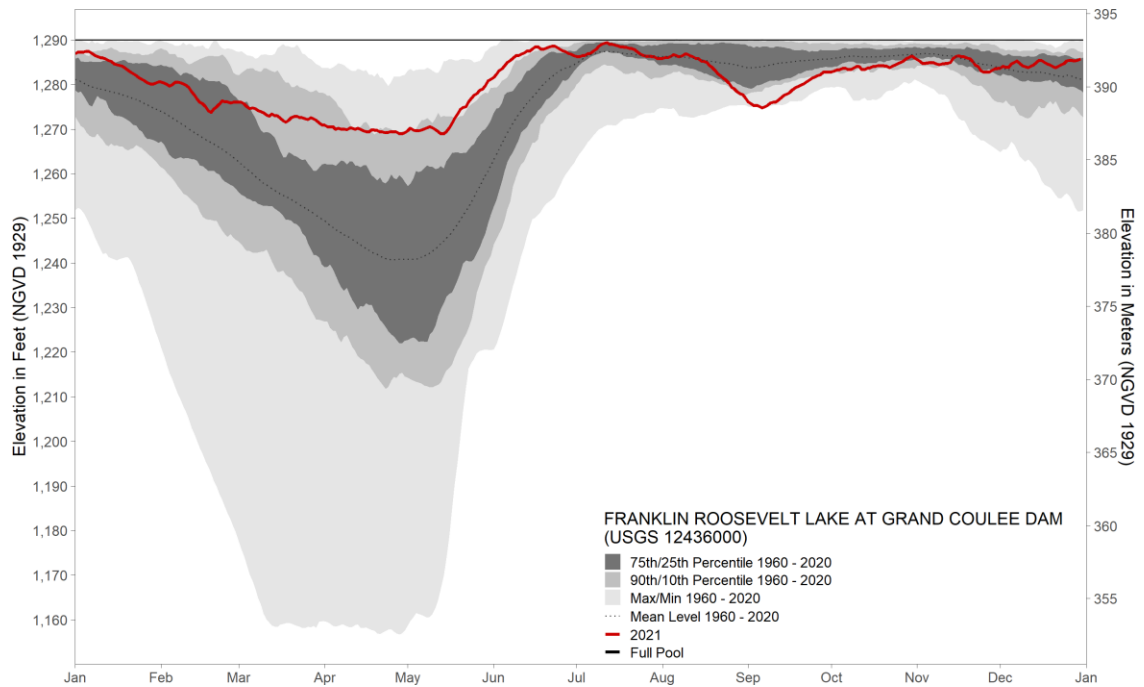


Figure 3. Franklin D. Roosevelt Lake (USGS Station 12436000). Historical range (1960-2020): maximum, 90th/10th and 75th/25th percentiles, minimum, and 2021 daily mean water-surface elevation (U.S. Bureau of Reclamation, 2021).

INTERNATIONAL COLUMBIA RIVER BOARD OF CONTROL MEMBERSHIP

 Canadian Membership	 U.S. Membership
<p>Dave Hutchinson Chair, Canadian Section Regional Chief, Pacific and North Hydrometric Operations National Hydrological Services Environment & Climate Change Canada 201 - 401 Burrard Street Vancouver, British Columbia V6C 3S5 Phone: (604) 240-7640 Email: david.hutchinson@ec.gc.ca</p>	<p>Cynthia Barton, PhD Chair, U.S. Section Director, Washington Water Science Center U.S. Geological Survey 934 Broadway, Suite 300 Tacoma, Washington 98402 Phone: (253) 552-1602 Fax: (253) 552-1581 Email: cbarton@usgs.gov</p>
<p>Secretaries</p>	
<p>Martin Suchy Secretary, Canadian Section Hydrogeologist National Hydrological Services Environment & Climate Change Canada 201 - 401 Burrard Street Vancouver, British Columbia V6C 3S5 Phone: (604) 209-3712 Email: martin.suchy@ec.gc.ca</p>	<p>Andrew Gendaszek Secretary, U.S. Section Research Hydrologist, Washington Water Science Ctr U.S. Geological Survey 934 Broadway, Suite 300 Tacoma, Washington 98402 Phone: (253) 552-1612 Fax: (253) 552-1581 Email: agendasz@usgs.gov</p>

APPENDIX: COLUMBIA RIVER BASIN KEY MAX AND MIN VALUES IN 2021

A. Columbia River at International Boundary (USGS station no. 12399500)

Maximum instantaneous discharge	186,000 cfs (5,300 cms) – Jun 6 22:45
Minimum instantaneous discharge	27,700 cfs (780 cms) – Apr 2 00:30
Maximum daily mean discharge	171,000 cfs (4,800 cms) – Jun 5 and Jun 6
Minimum daily mean discharge	37,800 cfs (1,070 cms) – Apr 4
Annual mean discharge	91,262 cfs (2584 cms)

Daily discharge at time of maximum backwater effect 114,000 cfs (3,200 cms) – Jul 18

The annual mean discharge was 92 percent of the 61-year (1960-2020) average of 99,596 cfs (2820 cms).

B. Franklin Roosevelt Lake at Grand Coulee Dam (USGS station no. 12436000)

Maximum instantaneous elevation	1289.52 ft (393.05 m) – Jul 12 09:00 - Jul 12 10:00
Minimum instantaneous elevation	1268.65 ft (386.68 m) – May 14 19:00 - May 14 21:00
Maximum daily mean elevation	1289.35 ft (392.99 m) – Jul 11
Minimum daily mean elevation	1268.93 ft (386.77 m) – May 14
Annual mean elevation	1280.59 ft (390.32 m)

C. Calculated Backwater at International Boundary

Maximum backwater	0.23 ft (0.070 m) – Jul 18
Minimum backwater	0.00 ft (0.00 m) – Multiple days
Annual mean backwater	0.01 ft (0.003 m)