

that the majority of direct Canadian economic impacts will come from losses in hydropower generation when Canada operates its dams to meet U.S. flood storage needs.

Analysis to Date

The Corps is leading efforts to identify how possible changes in Canadian reservoir operations after 2024 might affect flood risk in the U.S. This study will help determine the operations and measures that could maintain a level of flood protection similar to what we have today. After a final decision is made regarding the future of the Treaty, the Corps will draft new operating plans for these dams as a system and on a dam-by-dam basis. These plans

must include implementation of “effective use” and will help determine the potential for “Called Upon” operations. Federal dam operators will take into account other missions in the basin, such as fisheries, irrigation and navigation. Called Upon operations could mean that river operations will be different from today’s familiar practices.

For more information

For information regarding the Columbia River Treaty 2014/2024 Review, please visit www.crt2014-2024review.gov or email us at treatyreview@bpa.gov, or call the Bonneville Power Administration at 800-622-4519 or the U.S. Army Corps of Engineers at 503-808-4510.

The Columbia River Treaty 2014/2024 Review

The coordinated operation of the many dams and reservoirs under the Columbia River Treaty has provided significant flood risk management and hydropower benefits for both the United States and Canada. The Treaty calls for two “entities” to implement the Treaty, one for the U.S. and one for Canada.

The U.S. Entity, appointed by the president, consists of the BPA administrator and the Northwestern Division engineer of the U.S. Army Corps of Engineers. The Canadian Entity, appointed by the Canadian cabinet, is the British Columbia Hydro and Power Authority (BC Hydro).

While the Treaty has no specified end date, it contains provisions that will change its implementation in 2024. Additionally, either Canada or the U.S. may unilaterally terminate most provisions of the Treaty in 2024, with a minimum of 10 years’ advance notice, hence the focus on 2014 and 2024.

The U.S. Entity is undertaking a series of studies regarding current and potential future operations under the Treaty. The goal is a recommendation from the U.S. Entity to the U.S. Department of State by the end of 2013 on which elements the Pacific Northwest would like the Department of State to pursue in negotiations with Canada.

Collectively known as the Columbia River Treaty 2014/2024 Review, this multi-year effort will provide information critical to a U.S. Entity recommendation through evaluation of the value of Treaty benefits to the region and consideration of contemporary concerns that reach beyond flood risk management and power generation.

Integral to the Treaty Review process is the U.S. Entity’s direct consultation with the Sovereign Review Team, comprised of representatives of the four Northwest states, 15 tribal governments and 11 federal agencies. Supporting the Sovereign Review Team is the Sovereign Technical Team, responsible for completing the technical work that informs the Sovereign Review Team and the U.S. Entity.

This publication of the Columbia River Treaty 2014/2024 Review was developed to inform you of issues surrounding the Columbia River Treaty. It is published by the U.S. Entity, which includes the Bonneville Power Administration and the U.S. Army Corps of Engineers.



Columbia River Treaty 2014/2024 Review

Managing Flood Risk in the Columbia River Basin

Reducing flood risks under the Treaty

The U.S. Army Corps of Engineers, British Columbia Hydro and the Northwest River Forecast Center independently produce seasonal runoff volume forecasts (rain and snowmelt) for numerous locations in the basin to determine the amount of space needed in all of the flood storage reservoirs. However, knowledge of where and when flooding will occur still remains uncertain because it is not possible to accurately forecast the weather more than a few days ahead. The amount of rain and variations in temperature over just a few days, for example, can strongly influence the timing and extent of runoff.

Under the Columbia River Treaty, U.S. and Canadian water management agencies use volume forecast information to formally plan the storage and release of water in the four reservoirs built under the Treaty (three in Canada and one in the U.S.), in coordination with other U.S. reservoirs. This effort reduces regional flood risks in the basin, specifically where the risks to life and property are greatest.

Operating across the seasons

From September through December is the fixed reservoir drawdown season. During this time, operators lower reservoirs to predetermined levels because there is uncertainty about how much storage space will be needed for flood-risk management. Water volume forecasts for the months ahead are available beginning in January. The goal at this time of year is to ensure that reservoirs reach specific levels by the end of December.

Dam operators lower water levels during the variable drawdown season from January through April to create additional storage space for water from snowmelt and rain to help reduce downstream flooding. Computer models

help calculate the rate of these controlled releases to minimize damage downstream of the reservoirs while ensuring enough water is held behind the dams to meet other needs.

Beginning in April of each year, the reservoirs are refilled by capturing the runoff in the storage space made available by earlier releases. During the rest of the year, operators across the system of Columbia River Basin dams coordinate the release of the water stored in the reservoirs to meet other system needs and provide benefits, including increased flows for fish and other aquatic species, hydropower, navigation, recreation, irrigation and water supply.

Careful coordination also helps plan to catch and store runoff that may cause localized damage in the basin. State and local agencies manage levee systems, floodwalls or other riverbank protection infrastructure that provides additional lines of defense against high water. Areas with unregulated streamflows or those not adequately protected by levees face increased risk of flooding when flows are high.

It takes a system

No single agency or action can manage these floods. An entire system — with both manmade and natural features — contributes to their reduction. Huge reservoirs can capture vast quantities of water, wetlands can absorb floodwaters and even the individual actions of property owners can help. The Corps, the Bonneville Power Administration and other agencies also assist communities with non-structural measures that help manage floods, such as establishing response and land development plans to reduce flood risks and hazards.

The majority of the flood storage space is available from seven U.S. storage reservoirs (Libby, Hungry Horse, Dworshak, Brownlee, Kerr, Albeni Falls and Grand Coulee)

Flooding in the Columbia River Basin

Flooding typically occurs when runoff from rain and snowmelt flows over riverbanks and onto flood plains. Heavy or continuous rain west of the Cascade mountain range generates the greatest amount of runoff from November through March. Snowmelt runoff east of the Cascades is typically the cause of flooding from May through July. The potential for damage from these floods increases in the densely populated and highly developed areas in or near the Columbia River's floodplain, such as Portland, Ore., and Vancouver, Wash.

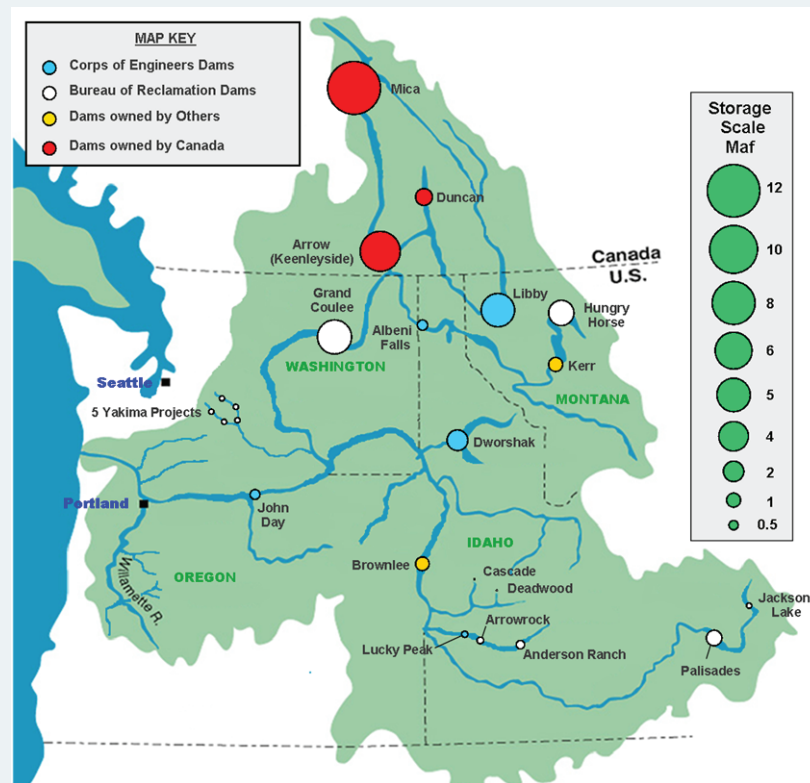


The catastrophic 1948 flood at Vanport, Ore.

Federal agencies in the Pacific Northwest use the storage space in United States and Canadian reservoirs to help regulate spring runoff from the upper Columbia River Basin. Approximately 25 percent of average annual runoff originates in the Canadian portion of the basin, but this increases to almost 40 percent during large flood events.

Explaining flood risk

Simply put, flood risk is the probability that an area will flood, causing negative consequences such as property damage or the loss of life. In more detail, this risk is the combination of several factors: the probability that the amount of runoff will be large enough to cause flooding, the ability to reduce human risks and damage from a flood, and the actual consequences should flooding occur. While protecting against the loss of life is vital, and most consequences are undesirable and even uncertain, flood risk cannot be eliminated.



The relative capacity of major Columbia Basin storage dams. A significant proportion of Columbia Basin water storage capability lies in Canada.

and the three Treaty reservoirs in Canada (Mica, Duncan, and Keenleyside — also known as Arrow in the U.S.). All but two of these projects are located on the Columbia River or its tributaries north of its confluence with the Snake River. Dworshak and Brownlee dams are located in the Snake River Basin. Dozens of additional dams play some role only in local flood risk management and provide water for other benefits, such as navigation, irrigation, hydropower, recreation, and fish and wildlife.

An updated approach to flood risk management

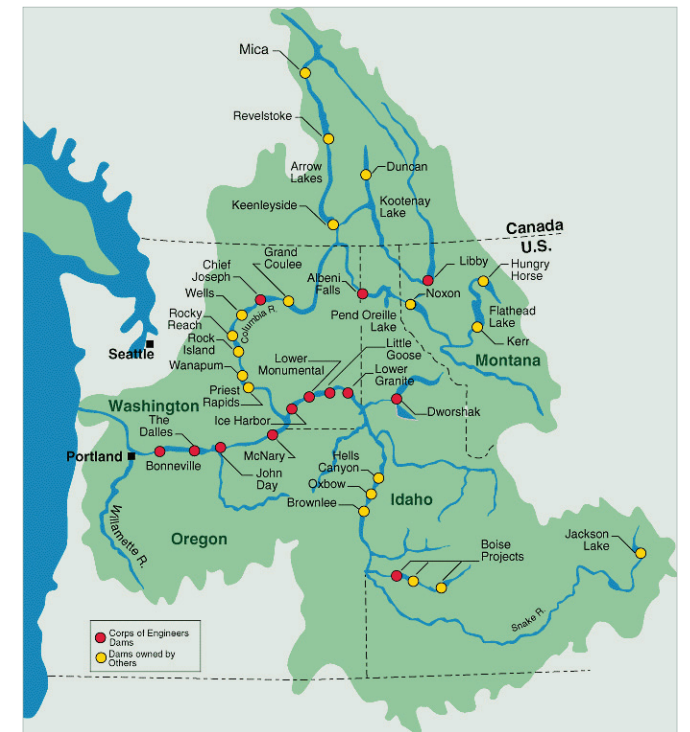
The Corps once used the term “flood control” for its efforts to protect people and property from flooding, but everyone knows that “flood control” is not possible. There are limits to both the ability to predict floods and the level of protection that the Corps, other agencies or human measures can provide. Following hurricanes Katrina and Rita, the Corps shifted to a risk-based approach to better understand and communicate its ability to assess and reduce flood risks. These three tasks make up this “flood risk management” approach:

- 1. Risk assessment** — This effort uses a methodical, evidence-based approach to measure and describe the type, likelihood and extent of risk associated with a current or likely situation. Assessments consider results from engineering, structural and other evaluations to help identify potential vulnerabilities to people and property.
- 2. Risk management** — This process identifies, evaluates, implements and monitors actions to reduce these risks.
- 3. Risk communication** — This open two-way exchange of information promotes an understanding of risks and supports better decision making.

Moving into the future

Introducing Called Upon assistance

While ultimate changes to the Columbia River Treaty after Sept. 16, 2024 (see Treaty Review sidebar) are uncertain, two provisions in the Treaty call for a change in how and when Canada provides reservoir space to help the U.S.



The major dams in the Columbia River Basin.

manage flood risks. In 2024, the guaranteed flood storage in the Canadian Treaty dams that the U.S. purchased from Canada for 60 years will expire.

New requirements will replace the original provisions, dictating a shift from coordinated planned operations for this pre-paid storage to what is known as “Called Upon” operations. This means that the U.S. can call upon Canada for assistance only when the storage capacity of U.S. reservoirs cannot meet current flood risk management needs. “Effective use” is the term for the prerequisite that the U.S. use its reservoirs to reduce flood peaks before calling on Canada for additional water storage.

Once the U.S. has used all the storage available from the eight reservoirs authorized as primary for flood risk management (the seven U.S. dams listed previously, plus the John Day Dam on the lower Columbia River), the U.S. must pay Canada for the costs of operating its Treaty dams to provide the necessary additional storage and for any resulting direct economic losses the Canadians might incur from these operations. The U.S. Entity currently believes