Northwest Power and Conservation Council

Nov. 9, 2010

MEMORANDUM

TO: Council members

FROM: John Shurts, General Counsel, and John Harrison, Information Officer

SUBJECT: Bonneville Power Administration/U.S. Army Corps of Engineers update on 2014/2024 Columbia River Treaty studies.

Under the Columbia River Treaty of 1964, the Administrator of the Bonneville Power Administration and the Northwestern Division Engineer of the U.S. Army Corps of Engineers comprise the United States Entity for treaty implementation. BC Hydro is the Canadian Entity under the Treaty. While the Treaty has no specified end date, either Canada or the United States can terminate most provisions of the Treaty on or after September 16th, 2024, with a minimum advance notice of 10 years. Thus, 2024 is the first year a notice of termination would take effect assuming written notice of termination is given by the Canadian or U.S. governments on or before 2014. Unless the two nations terminate or mutually modify the Treaty, it continues indefinitely with one big exception -- the Treaty's provisions for systematic flood control end in 2024 whether the Treaty is terminated or not, to be replaced by provisions allowing for "called upon" flood control subject to a number of conditions.

The Corps of Engineers and Bonneville implement the Treaty on behalf of the U.S. Entity. With BC Hydro, the Corps and Bonneville are conducting a multi-year effort to understand the implications of various future options for the Treaty -- termination, continuation, and modification. This effort is called the 2014/2024 Columbia River Treaty Review.

In Phase One of the review, the Entities conducted studies to provide fundamental information about post-2024 conditions both with and without the Treaty, and only from the limited perspective of power and flood control. The entities released the Phase One report for public review in July. Last month the Corps and Bonneville completed a supplemental report on behalf of the United States Entity that overlays river and dam operations required by biological opinions and other regulations on the results of the Phase One studies. The supplemental studies are important because they present a more realistic picture of current and future river operations under the various scenarios for the future of the Treaty.

At this meeting, representatives of the Corps and Bonneville will review the Phase One and supplemental studies. The scheduled presenters are Steve Oliver, vice president of generation supply at Bonneville; Jim Barton of the Corps of Engineers, who is the U.S. Entity Co-Chair under the Columbia River Treaty Operating Committee; and Matt Rea, also of the Corps, program manager for Columbia River treaty studies.

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2014/2024 Review

Columbia River Treaty

NW Power and Conservation Council

Presented By:

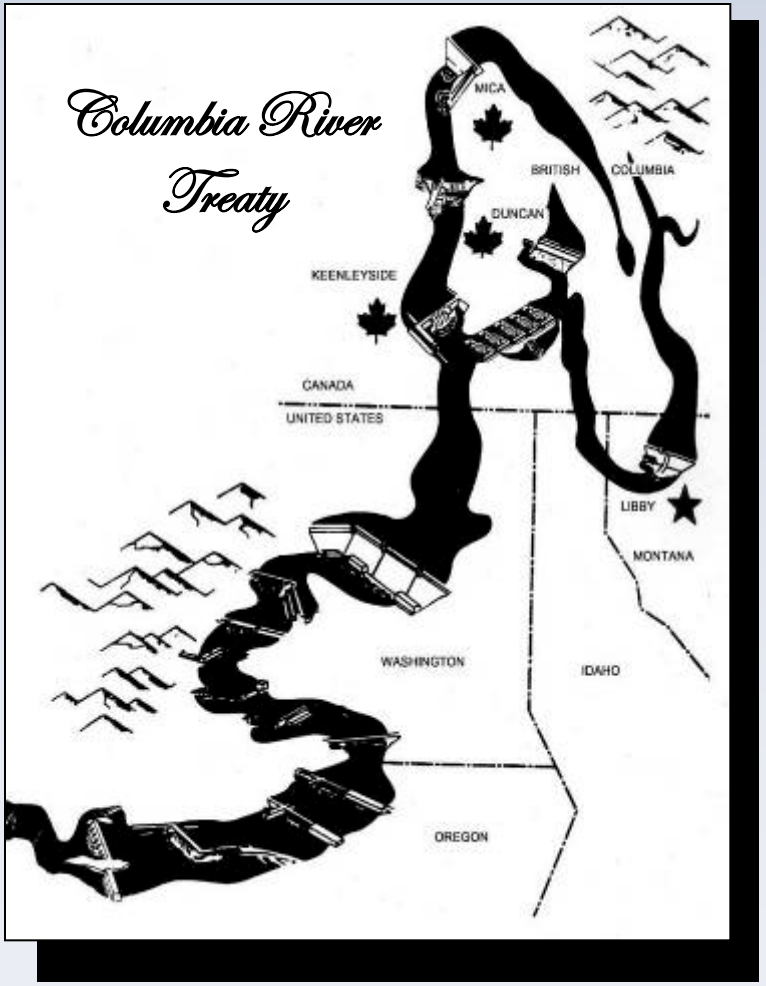
Stephen R. Oliver - Bonneville Power Administration
VP Generation Asset Management and
U.S. Entity Co-Coordinator for the Columbia River Treaty

James Barton - U.S. Army Corps of Engineers
Chief of Columbia Basin Water Management Division and
U.S. Co-chair for CRT Operating Committee

November 9, 2010

Outline

1. Treaty Background
2. 2014/2024 Review
   a) Joint Phase 1 Studies
   b) U.S. Entity Supplemental Studies
3. Flood Risk Management
4. Next Steps



Columbia River Basin – Treaty Provisions

1. Canada must operate the 15.5 Maf of Treaty storage for optimum power generation downstream in Canada and the United States.

2. U.S. delivers to Canada one-half the estimated U.S. power benefits (Canadian Entitlement), currently worth about $200-300 million annually.

3. The U.S. purchased 8.45 Maf of annually operated “primary” flood control for 60 years.

Columbia River Treaty Benefits

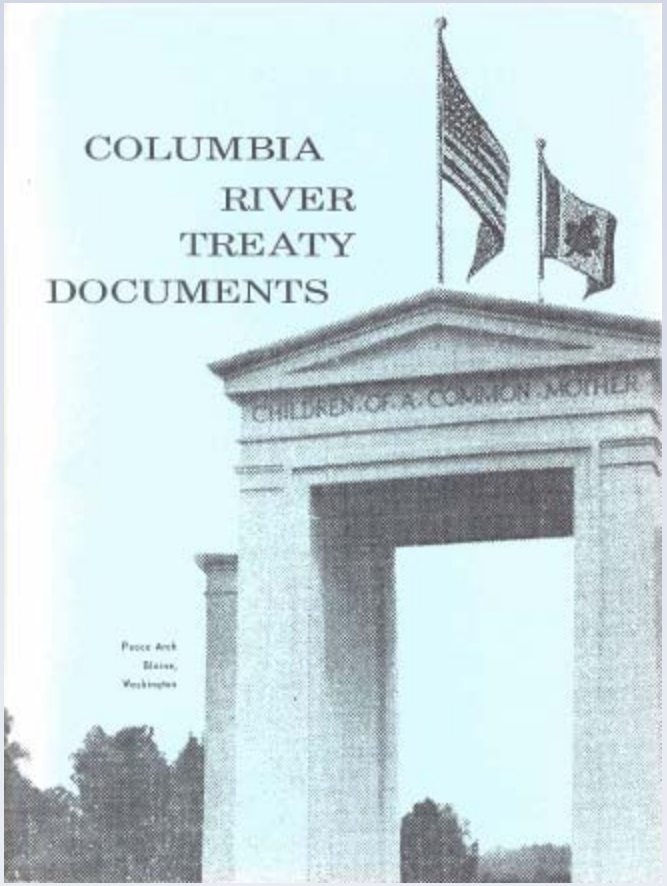
1. Canadian Treaty storage reduces flood flows, reduces spill, and shifts energy from low value time periods to high value time periods.

2. The Treaty motivated infrastructure and governance development such as the electrical intertie to California, regional power preference legislation, and added generators at most Columbia dams.

3. Several regional power coordination agreements are related to the Treaty (e.g. PNCA).

Why a 2014/2024 Review?

1. The Treaty has no specified end date; however, either nation can terminate most of the provisions of the Treaty as early as Sep 2024, with a minimum 10 years' written notice.
2. Current assured annual flood control operating procedures will end in 2024, independent of Treaty decision.



Post-2024 Power Operations

If the Treaty continues:

- Coordinated annual planning of an optimum U.S. and Canadian power operation continues
- U.S. continues to pay Canadian Entitlement
- Certainty in Canadian storage operations through Treaty planning and coordination

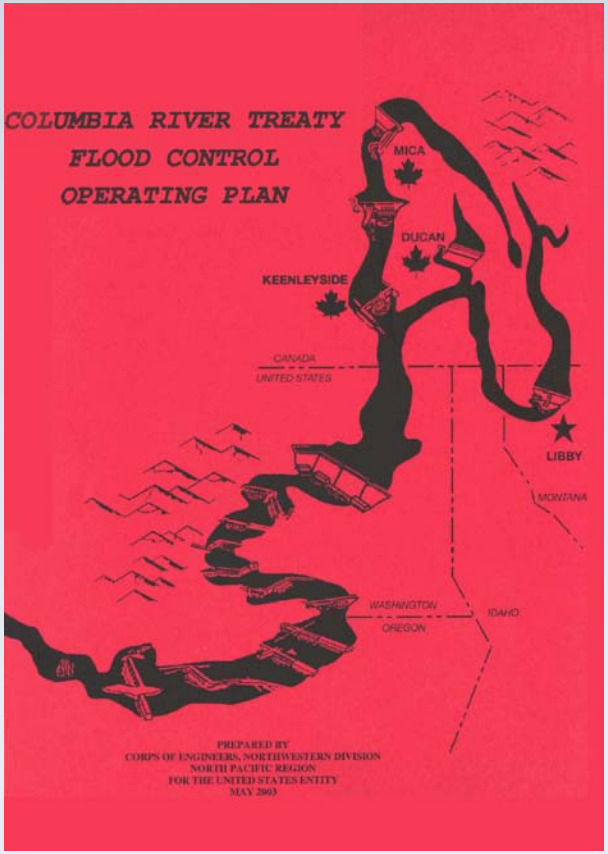
If the Treaty is terminated:

- B.C. will operate Mica, Arrow, and Duncan for the benefit of Canada (subject to Boundary Waters Treaty), except for Called Upon flood control operations. The U.S. will continue to coordinate with Canada on the operation of Libby.
- Canadian Entitlement will cease to exist

Post-2024 Flood Control

Regardless of Whether the Treaty Continues or is Terminated:

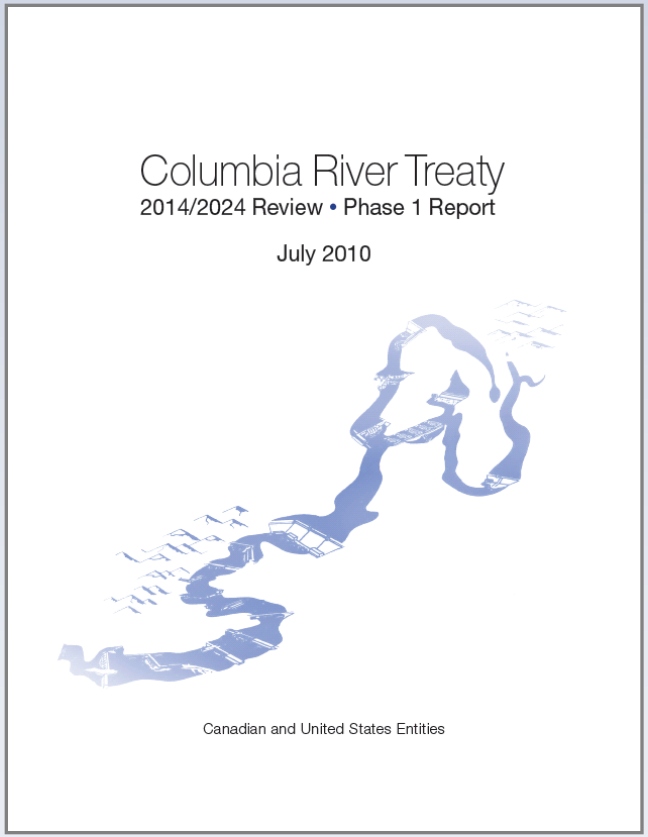
- Flood control provided by Canadian projects transitions mainly to a “Called Upon” operation after 2024 for the life of the projects:
- U.S. requests for called upon storage limited to potential floods that cannot be adequately controlled by all related (effective) U.S. storage
- Canada must be consulted prior to a called upon action
- Called upon storage to provide no greater degree of flood control after 2024 than prior to 2024
- U.S. must pay for operating costs and any economic losses in Canada due to the called upon operation



Phase 1 Studies:

Project Overview

- The Phase 1 studies were joint studies by the U.S. and Canadian Entities.
- The purpose of the studies was to provide fundamental information about post-2024 conditions, with and without the Treaty.
- These initial studies only addressed power and flood control. This was necessary to allow an informed regional discussion regarding how to model other factors such as fisheries mitigation and additional irrigation withdrawals over these existing base operations.



Phase 1 Studies

Key Driving Assumptions: Flood Control

1. **Methodologies and Requirements of Called Upon Flood Control:**
   Called Upon procedures used in the Phase 1 studies provided a starting point for refining future modeling of Called Upon. The Phase 1 Called Upon methodology is just one preliminary look at this procedure.

2. **Maximum Flow Objective:**
   Studies looked only at two alternative flood control maximum flow objectives (600 and 450 kcfs at The Dalles) in the Phase 1 studies represented only a range of potential flow objectives. Refining of the actual flood control need will be done through future studies and the Corps' Flood Risk Management effort.

3. **Effective Use of U.S. Reservoirs:**
   U.S. "can call upon Canada to operate storage to prevent flood in the U.S. that cannot be adequately controlled by all related storage facilities in the U.S."

4. **Called Upon Cost:**
   No calculation of Canadian operating costs and economic losses were done in the Phase 1 studies.

Phase 1 Studies

Key Driving Assumptions

5. **Future Loads and Resources:**
   Energy demand and the resources to meet that demand were estimated from available information, including projections of renewables and conservation, for the 2024-2025 and 2044-2045 periods. The process of forecasting loads and resources is highly uncertain.

6. **Future Canadian Operating Scenarios:**
   The Canadian operation used in the Treaty is Terminated scenarios only represents one type of power operation and does not adequately evaluate the possible ranges of operations and flows across the border.

7. **Use of Study Conclusions:**
   The results of both the Phase 1 studies and the Supplemental studies should not be assumed to be the conclusion or answer to issues related to post-2024 Treaty outcomes, but rather a starting point for discussion and future work. The limited scope to these studies does not provide enough information to base any recommendation or conclusion.

Phase 1 Results:

Canadian Entitlement and Generation

- **The Phase 1 studies looked at the possible value of Canadian Entitlement over the next 15 to 35 years. The results showed a decline in the Entitlement energy over time, decreasing from the current level of about 536 average annual megawatts (aaMW) to 470 aaMW in 2025 to about 290 aaMW by the year 2040. The Entitlement capacity actually increased from its current value of 1316 MW to about 1525 MW by 2045.**
- **Overall, without the Treaty the average annual energy production in Canada and the U.S. remained essentially unchanged in comparison to the Treaty continues studies; however, the monthly shape varied from the coordinated operation found in the Treaty continues scenarios.**
- **Overall, without the Treaty the ability of the U.S. hydro system to meet firm loads within the critical period (critical water sequence) diminished by approximately 225 aMW. In addition, the Critical Period was shortened from 4 years to 1 year, which may be of concern during prolonged low inflow conditions.**
- **Assured Treaty power draft provided U.S. flood control benefits (reduced the amount of Called Upon storage required).**

Phase 1 Results:

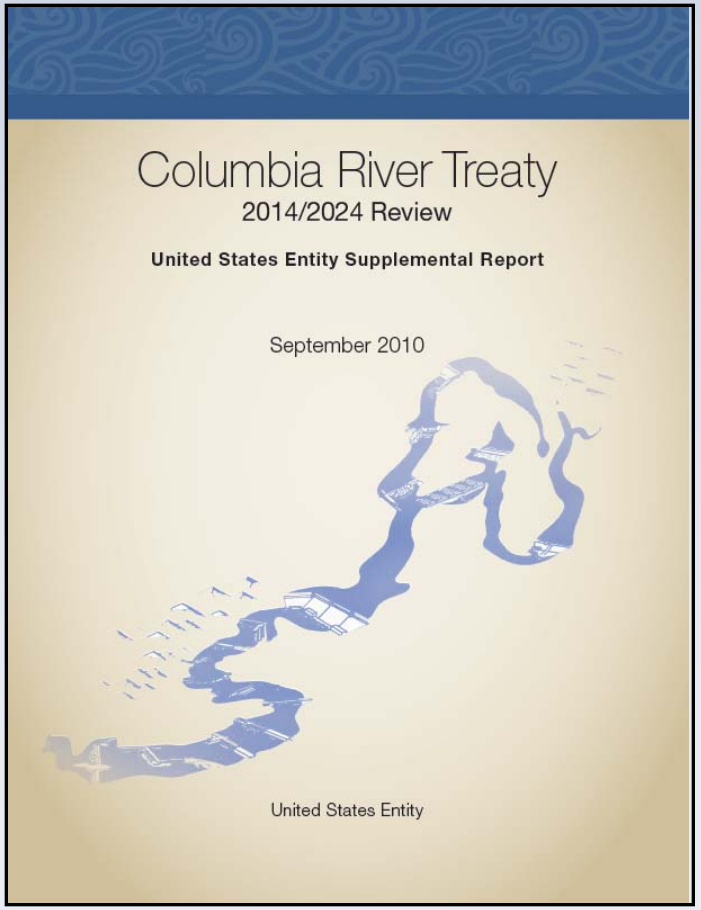
Flood Control and Reservoir Impacts

- The number of times Called Upon flood control assistance is needed from Canada depends on what level of flood control protection, or the maximum flow objective, is needed as measured at The Dalles Dam on the lower Columbia River.
- In order to show “effective use” of U.S. storage before calling upon Canadian storage, the U.S. projects had to draft deeper more often during Called Upon years than is required with the current flood control operations.
- In the Phase 1 studies, implementation of effective use of U.S. projects also caused a few additional refill failures during Called Upon years.
- Called Upon operations provide similar draft as regulation for U.S. power in high water years.
- Canadian reservoirs gained some degree of operating flexibility with or without the Treaty.

U.S. Entity Supplemental Report

Overview

- The joint Phase 1 studies did not include the ESA Biological Opinions and other fish operations at U.S. projects, and as such, they did not depict realistic results for flows, reservoir levels, and generation in the U.S.
- The Supplemental Report is a U.S. Entity developed companion report to the jointly developed Columbia River Treaty 2014/2024 Review Phase 1 Report.
- Purpose of the Supplemental studies was to overlay current Biological Opinions and other fish operations to the Phase 1 studies.



U.S. Entity Supplemental Report

Results

- With or without the Treaty, looking across all of the scenarios, the addition of fish operations to the Phase 1 studies reduced U.S. system generation by approximately 1600 annual aMW.
- Terminating the Treaty reduced U.S. average annual generation over the 70 water years studied by about 90 to 94 aMW, a relatively small amount. However, the month-to-month shape changed, with more generation in the winter-spring, and less in the summer-fall (especially in low water years).
- In the driest 20 years, terminating the Treaty resulted in a U.S. system generation loss of about 1460 aMW in the summer and 230 aMW annually and a decrease in the U.S. system's ability to meet fish flow objectives during the summer months.
- The difference in average U.S. reservoir drawdown (minimum) elevations for the Supplemental studies was driven by the assumed flood control flow objective at The Dalles, not by continuing or terminating the Treaty.
- Assumptions about U.S. flood control needs and Canadian Called Upon operations were a stronger influence on the ability of the U.S. reservoirs to meet fish operating criteria than other variables relating to Treaty continuation versus termination.

U.S. Entity Flood Risk Management Considerations

Considerations for Future Flood Risk Management Studies

1. **The importance of risk-based approaches to flood management**
   a) All key variables, parameters and components of flood management are subject to probability-based analysis
   b) Focus on uncertainties of variables having significant impact on study conclusions
   c) Must include:
      - Depth-damage relationships
      - Discharge associated with exceedence frequencies from hydrologic studies
      - Structural and geotechnical performance of levees and other structures
      - System-wide analysis and probability estimates of Estimated Annual Damages (EAD) and Annual Exceedence Probability (AEP)

2. **Systems Approach**
   a) Canadian storage drafts must be viewed within a systems approach to flood risk management in which this is one tool in a suite of tools to manage flooding in the Columbia River Basin in the U.S.
   b) Other tools include U.S. Reservoir Storage and local flood measures

Specific Flood Control Considerations for Future Studies

a) Re-evaluate use of a predetermined maximum flood flow objective as a “trigger” for CU storage;

b) Limit Canadian draft volumes used in CU operations;

c) Re-evaluate priority of drafting Canadian projects during CU;

d) Define procedures for returning Canadian projects to planned operation after CU operations;

e) Refine procedures for adjusting to volume runoff forecast changes in CU years;

f) Establish strategies for prioritizing between winter and spring flood control;

g) Refine procedures for incorporating Canadian local flood control;

h) Consider effects of Canadian flex on CU;

i) Develop strategies for knowledge and assurance of Canadian operations;

j) Better define “Effective Use” of U.S. reservoir storage

k) Estimate Canadian economic losses and operating costs for CU

U.S. Entity Flood Risk Management Studies

1. **Phase 2A: Flood Risk Assessment**
   a) Objectives:
      - Collect and manage data and develop tools and processes necessary to produce quantifiable estimates of flood risk management benefits and costs
      - Characterize current level of flood risk under base conditions
   b) Complete by September 2011

2. **Phase 2B: Flood Risk Management**
   a) Objective: Evaluate flood risk management benefits and costs associated with alternative Treaty strategies
   b) Complete by January 2013

3. **Phase 2C: Flood Risk Communication**
   a) Objective: Prepare Decision Documents needed to inform U.S. Treaty decision
   b) September 2013

Phase 2a Flood Risk Assessment:
Products and Deliverables

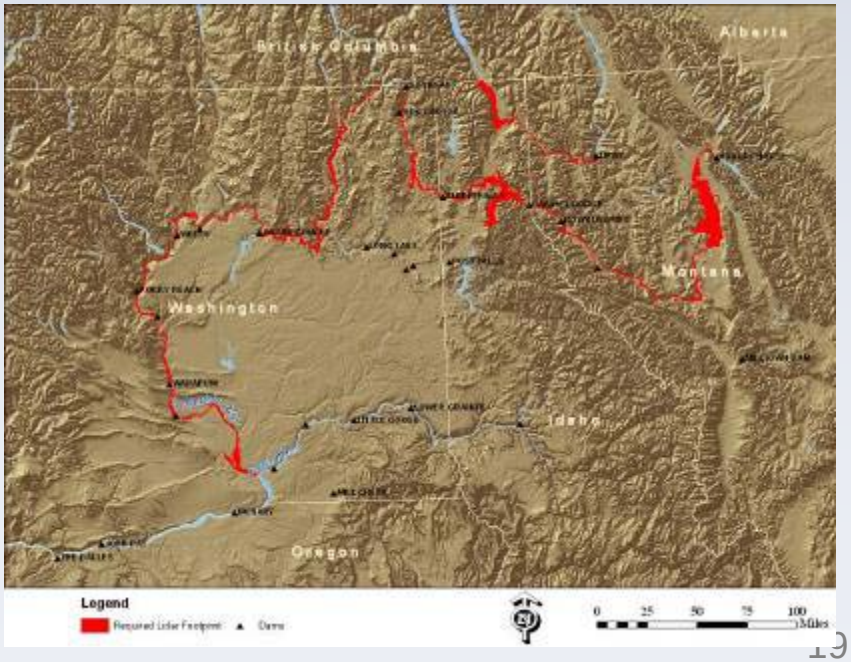
Inventory and analyze existing floodplain data…

a) Floodplain Mapping and Surveying

b) Levee Assessments

c) Economic Surveys

- 3000 sq. miles
- 4 states
- 42 counties
- 180,000 structures
- 160 levee systems
- 1600 river miles
- 9 points per sq. meter

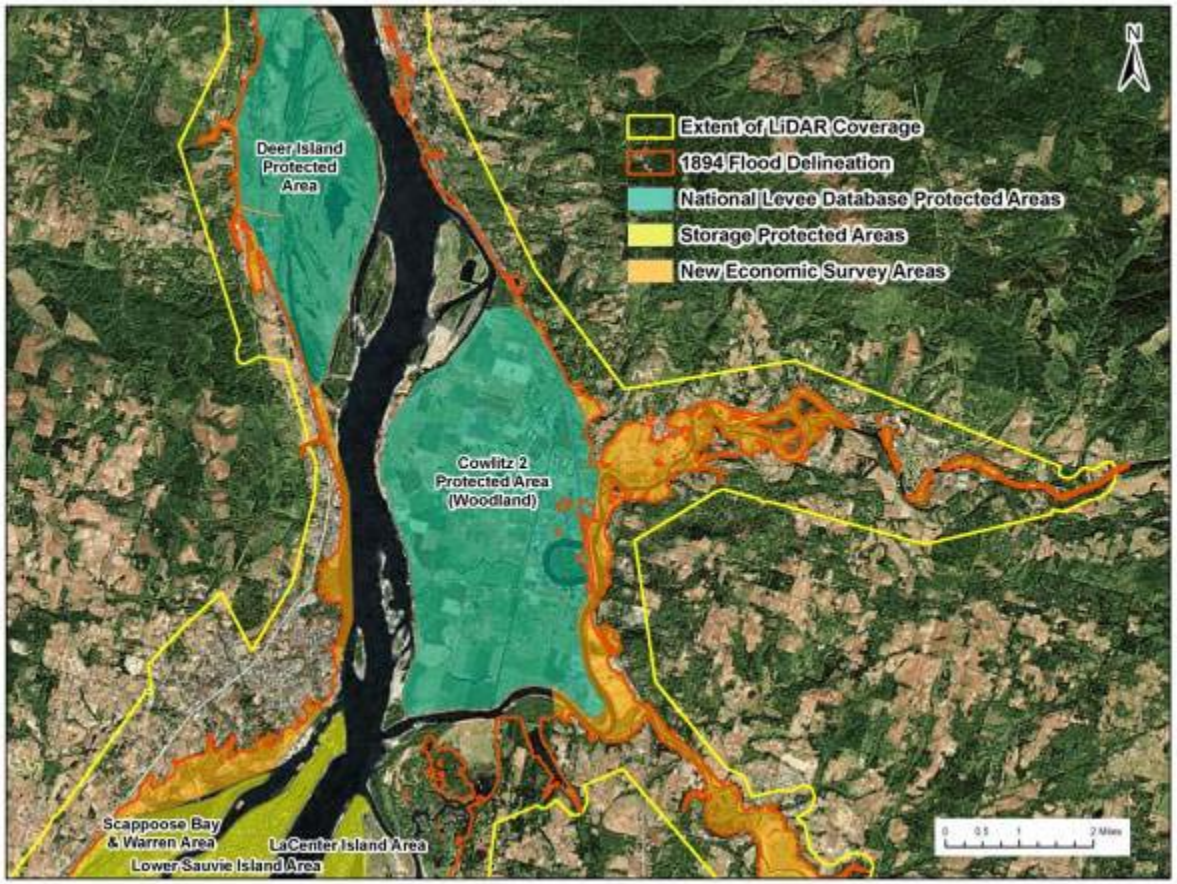


Phase 2a Flood Risk Assessment:
Products and Deliverables

Develop analytical tools…

a) Hydraulic/ Hydrologic Studies

b) Develop Updated Flood Stage-Damage Curves



Key Flood Management Questions to be Answered…

1. What is the residual flood risk in the Columbia River Basin under the current Flood Control Operating Plan?
2. Can we adequately manage flood risk through a “called upon” system for Canadian storage?
3. What are the implications of climate change for basin hydrology and flood risk between now and 2024? After 2024?
4. What is the economic value of Canadian flood control storage to the U.S.?
5. What are the potential non-economic (especially environmental) consequences for other river uses and benefits associated with flood risk management alternatives?

Columbia River Treaty
U.S. Entity Perspective

- The lack of coordinated hydro operations on an international river system such as the Columbia could result in significant uncertainty for downstream U.S. power, flood control, fisheries, and other non-power river uses and operations.
- Expectations are that Called Upon will be needed post-2024, but how much is needed, how it will be implemented, and how it will be paid for are still uncertain and will need to be evaluated in future work.
- U.S. reservoirs in the PNW may have to be operated much differently for flood control post-2024, and this could have significant implications for interests around those reservoirs.
- Without the Treaty, the U.S. retains about 300-500 aaMW of energy and 1300-1500 MW of capacity.
- Many of the current U.S. operations (e.g. BiOp objectives) are not considered when determining Entitlement return to Canada.

Columbia River Treaty

U.S. Entity Perspective

Responsibilities for CRT 2014/2024 Review

- Consistent with responsibility for implementing the Treaty, the U.S. Entity (BPA Administrator and Corps' Northwestern Division Engineer) is conducting the CRT 2014/2024 Review with input from and coordination with other federal agencies, states, tribes, and stakeholders.
- Continuation of the Treaty may be managed by the U.S. Entity, but any amendment or termination must be decided by the U.S. State Department and the President, and any amendments must be approved by the U.S. Senate (with an equivalent process in Canada).
- Coordination and communication on CRT 2014/2024 Review activities continue with the Department of State. Expectations are that the U.S. Entity will provide a recommendation on the Treaty future to the Department of State.

Columbia River Treaty

U.S. Entity Perspective

Next Steps

1. The purpose of the Phase 1 studies was to provide preliminary information about post-2024 conditions both with and without the Treaty from the perspective of the two purposes of the Treaty, power and flood control.
2. Other regional concerns such as ecosystem health, water supply and quality, climate change, cultural resources, recreation, navigation, irrigation, and other needs will need to be considered.
3. The Corps of Engineers will continue its comprehensive Flood Risk Management (FRM) effort.
4. The U.S. Entity is fully committed to an open, collaborative, and region-wide engagement process and expects to work with the region to develop additional analysis and include a broader range of scenarios for evaluation.
5. The U.S. Entity expects to make a recommendation to the Department of State by September 2013.

Engagement Plan

Design and Implement an Engagement Plan that meets the needs of the PNW region to define sovereign and stakeholder interests regarding various Treaty future scenarios and evaluation. This process must address the interests of key parties as well as general stakeholders in the region.

Sovereign Policy Group:

1. States: OR, WA, ID, MT
2. NW Tribes: 5 representatives (USRT, CRITFC, UCUT, Cowlitz, CSKT)
3. Federal Agencies: NMFS, USFWS, BOR, USACE, BPA, BLM, EPA, USFS, USGS, BIA, NPS)

NW Stakeholders:

Plan must take into consideration stakeholder concerns and input. This may be done in several ways:

- Regional workshops
- Joint Sovereign Policy Group/Stakeholder meetings
- Technical consultation with regional experts among stakeholder groups