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PREFACE

In 1961, Canada and the United States ratified the Columbia River Treaty (CRT), an agreement designed to share water resources, including costs and benefits, between the two countries. The treaty entered into force in 1964, and mandated the construction and joint management of three dams in Canada. These dams increased reservoir storage and as a result, hydropower generation and flood control benefits throughout the basin. The agreement also entitled Canada to half of the downstream power benefit gained through joint management. From a governance perspective, the CRT has largely been regarded as a successful example of an international water agreement between upstream and downstream countries.

Since the treaty was signed, the nature of water governance has become more nuanced and there is now significant concern regarding the narrow focus of the CRT. Notably absent from the structure of the agreement are ecological considerations, specifically regarding salmon, and input from tribes and First Nations and other local communities.¹ Although the overarching framework of the treaty is open-ended, the flood control provision is set to expire in September of 2024. Numerous actors on both sides of the border have signaled that this is an opportunity to modernize the CRT in order to better reflect the cultural, environmental, and economic concerns of the present day.

In 2008, university faculty from around the Columbia Basin formed the Universities Consortium on Columbia River Governance in an effort to facilitate dialogue between decision makers, key interests, and sovereign entities. In total, the Consortium organized four symposiums, the last in 2012. In 2010, the fifteen Columbia River Tribes² jointly published a document titled *Common Views on the Future of the Columbia River Treaty*, asserting their needs regarding the river. More recently, entities on both sides of the border have conducted extensive reviews of the CRT, with significant input. Both entities have issued sets of regional recommendations for a modernized treaty: the U.S. Entity Regional Recommendation (2013) and the B.C. Decision (2014). A key point of agreement between both documents is including ecosystem function as a third critical component, in addition to flood control and hydropower. Despite these efforts, negotiations between the United States and Canada have yet to begin. However, the United States Department of State has a negotiation team in place.

In February of 2017, Western Washington University (WWU) and Northwest Indian College (NWIC) hosted a two-day symposium on the modernization of the CRT. The purpose of this event was to develop public awareness and inform treaty negotiators from the United States and diplomats from Canada of key issues. Presenters and panelists explored the history of the treaty, governance ideas, Indigenous perspectives, hydrology and climate, electric energy, ecosystem function, and flood risk management/irrigation. Panelists included representatives from tribes and First Nations, government agencies, non-government organizations, private industry, and universities. During the panels, many speakers said that there is a need to look at governance

¹ Indigenous groups and governments are referred to as tribes in the U.S. and as First Nations and/or Aboriginal in Canada.

² See www.critfc.org/tribal-treaty-fishing-rights/policy-support/columbia-river-treaty/common-views/.

from a systems-level perspective to account for the interconnected nature of the issues. There was also widespread agreement that a modernized treaty contain a governance structure that includes multiple sovereign entities in the planning process and that is adaptable to future changes in physical systems.

Acknowledgments

Thanks to U.S. Senator Maria Cantwell who planted the seed for this symposium in a conversation with WWU leaders, who then asked NWIC to join in the planning process. Sponsors for the event included NWIC's Native Environmental Science Program and WWU's Border Policy Research Institute, Huxley College of the Environment, and Institute for Energy Studies. The planning committee for this event included Don Alper, Brian Burton, Thomas Christian, Steve Hollenhorst, Emma Norman, Chris Roselli, Steve Swan, Joel Swisher and Laurie Trautman. Staffing included Max Bronsema, Chuck Hart, Ruth Musonda, and Lorie McNeill.

Thanks to the Consulate General of Canada in Seattle for their financial support as well as the Lumni Nation for generously providing a salmon dinner. Special thanks as well to Althea Wilson who made over one hundred cedar bracelets for all who attended the symposium.

A Note About the Document

These proceedings were compiled using video recordings and notes taken during the symposium. The videos are available online at <https://wp.wvu.edu/crt/>. Please note that these proceedings represent a summary of the statements made during the panels and they are not a verbatim account of what the panelists said, though some select quotes have been included. We also cannot guarantee the accuracy of any facts, data, or claims made by panelists.

DAY 1: WELCOME

Emma Norman, Chair of the Native Environmental Science program at Northwest Indian College (NWIC), welcomed the audience to NWIC, the Lummi Nation, and Coast Salish territory. She then welcomed **Richard Jefferson**, a NWIC student and a member of the Lummi Nation, to open up the work with a drum and song.

Tim Ballew Sr. (Lummi Nation) welcomed the audience to NWIC and thanked **Jefferson** for the opening song. Ballew noted that the song represents who the Lummi people are and how they survived the great flood. Ballew highlighted that the discussion of the Columbia River is important because it affects everybody, Indigenous and non-Indigenous people, as well as the natural world. He also made a call to continue the work and conversation beyond the two-day symposium and he asked for patience and an open mind in the work ahead.

Carole Rave (Lakota), Vice President of NWIC, welcomed the audience to the college on behalf of NWIC **President Justin Guillory**. She also extended a special welcome to the elders in attendance. Rave introduced herself, her two Lakota names, and her life story. She also introduced NWIC, a “house of learning” for 82 students during the past winter quarter. Rave closed by saying that her people keep their word and trust the word of others. She then asked the audience to introduce themselves to the people around them.

After members of the audience introduced themselves to their neighbors, **Norman** reconvened the session and thanked **Senator Maria Cantwell** for asking Western Washington University to move this work forward. Norman then read a letter from Senator Cantwell (included in this document).

CALLING WITNESSES

Honoring Coast Salish tradition, **Norman** called on four witnesses for the event: **Dr. Steve Hollenhorst**, Dean of Huxley College of the Environment, WWU; **Angela Card**, NWIC; **Laural Ballew**, Lummi Nation; and **Dr. Michael Marchand**, Chairman of the Confederated Tribes of the Colville Reservation.

OPENING PRESENTATIONS ON THE HISTORY AND FUTURE OF THE COLUMBIA RIVER TREATY

Presenters

- **Barbara Cosens**, Professor
University of Idaho College of Law
- **Gregory Lemermeyer**, Deputy Director
U.S. Transboundary Affairs Division, Global Affairs Canada
- **Jay Johnson**, Chief Negotiator and Senior Policy Advisor
Okanagan Nation Alliance
- **Richard Paisley**, Executive Director
Global Transboundary International Waters Governance Initiative, University of British Columbia

Barbara Cosens gave the first presentation on the Columbia River Treaty, acknowledging that the symposium was meeting on land that belongs to the Lummi. She began with the history of the CRT and the 1948 Vanport flood (reportedly 1 million cubic feet per second at The Dalles) that was impetus for the treaty and joint management. Cosens noted that there have been many cultural, environmental, economic, and technical changes since the treaty was signed, specifically changes in energy demand, climate change, and a greater concern for ecosystems. She also highlighted the increased “capacity and empowerment” of local people, First Nations, and tribes to influence the decision-making process. Cosens then discussed the U.S. Entity’s 2013 [*Regional Recommendation for the Future of the Columbia River Treaty*](#) and the Columbia River Tribes’ 2010 [*Common Views on the Future of the Columbia River Treaty*](#), which she called “a highly sophisticated act of diplomacy.” She commented that the states in the Columbia Basin are not nearly as organized or sophisticated in their discussions as the tribal governments.

The U.S. Entity led the U.S. regional review process, which included five representatives from the fifteen tribes and a representative from each of the four main states (WA, OR, ID, MT). In 2013, the Entity sent the review to the Department of State and recommended that there be three main purposes for cooperation: “hydropower, with some changes; flood control, with some changes; and ecosystem function” as an elevated third purpose. Cosens finished by highlighting two of the major concerns. The first is regarding the Canadian Entitlement because the U.S. no longer optimizes downstream power generation, but still sends power to Canada as if it does. This frustrates the Middle Columbia utility companies in the U.S.. The second is the current management for flood control, which limits flows to 450,000 cubic feet per second (cfs) at The Dalles, and is likely too conservative. There should be an investigation as to whether or not the river can be managed for higher flows.

Gregory Lemermeyer, filling in for Kathy Eichenberger (B.C. Ministry of Energy and Mines), covered British Columbia’s Columbia River Treaty Review process. He said that since the two nations signed the treaty, there have been significant social changes in Canada, including greater concern for environmental issues and a constitution (1982) that recognizes Aboriginal rights. He noted that Canada and the United States negotiated the treaty without consulting people along the river and this is “simply not the way that things can happen anymore.” The review process, with B.C. as the “procedural lead,” tried to reconcile this by consulting the Ktunaxa, Secwepemc, and

Okanagan First Nations in separate government-to-government engagements. Lemermeyer said the federal government was also involved. The review included three rounds of public consultations with 23 communities over an 18-month period. The results of this review led to the [*Columbia River Treaty Review: B.C. Decision*](#), which the Province released on March 13, 2014. The stated goal is to continue with the treaty in its current format, but to seek improvements. Key points include the sharing of benefits, a consideration of climate change, the inclusion of ecosystem considerations, and a need for flexibility. Lemermeyer closed by saying that the Canadian team values ongoing dialogue as a means of developing an appreciation for different perspectives and that these conversations should consider the needs of future generations.

Jay Johnson spoke about the role of the Okanagan National Alliance (ONA). The ONA consists of seven member-communities in Canada and the Colville Confederate Tribes in the United States. The Okanagan are a salmon people and the fish has traditionally sustained their culture and economy. Like many of the other peoples who live along the Columbia River, the construction of dams cut the Okanagan off from salmon. The construction of the CRT dams flooded critical habitats, Indigenous villages, and burial grounds. He reiterated that Canada and the U.S. signed the CRT without First Nations input and that “land was essentially just taken from the communities.” In short, the treaty significantly altered the way of life for Indigenous and non-Indigenous communities along the river. Johnson also covered changes in Canadian relations with Indigenous people, specifically the Tsilhqot’in Decision (2014) that states: “Aboriginal title is real, meaningful, and can exist over large tracts of land.” Consent is required, where title exists, for the Crown or industry to use the land. Johnson finished by highlighting the needs of the ONA, specifically the restoration of fisheries and fish passage, as well as an ongoing role in the decision-making process, among other issues.

Richard Paisley began his presentation by telling the audience that they are not alone. There are 263 instances worldwide where people are trying to conserve and manage international waters and as a result, “there is a great reservoir of knowledge out there.” Paisley also said that the CRT, despite its problems, is an excellent example of how to share benefits between countries. He urged the treaty negotiators *not* to “blow up” the treaty, especially considering the state of U.S. federal politics, and to look for ways to make the necessary changes within the treaty. Echoing others, Paisley said that there are two main issues: 1) the inclusion of ecosystem considerations as a starting point for management; and 2) the meaningful inclusion of multiple publics in the decision-making process. He finished by saying that whatever adjustments are made, we probably won’t get it right, so it’s critical to think about how to include flexibility in the treaty so that a better management system can evolve over time.

Questions

Norman turned the microphone over to the audience for questions.

Question One: A member of the audience asked **Lemermeyer** about the federal government’s position regarding fish passage and salmon reintroduction. She asked him to address the fact that fish passage was not on the table in the B.C. Decision and the fact that the Canadian federal

government gave permission to block fish passage in the river (according to the member of the audience) in 1938.

Lermeyer said that B.C. has never stated that salmon reintroduction cannot be part of the treaty, but rather the province believes that it is a federal issue.³ Therefore, fish passage is not part of the provincial decision. Lermeyer said that the federal government does not have a specific position on salmon reintroduction because there is not a negotiation mandate. He also said that the Canadian government is not responsible for blocking fish passage and did not build Grand Coulee dam, but that the federal government “didn’t take a very productive approach to ensure that Salmon continue to run the Columbia.”

Paisley responded and asked what is the point of talking about the Columbia River Treaty if salmon are not included in the discussion? He said that with regard to governance, a modernized treaty is all about salmon.

Johnson added that if fish passage existed in the 1960s, Canada might have signed a different treaty. Because the Grand Coulee dam blocked passage, the Canadian federal government benefited economically from not having to address fish passage in the construction of the Columbia River Treaty dams.

Cosens responded and said, “we are responsible.” The United States built the Grand Coulee and Chief Joseph Dams that blocked fish passage to the Upper Basin.

Question Two: A second member of the audience asked for some clarification regarding the calculation of Canadian Entitlement.

Cosens said that the Canadian Entitlement is half of the added power increment that is produced when water is released from a dam in Canada and goes through a turbine in the U.S. Currently, water is spilled for fish without producing power, but the benefit is still calculated as if power was fully optimized. She said that from the utilities perspective, they lose power from spilling and still send fifty percent of it north, which is a 150 percent loss. We speak about the Canadian Entitlement in monetary terms, but it is actually an amount of electricity. Cosens also noted that the B.C. government says that the dams in Canada created other benefits in the United States and as a result, the Canadian Entitlement should actually be bigger. However, Cosens said that the United States could say a similar thing; hydropower generation facilities have been placed on the three Columbia River Treaty dams and as a result B.C. is still able to sell much of the Canadian Entitlement back to the United States because it doesn’t need that power. Cosens said that rather than starting with the question of benefits, negotiations should start with what we need for ecosystem function and flood control, and then from there, decide how to split the money.

³ The B.C. Decision reads, “Salmon migration into the Columbia River in Canada was eliminated by the Grand Coulee dam in 1938 (26 years prior to treaty ratification), and is currently not a Treaty issue.

Paisley said that we need to have empathy for the Mid-Columbia utilities because they are paying for benefits that they are not getting. However, he also said that Canada provides water to the United States at specific periods of time, which in turn creates a range of benefits, and Canada simply wants the United States to compensate them for those benefits. The question is then who pays for that compensation and the utilities do not want to pay all of it.

**PRESENTATIONS ON THE HISTORY
AND THE VISION OF AN EXTENDED TREATY FROM THE PERSPECTIVE OF
COLUMBIA BASIN TRIBES AND FIRST NATIONS**

Presenters

- **Pauline Terbasket**, Executive Director
Okanagan Nation Alliance
- **Nicole Kapell**, Environmental and Archaeological Stewardship Manager
Ktunaxa Nation Council (KNC)
- **D.R. Michel**, Executive Director
Upper Columbia United Tribes, Colville Nation
- **John Sirois**, Committee Coordinator
Upper Columbia United Tribes
- **Ron Suppah**, Vice Chairman
Confederated Tribes of Warm Springs

Norman reconvened the symposium and thanked the Federal officials from both the United States and Canada for joining in the symposium. Norman acknowledged that despite the involvement of many nations and sovereigns, the Canadian and American federal governments signed the treaty and ultimately, it is up to these two governments to renegotiate the treaty. Norman thanked **Brian Doherty** (Chief Negotiator), **Brian Nafziger** (Western Hemisphere Office), and **Cynthia Kierscht** (Deputy Director, Office of Canadian Affairs), all from the United States Department of State, as well as **Gregory Lemermeyer** from Global Affairs Canada and **Patrick Higgins** (Senior Political & Economic Relations Officer) from the Consulate General of Canada, Seattle.

Terbasket started her presentation by thanking the Lummi people for welcoming and allowing the symposium to gather on their land. She called upon the audience to have respect for different perspectives and end the “bullying” that she said is taking place in other conversations regarding the Columbia River Treaty. She said that this work is for the youth in the room as well as future generations. The Columbia River is a central part of life for Indigenous peoples and “water is the life blood of all living things.” She called on everyone to be engaged because these decisions effect all people, but in particular, Indigenous people have a right to be involved in the decision-making process. She said that the Columbia River is “sacred” and is our connection to each other.

Kapell introduced the Ktunaxa Nation Council (KNC) and said that the Columbia River and Kootenay River are foundational to the Ktunaxa people’s identity. Kapell contextualized the time in which the Columbia River Treaty was signed. In the 1950s and 1960s, Indigenous people could not leave their reservations without permission, could not hold large gatherings without permission until 1951, and were denied the right to vote until 1960. Kapell then spoke about the impact of the reservoir on the Ktunaxa people. In recent years, the KNC has worked with its people to develop principles for a modernized treaty. Critical needs include the reintroduction of salmon into the Upper Columbia River, the inclusion of ecosystem function as a co-equal

purpose of a modernized treaty, the co-management (international management) of the Libby Dam, and a governance system that involves the First Nations, considers the impacts of reservoir management and the distribution of economic benefits, and addresses climate change issues.

D.R. Michel, a member of the Colville Tribe, thanked the Lummi Nation, Northwest Indian College, and Western Washington University for hosting the event and inviting him to speak. He then introduced the Upper Columbia United Tribes (UCUT), an organization that represents the Coeur d' Alene Tribe, the Confederated Tribes of the Colville Reservation, the Kalispell Tribe of Indians, the Kootenai Tribe of Idaho, and the Spokane Tribe of Indians. The organization works for nearly 15,000 tribal members and represents the tribes in the “blocked area,” the section of the U.S. Columbia Basin that salmon cannot access due to the construction of the Grand Coulee and Chief Joseph Dam. He then read the organizations’ mission statement,

To unite Upper Columbia River Tribes for the protection, preservation, and enhancement of Treaty/Executive Order Rights, sovereignty, culture, fish, water, wildlife, habitat and other interests and issues of common concern in our respective territories through a structured process of cooperation and coordination for the benefit of all people.

Michel said that the last part of the mission statement is unique because the group works to benefit all people in the Columbia Basin.

He said that ecosystem function and fish passage are not just tribal issues, but a concern for all people. He said the UCUT helps to manage two million acres of reservation lands, fourteen million acres of Indigenous territories, five hundred miles of waterways, forty interior lakes, and thirty dams and reservoirs. Michel said that the Grand Coulee dam is not a treaty dam, but it is very important and it is the “lynchpin” in the U.S. because it is used to regulate the flows coming out of Canada. He also said that we should not talk about ecosystem function in terms of Canadian or American benefits, but rather as a shared benefit up and down the river. He reiterated his statement that fish passage does not just benefit the tribes, but others as well, including anglers. Fish passage also has an economic benefit.

Michel also talked about the ways in which the dams have moved floods from downstream to upstream, resulting in huge impacts for tribes. The tribes believe that it is important to review current flood risk management practices. Michel said that the Vanport flood, which was triggered by a rain on snow event in the United States, would not have been prevented by the construction of the Columbia River Treaty Dams in Canada.

Michel also said that as a society we can have healthy ecosystems with fish passage, while also protecting against major floods and generating hydropower. In 2010, the fifteen tribes in the United States put aside their individual upstream and downstream interests and took a basin-wide perspective in the publication of the document *[Common Views on the Future of the Columbia River Treaty](#)*. Then in 2014, the Columbia Basin Tribes and First Nations published the document, *[Fish Passage and Reintroduction into the U.S. & Canadian Upper Columbia Basin](#)*.⁴ He said that ecosystem function, with regard to the CRT, should not be complicated. It just means what happens downriver should not negatively affect ecosystems upriver and vice versa. Michel said that the people in Portland, who benefit from the current flood control system, don't pay for the benefits in the way that people upstream pay for them with the loss of culture, salmon, and ecosystems. He said that fish passage is a very important part of modernizing the

⁴ This document is available on the symposium's website. <https://wp.wvu.edu/crt/>

treaty and there are new technologies being developed that can help get fish over the big dams. He noted floating surface collectors and Whoosh Innovations technology.

Michel finished by commenting on the economic benefits of fish passage. In the early 2000s, the salmon run in the Okanagan River was down to about 2500 fish. Recently, the run has been over 500,000 to 600,000 fish which has created huge economic benefits for the town of Brewster. In the early 2000s, angler days increase from zero annually to 16,500 in 2014. An angler spends on average of \$90 dollars a day in the area. Michel said that there are significant economic impacts and benefits that are part of this system that are not being prioritized in the current system.

John Sirois started by thanking the Lummi People and all in attendance for participating in this process. Like Terbasket, Sirois said that the Columbia River “joins all of us Indigenous people.” He also responded to **Richard Paisley**’s comment, that the CRT is a successful governance model, by highlighting that most successful treaties on the Columbia, regarding the sharing of benefits, were the ones made between Indigenous nations from across the region. Sirois said that the salmon are important both culturally and economically to Indigenous people and the different nations have understood for a long time that it is important to share resources and take care of the salmon’s habitat. Sirois suggested that these treaties could be used to inform a new treaty between Canada, the United States, and Indigenous nations.

Sirois then highlighted UCUT’s work, including climate impact studies and climate resiliency workshops. He said that these studies are part of their culture, because Indigenous people have been working as applied scientists for thousands of years. He said there is a reason why Indigenous people fish for salmon at certain times of the year and that they use cedar as a resource because it has specific biological qualities. Regarding climate change, he also highlighted that the time to harvest first foods has change significantly, 23 days earlier in some cases. He also said that floods are “natural” and part of the future. Indigenous people have a traditional responsibility to take care of resources and UCUT is committed to fish passage in the Upper Columbia, especially in light of climate change impacts on the river and the need to get fish to healthy habitats in Canada. Sirois also highlighted the [*One River – Ethics Matter*](#) conference and the religious groups from all over the region that are joining Indigenous people in saying that we need to interact with the river “in a different way.” He closed by suggesting that we can change the narrative by coming together and working together to address the Columbia River Treaty and Columbia River.

Ronald Suppah called on his two nephews and the other young men to step forward and learn about business with other governments. Suppah then sang a song to show that “the Indian still has his voice....When we were placed on this land, the creator gave us a voice and everything that we would need to sustain ourselves.” He said that one of the common linkages between the nations up and down the river is the language.

Shifting focus to the treaty, Suppah said that the Confederated Tribes of Warm Springs want to renegotiate the CRT and are prepared to engage with other governments and to assert their interests. He said that equal footing is important to the tribes, because each tribe is sovereign.

We are here, we are not going anywhere, and we are going to participate in this process, whether we are welcome or not. We have to because we have to honor our word to the

Creator. When he put us here and gave us these things [the first foods] to sustain ourselves, the promise we made back to him was that we will look out and take care of those things forever.

Suppah also asked the audience and government officials to respect the tribal leaders. “They are coming to you, they don’t have their hat in their hand, and they are not asking you for anything, what is out there was always ours.” He said that the United States federal government has an unfulfilled fiduciary responsibility and a responsibility to trust the Confederated Tribes of the Warm Springs, which gave huge amounts of land to the United States. He then called upon the American officials to “honor your word too.”

Suppah then highlighted the 2010 tribal agreement and the work done by the tribes and the other entities in the 2013 Regional Review process. Suppah also said that he agreed with the Mid-Columbia utilities that the Canadian Entitlement is “too high and too steep.” He suggested that a modernized treaty use the savings from a reduced entitlement for ecosystem restoration. Suppah said he is also concerned about empty Department of State positions and the cuts in the Department of Energy. He said that when the Trump administration starts talking about “modernizing the ESA (Endangered Species Act) that gets scary for the tribes.” Suppah finished by thanking **Brian Doherty** and **Brian Nafziger** specifically, as well of the rest of the team.

Norman thanked the presenters and then opened up the floor to questions.

Question: A member of the audience asked the presenters how they think that the lack of commitment from both the Canadian and American federal governments, regarding salmon restoration, could be resolved?

Michel responded by saying that the U.S. federal government is responsible for the loss of salmon above Grand Coulee. He suggested that there is an opportunity to work through the treaty, but there is also a domestic process through the Northwest Power and Conservation Council. He highlighted that the tribes shine when it comes to fulfilling their responsibilities, which are to future generations.

Terbasket said that the ONA is working towards fish passage. Regarding the question, she said we are all responsible as we are all advocates and have the responsibility to address injustice. She also said yes, the federal governments are responsible, “but I have to go further, our leaders are going further to bring forward solutions.”

PANEL I: HYDROLOGY AND FUTURE IMPACTS

This panel focused on how the future is going to be unlike the present and the past, including the impacts of climate change on the CRT, and the predicted climate change impacts in the basin. Such impacts include the following: the increasing percentage of the basin's snow pack in Canada; the shift from snow to rain in the winter; and separate, more pronounced timing difference in the freshet (a flood caused by run off and melting snow pack) from the Snake River and the main stem of the Columbia River).

Panelists

Moderator: **Laural Ballew**, Chair, Tribal Governance and Business Management, NWIC

- **Alan Hamlet**, Assistant Professor
University of Notre Dame
- **Barbara Cosens**, Professor
University of Idaho College of Law
- **David Nazy**, Senior Hydrologist
Office of the Columbia River, WA Department of Ecology
- **Se-Yeun Lee**, Research Scientist
Climate Impacts Group, University of Washington
- **Francis Zwiers**, Director
Pacific Climate Impacts Consortium, University of Victoria

Norman reconvened the symposium and recognized the important work that goes on and the relationships that people build between the sessions. She then introduced **Laural Ballew**, the moderator of the Hydrology and Future Impacts panel.

Ballew introduced herself as a Swinomish tribal member who focuses on tribal governance with Northwest Indian College.

Presentation on the Future Hydrology of the Columbia River

Alan Hamlet started the panel with a short presentation on the Hydrology of the Columbia River, covering 500 years of paleohydrology and models that look 85 years into the future. Hamlet showed a map of the Columbia Basin and its many dams, but noted that only about 30% of the annual flow can be stored in reservoirs. In comparison, 400% of annual flows can be stored in the Colorado River Basin. As a result, he said, “we actually have relatively limited control of the Columbia.” About 50% of the Columbia storage is in Canada and about 50% is in the United States. Hamlet also noted that the Columbia River infrastructure, which has determined much of the management possibilities, is aging and will not last forever.

The second and third slides included a set of hydrographs that showed how snowmelt drives the changes in flow throughout the Columbia River system, meaning large flows in the spring and

early summer and low flows in the winter. The dams have shifted flows to the winter and lowered the flows during the spring freshet because the storage reservoirs need to be refilled. In the summer, there is also some consumptive demand from irrigation.

The fourth slide showed the record of flows: gaged flows dating back to 1878 and Railroad peak flow records dating back to 1858. In the late 19th century, Hamlet said that the region experienced “extraordinarily wet conditions.” In the 20th century, decadal averages have ranged, and there has been significant flow variability from year to year. Decadal scale and centennial scale variability are features of the Columbia River.

The fifth slide showed a reconstructed model of the Columbia River’s annual flow, using tree rings, to date back 500 years. The average annual flow for that period was about 5600 cubic meters per second. The model showed a great degree of annual, decadal, and centennial variability. It also showed that the drought of the 1930s and 1940s (the Dust Bowl) was one of the driest droughts on record. Hamlet said that the fact that we have gaged records from that drought is very useful for modeling purposes.

The sixth slide showed climate projection models for the Pacific Northwest Region: warmer temperatures during all seasons, little change in annual precipitation, wetter falls, winters, and springs, and drier summers. By 2100, the PNW could be as high as 9-10 degrees Fahrenheit warmer. These models use International Panel on Climate Change (IPCC) data.

The seventh slide included updated regional climate projections with a possible increase of 14 degrees Fahrenheit. Temperature rise could be less, depending on different emission scenarios. Hamlet noted that the models need to be updated as emission levels change.

The eighth slide depicted three maps showing current and predicted snow water equivalents. The A1B emissions projection showed a 29% reduction in snow pack and the B1 projection shows a 23% drop in snow pack. However, the models showed modest increases in snow water equivalents (SWE) at the higher elevations. There is a significant difference between the SWE response to climate change in Canada and the response in the United States. In the U.S. there is a significant predicted decrease in SWE, while in Canada, the predicted decrease is minimal. This means that the percent of the basin’s snowpack that is in Canada increases.

Slide nine showed hydrograph predictions for the 2020s, 2050s, and 2080s. It showed higher winter flows and an earlier freshet, though not necessarily a smaller freshet. It also showed flow reductions in the summer. Increased rain in the winter means increased run-off and decreased snow pack/water storage, which translates to lower spring and summer flows.

The tenth slide showed hydrograph predictions (2020s, 2040s, and 2080s) for the Kootenay, the Columbia, and the Yakima Rivers. The Kootenay River at Corlin Dam model showed minimal shifts in the hydrograph in the 2040s due to cooler weather in the higher elevations. By the 2080s, the predicted changes in the hydrograph begin to show up. In the Columbia at The Dalles, there are more significant shifts than in the Kootenay River, but the model predicts that the peak flow will still happen in the spring. However, the models for the Yakima basin predict an almost complete reversal in the flow regime with a high run off in the winter months and low flows in

late spring and summer. Hamlet noted that this is important because each place in the Columbia Basin has its own unique response to climate change.

Highlighting some key points, **Hamlet** said that: (1) centennial and decadal variability has been a key feature of the Columbia River for 500 years and that is predicted to continue. Shifts in the hydrograph can happen quickly and last for long periods. (2) The 1930s drought is one of the most extreme droughts in the last 500 years and its gage data can be used for planning purposes. (3) Climate change will have significant impacts on snow storage, with the percentage of snow storage increasing in Canada. (4) Shifts in the hydrograph will be relatively modest in the northern basin and high elevation places (Kootenay River), but will almost completely reverse in the warmer and lower elevations. (5) Climate impacts will include warmer weather in all seasons, wetter winters, and drier summers.

Panel Discussion

Topic: The Past and Future of the Columbia River Hydrology and the CRT

Ballew asked the panel, how has the hydrology of the river specifically changed since the signing of the CRT?

Hamlet suggest that recently we have seen a more variable climate than what we saw shortly after Canada and the U.S. signed the treaty, but the hydrograph has shifted only minimally.

Zwiers said that in a number of the studies that he has carried out, there is “a clear human signal” in the hydrology of the western United States. He said that there have been changes in the snow pack and that “we can attribute those changes to the human influence on the climate system.” Similar results have been found in British Columbia’s major river basins. Zwiers did note that these have not been major hydrologic changes, but that they are detectable and they have been predicted by climate models. This provides some confirmation that we can have confidence in the models that Hamlet described. Zwiers also pointed out that it is the natural flows that are being studied, not the regulated flows. He suggested that the regulated signal is probably stronger than what we would expect from the climate signal for some time into the future.

Ballew asked how the current management of the CRT might be affected by future hydrologic changes?

Cosens explained that her research group, which includes **Richard Paisley**, has looked at governance models that are flexible and could adapt to uncertain futures. She highlighted that we are looking at a less predictable future and it is difficult to be as precise in planning as we have been in the past. One new governance model might include a policy body that would “overlay” the engineering planning groups and make decisions when things happen that are outside of what is expected. That way policy changes could be made within the framework of the agreement. However, that model would also include

some boundaries for how much change the policy body could implement and a process for making those changes. She suggested that there are good models for this along the United States–Mexico border, specifically the management agreements regarding the Colorado, Rio Grande, and Rio Bravos Rivers. She said that built-in triggers for review, as well as a science policy panel would also be helpful.

Hamlet suggested that there might be an increasing conflict between Canadian and American environmental priorities. He said that Canada is focusing on supporting the lake ecosystems, which have been created because of the dam, while in the U.S., there is a heavy focus on salmon recovery and habitat restoration. Given the shifting snowpack and water storage that is predicted in the future, he suggested that there is a potential for increasing conflict over instream flows for salmon and the needs of lake ecosystems. The CRT does not have a mechanism to balance this. Hamlet said that a new governance model needs a mechanism to support the different ecosystem needs throughout the basin.

Zwiers said that what Hamlet was addressing with regard to different ecosystem priorities might be an opportunity for discussion, rather than just a conflict. With regard to climate and hydrologic modeling, he suggested that some of the uncertainty comes from the different models that are used between the different disciplines. Additionally, we do not know what the future emission path looks like. However, Zwiers was clear that there is confidence in the models and there are physical correspondences that support them. He also said the demands for water resources will probably shift in the future and we need to think about them through an economic lens. For example, the current hydroelectric demand profile peaks in the winter, but this may change significantly in the future. This means that there might be a need to release more water for hydrogenation in the summer, which is something to consider with regard to how that would impact other water uses and needs. Zwiers finished by noting that this river management discussion includes many more voices than it did in 1964.

Topic: Flexibility in Governance and Modeling

Ballew said that the regional recommendations are for a governance structure that is “resilient, adaptable, and timely as conditions warrant.” She asked the panel to address specifically what this might look like.

Cosens responded and explained that resilience means that we have the latitude to adapt as conditions change. She said that this term is being used increasingly to describe situations where there is uncertainty. Hydrology is only one area where there is uncertainty regarding climate impacts. Ecosystem impacts is another and those might be even more uncertain. She said that each time you go up in scale, from local, to regional, to international, building a flexible agreement gets harder. She said that this is because countries like to protect their sovereignty and they often prefer agreements that lay out each party’s obligations. The challenge is to figure out how to protect national sovereignty and still work together in a flexible manner. She suggested that a modernized treaty could create a science advisory team that can meet and discuss

possible future scenarios. This can help address which hydrologic track we are on, with regard to the possible scenarios that have been previously laid out. The governance model would also include a policy body that can make decisions, within boundaries, in the face of changing scenarios. If the group needs to go beyond those boundaries, that triggers a review and modification of the treaty. Then there would also have to be a process for members of the public to be involved and a process for First Nations and tribes to give input. With regard to Zwiers' comment about whether or not Canada and the United States are in conflict, Cosens said that studies suggest that both countries treat their diplomatic relations with each other differently than they treat diplomatic relations with other countries. The United States and Canada are far more likely to let problems be resolved at a lower level than have every decision go through the absolute top level of government. She highlighted that agencies work together to solve problems across the border all the time. "If anyone can do it, we should be the two countries that work this out and are able to act in a more flexible manner."

Lee introduced an optimization model, that she has been working on, that could be a new tool to manage the Columbia River system. She said that it can help balance costs and benefits. The impacts of climate change will vary across the Columbia River Basin; however, operational changes at one dam affect the overall system. This makes it difficult to adapt, but the optimization model can deal with all of the system's complexities. With a given climate scenario, the model can help adapt management for optimal benefits. Her model has figured out ways to increase power generation and add more summer flows, without increasing flood risks. She said this model would help management today and in the future.

Hamlet suggested that there is a need to regularly update models and that in a modernized treaty, it will be important to regularly come together to discuss the hydrologic changes that occurred in the previous decade, as well as ways to address those changes. He sighted the IPCC as an example or model for this type of governance framework. Hamlet said that in the future, we will learn new and important knowledge of what climate change means on the ground and it will be important to use that knowledge in managing the river. He said that we do not want to lock ourselves into a long trajectory of fixed operation rules and infrastructure that cannot be easily changed. This is what the original CRT has done. Hamlet suggested that re-optimizing the system every decade might be one way to keep the system flexible.

Zwiers said that there are different time scales we need to consider. One is the decadal scientific review, mentioned by Hamlet, used to adjust management based on new climate impact data and the emissions path that society decides to pursue. He also said that we need to consider future decisions regarding investments in new infrastructure or old infrastructure, all of which have impacts on the system. He said that decisions about infrastructure cannot be made on a decadal time scale, but rather they need a much longer term consideration.

Lee suggested that we could use optimization models to create management rules for the Columbia System. To add more flexibility and resilience to the system, she said that we

could use optimization models in a dynamic way where new management rules are created each month based on updated forecasts and storage values, all of which will continue to shift due to climate change. She also said that we need to invest in more research along these lines.

Nazy stated that one way to build in resilience is to look beyond the main stem of the Columbia River Basin. He said that there might be opportunities to capture runoff in other basins and small projects.

Hamlet followed up Nazy's point and suggested that distributed storage maybe helpful in addition to the federal projects.

Ballew read a question from the audience that said that climate change will likely lead to greater electricity demands in the summer, which will affect Canada. What is the solution to this?

Hamlet said that in the current CRT, the Canadian Entitlement is a good reward or mechanism for encouraging cooperation. Before the treaty, water just flowed across the border and there was no real decision to be made. Now there is a management decision that has to be made because Canada and the United States have invested in infrastructure. Hamlet said that if the United States needs more water during the summer, a time of the year when water is more valuable, the United States could use the compensation mechanism to pay the Canadians for sending the water south.

Cosens said that there is a group at Washington State University that is modeling storage, but their definition of storage includes wetlands, storage in groundwater, and electricity storage in batteries. She said that this starts to open up new opportunities in ways that resemble fully distributed flood control. Cosens also said that these opportunities are promising, but there needs to be more research done on these methods. These methods might also be able to increase summer flows and decrease summer water temperatures, which is another big problem that salmon are going to face.

Ballew asked a question from a student in the room regarding governance and the inclusion of tribal interests and needs. The question also asked if it is possible to work with nature, rather than manipulate it for human gain.

Cosens said that both the Canadian and American entities have expressed an interest in involving tribes and First Nations in the governance process. This has already happened in both regional review processes. She highlighted the governance models that Paisley, Mathew McKinney (University of Montana), and the tribes are working on. However, Cosens said that there are *not* a lot of really robust models for this type of governance structure and that globally, we are just starting to consider what it means that tribes and First Nations are sovereign and have a seat at the table. She highlighted the United Nations Declaration on the Rights of Indigenous People (UNDRIP) as just the start of this. With regard to the CRT, Cosens said that this would mean that Indigenous people need to be intimately involved in the planning and policymaking process. She said that once that structure is developed, it would create a mechanism for policymakers to

consider traditional knowledge. “By changing the governance, you can change the values that are reflected in governance.”

Hamlet said that the current operation system tries to reverse the flows of a natural hydrograph, but it might be possible to operate the system in a way that more closely aligns with natural flows. He said that they have modeled this and the outcome was a loss in hydropower generation, an equivalent of \$250 million dollars. Hamlet said that is “not nothing,” but considering how much money is spent on the system, and \$500 million on salmon research, operating the river in a way that resembles a natural hydrograph might be worth the \$250 million loss. He also said that in considering the cost, we have not considered that huge cost to the tribes and First Nations, and going forward we have an opportunity to work towards equity across the board.

Ballew asked a question from the audience regarding Dr. Lee’s optimization model and which needs and interests it optimizes.

Lee said that usually there is a conflict between lower flows for flood risk management and increasing flows for fish or hydropower generation. She said that the balance between these interests shifts throughout the year depending on runoff, but optimization can help balance this and it can still increase summer flows for salmon and hydropower generation. She also said that her research shows that with climate change, it would be possible to generate \$33 million more in hydropower.

Zwiers said that another way to phrase the question is “whose” cost function is being minimized? He said that these discussions have a lot to do with asking, “whose values are being respected and, in some respects, whose costs are being minimized?”

Hamlet said coming up with an objective to be optimized is a challenge in the development of these models. Hamlet said Lee “very cleverly” simplified the system so she was looking only at how deep the reservoirs need to be evacuated for flood control and if they need to be refilled. He said that this creates only two knobs to turn in the optimization process and that makes it relatively simple to use the historical flow data to balance flows for ecosystems, flood control, and power.

Ballew asked another question about flexibility. This question asked specifically about set review dates and limits to change that might trigger a review.

Cosens started by saying that it is important to be careful about asking for more reviews, given the length of the current renegotiation process, which in some respects, has not yet started. She said that you do not want to come back to the table on a frequent basis because you have affected the stability of the treaty, which is the reason for its existence. She said again that having some boundary that trips a revision of the treaty would be helpful, but a forced end to the treaty is a drastic measure. She said that she recommends review processes, which work within a framework, rather than complete renegotiations created by end dates.

Hamlet said that improved hydrologic forecasting is one way to incorporate flexibility because better forecasting will be able to better predict the future. He said that if we couple the management system to the forecasting system, as the forecasts evolve they could adjust the management system. He said that we could create a “self-tending system” that does not require regular intervention.

Topic: Traditional Knowledge

Ballew asked a question from the audience that pointed out that the presentation was based on western scientific modeling and asked if Indigenous people have been consulted as legitimate holders of knowledge regarding the hydrology of the river.

Hamlet said that he has not personally engaged elders, but he thinks that it is a good idea. Hamlet also said that he is very interested in much older data and wondered if traditional knowledge would be helpful or “explicit enough” for use in models. He said that some paleo-reconstruction models are in conflict – for example, some studies suggest that the 1840s were dry, other suggest that that time period was wet. Hamlet said that Indigenous knowledge and long-term perspectives might have a lot to add to these paleo-reconstructions.

Topic: Dam Removal

Ballew asked if removing dams, considering the age of infrastructure, makes economic, social, and/or environmental sense. The question also mentioned the Oroville dam in California.

Cosens suggested that the Oroville dam is a good example of infrastructure that needs to be removed or fixed. She also said that we will be removing dams in the future and we need to start considering that as an option. She suggested that the United States only paid for sixty years of flood control because the treaty negotiators thought that a dam’s life span was roughly sixty years. She also asked if we have really invested anything in the system since the treaty was signed.

Zwiers said that these discussions have to do with whose cost function is being given preeminent consideration. He said that the CRT was implemented in order to avoid floods like the one that occurred in 1948, which also occurred on the Fraser River, and as a result, we should think carefully about removing infrastructure that is meant to prevent flood damage. Zwiers said that despite a warming climate and less snow and spring runoff in the basin, we might still need the flood control infrastructure. He said that his research group’s studies have suggested that on the Fraser River, 10-year floods will probably decrease in size, but they do not have evidence that the historic floods will also decrease. He said that with climate change, we would be living in a warmer world, which could hold more moisture in the atmosphere and deliver more precipitation to a river basin. If the weather happens to be just cool enough to snow, there is potential for a lot of snow to fall in winter. As a result, it is not obvious that the largest extreme weather events will be smaller in the future. If flood damage is what we want to avoid, we should think hard about removing infrastructure or consider what other options we have.

Hamlet said that to date, most successful dam removal projects have occurred on privately owned dams and as a result, removal has been made on economic grounds.

Ballew ended the panel and thanked each of the panelists.

Norman thanked Ballew and each of the panelists while students from Northwest Indian College gave each panelist a blanket. Norman also thanked each of the earlier presenters.

DAY 2: WELCOME BY WWU PRESIDENT SABAH RANDHAWA

Good morning and welcome to all of our guests who are here today at Western Washington University. For the second day of our Columbia River Treaty Symposium we are honored to have you here. On behalf of Western I extend a special welcome to government representatives from Canada and the United States. And I would particularly like to recognize and welcome our tribal and first nation's guests. Thank you for being here.

As Laurie said, the symposium got off to a tremendous start yesterday at Northwest Indian College. I had the privilege of being a guest at the traditional salmon dinner, which many of you also attended, and I found it to be a moving and impactful experience.

I was humbled and honored by the blanket wrapping ceremony. I thank the elders, tribal leaders, students and others who shared their testimonies about the Columbia River: about water as a life giving, life sustaining resource for us and about the importance about connections with all life around us and among all of us and among our communities.

Western is pleased to be cohosting this event along with the special friends of Northwest Indian College. As we gather here today, I would also like to acknowledge that this place where we are convening here today, this University and this community are built on the traditional Lummi lands. For which, along with your presence with us today, we express our deepest gratitude.

The Lummi people are Lhaq'temish, the original inhabitants of this part of Salish Sea. In fact I believe that Lhaq'temish originally means people of the sea. Since time immemorial, they have sustained their way of life here by reef net fishing for the sockeye that move through the San Juan Islands and digging clams in these cold clean waters. In recent times, the Lummi have been on the cutting edge of environmental protection. A value in action that is closely shared by Western Washington University.

I was born and raised in a part of Pakistan, in fact part of Indian Pakistan's subcontinent that is called Punjab. The word Punjab literally means land of five rivers referring to the five, land of five waters referring to the five rivers originating in the Himalayan range and ultimately joining the Indus River. I understand the importance of water as a critical resource for life and culture and the impact of issues on our ecosystems.

Our host at yesterday's salmon dinner and program, tribal council chair Tim Ballew Senior said that water knows no boundaries. To his observation I would add that in my humble opinion the future of humanity is tied to the future of water, and how we use and sustain this critical resource for healthy ecosystems and for sustenance of all life. This symposium has been conducted in the spirit of those environmental values and the desire to restore the resources and traditions we have been given for future generations. Yesterday's panel on hydrology and the panels being held today on energy, ecosystem and the environment and on irrigation and flood risk management are important dimensions in shaping of policies and practices. It is our hope that the work being done at this symposium will help shape a future agreement that preserves and enhances the quality of life in this place we are all blessed to call home. Welcome all of you to Western, and best wishes for a rewarding day. Thank you.

PANEL II: ELECTRIC ENERGY

This panel focused on how the future is going to be unlike the present and the past and included the following topics: operating the energy system for a flexible grid; the impact of changes in hydropower on the need for other energies; governance; and how to manage the new hydro system (who makes the decisions, how to synchronize the U.S. and Canada, and identifying challenges).

Panelists

Moderator: **Joel Swisher**, Director, Institute for Energy Studies, WWU

- **Jennifer Boyer**, Secretary of the CRT Entity
Bonneville Power Administration (BPA)
- **Jeremy Benson**, Specialist Engineer
B.C. Hydro
- **Nicole Kapell**, Environmental and Archaeological Stewardship Manager
Ktunaxa Nation Council (KNC)
- **Scott Corwin**, Executive Director
Public Power Council

Topic: Power Planning

To begin, **Joel Swisher** asked the panelists to review the current power planning processes and to highlight the ways that they have evolved since Canada and the United States signed the treaty.

Jennifer Boyer explained that the BPA conducts two studies to optimize power generation, one model that includes the coordinated operation producers under the CRT and one model that does not include the CRT. To model this, the agencies use the second driest or “worst” stream flow on record to make sure that the BPA can meet load demand during low water events. The entities use the two studies to calculate the downstream benefit and the Canadian Entitlement. This planning process, known as the Assured Operation Plan, is done six years in advance. The entities then overlay the Assured Operation Plan with real-time plans and supplemental operating agreements.

Jeremy Benson added that the development and planning of the Assured Operation Plan (ASO) affects the calculation of the Canadian Entitlement, not the actual operation of dams. He stated that the ASO is a set of rules that dictates how B.C. Hydro operates the Canadian projects.

Boyer then responded, noting that the BPA performs instream adaptive management in conjunction with fish managers to respond to real time constraints for fish.

Swisher asked how management practices have changed since the CRT was signed, and if there is a need for adjustment.

According to **Benson**, the treaty writers anticipated increases in load demand in both Canada and the U.S., as well as changes in the economy and the forms of power production. He said the treaty and the planning process includes ways to account for changes in load and the addition of non-hydro power generation. He also noted that if thermal resources were added to the power generation system, they would operate the Columbia projects differently than if those thermal resources were not in place.

Scott Corwin responded by pointing out that economic and power supply/demand changes, in the last fifty years, have had a significant effect on the system that are used to calculate the shared benefit.

Boyer stated that the treaty authors expected a significant addition of thermal generation infrastructure, meaning that the value of the shared benefit would drop. This did not happen. She also noted the entities do have the authority to make additional agreements, but that they would like to see those agreements formalized moving forward.

Topic: Future Hydrology and Climate Change

Swisher asked the panel to address the points made in the previous day's hydrology panel, with regard to the effects of climate change on electric energy generation.

Boyer reiterated that the climate models predict that the critical water storage in the snowpack will diminish. Meanwhile, the peak load demand will probably shift from the winter to the drier, warmer summers. She stated that peak generation may not meet demand and that we are looking at becoming a "capacity limited system." Other resources may be needed to meet the peak loads.

Corwin noted that the Columbia system is increasingly important because of its large capacity value. Capacity is the ability to meet quick fluctuations in demand and balance other resources, such as renewables, that are not as predictable and harder to regulate. He noted that hydro projects are great tools to balance other resources, and in the past we have not been able to calculate the capacity value of the Columbia hydro projects.

Swisher clarified that capacity is the "instantaneous" ability to meet load demands. In the discussion of renewables, the term 'net load' is often used, which is the electricity produced by renewables subtracted from the total demand on the system. The net load is what needs to be met by the capacity of the system. He then asked the panel to address the increasing use of renewables and the interconnectedness of the western grid.

Corwin stated that the big question for the western interconnect, which includes British Columbia, has to do with the impacts of renewables, particularly new solar projects in California. In a solar power dominated system, power production peaks during the middle of the day, which does not correspond with demand that rises in the evening. Hydropower is a good resource that can help meet the gap between generation and demand, or the net load.

Kapell offered an alternative perspective and suggested that Ktunaxa Nation is interested in renewables as a way of moving away from a hydro dominated system and as a means to opening up other ways of operating the Columbia River system that would include greater ecological benefits.

Topic: Concerns Regarding the Current Treaty

Corwin explained the role of the Public Power Council, which represents multiple consumer-owned utilities. He said that from the consumer's perspective, BPA power rates have increased 30% over the last six years and are no longer the cheapest rates in the west. He said that this has had negative impacts on low-income households and that businesses who want to locate in the region have concerns as well. With regard to the CRT, he said that a new treaty must benefit both countries. From the perspective of the utilities, the Canadian Entitlement and shared benefits are no longer balanced. Corwin said there is value flowing north and that the ratepayers do not see a return benefit from a power generation perspective. He said that we need to modernize the treaty with an updated calculation of benefits.

Kapell stated that the KNC is also concerned about the distribution of benefits and wants to see better coordination regarding the management of the Libby Dam and the reservoir (Lake Koocanusa) that backs up into Canada. The KNC represents four communities that have few options other than electricity for heating their homes and as a result, they have concerns about power rates. The KNC is also interested in adding power generation to the Duncan dam. Kapell emphasized that in the construction of the four Canadian dams under the CRT, the local native and non-native communities have carried a heavy burden and covered many costs. The upstream flooding has made previously productive land unproductive, and the costs of this reoccur every year. She stated that the KNC does not see the shared benefits that go to the B.C. government and the people of the KNC only see larger power bills.

Benson briefly introduced B.C. hydro, which provides power to 95% of the province. He noted that there are two Canadian organizations with roles in the treaty. One is B.C. Hydro, which is in charge of implementation, and the second is the provincial government, which receives and sells the downstream benefit, the value of which goes back to all the residents of B.C. through general revenue. Benson then noted that in the last twenty years, there have been significant changes to the way that B.C. Hydro manages dams and reservoirs, and that local communities in the Columbia Basin have driven these changes. One example is the Water Use Planning Process, which balances numerous interests. This led to the supplemental operating agreement regarding fish flows. Benson noted that both Canada and the U.S. attempt to balance interests independently of the treaty and that he suspects that some of the discrepancy between the received benefits and the actual value of the entitlement is due to downstream re-regulation that has nothing to do with Canada.

Corwin responded by saying that yes, some discrepancy comes from re-regulation. The theoretical conditions that are used to calculate the entitlement do not “comport with reality.”

Boyer answered the question by saying that the treaty has worked well, but that BPA would like to see a more equitable sharing of costs and benefits. She suggested that a new treaty needs to be “adaptable” and “resilient,” and include measurable results so planners can measure progress. She also noted that there is a lot of uncertainty regarding the meaning of called-upon storage, which takes effect after the expiration of the assured flood control provision in 2024.⁵ According to Boyer, this uncertainty is causing trouble for the Army Corps of Engineers in particular.

Topic: Modernized Coordination and Modeling

Swisher asked the panel if they could envision an improved form of coordination, assuming that we can better understand future dynamics. He asked if it is possible to create more benefits minus costs.

Benson responded by pointing out the values are changing. Less snowpack means that the existing water storage would increase in value and that ecosystem function has added new values to that water as well. He said that we need to look at the management of the Columbia from a systems perspective because everything is connected. He also suggested that if we want to do more for ecosystem function, or other non-treaty uses, we need to ask for less from a power generation and flood control perspective.

Corwin suggested that we do need to look at “enlarging the pie” or increasing efficiency.

Boyer highlighted the strong cross-entity coordination that is already happening. She said that there is a group that negotiates weekly and daily on flows coming out of Canada.

Swisher asked if there is a role for university scientists.

Benson highlighted the work that Dr. Francis Zwiers at the Pacific Climate Impacts Consortium (University of Victoria) is doing for B.C. Hydro. He said that B.C. Hydro needs help with ecological and fish-focused modeling.

Kapell said the First Nations have been working closely with B.C. Hydro on what a future system could look like, drawing on both western science and Indigenous knowledge. She noted that these opportunities could be built on in the future.

Corwin echoed Kapell noting that the tribes have a lot to offer with regarded to modeling. He highlighted the Columbia River Inter-Tribal Fish Commission among the Upper Columbia United Tribes.

⁵ The United States paid Canada \$64.4 million for “assured” use of 8.45 MAF of Storage. This provision of the treaty expires in 2024.

Boyer noted that under Brian Doherty, the Columbia River working group has been formed, which includes NGOs, tribes, irrigators, and “just about everybody.”

Topic: Supplemental Operating Plans (SOP)

Swisher asked the panel to address the SOPs, their timescale, and specifically their role regarding ecosystem function.

Benson said that the entities sign the non-power use agreement annually; but it changes little from year to year.

Topic: Governance and Management Suggestions

Kapell emphasized that the KNC wants to be, and has an established right to be, part of the Columbia River governance structure.

Corwin said that there needs to be clarity around how flood control is paid for. He noted that there was an initial payment, but now the U.S. pays for the downstream benefit by moving power north. The new treaty needs to look at who pays and who benefits geographically. According to Corwin, the mid-Columbia utilities pay 27.5 percent of the Entitlement, but see none of the benefits from flood control. However, he also noted that this doesn't have to be looked at as an impassible issue, but rather as an opportunity to bring people together as a “package,” as was done with the regional recommendation where various interests can work together.

Swisher added a question from the audience about how renewables are and could be included into governance and management structures, as well as a question about revenue streams being invested back into the region to offset ecological costs.

Boyer suggested that the calculation for the Canadian Entitlement needs be revisited. It does include the addition of wind energy, but she said that it is very sensitive to small changes and it is cumbersome to calculate. She said it would be helpful if the calculation were simplified and more precise.

Benson reemphasized that the Entitlement revenue goes into general funds for the province, though he noted that somebody from the B.C. government could speak to that more in detail. He also pointed out that the province does fund numerous environmental initiatives specific to the Columbia Basin. Two other Crown corporations that work within the Columbia Basin: the Columbia Power Corporation and the Columbia Basin Trust (CBT). The purpose of the CBT is to return some of the benefits from the Entitlement specifically to local communities.

Corwin again said that there needs to be a net economic benefit from a power perspective and that the Trump administration will probably not negotiate a treaty that does not have a power benefit for the United States.

Topic: Effects of Energy efficiency and Demand Management

Swisher noted that on both sides of the border, the hydro industry has been innovative in using efficiency as a resource, which has helped moderate the load growth. He asked the panel to address efficiency and demand response/storage as a way of “enlarging the pie” to offset load growth going forward.

Corwin reemphasized that the writers of the treaty did not foresee the increasing integration of the western interconnect, made possible by computers that balance the system down to the second. New developments in technology, efficiency, and renewables will continue to affect the management of the system.

Kapell commented on the use of the term “enlarge the pie” and stated that we need think about limits instead of growth, saying “sorry kids, this is all the pie we have, this all we can do, and you have to figure out what to do within that.” She said that this relates to efficiency and the B.C. Hydro’s program Power Smart is a good example but it needs more funding.

Swisher agreed that physical resources are limited.

Topic: Additional Comments regarding modernization of the treaty

Benson highlighted that the flexible structure of the current treaty has worked well. The writers of the original treaty knew that they could not predict the details of the future so they built in flexibility. He said that negotiators need to consider flexibility in a modernized treaty, pointing out that we do not know what is going to happen with California markets and with loads in the future. Benson said that we need to be “humble” about the fact that we cannot forecast everything. We need a new treaty to be adaptive to the cultural values that are running the system as well as the physical changes that we expect to happen.

Boyer agreed with Benson that the writers of the original treaty were wise to build ambiguity into the treaty. “We need something that is going to be flexible and adaptable, yet provides us some planning certainty...that is the crux of the problem.”

Kapell reiterated that the KNC values the Columbia system as a good source of renewable, low carbon energy and that moving into the future we just need to balance the impacts.

Corwin echoed the need for flexibility and highlighted that the treaty, despite its shortcomings, has been a good partnership between both nations. Thus far, there has been

a lot of good local/ regional work, for example the Regional Recommendations. He said that it is now past time for the Federal governments to move forward on this issue.

Swisher closed out the panel and turned it over **Laurie Trautman** and **Emma Norman**.

Norman introduced Bachelors of Science students from Northwest Indian College. They gave a blanket as a gift to each of the panelists and the moderators and gave thanks to each of them, saying Hy'shqe for their words. She also acknowledged WWU President Sabah Randhawa's comments at the opening of the second day of the symposium, highlighting that it was the first time a president of WWU acknowledged that the university was on Lummi territory.

PANEL III: ECOSYSTEMS AND ENVIRONMENT

This panel focused on how the future is going to be unlike the present and the past and included the following topics: reconnecting flood plains, preservation of wetlands, balancing reservoir operations and flows across the basin for sustainable systems, restoration of fish passage and habitat, and recognition of recreation opportunities.

Panelists

Moderator: **Steve Hollenhorst**, Dean of Huxley College of the Environment, WWU

- **Paul Wagner**, Fisheries Biologist
NOAA
- **Cindy Pearce**, Executive Director
B.C. Local Governments' Committee
- **D.R. Michel**, Executive Director
Upper Columbia United Tribes
- **Jim Heffernan**, Policy Analyst
Columbia River Inter-Tribal Fisheries Council
- **Pauline Terbasket**, Executive Director
Okanagan Nation Alliance
- **Jim Waddell**, civil engineer
U.S. Army Corps of Engineers (retired), damsense.org
- **Greg Haller**, Conservation Director
Pacific Rivers
- **Larry Weis**, General Manager and CEO
Seattle City Light

Steve Hollenhorst asked the panel to introduce their own work and their organization's involvement in Columbia River governance.

Jim Waddell introduced his work experience with the Army Corps of Engineers and damsense.org, a group of current and retired federal employees that do studies on the lower Snake River dams.

Cindy Pearce represents the B.C. Local Governments' Committee, which has organized local residents. She noted that they have engaged local communities in the U.S., who initially knew little about the treaty, but those communities are now engaging in the governance process. One of the committee's main recommendations moving forward is "meaningful and ongoing engagement" with local efforts.

D.R. Michel said that he had never lived more than ten miles from the Columbia until he took his current job with Upper Columbia United Tribes (UCUT), which represents five tribes in what he calls the blocked area of the Columbia (where Salmon passage has been blocked). This group includes the Confederated Tribes of the Colville Reservation, the

Spokane Tribe of Indians, the Coeur d' Alene Tribe of Indians, the Kalispell Tribe of Indians, and the Kootenai Tribe of Idaho. UCUT hopes that a modernized treaty will include multiple concerns: economic (including underemphasized economic values such as salmon), environmental, and cultural. He also stated that they want to “return the salmon home,” and provide opportunities that have been taken from the tribes.

Jim Heffernan introduced Columbia River Inter-Tribal Fisheries Council (CRITFC), which represents the Nez Perce tribe, the Confederated Tribes of the Umatilla Indian Reservation, the Confederated Tribes of the Warm Springs Reservation, and the Confederated Tribes and Bands of the Yakama Nation. He noted that the tribes have treaty rights to fish, which means there have to be fish to catch and that includes a habitat component. These tribes want ecological issues, specifically fish passage, to be incorporated into a modernized treaty as a key component.

Greg Haller introduced Pacific River, a conservation group that works on land-use issues that affect rivers.

Pauline Terbasket is from the Okanagan Nation, which is a transboundary nation that does not recognize the 49th parallel. She said that her group works to assert their sovereignty, title, and rights. She highlighted that British Columbia is not a treated landscape and “without a treaty, we have never ceded our rights to our territory and the right of our people to assert their jurisdiction, particularly our chiefs and leaders, over the management and jurisdiction of our resources.”

Paul Wagner said that NOAA fisheries produces biological opinions about the 13 salmon species that are listed as endangered. As part of this, they come up with flow standards for the river that they try to achieve during the season. One of their major goals is to improve flows at critical times to help aid the return of salmon.

Larry Weis introduced Seattle City Light, the second largest (to the BPA) customer-owned power company in the U.S. He said that City Light participated in the regional recommendation. Weis pointed out that City Light has had success with habitat restoration and salmon recovery on its Skagit River projects.

Hollenhorst asked the panel to more explicitly explain the issues that are of particular concern for the communities they represent.

Wagner explained that under the treaty, it is assumed the reservoir and flows will be managed in a way that optimizes power generation and flood control. This means that dam managers draw the reservoir down all the way and then fill it all the way back up in the late spring. During the refill period, this causes a deficit in the river as water flows just to the reservoir. Now, NOAA fisheries has mandated that water must be spilled in the spring runoff and water must go to the river and the reservoir. Wagner said that it is concerning that Canada has no such stipulation and that one of his biggest concerns was avoiding deep draft. A stable Arrow reservoir would help avoid this deep draft.

Heffernan also stated that reservoir refill is also a significant concern for the tribes. The purpose of the CRT is to suppress the spring and early summer freshet and move the flood from downriver to upriver. Heffernan stated that “people are overly concerned about flooding.” Flows at 1,000,000 cubic feet per second (1,00 kcfs) at The Dalles are problematic, but flows of 450-550 kcfs are healthy for the river ecosystem and for fish. When you flood upstream, you damage upstream ecosystems.

Pearce referred to a handout with photos of the Canadian reservoirs during the spring draw down. She said that almost 90% of the Columbia River is flooded and there is a little more than a quarter million acres of land under those reservoirs. Four lakes were also flooded, which she said are deeply missed by local residents. Pearce also noted that dry year operations are also a challenge due to the reservoir draw down for hydro purposes. The Duncan and Arrow dams are drawn down almost all the way, because Arrow has only a small generation station and Duncan does not have one. Meanwhile, Lake Roosevelt is not drawn down because Grand Coulee generates huge amounts of power. Upstream, the wetland surrounding the Arrow reservoir dries out; there are huge ecosystem impacts in Canada and then nothing downstream across the border.

Michel argued that one of the biggest challenges is the politics. He said that people have looked at ecosystems as a cost to hydropower generation and flood risk management, but really, when we develop those benefits, it comes at a cost to the ecosystem. We only consider some economic opportunities (power and flood control) and overlook the people who the current structure affects the most. Michel called on the people who have the ability to play the political game and they need to consider people’s perspectives. Michel also said that we need to move beyond the us-versus-them mentality because we can have functioning ecosystems, provide fish passage, manage flood risk, and still have cheap electrical rates.

Waddell started by asking, “where is the ecosystem?” He said that this ecosystem extends out as far as the Aleutian Islands and is part of our ocean fisheries; it feeds marine mammals, including endangered orcas in the Salish Sea. According to Waddell the treaty has facilitated the belief that the dams are “immutable or mandated in law.” He argued that they are not. The federal government built the dams to develop the economic well-being of the country under the assumption that the costs would not exceed the benefits. He said that if a project is no longer economically viable, it should not continue, because it is no longer meeting its federal objective. Waddell pointed out that this is inherent in the Water Resource Development bills for the Army Corp of Engineers (ACE). He said that the ACE and Bureau of Reclamation have a fiduciary responsibility to take corrective action when projects are not meeting their objective. He said that the northwest mindset is locked into the current system. He also noted that in the last twenty years, society has added ecosystem function and environmental concerns to the federal objective and that needs to be considered as well. Waddell pointed out that there is a lot of talk about managing the river as a system, but we can and should assess each project independently because not all dams are equal. He finished by saying that we are running out of time for salmon recovery and that he has a hard time with the notion of patience since he feels that salmon recovery is an urgent issue.

Terbasket stated that the “Columbia River Treaty has wreaked havoc on our peoples.” Some of the Columbia Tribes have no access to salmon. “We have a longer climb.” She said that we need to take a social-cultural perspective when analyzing the issues. We cannot simply talk about the flows needed for fish, or for power, or for flood control. Terbasket made it clear the ecosystem does not mean only biology, but is a marriage of culture and biology. The ecosystem is not just the salmon, “it’s the people.” She said, “We are losing our language. We are losing our way of life.”

Hollenhorst asked what ecosystem function is and what ecosystem services are.

Haller said that ecosystem benefits, or services, flow from ecosystem function. “If you don’t have a functioning ecosystem, you can’t derive the benefits.” Haller also said that all the benefits, including power and ecosystem services, stem from what was once a free flowing river. With regard to salmon, Haller echoed Waddell, pointing out that we have a resistance to change, thanks to the built infrastructure, including dams and development in the flood plain. He stated that many of the issues we are concerned about require more action beyond just the treaty. He also argued that the treaty is part of a large puzzle and if we want to restore ecosystem function, we need to talk about fish passage at Grand Coulee and the Hells Canyon complex, removing dams on the lower Snake River, and moving people out of the floodplain.

Heffernan said that the term *ecosystem function* came from the tribe’s caucus and it is distinguished from the idea that ecosystem services are something people derive from the Columbia. He said, “the Tribes don’t view the river as a service...it is wrong for us to just think of taking something from the system without giving back.” One problem is that people monetize the term *ecosystem services*. He said that the clean water, the salmon, and the other first foods are priceless resources that the tribes have a responsibility to protect for future generation. Heffernan noted that this means you would have to value these resources with compounding interest into infinity, which means that they are priceless resources. He argued that the CRT’s focus on flood control and power generation has had a negative health impact on the tribes that have lost access to the first food.

Topic: Salmon Returns

Hollenhorst asked the panel how current salmon runs compare to twenty years ago. He asked how we know if we are meeting our recovery objective, and if we are meeting it.

Waddell stated that the American federal government has spent \$1 billion on the mitigation efforts for the lower four dams on the Snake River and there has been no improvement in Smolt-to-Adult Return Ratios (SARs). From 2015 to 2016, every stock was down from the previous year and the ten-year average (except for Idaho Sockeye, because the 2015 run was so low). He said there is a real urgency because 16 years ago geneticists reported that there were 17 years before the genes in wild salmon would run out. Many of the fish returning are hatchery fish, which have lower SARs than wild fish.

Wagner countered by noting that there have been improvements and that the size of some of the current returns are the highest since 1938. He said that there were one million fall Chinook swimming past the Bonneville Dam in 2014 or 2015. He noted that not all Columbia River salmon are listed under the Endangered Species Act. In 1992-1993, there were 2,300 wild salmon returning up the Snake River and in 2015 there were 9,000 fall Chinook (wild fish) spawning in the Snake River. He said that the total returns in 2014 were 60,000. However, the sockeye salmon had a difficult time in 2015 due to the high water temperature during the month that they migrated. Meanwhile, the spring Chinook did okay and the fall Chinook did “very well.” Certain species are affected by temperatures in different ways. In the 1960s and 1970s, before the Snake River dams were built, there was on average 55,000 Chinook salmon returning each spring. In the past ten years, there have been 90,000, but there has been a shift from wild fish to largely hatchery fish. Wagner said that overall, the salmon return highs are higher and the lows are higher. “We have seen progress” and one million fall Chinook is “remarkable.”

Michel responded by arguing that to get current returns to really improve, we need to change the way we are running the system. He said we need to get the salmon over the Chief Joseph dam and the Grand Coulee dam to habitats that can help improve those numbers. He said the salmon are resilient and still looking for a way around the dams. Michel also said, “We have an obligation to future generations to make those changes that are necessary to ensure that we all have those opportunities, we all have those economic benefits... For thousands of years the tribes shared those resources among themselves and amongst the settlers and the folks that came in... we always share and to this day that is still our philosophy.”

Heffernan provided some context for the fish return numbers, noting that 30 million sockeye used to return to the river and recent returns of one to two million fish is a “drop in the bucket.”

Topic: A Modernized Treaty

Hollenhorst asked the panel what a modernized treaty that includes ecosystem function might look like.

Heffernan said that ecosystem function needs to be a required starting point of a modernized treaty. More specifically, he said that if water years are broken down into five quintiles – low, moderate-low, moderate, moderate-high and high – the treaty should restore some of the natural flows to the river during the spring and early summer freshet. During low and moderate-low water years, 3-6 Million Acre Feet (MAF) should be spilled in the spring and early summer to push fish down the river to the ocean and help restore health to the estuary system. He called this a “surgical strike,” rather than a massive change. He also said that in the planning process, which looks at the critical water year, we must look at ecosystem needs as well. According to the Northwest Power Planning Council’s seventh energy plan, the region is looking at flat load growth through at least 2028 and we should not assume, as the writers of the original treaty did, that load would increase exponentially.

Hollenhorst asked if the non-power use agreements are sufficient to reach these objectives. Various panelists responded by saying “no” and “maybe.”

Heffernan responded by saying that the Supplemental Operating Agreements and non-power agreements have worked to a point. They have added 1 million acre feet (MAF) to the spring and early summer and add an additional .5 MAF in dry years, but he noted that this is the most that these agreements can do. One roadblock that is holding up the effort to move 3-6 million MAF to the spring is the permanent engineering board, which can overrule what the entities agree on regarding these agreements. The board is restricted to optimize hydropower and has overruled past agreements. In 1982 the tribes, the state agencies, and the federal agencies agreed that it would be a good idea to move more water to the spring for fish, but the permanent engineering board overruled them.

Pearce said that a new management system might look a lot like the Arrow scenarios put forward in the document [Arrow Lakes Reservoir Mid-Elevation Scenarios](#).⁶ The document describes a relatively stable lower level for Arrow with a freshet bump in the years that need it. She wants to avoid a situation where the Arrow reservoir is very low in dry years. She said that dry year operations need to be addressed because the current system is detrimental to both ecosystems and economies; tourism is significantly impacted by low water levels at Arrow. A new treaty should also have a way for everyone along the river to be engaged in the governance process. Pearce said that the Columbia River means a lot more to all the people who live along it and it is more than just a source of power and flood control. She said that currently, there is no local government involvement in the non-power agreements and that needs to change.

Wagner reemphasized that climate change is part of the future and another sixty-year treaty is a long period given our current uncertainty. He suggested a shorter treaty that is adaptable. He said that we have predicted warm summers and drier winters, but the changing weather patterns and the timing of weather events is something that we cannot predict. He is worried about the increased unpredictability of runoff from events such as snowstorms followed by huge warm-ups.

Terbasket noted that a new treaty must consider all the economic benefits of the river, but that does not simply mean that the fish and clean water are a commodity. She also reemphasized that the First Nations in B.C. do not have a treaty with Canada and that their claims to land and water are still legitimate. Terbasket said that, “There are multiple governments that claim our land, claim our resources, and claim how Indigenous people should integrate into that system.” She also said that we must return salmon to the upper river and that ecosystem concerns are not just about biology, but also about culture. Regarding the dry year of 2015, she stated that it had a significant negative social impact. “When you use [the term] *ecosystem*, when you frame it that way, that is who I am. That is everything about who we are. You can’t separate it out. You can’t put it over in a neat little box.”

⁶ This document is available on the Symposium’s website. <https://wp.wvu.edu/crt/>

Haller added that the U.S. regional recommendations made a call for a domestic review of flood risk management. He said that this review is needed to find the opportunities for additional flows in low flow years. He said we are currently managing the river too conservatively.

Heffernan said that the tribes still want to see some measure of assured storage in Canada, but we need the review of flood risk management. Heffernan said that the big floods of 1948 and 1894 are not going to go away with climate change and we need to think about the location of development along the Columbia River. He said adding coal and oil terminals in the flood plain in Portland “scares me.” It may be cheaper in the long term to move people and infrastructure out of the flood plain and to avoid the risk of a major environmental cleanup by keeping oil and coal infrastructure out of the flood plain to begin with.

Hollenhorst asked **Weis** for the perspective of the power industry and if there are good models to look at.

Weis offered Seattle City Light’s climate change adaption plan as a model. He said that we need more studies on the range of climate change impacts

Topic: Monetizing and Counting

Hollenhorst asked how we count or monetize ecosystem benefits, and if we should.

Wagner stated that fish have many more “attributes than what is captured by a dollar figure.” He listed the intrinsic, cultural, and life values of the river. He stated that money is a value, but monetizing is not necessarily the right value.

Haller countered and said that we need to monetize to push back against the economic arguments that we cannot afford to invest in ecosystem function.

Waddell said that it is better to “flip the question” and ask, what is the cost of *not* implementing ecosystem function? He suggested that we look at the river first and then ask, what are the costs of implementing flood control and hydropower to the ecosystem and cultural values of both native and non-native people?

Pearce highlighted that counting is also key in the collaborative modeling work. She said that a new treaty must set the right performance measures so that models are appropriate for the planning process. Many of the current performance measures are not broad enough in scope as they are constrained by the narrow focus of the current treaty.

Topic: Governance Structure

Hollenhorst asked if the Permanent Engineering Board (PEB) is sufficient from a governance standpoint or if another entity is needed.

Heffernan argued that in the process of developing the six year Assured-Operating Plan and the other operating agreements, the PEB does not include all the necessary parties. He said that a modernized treaty should expand the entities to include additional sovereigns – states and tribes. The Pacific Salmon Treaty (1985) which replaced the old and narrow Sockeye Convention might be an example. He also suggested that panels of stakeholders could be added to advise the entities and the technical committees could be expanded as well. He also noted that another alternative is a basin-wide structure outside the treaty process

Haller said that there should be an ecosystem representative on the PEB or as part of the entities.

Heffernan suggested that we are trying to do a lot with the treaty and if we cannot do that, a basin-wide commission is a good alternative. He said that the tribes and First Nations have already been talking about this with the University Consortium on Columbia River Governance. Heffernan suggested that a basin-wide commission, in addition to the treaty, could be a lot more comprehensive and deal with issues that the treaty cannot – monitoring toxins, water quality, invasive species, etc.

Hollenhorst, drawing on Heffernan’s point, asked if we are asking too much of the treaty?

Wagner said that there are many overlapping issues that need work and that the tribes should get a lot of credit for the progress that has been made to address a wide range of issues that have helped revitalize the fisheries.

Michel closed the comments by saying that home is the Columbia River and that that is not going to change. He said that often we frame the treaty talks as us-versus-them, Canadian benefits versus U.S. benefits, upstream benefits versus downstream benefits, and that doing this is problematic. Michel said that we have a new opportunity to change that direction and make a better future for all people. He said, “We are all in this together.”

Hollenhorst turned the microphone over to **Trautman** and **Norman**.

The Native Environmental Science students, including **Johnny Buck, Richard Jefferson, Sonni Tadlock, Daniel, and Althea Wilson** gave blankets as a gift to each of the panelists and the moderators and gave thanks to each of them, saying Hy’shqe for their words.

Norman recognized Wilson who made the cedar bracelets for all of the symposiums attendees.

PANEL IV: IRRIGATION, NAVIGATION, AND FLOOD RISK MANAGEMENT

Moderator: **Don Alper**, Professor Emeritus, Border Policy Research Institute/Political Science, WWU

Panelists

- **Derek Sandison**, Director
Washington Department of Agriculture
- **Kristin Meira**, Executive Director
Pacific Northwest Waterways Association
- **Phil Rigon**, Deputy Director
Department of Natural Resources, Yakima Nations
- **Jay Johnson**, Chief Negotiator and Senior Policy Advisor
Okanagan Nation Alliance
- **Bill Owen**, Flood Control Director
Multnomah County Drainage District

Dr. Don Alper asked each panelist to introduce the major concerns of the organizations or communities that they represent.

Kristin Meira started by giving an overview of the navigation industry that has developed since the signing of the CRT. The Columbia is the top U.S. export gateway for wheat; half of the U.S. wheat export leaves via the Columbia. The industry is also the top West Coast exporter of mineral bulks and wood products. She explained that deep draft (ocean going) ships travel 105 miles inland to Portland and Vancouver. There is also a 14-foot barge channel up to the Tri-cities and up the Snake River to the port at Clarkston, WA/Lewiston, ID. There are eight lock and dams in the system. Meira said that the top concern for the industry is how negotiators might incorporate flexibility in a new treaty. She also explained that the industry has grown significantly in the last fifty years and that her organization is looking forward “to more” growth.

Derek Sandison echoed Meira as he pointed out that barges transport many agricultural products down the river, and as a result, navigation is extremely important to the agricultural industry. He highlighted that one major concern for the \$11 billion agriculture industry is the future “stability” of the water supply for irrigation. He also said that the industry is concerned about water levels for irrigation pumps. The industry wants to continue to draw water from the Columbia River and potentially it will need more water in the future, as the demand for food products increases globally.

Jay Johnson highlighted that his organization is very concerned about ecosystem function, which means the river, the salmon, the flows for salmon, and the relationship between salmon and communities. For Indigenous communities, this also means food security. Johnson noted that today, mitigation of impacts is a subject that has not been discussed a lot and it should be. With regard to governance, Johnson highlighted that Indigenous and non-Indigenous communities need to be included in discussions

regarding operations and flows. He also echoed Pauline Terbasket and asserted that economic benefits from river management need to flow specifically to local communities.

Bill Owen explained that the Multnomah County Drainage District provides drainage for four “bathtub” basins in the north Portland Metro area. It also maintains levies along the Columbia, Sandy, and Willamette Rivers and ones for which its critical mission is to provide flood control for Portland.

Phil Rigdon explained that the Columbia is an important place and that his ancestors have lived near it since time immemorial. He said that the ability to live lives along the river is at risk. Without that salmon, their brothers and sisters in Canada cannot live their history. He said that his people’s culture is linked to the water and the fish and that is part of the reason why the tribes have taken a lead in the scientific study of salmon. Rigdon also said that this issue should not be viewed as “environment-versus-man,” rather it is man-versus-man because there are social impacts and questions about the distribution of those impacts. Rigdon argued that Indigenous people have continued to carry the biggest burden in the basin. He also said that the first economy in the river basin was focused on salmon, the trade and commerce of which is a major part of the history of the region.

Topic: Flood Risk Management

Alper asked the panel if we need as much flood storage as we have now.

Rigdon responded by saying that we talk about a changing hydrograph in the future, but the hydrograph has already changed. He said that reservoir storage should not be the first flood control option and that we can do a lot by restoring flood plains and other habitats.

Owen noted that his organization focuses on the Portland area exclusively and he would like to see a study regarding this issue throughout the whole Columbia Basin. He said that his organization is focused a lot on the Willamette and that the Columbia system can help avoid major flooding on the Willamette by holding water back upstream of the Portland area.

Sandison suggested that we cannot look at flood risk management in a vacuum because we have to understand the other biological objectives/needs of the river. He also noted that a post-2024 called upon system is “scary” for both water supply and for fish. He said that in a called-upon system, we would draw reservoirs down even more than we do today. With regard to the question of storage, Sandison said that he is not sure that we need the full 8.9 MAF, but some level of assured storage is appropriate and needed.

Johnson said that we do need to recognize the success of the flood control aspect of the current treaty. However, he said that its success might have led to some bad policy and more infrastructure in the flood plain than is wise. He said that going forward, we need an open conversation about what development is in the flood plain and to analyze what we are actually protecting. For example, are we protecting park benches, parking lots,

homes, or other real infrastructure? He said that he is not sure if the analysis exists, but we need to consider the value of infrastructure and consider it if we want to double down on our investments in the flood plain.

Meira emphasized that the navigation infrastructure and economy grew up around the current flood control system. She said that the KCFS levels at The Dalles matter a lot to the shipping lanes and the ability to navigate safely on the Columbia.

Alper asked a question from the audience: If water were not available in the needed quantities, what would be the impacts on navigation and irrigation?

Meira said that in 2014, 9 million tons of cargo moved on the inland part of the Columbia system. Without barging on the Columbia, it would take 371,000 trucks, or 96,000 rail cars to move the equivalent in agriculture cargo. She highlighted that a called-upon flood control system “would have a significant impact on growers and other producers in the PNW and their ability to compete in extremely competitive overseas markets.”

Sanderson also pointed out that the original treaty acknowledged irrigation as a significant use of the river.

Topic: Climate Change – Irrigation, Flood Control, Navigation

Alper asked the panel to address the impacts of climate change on navigation, agriculture/irrigation, and flood risk management.

Sanderson responded by pointing out that the predicted climate impacts are different on the main stem of the river than they are for the Snake River. He said that we would see longer growing seasons and warmer temperatures, with some increases in water use for crops. He said that the Snake River might experience more extreme peaks in the early part of the year and potentially lower flows later in the year. In general, the impacts may be a more dynamic system on the Snake River basin than on the upper/main stem of the Columbia.

Meira suggested that there are concerns regarding higher and faster flows, which make it harder to run barges and deep draft ships in a safe manner. She said that later in the year, there is a concern that the water levels could drop below the 43 feet needed to operate deep draft ships.

Owen said that on the west side, they are not just worried about spring and summer flows, but also the flows from November through early February. He said that from a flood risk management perspective, his organization is concerned with rain on snow events, particularly on the west side where they would need the Columbia to hold backwater.

Johnson said that he does not think there is enough flexibility built into the treaty to deal with the significant changes that are expected. He pointed out that there is an extra 5 Million Acre Feet that is managed simply as a business agreement between B.C. Hydro and BPA. He said that this offers a lot of flexibility with regard to storage that is not part of the current CRT. Johnson also said that we should think about irrigation within the CRT as the removal of water from the Columbia for food production and how that relates to ecosystem function. If we think about this in a comprehensive manner, we will probably develop a more “holistic” and “sustainable” management system. He said that people in Canada often tell him that we cannot control what is happening on the other side of the border, specifically regarding flows for salmon. He emphasized that this is an opportunity for people from both countries to influence domestic policy on both sides of the border.

Topic: Navigation and Flows

Alper asked what types of flows hamper navigation and what types of flows would improve navigation?

Meira said that ideally, the river would be managed with a nearly flat hydrograph to avoid draft restriction from both high and low flows. She was also clear that this would have other significant consequences, specifically for fish. The navigation system has developed around a system focused on multiple uses of the river and Meira said that this is important. Currently, if the river is running high and fast, the barge tows go from four barges down to three barges, and then will stop running if there are navigation and safety issues around the locks.

Topic: Storage – Surface water and ground water

Alper asked the panelists to speak to the relationship between ground water and surface water in the Columbia Basin.

Sandison said that the Columbia Basin project is the largest irrigation project in the United States. Irrigators divert between 2.7 and 2.8 MAF from the river per year. Sandison said that total use has gone down recently, despite an increase in irrigated acreage. He said this was due to efficiency measures. He said that with regard to groundwater, Central Washington and North Eastern Oregon (near Umatilla) both have a problem with the overuse of groundwater. He said that in Washington, there is a large aquifer, west of Moses Lake to Spokane and that this is the most significant area of groundwater decline in Washington. This aquifer is very old, it is not being recharged, and it is a result of the Missoula Flood. He said that the Department of Agriculture started the Office of the Columbia in 2006, partly in response to groundwater overdraw.

Alper asked the panel if we could utilize the smaller, non-federal storage projects that exist within the basin, in addition to the major federal projects.

Sandison said that there is actually not a lot of off main stem storage capacity. The Yakima basin has the most with about 1 MAF, but Lake Roosevelt alone has 6.4 MAF of storage.

Rigdon addressed the Yakima Basin, where there are five reservoirs, but they also have water use and treaty agreements so he said that changing them would be very complex. He said that we should think about other forms of storage, such as groundwater storage, and smaller projects, but the downside is that all of those projects also cost money.

Sandison responded by saying that the State of Washington is actually pursuing groundwater storage near the river that could be used to store water during high flows. However, the largest of these projects can capture around 70,000 Acre Feet but the lower Columbia can pass 500,000 CFS for weeks at a time. This means that there is a scale issue with these storage projects.

Johnson said that Sandison and Rigdon are doing the right thing by thinking outside the box. He also noted that in the Okanagan, there are non-managed derelict high country dams that have created a safety risk. He said that we should discuss what is going on in the tributaries and in the backcountry, in addition to what is happening along the main stem. Johnson said that it might make sense to keep these issues separate from the CRT, but we should include them in the discussion of the treaty.

Topic: Collaboration and Ethics in Governance

Alper asked if organizations or agencies are sharing best practices and doing collaborative work and pilot projects together.

Sandison said that he does not think there is a lot of collaboration between the U.S. and Canada or Washington and B.C. He did say that there has been a lot of focus on this type of collaboration between Washington and Oregon and there have been good results, but we need that type of collaboration across the Columbia Basin.

Bill Owen said that there has been a fair amount of information sharing regarding levy removal pilot projects, but more collaboration could be done as well.

Alper asked what the barriers are to this type of collaboration, particularly with regard to the pilot and demonstration projects.

Rigdon, said that tribes, on both sides of the border, are working together and leading the way with regard to innovative restoration science. He cited collaboration between the Okanagan Nation, the Colville Nation, and the Yakima Nation, on salmon restoration projects as an example. Together, they worked to reintroduce salmon to the Yakima basin and Lake Cle Elum. He said that they used all their own resources and as a result, the process was similar. It was one sovereign to the other and they did not have to go through

the state or national Environmental Protection Acts. He said that this project worked because of their strong relationship with their “brothers to the north.”

Johnson suggested that there are many formal and informal relationships and that some of them are very deep. He said that the Okanagan National Alliance’s technical staff is crossing the border every week to advance their interests. Johnson said that on the formal side, the CRT discussion is an opportunity to structure more formal engagements between actors.

Alper said that this is an important and interesting discussion because institutions are critical. “Often the precursor to institutions is culture,” he said, “A cultural understanding, commonalities, and interactions is extremely important before you can build anything.” In his view, the First Nations and tribes are ahead of the curve on this type of relationship-building. He called on the audience to explore what type of barriers are inhibiting both formal and informal interaction between the non-Indigenous communities. Alper also said that when morals and ethics are introduced to policy discussions, it is easier to get buy-in than it is with “hard” political or economic discussions. He asked the panel to address the role of ethics in governance, especially in light of the Declaration of Ethics that tribal and first nation representatives, religious leaders, and other members of civil society signed in 2013.

Meira said that we are operating in a remarkably different time and the regional recommendation, which included agencies, states, and sovereign tribes, is an excellent example of how ethics and collaboration are being considered.

Rigdon said that ethics are part of the reason why the tribes have started a fisheries program. For them, it is not just about the right to catch fish, but making sure there are fish in the river to catch. He also told the representatives of the State Department and Global Affairs Canada that they need to consider what fishing rights mean to Indigenous people. He said that “we have to figure out how to live together...and not trade off the values that make the Northwest and the Columbia river unique and grand in the way that it is.”

Sandison said that the State of Washington requires the Department of Agriculture to manage water resources in a way that meets different objectives so that no single interest is favored over others. He said that in practice, this has not always happened. As a result, it is important to respect other interests, needs, and perspectives. He suggested that the collaborative management of the Yakima Basin, which both he and Rigdon have worked on, is an example of a governance structure that has durable respect for diverse interests and needs.

Johnson echoed Sandison and highlighted the importance of going into this negotiation with a shared set of values or ethics.

Alper asked the panel if the International Joint Commission (IJC) might have a role in this treaty process.

Johnson said that from the Indigenous perspective in Canada, the IJC is not very accessible to First Nations and may be an organization that does not foster collaborative governance.

Ridgon said that bringing in the IJC would make this process even more complex than it already is.

Alper asked the panel what might be the best way to bring all of the groups together, not just to have a voice, but also to have real influence on river management.

Sandison said that he has long felt that a regional process is essential, and one that would interact with a regional process in Canada. He said the AOC and BPA regional engagement worked pretty well while developing the regional recommendation, but that work needs to be ongoing. There needs to be some middle ground between being too big (unwieldy) and too small (not inclusive).

Johnson asked Brain Doherty and Greg Lemermeyer their thoughts on the question.

Brian Doherty said that a good way to influence the negotiators is by holding events like the symposium today. He also said it is important to listen to one another and not just talk past each other in these conversations.

Greg Lemermeyer echoed Doherty and said that it is important to go to these events and share information, ideas, and perspectives. With regard to Sandison's point about being too small or too big, he said that these conversations about the Columbia River can be telescoping. Sometimes a big event, with many people with open minds, is important. He said that at other times, a small group that can really "refine a course" is important. Reflection and ideas are very welcome.

Johnson thanked both Lemermeyer and Doherty for their commitment to listen. He also said that it is important for the panelists and all involved to be as committed to their communities and constituents. He said that the panelists need to make sure that their constituents are also informing their actions going forward.

Owen suggested that many local organizations have a lot of expertise regarding ways to reach out directly to their own constituents, and being able to lean on local agencies and entities is an excellent way to help inform the public.

Johnson said that case law must inform the final modernized treaty, specifically with regard to Indigenous communities' role and involvement in decision-making processes.

Alper thanked the panel and turned the floor back over to **Laurie Trautman**.

Emma Norman and the students from Northwest Indian College thanked each of the panelists, giving them blankets. Norman also gave a special thank you to **Don Alper**.

CLOSING

Laurie Trautman called the four moderators back up to share some final thoughts on the symposium.

Laurel Ballew thanked those who stayed and wanted to learn. She said, “Climate change is real. I want my children’s grandchildren’s grandchildren to experience what I have [experienced] along the rivers...to be able to eat that fish like we had last night for dinner.” She finished by reiterating one of the critical challenges facing the negotiators: building a governance structure that is flexible and adaptive to cultural and physical changes, while at the same time providing clear guidelines for management that include the necessary input from tribes, First Nations, and other local peoples.

Joel Swisher started by saying that he has long admired the Pacific Northwest’s energy governance structures, specifically the 1980 Power Act and the Northwest Power and Conservation Council. He highlighted the regions’ successful work using energy efficiency as a resource. By some estimates, the region has captured two Grand Coulee dam’s worth of power and there are plans to capture more, which is power that we do not have to produce. Swisher also said that there has already been a lot of collaboration in governance as well as research and analysis, but there is clearly room for more collaboration. He noted that it is important to bring together the hydrology and energy production analytics. As a starting point, Swisher recommended that we focus on developing better ways to manage all of the resources, including ecosystems and energy trade with California, before we jump into the discussion about the Canadian Entitlement.

Steve Hollenhorst said that it is clear that we still have a lot to learn about the biophysical science, the climate science, and the social science of the Columbia River system. He stated, “we need to build our capacity to find answers to scientific and cultural questions.” He also observed a few key points: (1) Water temperature did not come up during the panels and it will have a significant impact on ecosystems in the years ahead. (2) Panels did not discuss mitigation, but this is an important topic because we cannot optimize everybody’s interest one-hundred percent. (3) Dams do not last forever and not all dams are the same. (4) The addition of renewable energy sources is changing the way that we need to talk about the Columbia River.

Don Alper said that he was very impressed by the demonstrated empowerment and capacity of people, First Nations and tribes, and civil society in general. He said that this gathering gave him political hope. He also said that if this type of work continues, it would help to develop social buy-in for a modernized treaty, which he said is critical. Alper’s second point was that it is important to reimagine the way that we govern the Columbia River. He suggested that imagination gets us beyond what we have done in the past and moves us to new possibilities. He said that with all the “intelligence, compassion, and energy that is in this room [for the symposium], and was in the room yesterday, there is really no end to what we can come up with in terms of good ideas for making this a better region and certainly a better Columbia Basin.”

Laurie Trautman said that this symposium highlighted the importance of looking beyond physical and national borders, but also the borders that exist between the individual worlds that

we live within. Trautman said that there are many different ways of knowing and understanding science and symposiums like this can help develop mutual respect between different perspectives.

Gregory Lemermeyer thanked the Lummi Nation, saying Hy'shqe for allowing the symposium to meet on their territory. He also thanked the organizers from Western Washington University and Northwest Indian College, highlighting Laurie Trautman and Emma Norman. He thanked the panelists for all their information, which he said was excellent, but too much to absorb so we need to “keep getting together.” He also thanked the audience for their interest and finally thanked his State Department colleagues. Lemermeyer said the event had been enriching and educational. He said that the most important takeaway is that people care, are engaged, and are committed.

Brian Doherty said that this was an “awesome conference.” He said that he is in awe of the knowledge, heartfelt feeling, and goodwill, which has reinforced his belief that this issue will be resolved in a positive manner that is workable for all people. He said that the participants need to sustain this dialogue and that there is a “cornucopia” of human resources working on this issue. Doherty also said “we owe it to one another, we owe it to our families, to the next seven generations, and maybe even more.” Doherty specifically thanked Emma Norman, Laural Ballew, and everyone at the Lummi Nation for their generosity in hosting the event on Lummi territory. From Western Washington University, Doherty thanked Vice President Steve Swan and Laurie Trautman, as well as President Randhawa and NWIC President Guillory. Doherty finished by saying that this symposium was immensely helpful and that he felt enriched and uplifted. He said that the problem is complex, but “we can do it.”

Emma Norman and the students from Northwest Indian College thanked the federal representatives in attendance: Patrick Higgins (Senior Political & Economic Relations Officer, Consulate General of Canada, Seattle); James Hill (Consul General, Consulate General of Canada, Seattle); Gregory Lemermeyer (Global Affairs Canada); Brian Doherty (Chief Negotiator, Department of State); Brian Nafziger (Department of State); and Cynthia Kierscht (Deputy Director, Office of Canadian Affairs, Department of State).

Trautman thanked everyone for attending the symposium and recognized the financial support from the Canadian Consulate. She also thanked Chuck Hart, Ruth Musonda, Thomas Christian, Chris Roselli, Steve Swan, Camron Threadgrill, and the audiovisual team.

Norman highlighted the collaborative effort between WWU and NWIC as well as the fact that this moment in time is a “pivot point.” In 1964, when the treaty was ratified, it was a different era. She introduced Sonni Tadlock, a former NWIC student who is a direct descendent of the Okanagan Band and is from the Colville Nation, as well as a native environmental scientist. Norman said that she wanted the next generation to close the symposium, handing over the floor to Tadlock and Richard Jefferson, the closing singer.

Tadlock said,

“My name is Sonni Tadlock. I am a direct decedent of the Okanagan Band...I am a native scientist and my journey through Northwest Indian College has led me here today. I grew up in Spokane. I did not grow up on the reservation, but my traditional homeland is the Columbia River. It is really interesting that that traditional territory made its way back here to the Lummi people, where I have lived for three years now. It is really cool to see this go full circle and see my home issues are coming here, and that tells me that I need to step up and start addressing them, to give my voice, my opinion to the issues that are going on. I applaud Emma and Laurie, as well as everybody else on the planning teams for convening this symposium and having these words. I thank you for allowing my culture to be integrated into this symposium. These gifts mean a lot. These blankets are not just blankets; they are warmth that is being provided to you. This gift is not just a material item. This a part of our home. This a part of who we are. So thank you for that. Northwest Indian College is right across the water and now we are at Western Washington and to be able to share this responsibility between these two institutions, and to solidify this partnership even more has been amazing...I am really honored and grateful for you guys to set this work up for me to continue, because the implications that you are making, are going to directly affect me. And to just put a face, and a voice, and smile on that, I hope you remember. Thank you. Lemlmtš.”

Richard Jefferson, a Northwest Indian College student, closed the symposium with a Lummi drum and song.

Takeaways and Observations

- One of the goals of the current Columbia River Treaty is to share costs and benefits across the Canadian-American border. It is clear that this is no longer enough and it is important to consider the distribution of benefits throughout the basin. For example, are people in the Interior of British Columbia covering the costs of benefits that are distributed to all of British Columbia? Or, are the mid-Columbia utilities and ratepayers in Chelan County paying for benefits that are directed towards the Portland metro area? Reimagining the geography of costs and benefits maybe one way to overcome some of the disagreements regarding the Canadian Entitlement.
- There are disagreements regarding the size of the Canadian Entitlement; however, numerous panelists from a variety of organizations suggested that treaty negotiators should begin by addressing the needs of the region, how to meet those needs, and then address compensation and the Entitlement at the end.
- Both the U.S. Regional Recommendation and the B.C. Review stated that ecosystems should be incorporated into future planning processes. During the symposium, both Indigenous and non-Indigenous speakers made it clear that the term ecology is not simply a synonym for biology, but includes a cultural component. Pauline Terbasket's comments about the interconnectedness between humans and nature were particularly poignant.
- Fish passage in the Upper Columbia is a critical social issue directly related to the treaty. Many speakers made it clear that the dams that blocked fish passage created ongoing cultural and economic injustices, and the CRT functions within that system.
- There was lots of discussion about the need for a flexible governance model that could adjust to physical changes in the river system, hydrology, climate, power demand, etc. It is also clear, though it was made less explicit, that a flexible system would help water managers adapt to shifting cultural and social values. (See Jeremy Benson's closing remarks.)
- The role of federal governments in Canadian-American water governance has diminished in recent decades. At the same time, other sovereign entities (states, provinces, tribes, First Nations, local governments, etc.) have taken on increasingly important governance roles. Despite these trends, the federal governments are still critically important because ultimately they negotiate and sign international agreements like the CRT.
- The phrase "different ways of knowing" was used multiple times during the symposium. However, it is also clear that a dichotomy of Western science versus Indigenous knowledge is an oversimplification of this phrase. Multiple speakers made it clear that Indigenous people are scientists too, and have been empirically observing the river for hundreds of years.

BIOGRAPHIES

Don Alper

Research Fellow, Border Policy Research Institute, WWU

Don Alper has more than forty years experience teaching and conducting research in political science and Canadian studies. Alper has served as the chair of the Canadian-American Studies program and the director of the Border Policy Research Institute. He is a respected expert on Canadian-United States relations.

Laural Ballew

Department Chair, Tribal Governance Business Management, NWIC

Laural Ballew, Ses Yehomia/tsi kuts bat soot, is a Swinomish Tribal member and employed with Northwest Indian College. She has lived on the Lummi reservation with her husband, Timothy Ballew Sr. for forty years. In addition to serving as the department chair for the Tribal Governance and Business Management Department, she teaches classes for the Public and Tribal Administration and Tribal Governance and Business Management degree programs. Her professional experience is in finance and management. She has worked for the Lummi Nation as an accountant, grants office manager, budget officer and business office manager for the Lummi Tribal Health Center and is active with several committees at Northwest Indian College and the Lummi Nation.

Jeremy Benson

Specialist Engineer, Generation Resource Management at B.C. Hydro

In addition to his work for B.C. Hydro, Jeremy Benson is also the secretary to the Canadian Entity for the Columbia River Treaty. B.C. Hydro is a provincial Crown corporation in B.C. with a mandate to generate, purchase, distribute, and sell electricity. The Generation Resource Management division is responsible for planning the operation of 30 hydroelectric and two thermal generating stations to meet electric load obligations within the province while respecting the multitude of operating constraints on the various river systems. Benson manages several coordination agreements with other utilities in the region to maximize the benefits arising from operating the river and electrical systems.

Jennifer Boyer

U.S. Entity Secretary, Columbia River Treaty Entity & Operations Research Analyst of the Bonneville Power Administration

Jennifer Boyer has done extensive work modeling and analyzing operations of the Pacific Northwest region's hydropower projects to determine the current and potential future downstream power benefits and effects on water quality from coordinating operations with Canadian Treaty projects. Boyer is most interested in how to reach an agreement that best incorporates the competing needs of regional stakeholders, U.S and Canadian Entities. She also has been in charge of determining the power delivery obligations of the five public utility district hydro projects located between the Chief Joseph and McNary dams on the Columbia River.

Scott Corwin

Executive Director, Public Power Council (PPC)

Scott Corwin came to the Public Power Council as executive director in 2007. PPC represents the common interests of consumer-owned electric utilities with respect to the Federal Columbia River Power System, including issues around BPA power and transmission. Prior to joining PPC, Corwin was a vice president at Pacific Northwest Generating Cooperative and before that worked for Portland General Electric, the Speaker's Office of the Oregon House of Representatives, and in the United States Senate in Washington, D.C., both as legal counsel to Senator Mark Hatfield and as staff to the U.S. Senate Appropriations Committee. Currently, he serves on advisory committees to the American Public Power Association and the National Rural Electric Cooperative Association.

Barbara Cosens**Professor, University of Idaho College of Law**

Barbara Cosens joined the law faculty at the University of Idaho in 2004 as an associate professor. She was granted tenure in 2009 and promoted to full professor in 2010. She teaches water law, water policy, law and science, and leads a team-taught course in Interdisciplinary Methods in Water Resources. Her research interests include resilience and the law, the integration of law and science in water resource management and dispute resolution, and the recognition and settlement of Native American water rights.

Greg Haller**Conservation Director, Pacific Rivers**

Pacific Rivers is a regional conservation organization dedicated to protecting and restoring rivers and their watersheds. He has spent more than ten years working in collaborative processes focused on complex river basin management issues including the development of the Nez Perce water rights settlement, hydropower operations in the Columbia River Basin, relicensing of the Hells Canyon Complex, the development of total maximum daily loads and other provisions of the Clean Water Act.

Alan Hamlet**Assistant Professor, Department of Civil & Environmental Engineering & Earth Sciences, University of Notre Dame**

Alan Hamlet investigates the impacts of climate variability and climate change on surface and subsurface water resources, which in turn are linked to many natural and human systems. His research informs management and water policy related to municipal water supplies, irrigated agriculture, hydropower production, lake recreation, flood plain management, ecosystem restoration, emergency management and transportation. Prior to his appointment at Notre Dame, Hamlet was a research assistant professor and member of the Climate Impacts Group at the University of Washington. He has been actively involved in stakeholder education and outreach programs in the Pacific Northwest for many years and is a leader in the development of decision support systems and sustainable climate change adaptation strategies in the water sector.

Jim Heffernan

Policy Analyst, Columbia River Inter-Tribal Fish Commission

Jim Heffernan focuses his work on the regional effort to modernize the Columbia River Treaty. Under direction from tribal governments, he worked with federal and state representatives on the Sovereign Review and Technical Teams on the regional collaboration that led to U.S. Entity Regional Recommendation on the Future of the Columbia River Treaty after 2024. Heffernan continues to work with tribal leaders and staff for the fifteen tribes in the Columbia Basin Tribes Coalition to ensure that ecosystem-based function, including fish passage and reintroduction to Canadian spawning grounds, is integrated as a third key element of a modern Columbia River Treaty, equal to coordinated flood risk management and hydropower production.

Steve Hollenhorst

Dean, Huxley College of the Environment

Steve Hollenhorst has been the dean at Huxley since 2012. Prior to that he was a faculty member at the University of Idaho, where he served as associate dean of the College of Natural Resources, chair of the Department of Conservation Social Sciences, founding director of the university's award-winning Building Sustainable Communities Initiative, and founding director of the McCall Outdoor Science School (MOSS). He was also director of the University of Idaho's Park Studies Unit, which is a branch of the National Park Service Social Science Program. Formerly he was co-editor of the international academic journal *Society and Natural Resources*. Prior to the University of Idaho, he was a professor and program coordinator in the Division of Forestry at Western Virginia University. He is the founder and first executive director of the West Virginia Land Trust. His research interests are land use policy and management, land trusts, and conservation easements and environmental leadership.

Jay Johnson

Okanagan Nation Alliance (ONA)

Jay Johnson is the chief negotiator and senior policy advisor to the Chiefs' Executive Council of the Okanagan Nation Alliance, a Southern Interior tribal council in B.C. operating on 69,000 km² of territory that includes the Okanagan, Similkameen Valley, the West Kootenays and the Colville Confederated Tribes' lands in northern Washington State. Johnson has worked to represent and advance Aboriginal rights and title interests for over fifteen years and has led a variety of natural resource and energy sector negotiations and governance files, including the Columbia River Treaty negotiations on behalf of the Okanagan Nation. He is the Provincial First Nations Leadership Council's provincial coordinator of the B.C. First Nations Gaming Committee, has been a special advisor to three B.C. cabinet ministers, and has worked on international development projects in Jordan, Egypt, Mexico and the Caribbean.

Nicole Kapell

Environmental and Archaeological Stewardship Manager, Ktunaxa National Council (KNC)

Nicole Kapell joined the Ktunaxa Nation Council in 2010 and currently manages KNC engagement in environmental and archaeological projects within the Ktunaxa Territory. Kapell also serves as the first director with the British Columbia Association of Professional

Archaeologists, chairs the Membership and First Nations Liaison Committees and has worked as an archaeological consultant in Belize, Central America, Northern British Columbia, and Alberta.

Se-Yeun Lee

Climate Scientist, University of Washington Climate Impacts Group

Since completing her doctorate in civil and environmental engineering at UW, Se-Yeun Lee has worked on assessing the hydrologic impacts that climate change has on the region and has developed a comprehensive data set of climate change scenarios in support of water resources planning for the Pacific Northwest. She has also been involved in interdisciplinary research focused on understanding and modeling the complex interactions between climate, hydrology, and natural resource management such as the montane wetlands, the Columbia Plateau wetlands, and stream temperature.

Gregory Lemermeyer

Deputy Director, U.S. Transboundary Affairs Division, Global Affairs Canada

Gregory Lemermeyer is the Deputy Director for Energy and Environment Issues in the U.S. Transboundary Affairs Division of Global Affairs Canada. He has previously worked in the Foreign and Defense Policy Secretariat of the Privy Council Office, as well as previous diplomatic assignments in Ukraine and Russia. He has worked on issues related to the Middle East, Eastern Europe, and global security policy at Global Affairs Canada.

Kristin Meira

Executive Director, Pacific Northwest Waterways Association (PNWA)

As the Executive Director of Pacific Northwest Waterways Association, Kristin Meira leads the association's work with Congress, federal agencies, and regional decision-makers on transportation, trade, energy, and environmental policies and projects. PNWA's membership includes more than 130 public ports, transportation providers, agriculture and forest products producers, public utilities, manufacturers, municipalities and others in Washington, Oregon and Idaho. Meira moved to Portland in 2000 after spending five years on Capitol Hill in Washington D.C., where she worked for U.S. Senator Patty Murray and U.S. Senator Bill Bradley.

D.R. Michel

Executive Director, Upper Columbia United Tribes (UCUT)

D.R. Michel directs UCUT, comprised of five tribes in the Upper Columbia, and provides a common voice for the Upper Columbia region to ensure a healthy future for traditional territorial lands while taking a proactive and collaborative approach to protect, preserve, and enhance treaty/executive order rights, sovereignty, culture, fish, water, wildlife, and habitat issues. UCUT was awarded the Ralph W. Johnson Water Hero Award for their work in restoring the Upper Columbia River region, including their central role in restoring salmon above Grand Coulee Dam. Michel is an enrolled member of the Colville Confederated Tribes and has worked in natural resource management and forestry for more than thirty years.

Dave Nazy**Hydrologist & Project Manager, Washington Department of Ecology**

Dave Nazy is a groundwater and water resources specialist that brings a diverse and varied background addressing water management issues throughout the state of Washington. He is a senior hydrogeologist with the Department of Ecology's Office of the Columbia River, specializing in aquifer storage and recovery, groundwater recharge, monitoring, and characterization and climate change adaptation. Nazy has more than two decades of experience working with a wide variety of clients focused on understanding, permitting, and resolving water resource issues throughout Washington.

Richard Paisley**Director, Global Transboundary International Waters Governance Initiative (GTIWGI), UBC**

In addition to serving as director of the Global Transboundary International Waters Governance Initiative, Richard Paisley is also a senior research associate at the Institute of Asian Research and an adjunct professor and founding director of the Dr. Andrew R. Thompson Natural Resources Law Program at UBC. He has degrees in biochemistry, marine resource management, law, and international law. His current research, teaching and legal practice interests are in the areas of international water and energy law, international environmental law, negotiations and environmental conflict resolution. He has directed a wide range of conferences, workshops, and research projects, published extensively, and been an advisor, trainer and special counsel on these subjects to numerous international agencies, governments, non-governmental organizations, and Indigenous groups.

Bill Owen**Flood Control Director, Multnomah County Drainage District**

Bill Owen provides leadership and oversight to the Flood Control Division which includes construction, engineering, operations and maintenance in the district as required for continued improvement of the systems for stormwater conveyance and flood protection. Owen has extensive experience as a water resources engineer and works through the Multnomah County Drainage District to protect lives, property, and the environment through innovative, proactive floodplain management. The Multnomah County Drainage Districts protect vital urban areas from the Columbia River Floodplain, including the Portland International Airport and its surrounding neighborhoods.

Cindy Pearce**Executive Director, B.C. Columbia River Treaty Local Governments' Committee**

As a freelance consultant Cindy Pearce is known for her sensible and innovative approaches to crafting sustainable futures for rural communities. Climate change adaptation, community wildfire protection, and community planning are the current focus of her work. Since 2012 she has served as the part-time executive director of the B.C. Columbia River Treaty Local Governments' Committee. This group of elected officials was appointed by the local governments in the basin to assist local governments and region residents to engage in decisions

around the future of the CRT. Pearce was raised near the Seven Mile dam on the Pend Oreille River and has worked in most of the communities along the Columbia and Kootenay Rivers in B.C. She now lives in Revelstoke at the top of the Arrow Lakes Reservoir.

Derek Sandison

Director, Washington Department of Agriculture

Appointed by Governor Jay Inslee, Derek Sandison oversees an agency responsible for animal health, plant inspections, food safety, fruit and grain inspection and certification, weights and measures, pesticide registration, and marketing the state's agricultural products regionally and globally. Sandison is familiar to many in the agriculture industry from his previous role as director of the Department of Ecology's Office of the Columbia River, where he oversaw numerous water supply development projects important to farmers and ranchers. He was also a principal architect of the Yakima River Basin Integrated Water Resource Management Plan and has played a key role in the Odessa Groundwater Replacement Project.

John Sirois

Committee Coordinator, Upper Columbia United Tribes (UCUT)

John Sirois joined UCUT in 2014, bringing his expertise in and commitment to cultural preservation, renewable resources, the Columbia River Treaty renewal, and fish passage up and down the Columbia River. As committee coordinator, Sirois develops and organizes partnerships within private, educational, non-profit and governmental organizations working toward a sustainable future. Sirois is a member of the Confederated Tribes of the Colville Reservation.

Ron Suppah

Vice-Chairman, Confederated Tribes of Warm Springs

Councilman Ron Suppah has served twelve years on his tribal council and views the protection of sovereignty as his most critical role. Currently in his fifth term, Suppah works to improve communication between the tribal council and the tribal membership, as well as improving communication between Columbia River Tribes and state and federal governments. Born and raised in Warm Springs, Suppah is of the Tyghpum band of the Itcheeskin-speaking bands of 1855 treaty signers. He is a practitioner of the Washat religion and hunts for feasts and special spiritual ceremonies for the tribe, and is a keeper of the longhouse songs while serving as a drummer of those songs.

Joel Swisher

Director, Institute for Energy Studies, WWU

The Institute for Energy Studies seeks to educate leaders in building a clean and efficient energy future through interdisciplinary studies and research. Joel Swisher is responsible for guiding the institute's research and academic programs, defining strategy and new directions, securing internal and external support, and executing its mission. As a registered professional engineer, he is also a consulting associate professor of civil and environmental engineering at Stanford University, where he has taught graduate-level courses in greenhouse gas mitigation and electric utility planning methods. Swisher has over thirty years' experience in research and consulting on

many aspects of clean energy technology. He is an expert in energy efficiency technology and policy, carbon offsets and climate change mitigation, and electric utility resource planning and economics. Swisher is a thought leader in several areas of clean energy technology and business strategy. He has consulted with utilities and technology companies on resource planning and clean energy deployment strategies.

Phil Ridgon

Director, Department of Natural Resources for the Yakima Nation

Phil Ridgon has been the Yakima Nation deputy director of Department of Natural Resources for the last eight years and has worked for the Yakama Nation for more than twenty years within Forestry and Natural Resources. He represents the Yakama Nation on the Tapash Sustainable Forest Collaborative, the Yakima River Basin Watershed Enhancement Project (WRBWEP) Workgroup and Conservation Advisory Group, the State of Washington Columbia River Policy Advisory Group, as well as the Hanford Natural Resource Trustee Council. Working with the WRBWEP, Ridgon helps develop a consensus-based solution to the Yakima Basin's water problems while working on a plan to address fish passage, habitat enhancement, groundwater storage, water conservation, surface storage, and modifying existing structures and operations.

Pauline Terbasket

Executive Director, Okanagan Nation Alliance (ONA)

Pauline Terbasket is a proud Syilx (Okanagan) woman and member of the Lower Similkameen Indian Band. Terbasket has more than 25 years of experience working for a variety of First Nations organizations and government and is a strong advocate for Indigenous titles and rights while working to promote sustainable economic development and reduce poverty amongst First Nations. She is currently the chair of the First Peoples Culture Foundation, a Provincial First Nations Organization, and is committed to tackling issues confronting the growth and wellness of Indigenous citizens.

Jim Waddell

Civil Engineer (retired), U.S. Corps of Engineers

Jim Waddell spent 36 years as a civil engineer for the Army Corps of Engineers. In 2002, while overseeing the Lower Snake River Feasibility Report, he recommended the Corps breach the four Lower Snake River dams in eastern Washington. Waddell has spent the last four years actively engaged in a review of the biological and economic benefits and costs of those dams. His work has involved cost research, forensic accounting of costs, value engineering, breach planning and constructability, hydro system effects on salmon survival and more. He is leading a small volunteer team of mostly current and former government employees working to develop a supplemental environmental impact statement and supporting documents, which can be found at www.damsense.org.

Paul Wagner

Fisheries Biologist, Environmental Assessment Services (EAS) and NOAA Fisheries

Paul Wagner has more than thirty years of experience as a professional fish biologist conducting

work throughout the Columbia Basin as well as in other anadromous waterways in Washington, Oregon, Idaho, Montana and Canada. In addition to serving as a fish biologist for the Columbia Hydropower Branch of NOAA's Interior Columbia Basin office, Wagner serves as the EAS aquatic resource director/senior environmental scientist, supporting the Public Safety and Resource Protection (PSRP) program at the Hanford site. Wagner's role includes developing and monitoring plans for aquatic species and the management plan for aquatic species listed under the Endangered Species Act. He provides senior-level guidance and oversight of aquatic projects conducted under the Environmental Surveillance and Ecological Monitoring and Compliance components of the PSRP. Wagner has also assisted in the evaluation of the Deepwater Horizon oil spill and has written or contributed to more than one hundred technical reports.

Francis Zwiers

Director, University of Victoria Pacific Climate Impacts Consortium (PCIC)

As a research scientist, Francis Zwiers' expertise is in the application of statistical methods to the analysis of observed and simulated climate variability and change. His former roles include chief of the Canadian Centre for Climate Modelling and Analysis and director of the Climate Research Division, both at Environment and Climate Change Canada. Zwiers is a fellow of the Royal Society of Canada and of the American Meteorological Society and is a recipient of the Patterson Medal and President's Prize.

Larry Weis

General Manager and CEO, Seattle City Light

Seattle City Light is the nation's tenth largest consumer-owned utility and was the first in the nation to become greenhouse gas neutral. Larry Weis is an accomplished and recognized leader in the nation's utility industry with a track record of innovative leadership including smart grid technology and energy efficiency. Weis worked at the Snohomish County Public Utility District and was later manager at the Pend Oreille County PUD. Prior to heading Seattle City Light, Weis was the general manager of Austin Energy in Austin Texas. Weis has a degree in electrical and mechanical technology from Western Washington University.