

In 2007, the Estuary Partnership initiated the *Lower Columbia Science to Policy Summit* series to expand the dialogue among scientists, natural resource professionals, and community leaders within the region. The summits focus on topics that require regional attention by assembling a panel of leading experts to present current scientific research and then engage the entire group to define the needs of the region. We conclude by discussing what the Estuary Partnership can do to support this regional need.

At the invitation of then **Representative Deb Wallace** (Washington State Legislature) and then **Senator Jackie Dingfelder** (Oregon State Legislature), we made this a cross-river dialogue to ensure the region was uniting to address lower Columbia River issues. This ongoing dialogue, a sort of constituent check-in for the Estuary Partnership, makes sure science informs decisions and decision-makers are getting the information they need. Members of the Oregon and Washington legislatures continue to host each year.

These annual summit meetings bring those involved with emerging science together with policy makers and people working on the ground in the lower Columbia region. Community leaders from tribal government, academia and applied science, agriculture, transportation, fisheries, recreation, elected officials, and local, regional, state, and federal government agencies participate in each summit. Scientists with expertise in habitat restoration, ecosystem function, toxics contaminants, climate change, and many other disciplines contribute regularly as speakers and participants. Keeping the dialogue active advances protection of public and ecosystem health and fosters a thriving economy. Full reports are available at www.estuarypartnership.org. Following are summaries of each summit.

2007—Many Perspectives, One River

William Reilly, former US EPA Administrator, keynote speaker at the launch of this series, offered a challenge. He urged us to acknowledge that despite the progress we have made nationally with environmental improvements, we are ‘stalled on water issues’. Beaches are closed, commercial fishing is impaired due to toxics and pesticide, fertilizers and pet waste still run into our water bodies. Over half of US waters do not meet prescribed uses and the impacts of climate change are exacerbating conditions.

The summit, hosted by the Estuary Partnership and US Geological Survey, was followed by two days of technical presentations about conditions in the lower Columbia River and estuary. Scientists from USGS and NOAA presented findings from recently completed water quality monitoring and juvenile salmonid sampling.

Three key messages emerged from the discussions and the technical papers:

- When we talk about toxics and other pollutants and data, we need to do a better job talking about the implications of what the information means. We need to put data into context, define the problem and the risks to human health, and offer options and costs, including the cost of doing nothing.
- We know enough to act now and we need to make the investment in long-term, comprehensive monitoring to look at more issues in more depth. This would allow us to assess trends over time to determine if we are achieving the results we need and to adapt our investments so they align with current problems.
- We need more investment in toxics clean-up and reduction that is guided by monitoring and data analysis.

What Happened Following the Summit? The Estuary Partnership worked with USGS and NOAA over the next year to develop a monitoring and sampling action plan for the lower river that will help direct toxics reduction or clean-up actions. The Estuary Partnership submitted an appropriations request to Congress; all members of the delegation included funds for it in their appropriations request. It has not been funded.

2008—Toxic Contaminant Reduction

The Estuary Partnership and US Geological Survey hosted this summit to initiate regional collaboration to define an action plan to reduce toxic contaminants in the Columbia River system. Monitoring and analysis will allow us to identify contaminants, their levels and movement over time, and the effectiveness of reduction efforts.

Participants identified four interdependent actions for the Estuary Partnership to help reduce toxics:

- Expand and sustain monitoring of toxics in the lower river;
- Reduce toxics through take-back programs for pesticides and pharmaceuticals;
- Institute consumer campaigns to identify contaminants in personal and home care products, including flame retardants; and
- Clean up small pockets of contaminants in sediment and/or river shoreline sites.

Doing nothing is not acceptable:

- Columbia River ports require dredging to maintain their operations, yet there is no sediment management plan for the region, nor is there a plan to dispose of contaminated dredge spoils.
- There are no funds for toxic cleanup or toxic reduction activities on the mainstem, inhibiting economic development of urban lands.
- The commercial fishing industry now realizes less than one tenth what it did three decades ago.
- Large populations, including Native American cultures, consume high levels of salmon daily.

What Happened Following the Summit? Based on the monitoring strategy developed and the input from the community leaders, the Estuary Partnership submitted an appropriations request to Congress; all members of our delegation included it in their appropriations request. It has not been funded.

The Estuary Partnership also began work with members of Congress on legislation to elevate the status of the Columbia River to bring it in line with other water bodies of its significance; the bill would authorize funding for clean-up and reduction actions. In 2010, Congressman Blumenauer and Senator Merkley introduced The Columbia River Restoration Act of 2010. It gained full support of the Northwest delegation and had hearings in both the House and the Senate. The bill made its way through committee hearings but was not acted on by Congress. We continue to work with a broad coalition of interests for re-introduction.

2009—Habitat Restoration in the Next Decade

The Estuary Partnership, Columbia Land Trust, and Columbia River Estuary Study Taskforce hosted the 2009 summit to foster a regional dialogue on habitat restoration. To date, regional partners have restored 13,054 acres of habitat—on track to meet the Estuary Partnership 1999 Comprehensive Conservation Management Plan goal of 16,000 acres by 2010. As we reach that point, we know we are far from finished. The region has lost 84,000 acres of habitat since 1870. Thirteen species of salmonids remain listed on the Endangered Species Act as threatened or endangered and they all use the estuary twice during their lifecycle.

After ten years of habitat restoration in the lower river, we knew that the approaches of the past decade would not take us to the next: ready-to-go projects are diminishing, emphasis on fish survivability is paramount, projects are more complex and need more technical assistance, and the impact of toxics on habitat needs to be more integrated into restoration programs.

Participants agreed:

- Restoration and conservation efforts need to incorporate community needs.
- Developing projects require more access to technical expertise.
- Current funding is not diverse enough: allowable portions of projects and funding cycles are limited.
- We must be strategic with restoration projects.
- It takes time to acquire land.
- We need to work on the impact of restoration on other species' health; develop more acknowledgement (and funding) of the link between toxics, habitat restoration, and fish recovery (and species health); and better address fish survivability.

To achieve this, we need: continued advancement of knowledge, technical capacity, community and landowner engagement, increased and diversified funding, and regional coordination and collaboration.

What Happened Following the Summit? The Estuary Partnership again submitted an appropriations request to Congress that included additional funding for habitat restoration; all members of our delegation included it in their appropriations request. It has not been funded. The Estuary Partnership was able to access funds for technical assistance for local entities to help them identify and design more complex restoration projects. The Estuary Partnership completed two restoration tools:

- **The Columbia River Estuary Ecosystem Habitat Restoration Prioritization Framework**, a GIS framework that assesses disturbance at project sites and allows comparison of potential benefits and effectiveness for projects. Using a “multiple lines of evidence” approach, regional partners now have a scientific basis to identify and prioritize key locations for habitat restoration to aid in the recovery of ESA-listed salmon and the restoration of ecosystem structure and function.
- **The Columbia River Estuary Ecosystem Classification**, a set of six data layers that allow us to categorize habitats at different scales to provide scientific basis for selection of monitoring locations and habitat restoration sites.

2010—Accountability & Resiliency to Meet the Future

As we worked with members of Congress on the Columbia River Restoration Act of 2010 and testified before Congressional committees, one question repeatedly came up: ‘Can we ensure the funds invested today will give the results needed to protect public health and restore the health of the ecosystem?’

The focus of this summit was to help provide accountability for public investments in protection and restoration when the problems are not always resolved. We talked about goals for accountability, obstacles to reaching them, and steps we could take. We reminded ourselves to recognize that the Columbia River is a dynamic system and to accept that decisions made today may be better than the decisions made five years ago but may not as good as the ones made in the future. There will be no definitive science. We have to act with what we know now and adapt. Results will take a long time; we are working in geologic time not human time.

Some key obstacles:

- Efforts on the River are not always focused on environmental goals, although that’s the intention;
- Measures are not in sync with environmental goals;
- Efforts of partners working on the River are not always coordinated;
- Failure is often punished, rather than accepting risk and learning from the challenges;
- A prescriptive path to goals doesn’t allow adaptation or innovation; and
- Too much time spent planning; too much paperwork and cumbersome processes get in the way of results.

Participants asked the Estuary Partnership to:

- Continue to build on successful collaboration: expand connections among partners and with the community; work to secure funding for the region; and support partners and fill gaps to facilitate getting projects planned, designed accurately, and implemented on the ground.
- Improve communication for the partners and the public: tell the story of successes on the lower Columbia River to connect and inspire people. Help people connect.
- Continue to work on regional metrics: define metrics that track environmental change, not just processes.

What Happened Following the Summit? The Estuary Partnership overhauled our website to make it more accessible to more users and designed from their perspective and what they need; to be more current. The Estuary Partnership is working with regional scientists to refine a set of metrics that tells the scientific story in terms that are meaningful to a range of users, including citizens. The first workshop took place in April 2012. In January 2014, the Estuary Partnership began convening state agency policy directors to improve communication, coordination and data sharing among state agencies.

2011—Climate Change: Adapting Our Actions

The Estuary Partnership's fifth annual summit focused on Climate Change. A panel of leading experts presented an overview of scientific research addressing the impacts of climate change on the lower Columbia River and estuary. Community leaders, natural resource professionals, and scientists discussed factors that limit our response to climate change. Estuaries and coastal areas are particularly vulnerable to the effects of climate change. Sea level rise, changes in water temperatures, hypoxia and acidification, and other impacts associated with climate change are going to change the lower Columbia River ecosystem. We need to overcome: disbelief and distrust, the complexity of climate change, the blame – no blame approach, limited funding, lack of leadership, lack of data, and jurisdictional barriers.

Attendees suggested a few actions for the Estuary Partnership:

- Keep the conversations going; host meetings, add science, and bring in new partners.
- Continue to focus habitat projects to restore the full ecosystem.
- Develop maps of climate change effects or projections.
- Continue pursuing funding for monitoring on the Columbia.
- Incorporate climate change into education activities for all ages.

Bill Bradbury, with the Northwest Power and Conservation Council, gave a final challenge to the attendees: move beyond the words “climate change” and instead address the behaviors and policies contributing to and being impacted by changes in our climate. The term is almost irrelevant, has become polarizing, and too often stops the conversation. What matters are the facts and the facts are clear: the planet's climate is changing at a faster rate than any time in its past.

What Happened Following the Summit? As an initial step, the Estuary Partnership used input from this summit to revise the actions in our Comprehensive Conservation and Management Plan, our governing document, to include steps to adapt, mitigate, or abate climate change. The revised set of actions was completed in November 2011. The Estuary Partnership is seeking funding for an inundation assessment to map the effects of climate change in the lower river.

2012—The Management Implications of Emerging Science

Former US Congressman Brian Baird opened our sixth annual Science to Policy Summit with a charge to participants: provide information to policymakers that includes the science while addressing economics, social issues, and political realities. He urged us to present information succinctly in the context of what matters to people in their everyday lives. Key findings from the Columbia River Estuary Conference formed the basis for the day's discussion. **Dick Pedersen, Director of Oregon Department of Environmental Quality**, and **Joan Dukes, former Chair of the Northwest Power and Conservation Council**, spoke about making policy decisions. They suggested that we need to make the best decisions we can with information available; there is no absolute science. Sometimes science and public health need to demand action and it is the right thing to do but it may not be popular; it takes leadership.

Participants offered a few key roles for the Estuary Partnership.

- Apply what we know now and adapt as information evolves;
- Serve as a bridge between science and the public;
- Collect data and get it to policy makers; and
- Build collaboration to share information, improve efficiencies, and get broader results.

What Happened Following the Summit? We launched a redesigned website in December of 2012. We worked with professionals to better identify what kinds of information and what formats for information would be most valuable to key users of our site. There is more interactive technical mapping; access to our habitat classification system data sets that help identify where and how to restore habitat; more opportunities for social media; an electronic library of research and data; full integration with our Water Trail site; a focus on volunteer activities; and portals for scientists, teachers, and students. We are continuing discussions with members of Congress to secure re-introduction of the Columbia River Restoration Act in 2013.

2013—The Columbia River Treaty

Our seventh *Science to Policy Summit* focused on the Columbia River Treaty and its impact on the lower River. Since the Treaty's approval in 1964, ecological function, climate change, equity in governance, protection of species, and recreation have become as important as flood risk management and power generation. The United States and Canada are now engaged in reviewing the Treaty; these discussions could change how the river is managed.

Several expert presenters helped us better understand the Treaty, flood control, hydropower operations, and ecosystem management. We heard perspectives from throughout the basin, including Canada and Native American Tribes.

Participants discussed what they learned and then identified key components for a Treaty for the coming years:

- The *ecosystem is not adequately represented* in discussions. The Columbia Basin is one integrated system—flood control, agriculture, commerce, cultural—from headwaters to estuary. Actions in one area affect another.
- The treaty needs to be *flexible and adaptable* to respond to changing conditions, advancing science, and evolving values.
- An *inclusive equitable and informed process* is critical. There was no public process in the 1950s and 1960s, and not much now.
- The Treaty must allow for *alternative energy sources*. Energy conservation and alternative energy sources need further development and implementation to allow management of the dams to restore ecosystem function and mitigate for climate change, and to potentially decommission dams in the future.
- *Flood management* needs to protect people, commerce, navigation, and other interests *and* restore ecosystem function. National and local leadership is needed to incorporate environmentally sustainable flood controls.

What Happened Following the Summit? The Estuary Partnership Board of Directors, by majority, with federal agency and Governors' representatives abstaining, forwarded comments to parties involved in Treaty decisions:

- A treaty will best address regional needs and have with long-term success, if it:
- Considers the ecosystem on par with flood risk management and hydropower
- Considers the system as a whole from the headwaters to the estuary.
- Reflects modern regional values and is flexible and adaptable to new information.
- Has more balanced governance that uses a collaborative, open process with broad involvement.

The ecosystem lacks adequate stature and is undervalued in treaty discussions. The current US entities carry out missions and authorities with expertise that comprehensively addresses current and future power and flood risk management. Extending their missions to cover ecosystem function is unfair. Including ecosystem function will bring equity to the three foci: flood risk management, hydropower operations, and ecosystem function. Broader dialogue with more diverse interests must happen in order for the discussion and decisions to reflect regional values and needs, including conservation, alternative energy, fish passage through upper dams, coordinated storage in Canada, non-structural flood management, the economy, tourism and recreation, strategic levee modification, navigation, commerce, industry, agriculture, and cultural impacts.

After submitting comments, the Estuary Partnership Executive Director was invited to attend a briefing with the Department of State and the US entities and provided these comments in person. She is participating in meetings with the Department of Interior to help refine how ecosystem management can be included.

2014—Toxic Contaminants in the Columbia River

In 2014, we re-visited the state of toxics contamination in the lower river. The 2008 summit directed the Estuary Partnership to help secure major funding for toxics reduction. We got a start with the introduction of the Columbia River Restoration Act of 2010. Since then, we have built a strong regional coalition for re-introduction.

Contaminants of emerging concern, including chemicals in personal care products, pharmaceuticals, and flame retardants, have been shown to have negative impacts on par with previously known contaminants. Rates are increasing for some forms of cancer, hormone balances are disrupted, and brain function is impacted. The contamination is the collective result of many activities over many years, is extensive, and needs comprehensive solutions. Many industries, businesses, municipalities, states, growers, farmers, ports, and others are voluntarily reducing contaminants. We wanted to learn more, hear about successes, and set a course for the next few years.

Rob Duff and Gabriela Goldfarb, representatives of Washington and Oregon Governors and Estuary Partnership Board Members, **set the challenge for the day.**

The **State of Washington** has established green purchasing standards, with Oregon, has adopted child product safety legislation, and is wrestling with fish consumption rates. Rob encouraged us to look more closely at sources and the synergy of toxics, assess our choices, examine federal statutes that still allow the use of these contaminants, and consider the option of not using toxics. Not using them results in no harmful impact and no clean-up cost. Change is imperative for our children: one in thirteen now have learning disorders linked to persistent exposure to PCBs, lead, mercury, and other toxics. The **State of Oregon** is developing a janitorial supplies pilot, with Washington, and will expand to office supplies. These can have broad market impact given the volume of the states' purchasing. Oregon next working to reduce flame retardants and has adopted the most protective criteria for human fish consumption in the nation.

A panel of scientists presented emerging data on toxics in the lower river.

Jennifer Morace, Hydrologist, United States Geological Survey, recently completed work that found contaminants in water, sediment, fish, birds, and the aquatic food web, with higher concentrations in the urban corridor of Portland to Longview. It documented exposure to contaminants and bioaccumulation and magnification of contaminants within the food web, and indicated genetic and reproductive effects to organisms. Many of the compounds studied are constantly being introduced in the environment through human use.

Paul Lumley, Executive Director, Columbia River Inter-Tribal Fish Commission, noted that tribes eat 6 to 11% more salmon than the general public. Concentrations of PCB and PBDEs in juvenile fall Chinook are high enough to change thyroid function, reduce disease resistance, impair growth and metabolism, and impact reproduction. Mercury is prevalent and contaminants bioaccumulate in endangered juvenile salmon, Pacific lamprey, and white sturgeon; high concentrations have been found in the larval stage of lamprey. CRITFC supports two resolutions to protect the rights and health of indigenous people and the health of salmon: eliminating PCBs that can be used or discharged and removing the outdated Insecticide, Fungicide, and Rodenticide Act.

Nat Scholz, Ecotoxicology Program Manager, NOAA Fisheries, studied the effects of urban runoff on survival of adult Coho salmon. At Longfellow Creek, they found that 60 to 90% of returning Coho die prior to spawning. Results in other urban watersheds were parallel. The impacts correlated to the amount of impervious surface and road density within a drainage. Experiments that collected highway stormwater runoff after rainstorms showed Coho adults placed in tanks with urban runoff had 100% mortality after three and a half hours, while all fish in clean tanks free of stormwater runoff survived. Over 200 different chemical combinations were identified in the runoff, including heavy metals and hydrocarbons.

A second panel presented successes in reducing contaminants, including pesticide stewardship partnerships, child product safety legislation, and green purchasing.

Kevin Masterson, Toxics Coordinator, Oregon Department of Environmental Quality. Oregon is using local partnerships (Pesticide Stewardship Partnerships) with state agencies, natural resource groups, tribes, landowners, and growers to reduce toxic pesticides. Partners voluntarily adjust practices and monitor results. The program now includes eight partnerships in seven watersheds. Actions include training growers how to

reduce spray drift and integrated pest management, implementing buffer strips and reducing spraying near streams, and encouraging the use of less toxic pesticides. One example in the Wasco watershed saw mathalioin concentrations reduced from eight times the water quality level to below the accepted level in just two years. In the Yamhill watershed, improved spraying techniques have reduced pesticide use by 35% and drift by 99%.

Josh Grice, Research Analyst, Washington Department of Ecology. Washington State’s Children’s Safe Product Act (CSPA) was passed in 2008 banning various toxics, including lead, cadmium, and phthalates, in products designed for children, such as children’s toys, jewelry, clothing, cosmetics, and car seats. The CSPA requires reporting to Ecology on Chemicals of High Concern to Children in children’s products. These chemicals are linked to cancer, reproductive disruption, and endocrine disruption. Data gathered by Ecology shows many chemicals thought to be successfully banned are still in products—over half of phthalates reported are permanently banned under federal law. An alarming 63% of contaminants listed in products have no reported function.

Alice Brawley-Chesworth, Regulatory and Policy Analyst, City of Portland, Bureau of Environmental Services. Wastewater plants are highly successful in removing solids, pathogenic bacteria, and bulk nutrients, but adding technologies to capture them increases treatment costs by 70%. It also increases land consumption needed for treatment plants, increases energy use and greenhouse gas emissions, increases chemical demand, and increases disposal of solid and contaminated liquid waste. Further complicating efforts, 500 to 1000 new chemicals are found in waterways each year. Preventing toxics from entering wastewater is more cost effective than developing and implementing new technologies at all wastewater facilities, and it removes exposure to contaminants.

Kevin Scribner, Salmon-Safe, Growers: Voluntary Reduction in Pesticides. Salmon-Safe has certified farms, vineyards, university and corporate campuses, parks, residential developments, and large-scale construction from northern California to British Columbia for over 17 years, with more than 350 success stories. This lets the consumer support farms, businesses, and developments that use sustainable agricultural practices that protect water quality and native salmon. Salmon-Safe has expanded into the urban landscape. The 175-acre Nike World Headquarters campus was certified. The City of Portland has set a goal of being Salmon-Safe by 2018.

Roger McFadden, Senior Scientist, VP, Staples, Inc., Corporate Changes: Transitioning to Safer Chemicals, Materials and Products. Staples has adopted an aggressive approach to decrease use of toxic chemicals, focusing on the chain of the product from development to disposal. Chemicals are key to retailers and the public, with new chemicals often increasing productivity, quality, and convenience in our lives. Staples challenges suppliers to improve their products by handling chemicals of concern as contaminants and considering potential exposure to vulnerable populations, life cycle impacts and cost, and green chemistry options. Using safer chemicals protects consumers, the environment, and future generations and creates shared values with consumers.

Participants offered a few key roles for the Estuary Partnership:

- Provide credible, on-going science and data. Communicate information in ways that relate to the public. Give choices and specific steps individuals and businesses can take to decrease their use of toxics.
- Create a market; follow the States, Salmon Safe concepts, and Staples business practices.
- Engage the next generation so they can be environmental stewards and make informed decisions.
- Use a mix of regulatory and voluntary tools; put processes that reduce toxics on a different path than actions that would cause harm or use toxics.
- Find Leaders; strong and dedicated leadership is absent right now. Find our common ground.
- Pass the Columbia River Restoration Act—get funding to reduce and remove toxics.

The **Honorable Brad Witt, Oregon House of Representatives**, reminded us to make sustainable choices and make sure the paths we take forward support the people who live and work in the lower Columbia communities.

Dan Opalski, US EPA Region 10, noted that what brings us together is our care of the Columbia. The choices we make today will affect the world our children have tomorrow. Regulations and monitoring are important, but it will take good choices—choices that likely will not all be easy. They will require we work together, even remove our business viewpoints and think about what is paramount: making our children safe.

What Happened Following the Summit? In July 2014, the Columbia River Basin Restoration Act of 2014 was re-introduced.

2015—Peer to Peer: Toxics Reduction Successes & Challenges

Our ninth *Science to Policy Summit* took a different turn. We hosted two peer-to-peer workshops to examine pesticide use and stormwater management to build on last year's summit on toxics. Peer-to-peer discussions are symbolic of what we need to do: if we act individually and collectively, we will make an impact. More importantly, we learn best from our peers who understand what we do. Many people and businesses are already voluntarily using fewer or no toxics in their practices.

The Honorable Earl Blumenauer, US House of Representatives, opened our session with a video message encouraging us to continue collaborations and partnerships. The threat of toxics to the lower river and humans is too big for government alone. He applauded the peer-to-peer discussions; they will help build more critical momentum.

The first workshop brought together local farmers and growers who represented a diversity of perspectives and crops; ranging from conventional large scale fruit tree operations to strictly organic farmers who sell products directly to consumers. They pointed out the importance of knowing where food comes from and that accepting "less than perfect" aesthetics will pay off in reduced chemicals used and better flavor. Our personal choices are key to creating market demand for products with less toxics. Lack of academic research is a big challenge and farm research is constrained by financial risk.

The second workshop included representatives of public agencies and private businesses that have successfully reduced stormwater with specific innovative and practical techniques. From the building community, we learned that incentives are helpful, especially at the early stages of technology.

Key points that arose from the summit:

- Use innovative approaches. Reusing rainwater can meet much of a building's non-potable water needs. Solar arrays drive down energy use. The Grattix is an innovative, portable 'rain garden in a box' that treats stormwater from galvanized metal roofs and downspouts. Innovative pilot projects may be funded in their initial application, but funding for continuation of successful work can be more difficult to acquire.
- Focus on continual improvement and a respect for people, including the health and wellbeing of both consumers and employees.
- Green infrastructure that mimics natural filtration has multiple benefits: economic, public infrastructure, environmental, and community.
- Research and information is critical and a barrier when absent for implementing techniques to reduce the use of pesticides and fertilizers. Much agricultural research is funded by chemical companies.
- Consumers need to know what is in their food products, where it comes from, and what it takes to produce it.
- Marketing can be a difficult skill for a small farmer to master. Markets are driven by appearance and cost rather than quality of food. Blemish-free produce or the iconic Christmas tree shape is perceived as better without consideration of pesticides needed to achieve it.
- Early farm adopters have the power to facilitate change and inspire others, as well as be the catalyst for establishing trust between landowners and regulators.
- Toxics reduction requires partnerships—and trust—between regulatory agencies and farmers.
- Stormwater permitting processes and regulations can vary widely among local governments and states.
- Consider and prevent off-site impacts.
- Connecting early adopters to conservation districts or extension services builds outreach, solves problems, and helps expand use of Best Management Practices (BMP).
- Identify cost saving or market benefits and procurement as tools for toxics reduction.
- Small and underserved communities are often left out.
- Leadership is critical and it takes time. The City of Portland has been successful with the Foster Floodplain Natural Area restoration project, which took 20 years of planning and implementation.

What Happened Following the Summit? In July 2015, the Columbia River Basin Restoration Act of 2015 was re-introduced.

2016—Climate Change: How Vulnerable is the Lower Columbia River

For this summit, we focused on how climate change will require us to change how we protect ecosystems. Rather than making decisions on past impacts, we now must make decisions based on projections. We cannot wait until the damage is done and mitigate for it. We need to gather more data but also act now to protect our natural systems and communities. National Estuary Programs are assessing the impacts of seven climates and how those stressors affect our ability to implement actions in our Management Plans. By 2020, all NEP workplans will incorporate goals and actions that mitigate for climate change stressors. The stressors are warmer summers; warmer winters; warmer water; increasing drought; increasing storminess; sea level rise; and ocean acidification.

The Honorable Suzanne Bonamici, United States House of Representatives, opened our summit encouraging us to help overcome climate change deniers by promoting science and data that show how the changes impact, directly and personally, businesses and individuals.

Several scientists and regional experts presented emerging information and impact on the Columbia River

- Temperatures in the mainstem of the Columbia have risen and will continue to increase. Mainstem thermal refuges are necessary for migrating juvenile salmonids and returning adult salmonids.
- Increasing carbon dioxide (CO₂) is causing oceans to be more acidified, threatening the health of ecosystems and industries that depend on them. Lower pH changes the chemistry within the blood of a fish and can alter a fish's behavior, their homing mechanisms, and how they avoid predators.
- All climate scenarios show a warming across the Pacific Northwest (5-10°C increase), meaning wetter winters; warmer, drier summers; and increased frequency and intensity of extreme events. The Columbia Basin will transition from a snow-dominated to a rain-dominated basin by the 2080s, increasing flood events. Increased water temperature and changes to flow patterns will impact aquatic life.
- The Columbia River estuary is a Tribal Culture Landscape—a regional trade highway that connected multiple cultures, villages, and gathering sites. Climate change and associated impacts such as sea level rise will have detrimental effects on archeological sites, gathering practices, and hunting and fishing grounds.
- The data and science clearly show that climate change is happening and yet we are not taking action to account for future conditions. We have the data and science at our fingertips; we can choose to act in such a way that takes future conditions into account, leading to better outcomes for habitat and for fish and wildlife.

The Honorable Earl Blumenauer, U S House of Representatives, offered a lunchtime address. The role the Estuary Partnership plays bringing scientists and policy experts together is key. If membership in Congress changes, there is potential for significant gains in climate change policy decisions. Attitudes toward climate are changing across the nation; we may soon wonder why we debated so long over these issues.

Attendees offered several challenges and Barriers:

- Lack of available monitoring and limited funding affects our ability to plan for impacts.
- The uncertainty of science and exact future conditions and the ecological complexity of the lower river make it difficult to predict which actions will most effectively reduce or mitigate impacts.
- Out-dated infrastructure, such as storm water and wastewater facilities, could be overwhelmed by impacts associated with changes to precipitation patterns, river flow, and sea level rise. The cost of upgrading to more sustainable designs or re-building facilities can be very high.
- Climate change may not be compatible with regional conservation goals or funders' priorities.
- The pressures of increased population growth will intensify climate change impacts by reducing available land and increasing pollutant levels and water use demands.

Dan Opalski, US EPA Region 10, Director of Office of Water and Watersheds, closed by asking us to consider four things. **1) Think aquatically, act terrestrially; 2) Think estuarily, act tributarily; 3) Think ecologically, act electorally; 4) Remember the positives.** Forums like this summit allow us to build momentum and form a robust consensus on decisions to move us forward. Education and outreach is key and providing informed communication about climate change for our children will be their legacy.

What Happened Following the Summit? The Estuary Partnership completed its Climate Change Vulnerability Assessment and is integrating it into our 2017 – 2023 Six-Year Strategy.

2017—Sharing Information + Sharing Values & Needs = Sustaining Our River

This Summit discussed how we can do a better job making science and data more relevant to more people.

The Honorable Suzanne Bonamici, United States House of Representatives, opened the day with several key points: now is the time for more science and research; local entities need to step up—especially with the U.S. withdrawal from the Paris Agreement; we need to find common ground even if we don't agree on all the issues; we need to promote media literacy; and we need to integrate the arts with science to inspire innovation. As founder and co-chair of the Congressional STEAM (Science, Technology, Education, Arts, and Math) Caucus, she places significant weight on using science and helping the next generation think critically and creatively.

We chose to have a dialog among experts and the audience. Each has extensive experience and needs communicating technical information to a range of people and we wanted to take advantage of that expertise and talk together. Our expert panel started the discussion with a several points. Among them:

Dameon Pesanti, The Columbia Journalist – “The media is a community partner and ally—don't be afraid to reach out. We can take your science and show people how it impacts their everyday lives.”

Susan Holveck, Beaverton School District, Science Teacher - “Our job is to produce a literate citizenry that participates in science. Science is for everyone.”

Kim Orion, LKE Corporation, Business Owner - “Make communication personal. Reframe science in a way that communicates impact to the everyday lives of local people.”

Robb Duff – Governor Inslee's Office, Policy - “Find the champions within a community to maintain credibility. It's easier to maintain credibility than to regain it back after it's been lost.”

Jannie Castro, USFWS/NOAA, Scientist - “Don't separate people by using jargon.”

Attendees identified several tips and tools for better communication:

- Invest the time to get to know people. Immerse yourself in their community to understand their values, beliefs, and vocabulary.
- Relate information to people's lives, like flooding, storms, and drought versus climate change. *Be succinct* and know what is relevant to your audience.
- Use clear, understandable visuals and infographics.
- Include the non-ecological benefits (economic, human health, recreation) of restoration, contaminants reduction, climate change mitigation, etc.
- Enlist Support from Trusted Community Influencers: *Peers* convey information in ways that are most meaningful and trusted.
- Know the Cultural Context: Because of historical injustices and harmful government policies, it can be difficult for Tribal peoples and Tribal governments to fully trust federal and state government agencies.
- Include Communities Marginalized on Environmental Issues, including communities of color and low income communities: They often are most negatively impacted by water quality issues, toxics, and other environmental impacts and decisions.

What Happened Following the Summit? The Estuary Partnership is working on these efforts in several key ways: making our science more visible to more people; changing our communication methods to make information more digestible and relevant to more people and show cause and effect; convening and engaging more people with different perspectives, especially communities of color and low income communities; helping us all listen and learn what matters to each other and how science matters affects what matters to them; keeping the Columbia and people at the core of what we do – connecting more people to the river.