



Oregon Law Institute
of Lewis & Clark Law School

Integrating Floodplain Management Policies

Thursday, December 10, 2015
Columbia River Inter-Tribal Fish Commission
700 NE Multnomah St., Room 502
Portland, Oregon 97232

Integrating Floodplain Management Policies

Course Materials from the
December 10, 2015 Program in Portland

OREGON LAW INSTITUTE
OF LEWIS & CLARK LAW SCHOOL
10015 SW Terwilliger Blvd.
Portland, OR 97219
(503) 768-6580
(800) 222-8213
Fax: (503) 768-6585
Email: oli@lclark.edu
Website: <http://go.lclark.edu/oli>
Follow us on Twitter: @OregonCLE

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Schedule

8:25	WELCOME AND INTRODUCTORY REMARKS	
8:30	Keynote Address	Lori Faeth
9:15	Flooding and the Columbia River Ecosystem	Bill Bradbury Kathy Eichenberger Paul Lumley Reed Wagner
10:30	NETWORKING BREAK	
10:45	Climate Change and Floodplain Resiliency	Larry A. Larson George R. Pess Monty Schmitt
12:00	LUNCH (<i>on your own</i>)	
1:15	Floodplain Management Policies	Lorri Bodi Kaitlin Lovell Bonnie S. Shorin
2:15	Local Floodplain Management Programs	Jackie Dingfelder Christine Shirley
3:00	NETWORKING BREAK	
3:15	Economic Considerations in Floodplain Management	Noah Enelow Gregory Haller Joshua Reyneveld
4:00	Closing Address	Mary Lou Soscia
4:30	ADJOURN	

Planners

Christine Golightly, Policy Analyst, Columbia River Inter-Tribal Fish Commission, Portland; B.S., Ecology & Evolutionary Biology, University of Arizona (1994); J.D., Lewis & Clark Law School, Certificate in Natural Resources & Environmental Law (1999); member of the Oregon State Bar since 1999; practice focuses on Indian and environmental law and government.

James P. Heffernan, Policy Analyst, Columbia River Treaty, Policy Development and Litigation Support, Columbia River Inter-Tribal Fish Commission, Portland; B.S., Wildlife Biology, Colorado State University; J.D., Lewis & Clark Law School, Certificate in Environmental and Natural Resources Law; previously served as advisor to the U.S. Section of the Pacific Salmon Commission (U.S.–Canada Pacific Salmon Treaty); focus is on the Columbia River Treaty 2014–2024 Review, working with the Sovereign Review and Technical Teams and reporting to tribal governments on regional, consensus-based recommendations on the future of the Treaty.

Robert C. Lothrop, Policy Development and Litigation Support Manager, Columbia River Inter-Tribal Fish Commission, Portland; B.A., Biology, Cornell College (1978); J.D., Lewis & Clark Law School Certificate in Environmental and Natural Resources Law (1981); member of the Oregon State Bar since 1981; 33 years at CRITFC working on the salmon management aspects of international fisheries, federal land management practices, coordination with state and federal fishery agencies in the Columbia Basin, and mitigation of hydroelectric project impacts; recipient, Lewis & Clark Law School Distinguished Environmental Graduate award (2004).

Kaitlin Lovell, Division Manager, Science, Integration Division, City of Portland, Bureau of Environmental Services, Portland; B.S., Environmental Science, *summa cum laude*, Bucknell University (1997); J.D., Cornell Law School (2000); member of the New York State Bar since 2000 and the Oregon State Bar since 2002; practice focuses on restoring wild salmon runs in some of the most urban, and most promising, streams in Portland; former salmon policy coordinator and ESA attorney for Trout Unlimited; author, Climate Change Preparation Strategy and the Risks and Vulnerabilities Assessment, City of Portland (Oct. 2014); in her spare time she works on restoring the Molalla River (Milk Creek) headwater ecosystem on her farm in Clackamas County.

Mary Lou Soscia, Columbia River Coordinator, U.S. Environmental Protection Agency, Portland; B.A., and B.S., Virginia Tech (1975); M.A., University of Maryland (1982); as the coordinator, she leads the Columbia River Toxics Reduction Strategy, the Columbia River Toxics Reduction Working Group, the implementation of the Columbia River Basin Toxics Reduction Action Plan, and provides senior EPA representation on Columbia River Forums as well as leading the collaboration for the Oregon Water Quality Standards human health criteria and is currently leading the collaboration with Idaho Tribal Governments to address Idaho human health criteria revisions; provides senior EPA representation on regional Columbia River Treaty work efforts; past board member, Association of State Floodplain Managers.

Faculty

Lorri Bodi, Vice President, Environment, Fish and Wildlife, Bonneville Power Administration, Portland; B.A., and M.S., University of Pennsylvania (1972); J.D., *with honors*, George Washington University (1976); member of the Washington State Bar since 1979; responsible for environmental stewardship and fish and wildlife enhancements for BPA's Transmission and Power businesses; former BPA Senior Policy Advisor for Fish and Wildlife; former co-Director, Northwest Office of American Rivers; past attorney for the National Oceanic and Atmospheric Administration (1978–1991) and the Environmental Protection Agency (1976–1978); former member, State of Washington Citizen's Advisory Committee on Trust Water Rights (1993–1994); former President and board member, Save Our World Salmon Coalition, Seattle; former advisory board member, NAFTA Environmental Advisory Council, Washington (1994–1995); former board member, Sustainable Fisheries Foundation, and Northwest Renewable Resources Center, Seattle; co-author, *Our Common Lands* (1988), *Salmon Documentary History* (1996), and *Ecology Management of Streams and Rivers of the Pacific Eco Region* (1997).

Bill Bradbury, Oregon Member, Northwest Power and Conservation Council, Portland; Antioch College (1969); State Senator and Senate President, Oregon Legislature (1980–1995); Oregon Secretary of State (1999–2009); former director, of the non-profit organization, For the Sake of Salmon, working with Northwest

Native American tribes, federal, state and local governments, and timber, agriculture and fishing interests; travels throughout the state presenting locally adapted information on global warming.

Jackie Dingfelder, Policy Director for Planning and the Environment, Mayor's Office, City of Portland, Portland; B.A., University of California, Los Angeles; M.S., University of North Carolina; Ph.D. Candidate, Portland State University; oversees environmental, planning, sustainability and climate change policies for the City of Portland; over 30 years of professional planning experience in the private, non-profit, and public sectors; former Executive Director, for a watershed restoration non-profit organization while serving as a Senator in the Oregon Legislature. Chair, Energy and Environment Committees (2001–2013); member, Senate Judiciary, Ways and Means, and Consumer Protection Committees as well as House Transportation, Agriculture and Natural Resources, Audits, and Water Committees; former chair, Council of State Governments West Energy and Water Committees.

Kathy Eichenberger, Executive Director, Columbia River Treaty Review, BC Ministry of Energy and Mines, Victoria, BC (2011–present); BEng., Concordia University (1986); responsibilities include regulation of industrial and municipal activities, leading environmental assessments of major projects in BC, and managing regional environmental data collecting and watershed restoration

programs; former Regional Manager, Environmental Protection, Ministry of Environment (1996–2007); former Executive Project Assessment Director, BC Environmental Assessment Office, leading the assessment of major natural resource development projects throughout BC (2007–2011).

Noah Enelow, Senior Economist, Ecotrust, Portland; B.A., *with distinction*, Yale University (1999); M.A. (2006) and Ph.D. (2012), University of Massachusetts, Amherst; an ecological economist, providing regional impact analysis and ecosystem services, and value chain analysis; member, Economists for Equity in the Environment (E3) Network.

Lori Faeth, Deputy Assistant Secretary for Policy and International Affairs, U.S. Department of the Interior, Washington, DC (2011–present); serves as the Department’s Senior Sustainability Officer with primary responsibility to oversee implementation of sustainability initiatives for bureau and office operations and provides policy and guidance to Interior bureaus to help identify and report environmental liabilities; liaison for the Columbia Basin tribes’ input into federal forums considering the future of the Columbia River Treaty; former Senior Policy Advisor to Arizona Governor Janet Napolitano for natural resources, agriculture, energy and environment, working on broad policy issues including forest health, climate change, and water management (2003–2009); former Directory, Office of Intergovernmental Affairs, U.S. Department of the Interior (2009–2010), and Acting Assistant Secretary of Insular Areas (2014);

member, National Resource Management Professionals.

Gregory Haller, Conservation Director, Pacific Rivers Council, Portland; B.S., State University of New York College of Environmental Science and Forestry (1992); M.P.S., Natural Resource Economics, Cornell University (1999); J.D., University of Idaho College of Law (2011); the Pacific Rivers Council is a regional river conservation group which works throughout the Columbia basin and northern California to protect rivers, their watersheds and the native aquatic species that depend on functioning, high quality ecosystems; over 10 years’ experience 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.

Larry Larson, P.E., CFM, Executive Director Emeritus (1982–2012), and Senior Policy Advisor, Association of State Floodplain Managers, Madison, WI; B.S., University of Wisconsin–Platteville (1962); was instrumental in the formation and development of this national, non-profit membership association of over 15,000 professionals and 35 State Chapters; the ASFPM represents the states and 22,000 communities in the nation that are responsible for implementing flood loss reduction programs, and promotes multi-objective approaches to management of flood hazards and natural resources to achieve common goals

at the local, state, and federal levels; founding member ASFM, Inc.; engineer, California Department of Water Resources (1962–1967); Staff Engineer, (1967–1974), manager, Floodplain and Shoreland Management Programs (1975–1985), and Section Chief (1985–1997), Wisconsin Department of Natural Resources Floodplain Management and Dam Safety Program; recipient, Outstanding Public Service Award, FEMA (1983); Goddard-White Award (1985); Business Associate of the Year Award, Wisconsin Chapter of American Business Women's Association (1989); Jerry Louthain Service to Members Award, ASFPM (1996); Outstanding Service Award, FEMA Region V (1997); John Wesley Powell Award, USGS (2005), and Outstanding Service to the Industry Award, Oklahoma Floodplain Managers Association (2006); author and co-author of numerous ASFPM key policy papers.

Paul Lumley, Executive Director, Columbia River Inter-Tribal Fish Commission, Portland; B.S., Western Washington University (1986); citizen of the Yakama Nation; Sovereign Review Team member, Columbia River Treaty, representing four treaty tribes of CRITFC to develop the U.S. Regional recommendation, and has an extensive history working with Northwest Tribes on salmon issues, particularly in the Columbia River Basin.

George Pess, Acting Program Manager, Watershed Program, NOAA-NMFS-NFWSC, Seattle; B.A., Bowdoin College (1987); M.S., Yale University (1992); Ph.D., University of Washington (2009); current main research projects include the ecosys-

tem response to the removal of the Elwha River dams, and differences in salmonid recolonization associated with population and aquatic habitat dynamics; working in fisheries since 1989, his primary research interest has been the examination of natural and land-use effects on salmon habitat and salmon production, the influence of wood in forested stream channels, and how landscape characteristics and land use affect salmon abundance.

Joshua Reyneveld, Co-Founder and Managing Director, Earth Economics, Tacoma, WA; leads the day-to-day operation of the organization, guides the business development effort, manages client relationships, and directs key projects; trained as a planner, architect and engineer, he has focused most of his career on endeavors that are exemplary because they utilize lower ecological footprints and create more self-sufficiency; 15 years of service as CEO with consulting firms in California and Washington, executed numerous significant planning projects, and directed capital projects up to \$200 million in scale.

Monty Schmitt, Senior Scientist and San Joaquin River Restoration Project Manager, Water Program, Natural Resources Defense Council, San Francisco, CA; B.S., University of California, Santa Cruz (1992); M.S., Humboldt State University (2002); focuses on protection and restoration of riverine ecosystems, salmon, fresh water fisheries, flood management, climate change, water supply management, riparian habitat, and impacts of dams, ensuring healthy rivers for fish, wildlife, and people; lead scientist in the effort to restore flows

and salmon to California's second largest river, the San Joaquin; expert on floodplain management issues in California, and served on the Governor's Taskforce on Floodplain Management; helped pass legislation that lead to the creation of the Central Valley Flood Protection Plan, California's first comprehensive plan to improve public safety and management of floodplains while also protecting and restoring riverine ecosystem (2007); co-author, reports on water management strategies to weather the effects of global warming and the impacts of oil shale development and climate change on Colorado River Basin water supply.

Christine Shirley, CFM, National Hazards and Floodplain Management Coordinator, Oregon Department of Land Conservation and Development, Salem; B.A., World College West; MSc, Geographical Information Science, Birkbeck College, University of London; assists communities with implementing the National Flood Insurance Program at the local level, as well as local and statewide hazard mitigation and long-term recovery planning; recently appointed to FEMA's Technical Mapping Council; member, Association of State Floodplain Managers; prior experience working with county government and nongovernmental organizations on watershed protection initiatives.

Bonnie S. Shorin, Program Analyst, National Marine Fisheries Service, West Coast Region, Lacey, WA; B.A., Whitman College (1985); J.D., University of Oregon School of Law; member of the Washington State Bar since 1990; Recovery Coordinator, Lake Ozette Sockeye; principle au-

thor, Effects of the National Flood Insurance Program on Puget Sound Species; assistant in the consultation on the Effects of the National Flood Insurance Program on Listed Species in the State of Oregon, and played a key role in developing, negotiating, and finalizing the Reasonable and Prudent Alternative for that consultation; previously with the Washington State Department of Ecology, where she worked on shoreline, coastal zone, clean water act, and floodplain management issues.

Reed Wagner, Executive Director, Multnomah County Drainage District, Portland; M.P.A., University of Oregon (2004); Prior to MCDD, he worked for the State of Oregon and Metro Regional Government and also has a background in the broadcast and new-media industries in executive management, project management, and marketing capacities; member, Special Districts Association of Oregon Board of Directors.

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CHAPTER 1

Flooding and the Columbia River Ecosystem

BILL BRADBURY

Oregon Representative, Northwest Power and
Conservation Council, Portland

KATHY EICHENBERGER

Executive Director, Columbia River Treaty, British Columbia
Ministry of Energy and Mines, Victoria, BC

PAUL LUMLEY

Executive Director, Columbia River Inter-Tribal
Fish Commission, Portland

REED WAGNER

Executive Director, Multnomah Drainage District, Portland

Chapter 1

FLOODING AND THE COLUMBIA RIVER ECOSYSTEM

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NOTES

Chapter 1

FLOODING AND THE COLUMBIA RIVER ECOSYSTEM

PART A FLOOD RISK Bill Bradbury

Flood risk is very real where we are sitting right now in Portland, Oregon.



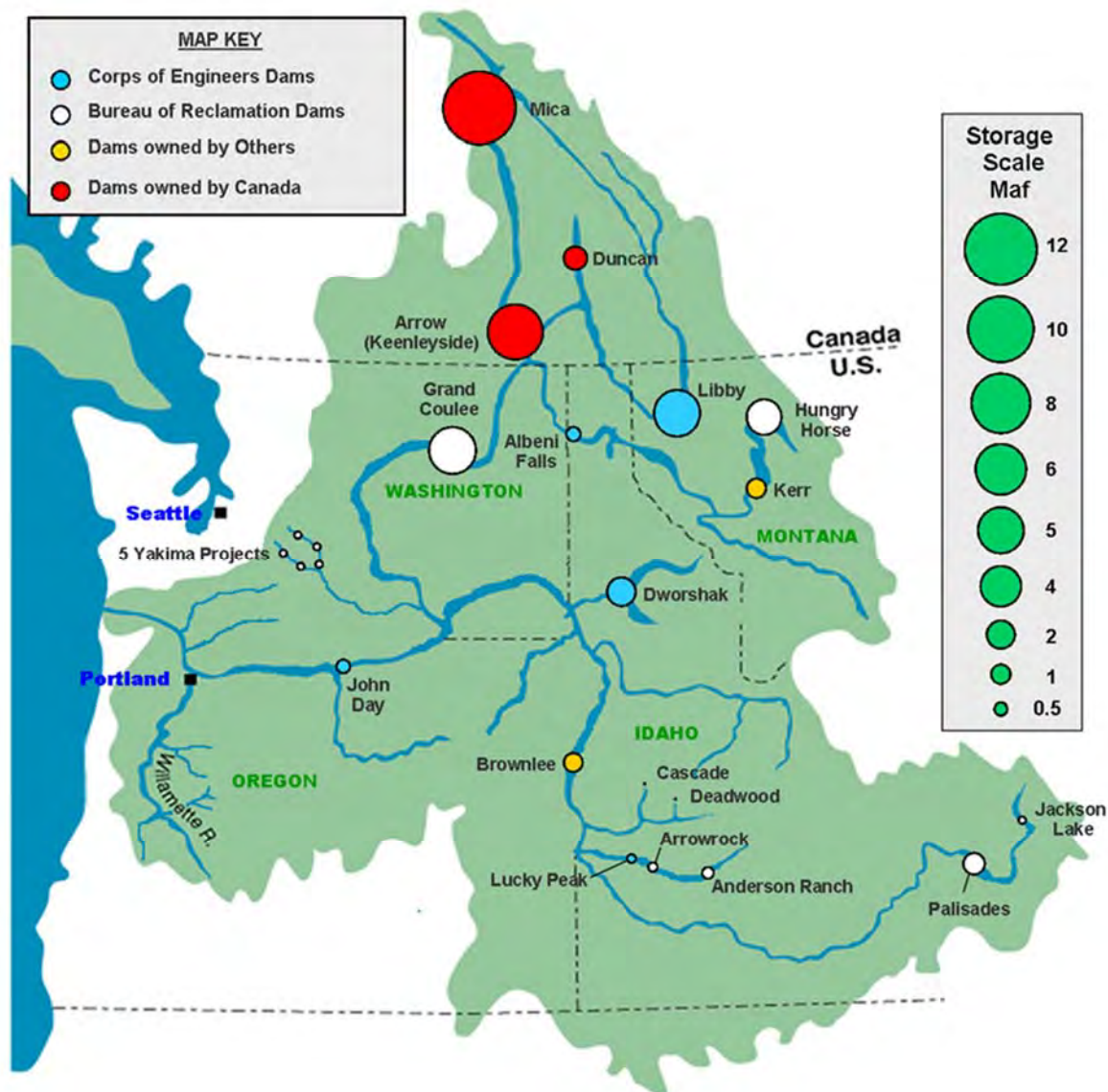
Let me take you back in time to 1948 and the Vanport flood which devastated Portland.



The Columbia is a mighty river (Vanport flood 1948) and the flood of 1948 showed that quite convincingly - and made it very clear how vulnerable the largest city in the Columbia basin is to flood events.



The risk of flooding led to negotiation of the Columbia River treaty that was ratified in 1964.



The treaty led to the construction of major Hydro projects in Canada that both reduce flood risk down-river *and* produce hydroelectricity to the benefit of Canadians.

This map clearly shows the significant flood storage that is provided by significant Canadian hydroelectric projects - including the Mica and Arrow Hydro projects. Both projects were built as a result of the Columbia River treaty and the projects dramatically reduce the flood risk in the lower river.



For example, the high flows in 1996 did not become a major flood event because of the cooperation between United States and Canada. Thank you Kathy!



How many people here remember the Willamette river flood walls in Portland in 1996?

Mayor Vera Katz spearheaded an effort to quickly erect the flood walls and protect downtown Portland from high flows in the Willamette River.



Canada reduced the problem caused by the Willamette because Canada voluntarily reduced flows in the Columbia to reduce the impact of the flooding Willamette on the Portland area.



There was still quite an impact from the high water, but it was nowhere near as bad as it could have been without the cooperation of Canada.



That's a little background on flood risk and its relevance to the Portland metropolitan area.

As we negotiated for a revised Columbia River Treaty, Oregon was obviously concerned about flood risk but also concerned about the survival and health of salmon in the Columbia River system.



Hence, Oregon was very supportive of ecosystem services as part of the proposed new treaty.

Salmon benefit from higher flows, particularly in the spring to move them out to the ocean. These proposed higher salmon flows run 180° in the opposite direction from US Army Corps of Engineers flood risk management programs.

As we worked on the treaty, the Corps received a great deal of pressure for increased

salmon flows and here was their response as reflected in a slide they showed to the Sovereigns:

USACE Flood Risk Management

“US Army Corps of Engineers has stated that a priority...is providing current flood risk protection levels in the basin.

The goal of achieving similar levels of flood risk has not been readily accepted by some Sovereigns.

The Corps is analyzing alternatives that look at improving ecosystem function and hydropower benefits with both similar and higher levels of flood risk...

Some Sovereigns expressed interest in... improvement of levees as a means to achieve similar protection levels while increasing flows for ecosystem function.

Corps processes for changing levels of flood risk require a lengthy public process to modify the existing Congressional authorization.”

Bottom line: the Corps thinks flood risk is the most important value in managing the Columbia River system. Ecosystem function/fish is a nicety but not a necessity.

In fairness, that is what Congress has told them to do.



But can a renegotiated treaty provide both for flood risk management and ecosystem function? I believe that it can do both and it will take the cooperation of all the partners to achieve it.

I'm ***not*** interested in serious flooding in the Portland metropolitan area but I also am ***not*** interested in having a river that fails to support magnificent runs of Salmon.

So what's it going to take to get to acceptable flood risk ***and*** ecosystem function with fish?

A broad range of alternatives for achieving acceptable future flood risk goals must be critically analyzed to disclose the full economic and ecological cost of the various alternatives.

While a significant increase in flood risk that results in loss of life or significant damage to

high value assets is **not** desirable, a **zero** tolerance for increased flood risk is too simplistic and jeopardizes the potential for a Columbia River Treaty that adequately addresses ecosystem function improvements.

Further analysis is warranted to ensure that minor flood risk increases for low value assets *might* be acceptable.

On a case-by-case basis, increased flood risk from a higher flow regime may be justified if the estimated value produced by the higher flows (for instance, the value of increased fish survival) approximates or exceeds the expected property damage.

In addition, increased flood risk could potentially be offset by other actions, such as strategic **levee fortification**. (Which I'm hoping Reed Wagner of the Multnomah County Drainage District might talk about next.)

It will take creativity and a willingness to take reasonable risk to achieve salmon health and abundance in the Columbia River.

PART B
Reed Wagner

I. INTRODUCTION

A. One of the most significant impacts of climate change is the increase of water levels in the ocean and in freshwater bodies from storm events.

B. Flooding events have devastated many urban areas where significant economic assets are located. Recent examples include the Great Flood in Mississippi, Hurricane Katrina, and Hurricane Sandy. Also, flooding in the Southwest—Arizona and Nevada—occurred this past fall.

C. The legal risks are real. Most floodplain regulations are adopted at the local level where review and approval of development that impacts flooding risks are made. Special units of governments operate drainage and flood control projects.

II. FEDERAL FLOOD CONTROL ACT (“FCA”)

A. The 1936 FCA established a program in which the federal government, acting through the U.S. Army Corps of Engineers (“USACE”), may engage in cooperative flood control projects with states and local governments. 1936 FCA §§ 1, 3 (33 USC §§ 701a, 701c). The 1936 FCA authorized an inaugural group of flood control projects, including:

1. Multnomah County—Multnomah County Drainage District No. 1; Peninsula Drainage District No. 1; Peninsula Drainage District No. 2; Sandy Drainage District; Sauvie Island;
2. Columbia County—Scappoose Drainage District; Rainier Drainage District; Beaver Drainage District; McGruder Drainage District; Midland Drainage District; Marshland Drainage District; Webb Drainage District; Woodson Drainage District; Deer Island area; Prescott area; Westland area;
3. Clatsop County—Westport District; Tenashillahe Island; Blind Slough; Drainage District No. 1; Knappa area; Karlson Island; John Day River dikes; Walluskia River dikes; Youngs River dikes; Diking District Nos. 2, 3, 5; Lewis and Clark River dikes; Warrenton Diking District; Warrenton Diking District Nos. 2 and 3; and
4. Flood control works in Pendleton.

B. In return for a federal contribution, Section 3 of the 1936 FCA imposes three “local cooperation requirements” on the Districts, the most relevant of which is the requirement to “maintain and operate all the works after completion in accordance with regulations prescribed by the Secretary of [Army].” 1936 FCA § 3 (33 USC § 701c).

C. Also, section 201 of the 1950 FCA obligates the Districts to comply with the local cooperation requirements of the 1936 FCA—including ongoing operation and maintenance—and conditions the federal contribution on the compliance with such requirements within five years of the 1950 FCA. 1950 FCA § 201. Under the 1936, 1948, and 1950 FCAs, local sponsors are obligated to operate and maintain the federally-authorized flood control projects in accordance with federal flood control regulations.

1. Local projects that are subject to local cooperation requirements are subject to federal performance standards at 33 CFR § 208.10.33; CFR § 209.220. These include the requirements to operate and maintain the projects to achieve “maximum benefits” and be subject to inspections by USACE.

2. By rule, at 33 CFR § 208.10, USACE establishes standards for “structures and facilities constructed by the United States for local flood protection,” including the following:

“No encroachment or trespass which will adversely affect the efficient operation or maintenance of the project works shall be permitted upon the rights-of-way for the protective facilities.

No improvement shall be passed over, under, or through the walls, levees, improved channels or floodways, nor shall any excavation or construction be permitted within the limits of the project right-of-way, nor shall any change be made in any feature of the works without prior determination by the District Engineer of the Department of the Army or his authorized representative that such improvement, excavation, construction, or alteration will not adversely affect the functioning of the protective facilities.” 33 CFR § 208.10(a)(5) (“Rule 208”).

D. Section 14 of the Rivers and Harbors Act, codified at 33 USC § 408 (“Section 408”), also governs permitting of activities that impact federally-authorized projects.

1. Under this authority, USACE’s approval is required for modification to a federally-built flood control works:

“It shall not be lawful for any person or persons to * * * build upon [or] alter * * * any sea wall, * * * dike, levee, * * * or other work built by the United States , * * * to prevent floods * * * : Provided further, that the Secretary may, on the recommendation of the Chief of Engineers, grant permission for the alteration or permanent occupation or use of any of the aforementioned public works when in the judgment of the Secretary such occupation or use will not be injurious to the public interest and will not impair the usefulness of such work.” (Italics added.)

2. Violations of Section 408 can give rise to civil criminal liability. 33 USC § 411 (knowing violations can result in “a misdemeanor, and on conviction thereof shall be punished by a fine of up to \$25,000 per day, or by imprisonment (in the case of a natural person) for not less than thirty days nor more than one year, or by both such fine and imprisonment”).

E. Rehabilitation and Inspection Program (“RIP”) under Public Law 84-99.

1. The RIP authorizes USACE to regulate flood management through emergency management programs—disaster preparedness, advance measures, emergency operations (disaster response and post-flood response), rehabilitation of flood control works threatened or destroyed by floods, protection or repair of federally authorized shore protection works threatened or destroyed by coastal storms, emergency dredging, and flood-related rescue operations. More significantly, USACE can repair damage caused by a natural event at a levee that participates in RIP.
2. Levee Safety Program:
 - a. Maintains national inventory of levee systems and makes the information available in the National Levee Database. The levees included in the USACE Levee Safety Program represent only about 10 percent of the nation’s levees.

- b. Inspects and assesses about 2,500 levee systems nationwide, and uses the data to prioritize action.
 - i. Routine Inspection is a visual inspection to verify and rate levee system operation and maintenance. It is typically conducted each year for all levees in the USACE Levee Safety Program.
 - ii. Periodic Inspection is a comprehensive inspection conducted by a USACE multidisciplinary team that includes the levee sponsor and is led by a professional engineer. USACE typically conducts this inspection every five years on the federally-authorized levees in the USACE Levee Safety Program. Periodic Inspections include three key steps: data collection, field inspection, and a final report.
 - iii. Each levee segment receives an overall segment inspection rating of Acceptable, Minimally Acceptable, or Unacceptable. If a levee system comprises one or more levee segments (if there are different levee sponsors for different parts of the levee), then the overall levee system rating is the lowest of the segment ratings.
- c. Communicates risk-related issues and concerns, holding life safety as paramount, and supports USACE and local decisions aimed at reducing risk.
- d. Works closely with federal, state, local, and international partners to share information and develop solutions.
- e. The Levee Safety Program is currently working to develop a robust levee safety program similar to the USACE Dam Safety Program. This includes multiple new components including:
 - i. Levee Screening Tool was developed in 2011 and assigns a Levee Safety Action Classification (LSAC) rating for each levee system in the RIP. This rating identifies relative risk for each levee system and identifies not only performance concerns but also potential consequences of a levee failure. The screening is a high level risk assessment that can help identify levee systems that need additional research or risk abatement. This allows for improved communications regarding levee deficiencies, qualitative conditional performance, and consequences.

III. NATIONAL FLOOD INSURANCE PROGRAM (“NFIP”)

A. The NFIP is implemented by the U.S. Federal Emergency Management Agency (“FEMA”) as a unified floodplain-management strategy to reduce property losses and public spending to compensate disaster victims from flood events.

B. The NFIP applies to a “community” that is defined as a state or a political subdivision that has “zoning and building code jurisdiction over a particular area having special flood hazards” and, specifically, “authority to adopt and enforce floodplain-management regulations in the areas within its jurisdiction.”

C. To address flood-risk concerns, FEMA maps flood-prone communities to identify Special Flood Hazard Areas (“SFHAs”) on the Flood Insurance Rate Map (“FIRM”). 42 USC § 4105; 44 CFR pt 65.

D. Participating communities avail themselves of the benefits of NFIP: 42 USC § 4002(b)(3) (one of the purposes of the NFIP is to “require States or local communities, as a condition of future federal financial assistance, to participate in the flood insurance program and to adopt adequate floodplain ordinances with effective enforcement provisions consistent with Federal standards to reduce or avoid future flood losses”); 44 USC § 4106(a).

1. Such federal financial assistance includes those for the acquisition, construction, reconstruction, repair, or improvement of any publicly-owned or privately-owned building or mobile home, and for any machinery, equipment, fixtures, and furnishings, and shall include the purchase or subsidization of mortgages or mortgage loans. 44 USC § 4003(a)(4).
2. This includes the vast majority of home loans backed by Fannie Mae and Freddie Mac, and other loans that are guaranteed by the FDIC, the Federal Housing Administration, Small Business Administration, and Department of Veterans Affairs, and grants by federal agencies. 42 USC § 4012a; 44 CFR § 59.2; Mandatory Purchase of Flood Insurance; Guidelines, 54 Fed Reg 29,666 (July 13, 1989).
3. Specifically, lending institutions are prohibited from providing such federally-backed loans for properties located or to be located in an SFHA in which federal flood insurance has been made available through the NFIP, unless the property securing such loans is covered by flood insurance. 42 USC § 4012a(b).
4. Insurance policies from NFIP are offered at rates lower than the market rates. 42 USC § 4001(d); 42 USC § 4014. The NFIP insurance is only offered to participating communities. 44 CFR § 59.21-.22; 44 CFR § 64.1.
5. NFIP Obligations. A participating community must adopt and enforce floodplain management measures to regulate new construction and by making substantial improvements within its SFHAs to eliminate or minimize future flood damage. 42 USC § 4022(a)(1); 44 CFR pt 60.

E. Accreditation of the Levee

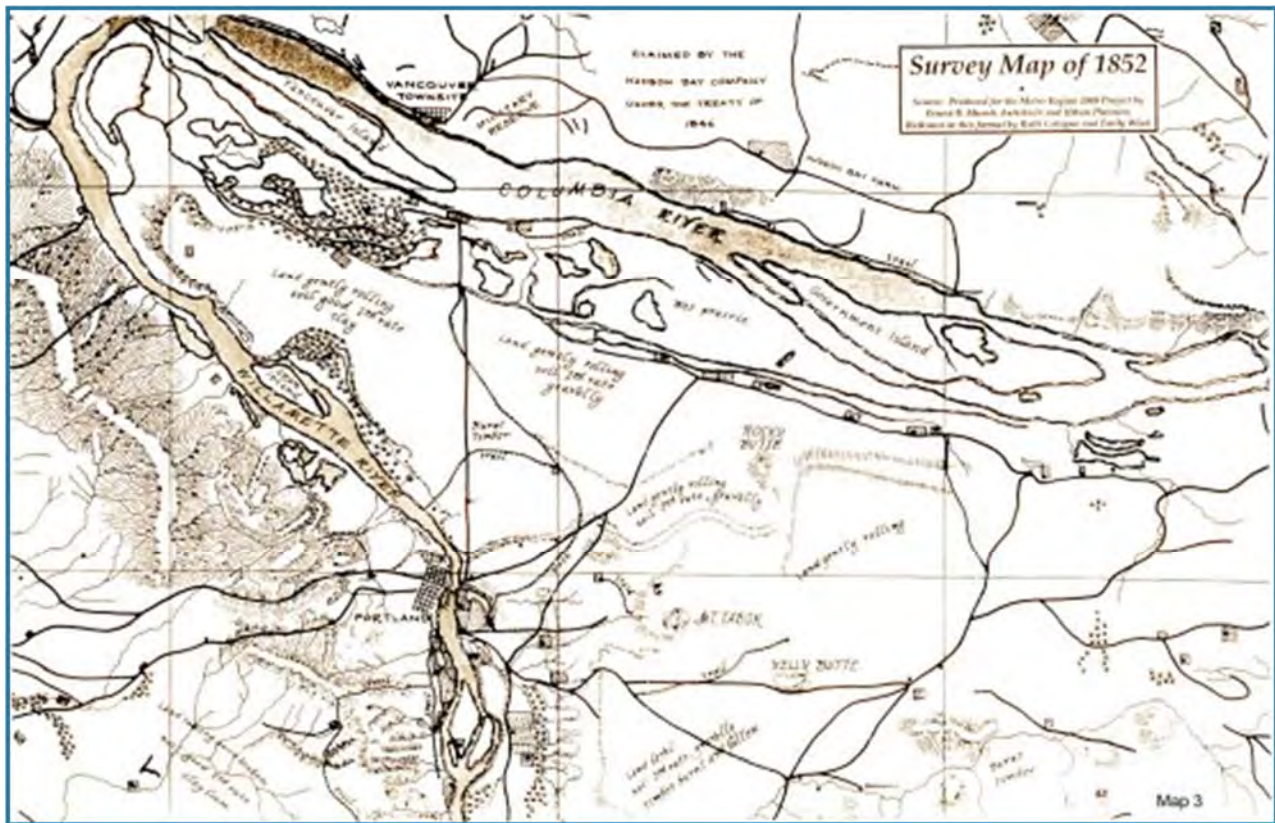
1. FEMA recognizes levees as one of many tools a community uses to manage flood risks.
2. When FEMA “accredits” a levee as providing adequate flood protection, FEMA will identify the areas behind the levee as having minimal risk and not give the area a SFHA designation. 42 USC § 4014(e); 44 CFR § 65.10.
 - a. Such a status relieves the participating community from complying with NFIP land use requirements for regulation of floodplain activity and mandatory purchase of flood insurance. 42 USC § 4014(e); 44 CFR § 60.3; 44 CFR § 65.10.
3. Accreditation Process
 - a. Certification of the levee must be completed for the levee to be eligible for accreditation by FEMA.
 - b. Certification consists of documentation, signed and sealed by a registered Professional Engineer (“PE”), as defined in 44 CFR 65.2. The PE can be USACE or a private consultant firm.

4. 44 CFR § 65.10 Criteria
 - a. Design criterion requires evidence that the levee is adequately designed and operated to provide reasonable assurance of protection from the base flood (freeboard, closure device, embankment protection and foundation, settlement).
 - b. Operation Plans to include operation of closure structures and interior drainage systems.
 - c. Maintenance Plan that must include formal procedure that ensures that the stability, height, and overall integrity of the levee and its associated structures and systems are maintained and specification of the maintenance activities to be performed, the frequency of their performance, and the person by name or title responsible for their performance.
 - d. Certification package includes a PE's certification that the data supports the levee system compliance with the structural requirements and contain certified as-built plans of the levee.
5. FEMA does not own, operate, maintain, inspect, or certify levees. FEMA's role is limited to identifying and mapping the level of flood risk associated with levees and only accredits them where data shows compliance with 44 CFR § 65.10.
6. A community or levee owner's failure to provide full documentation of the status of a levee does not mean the levee doesn't provide the designated level of risk reduction—it merely ensures the levee will be mapped on a FIRM because it will be de-accredited, and the impacted area will be mapped as an SFHA.



Flooding and the Columbia River Ecosystem

Presented by:
Reed Wagner, Executive Director
Multnomah County Drainage District #1
Portland, OR
December 10, 2015





Contact

Reed Wagner
rwagner@mcdd.org
(503) 281-5675

www.mcdd.org
facebook.com/MCDDfloodprotection
Twitter: @MCDDorg



PART C
STATUS OF COLUMBIA RIVER TREATY
A BC GOVERNMENT PERSPECTIVE
Kathy Eichenberger

BC Treaty Mandate

- Under Canadian Constitution:
 - Federal treaty-making power
 - Provincial jurisdiction of natural resources, including hydroelectric development
- 1963 Canada/BC Agreement transferred most of the Treaty obligations and benefits to BC
- BC Hydro is Canadian Entity to implement the Treaty
- Government of BC is the Canadian Entity for the disposal of the Canadian Entitlement



Provincial Decision

- Released March 13, 2014
- Generally reflects input from First Nations, local governments and public
- Decision to continue the Treaty and seek improvements within its existing framework
- 14 principles to guide BC in discussion of any potential Treaty changes



Provincial Decision – Principles

High level themes:

- Goal is to create and share benefits equitably
- There is a lot of value from upstream regulation provided by Canada to a broad range of U.S. interests
- Treaty operations continue to impact Canadian basin residents and regional interests



Benefits of the Treaty to the U.S.

- Prevents of significant flooding, loss of life, property and infrastructure damage
- Increases power production potential
- Manages flows for fisheries enhancement, ESA
- Ensures relief during annual low flow periods and dry years
- Provides seasonal availability of water supply for irrigation, municipal, industrial uses
- Maintains commercial navigation conditions
- Prolongs recreation season

Current Benefits of the Treaty to BC

Canadian Entitlement

- Sold on the market
- Currently worth: approx. \$ 130M/year

Provincial Decision – Principles (cont'd)

- Treaty should be adaptable to changing conditions
- Treaty has flexibility to incorporate ecosystems and further improvements can be explored
- The feasibility of reintroduction of salmon in the Upper Columbia does not need to be a Treaty issue

Provincial Decision – Principles

- Changing flood control in 2024 from assured to ad hoc Called Upon Flood Control
- Climate change will make collaboration even more important
- BC is committed to continued engagement with First Nations and the public through any potential negotiations



Next Steps

- Conduct valuation of full suite of U.S. benefits
- Pursue further modeling of potential BC ecosystem option(s)
- Continue to work with Canada on developing a collaborative approach to any future negotiations
- Gain a further understanding of U.S. perspectives and next steps in U.S. process
- Explore options to increase benefits to both countries

Thank You



PART D

Paul Lumley



Tribal Perspectives on the Columbia River Treaty

Paul Lumley (Yakama), Executive Director
Columbia River Inter-Tribal Fish Commission

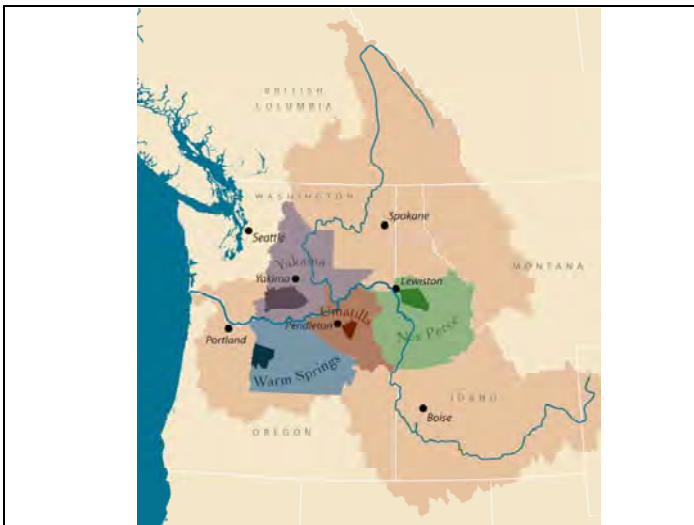


FIRST FOODS



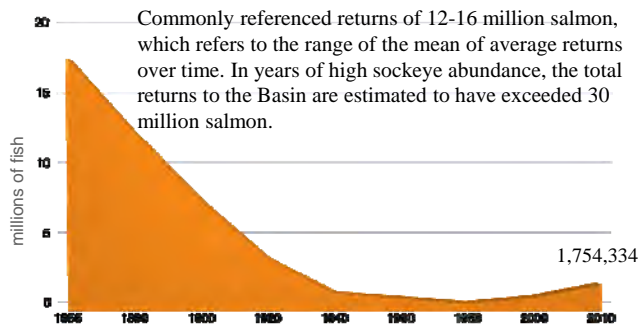
“...the right of taking fish at all usual and accustomed places, in common with the citizens of the Territory, and of erecting temporary buildings for curing them, together with the privilege of hunting, gathering roots and berries....”

—1855 Treaty with the Yakama Nation



Salmon Decline

Columbia River salmon (chinook, steelhead, sockeye, coho, and chum)





Kettle Falls Tribal Fishery

On the Columbia River in Washington State
(inundated by Grand Coulee Dam in 1940)

Many Tribes and First Nations lost all access to salmon



Celilo Falls Tribal Fishery

On the Columbia River near The Dalles, Oregon
(inundated by The Dalles Dam in 1957)

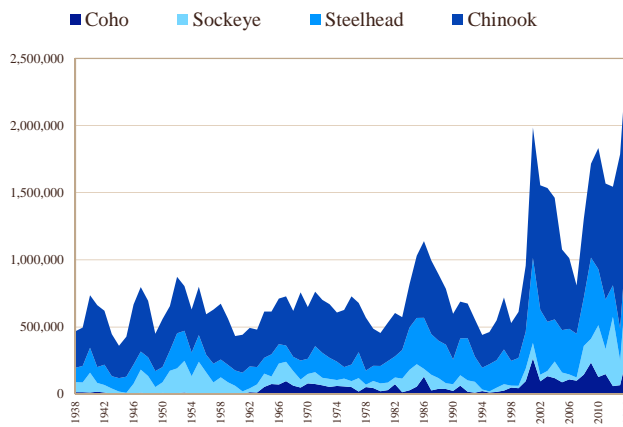
Tribal Villages and Fishing Sites Destroyed by Dams and Reservoirs



Big River Big Dams

- The tribes never anticipated massive changes to the river when the treaties were signed in 1855.
- Our treaties are contracts with the United States.
- We reserved our rights to the First Foods.



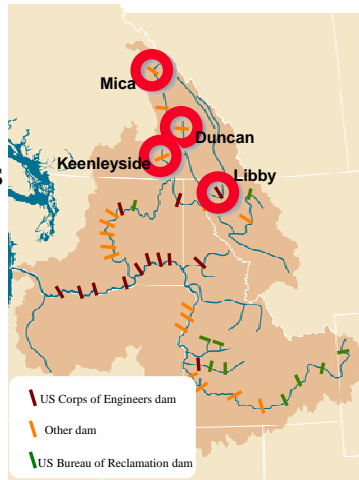


Vanport Flood

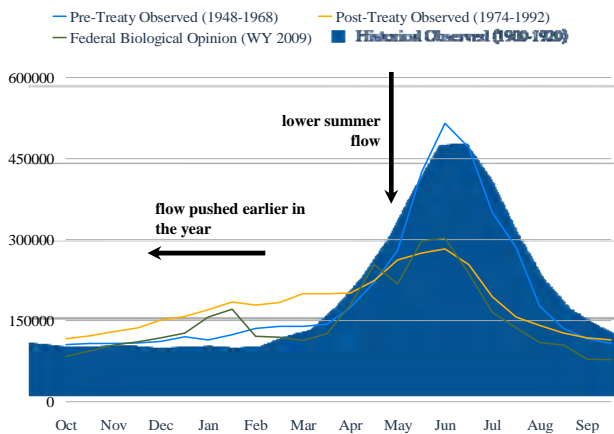
The Columbia River flooded in 1948, completely wiping out Vanport, Oregon
Note: this city was built in a floodplain without adequate flood protection (levees)

Columbia River Treaty

- Treaty came into force in 1964, no end date
- Canada builds three dams, US builds Libby – no passage
- Twin goals:
 - optimize hydropower
 - coordinate flood control
- Treaty may be terminated with 10 years notice
- Tribes not consulted, no fish & wildlife coordination



River Level at The Dalles Dam



Permanent Floods Created Upriver to Protect Portland from Flooding



Relocating a Church from Waldo
Now under Koocanusa Reservoir



Mica Dam built in 1973



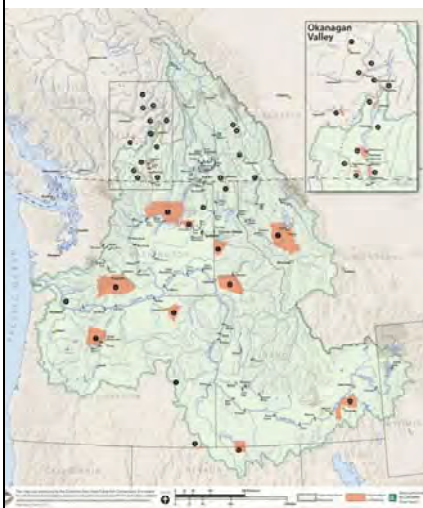
Kinbasket Reservoir
Drawdown Effects



Vanport Flood, near Portland

Effect of Implementing Current Treaty

- Moved water to a different time of the year
 - Built reservoirs
 - Captured spring freshet
 - Created permanent floods upriver
 - Substantially reduced spring and early summer flows to the detriment of salmon
- Reduced flood risk, allow for floodplain development
- Released water later in the year for coordinated power production purposes



Columbia Basin Tribes

15 tribes with management authorities and responsibilities affected by the Columbia River Treaty

2009 - Formed
2010 - Common Views
2011 - First Nations G2G

Broad Regional Consensus Achieved: Modify the Treaty

(U.S. Entity Dec 13, 2013)

Recommendation Elements:

- Add ecosystem-based functions
 - Restore fish passage to historic locations
- Recalculate Canadian Entitlement (~\$300m)
- Address flood control management post-2024
- Recognize Water Supply Interests
- Adapt for Climate Change impacts

Implementing Ecosystem-based Function

Regional Recommendation integrates ecosystem-based function by:

- Building upon current operations
- Incorporating existing Treaty flow augmentation
- Accommodating modifications to flow augmentation
- Incorporating dry year strategy
- Ensuring that modernized operations do not interfere with fish passage and reintroduction opportunities

Rethinking Floods

- Floods are natural, good and healthy for a river system. If you don't want to be flooded, **don't** move into a flood plain.



- These are permanent floods behind all these dams, to keep Portland dry.
- Dislocated tribal communities, damaged culture and a wrecked ecosystem. Was this a good deal?

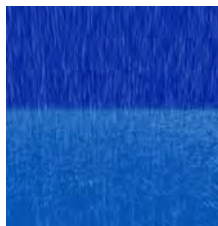
Now is the time to reconsider Flood Risk Management

Climate Change

Increasing Temperatures Mean Some Areas will Change



Snowfall Dominated



Rainfall Dominated

Impacts on Fish



- Winter Flooding, Increased Frequency and Severity
 - eggs and overwintering juveniles
- Low Summer Flows
 - adult migration and spawning
- Higher Water Temperatures
 - adult and juvenile migration, disrupt growth

FUTURE OF OUR SALMON 2016

A Vision of Restoration in the Columbia River Basin

Healthy Floodplains, Living Rivers

Focusing on the role floodplain management and restoration plays in salmon restoration efforts

Portland, October 18-20, 2016

- Role floods play in ecosystem health
- Impacts of flood control on the ecosystem
- Benefits of floodplain restoration
- Alternative flood control management to benefit fish
- Climate change impacts on floodplains
- Role of Traditional Ecological Knowledge in understanding and restoring floodplains



Tribal elders taught us that if we take care of the First Foods, the First Foods will take care of us

Comments - Questions?



Tribal Chiefs watch the construction of Grand Coulee Dam

United States Entity

Columbia River Treaty

P.O. Box 3621, Portland, OR 97208-3621

Chairman:

Administrator and Chief Executive Officer
Bonneville Power Administration
Department of Energy

Member:

Division Commander
Northwestern Division
Corps of Engineers
Department of the Army

13 December 2013

In reply refer to: BPA A-7 / USACE CENWD-DE

Ms. Sue Saarnio, Director
Office of Canadian Affairs, WHA-CAN
United States Department of State
2201 C Street Northwest
Washington, D.C. 20520

Dear Ms. Saarnio:

The purpose of this letter is to transmit the U.S. Entity's regional recommendation concerning the future of the Columbia River Treaty after 2024. The U.S. Entity for the Columbia River Treaty (Treaty) is composed of the Administrator of the Bonneville Power Administration and the U.S. Army Corps of Engineers Northwestern Division Engineer, and is charged with the duty to formulate and carry out the operating arrangements necessary to implement the Treaty. The attached recommendation is being provided to the U.S. Department of State and the Administration at the direction of the Interagency Policy Committee to produce a regional recommendation that reflects the broadest possible consensus.

The regional recommendation was developed by the U.S. Entity in collaboration and consultation with the region's sovereign states, federally recognized tribes, and a variety of stakeholders through an extensive, multi-year process known as the Columbia River Treaty Review (Treaty Review). The U.S. Entity submits that the Pacific Northwest region broadly supports modernization of the Treaty to bring about better and more balanced benefits, and believes this would be in the best interest of the region and the United States.

The stated goal of the regional recommendation is for both countries to develop a modernized Treaty framework that reflects the value of coordinated power operations with Canada, maintains an acceptable level of flood risk and supports a resilient and healthy ecosystem-based function throughout the Columbia River Basin. It is important to achieve a modernized framework for the Treaty that balances power production, flood risk management, and ecosystem-based function as the primary purposes addressed in the Treaty, while also meeting other congressionally authorized purposes of the U.S. projects, such as irrigation and navigation.

The recommendation includes general principles, followed by topic-specific recommendations for a modernized Treaty. In addition to the regional recommendation, we have included a section that identifies domestic matters for consideration by U.S. domestic interests to be addressed post-2013.

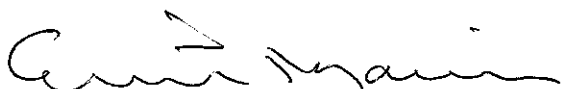
Throughout the Treaty Review process, every effort was made to achieve the broadest regional consensus possible. This recommendation represents the U.S. Entity's best effort to reflect the perspectives of the full spectrum of regional interests, but, like any process of this scope and complexity, some compromise

was necessary to garner as much region-wide support as possible. As such, not every opinion or perspective submitted to the U.S. Entity could be incorporated into the recommendation.

In forthcoming discussions at the national level, some parties may advocate for future Treaty operations that benefit certain uses over others. The U.S. Entity believes this would be inconsistent with the spirit and letter of this recommendation, which is built around the idea that all of the general principles outlined in this document are to be taken together and should be mutually achieved in a post-2024 Treaty. We support improving the Treaty for the benefit of all interests in the region by providing a collective net “win” and ensuring the Treaty is sustainable for the long term.

While the submission of this recommendation is an important first step, we understand that we now enter a new phase of review that will be carried out by the State Department in consultation with the Administration. The U.S. Entity, regional sovereigns and stakeholders remain very interested in participating in the State Department’s future review and any subsequent related actions or decisions. In particular, the U.S. Entity and its Northwest partners stand ready to work with our Canadian counterparts in coordination with the State Department to develop the details of a modernized Treaty that is fair, balanced, and sustainable.

Sincerely,



Elliot E. Mainzer,
U.S. Entity Chair, Columbia River Treaty
Acting Administrator, Bonneville Power Administration



Brigadier General John S. Kem
U.S. Entity Member, Columbia River Treaty
Commander, U.S. Army Corps of Engineers, Northwestern Division

Attachment: “U.S. Entity Regional Recommendation for the Future of the Columbia River Treaty after 2024”

U.S. Entity Regional Recommendation for the Future of the Columbia River Treaty after 2024

December 13, 2013



U.S. Entity Regional Recommendation for the Future of the Columbia River Treaty after 2024

Introduction

The Pacific Northwest depends on a healthy Columbia River system to provide environmental sustainability, national energy independence, protection of public safety and infrastructure, and economic well-being. The Columbia River Treaty (Treaty) has provisions that should be improved to address this region's long-term ability to meet these objectives. Consequently, the region's sovereigns and stakeholders believe that modernization of the Treaty is in the best interest of the United States.

This recommendation identifies potential modifications to the Treaty post-2024. It begins by identifying regional goals for the future of the Treaty post-2024. It includes a set of general principles underlying this recommendation, followed by more specific recommendations related to a number of Treaty elements. Finally, in addition to this recommendation, we identify a number of matters related to possible post-2024 Treaty implementation for consideration by domestic interests.

The U.S. Entity developed the regional recommendation in collaboration and consultation with the region's sovereign states, federally recognized tribes, and a variety of stakeholders through an extensive, multi-year process known as the Columbia River Treaty Review.

Regional Goal for the Columbia River Treaty

The Pacific Northwest recognizes the value of the Columbia River Treaty in facilitating shared water resource management in the Basin to maximize benefits to both the United States and Canada. When the Treaty was originally drafted in the 1960s, it was designed to optimize hydropower production and coordinate flood risk management as its two primary benefits. In terms of those purposes, the Treaty has served the people of the region well. The assured streamflows under the Treaty support the region's hydropower system, which serves as a crucial backbone of the Pacific Northwest economy. The Treaty also has assisted in effectively managing flood risk to ensure public safety and facilitate regional development.

While the importance of the Basin's ecosystem has long been recognized and valued by those in the region, the Treaty does not identify ecosystem considerations. Significant efforts to address ecosystem concerns began in the 1980s through various avenues, and the region, principally through its electric utility ratepayers, has invested hundreds of millions of dollars annually to achieve ecosystem mitigation and improvements throughout the Basin over the intervening decades. In addition, the United States and Canadian entities in 1993 began using the flexibility in the Treaty to assist in meeting Endangered Species Act (ESA) requirements and to address ecosystem considerations on an annual basis through actions such as flow augmentation agreements. While it is recognized that significant ecological improvements are being implemented and realized in a number of critical areas and are anticipated to continue over time,¹

¹ There are a number of domestic actions that have contributed, and will contribute to ecological improvements in the Basin. These include the Federal Columbia River Power System Biological Opinion requirements under the Endangered Species Act, the Nez Perce Water Rights Agreements of 2004, actions under the Northwest Power and Conservation Council's Columbia River Basin Fish and Wildlife Program, actions under the Clean Water Act to improve water quality, and implementation of the Columbia Basin Fish Accords. In addition, there are numerous habitat and conservation programs and FERC license requirements associated with non-federal dams on the Columbia River.

there is an opportunity for inclusion of certain additional ecosystem operations to expand, enhance, and complement these existing ecosystem investments as part of the post-2024 Treaty.

There also is increasing awareness in the region that an imbalance has developed in the equitable sharing of the downstream power benefits resulting from the Treaty. When the Treaty was ratified, the United States and Canada structured Canada's share of these benefits as one-half of the downstream power benefits with the Canadian Treaty projects as compared to without those projects. An equitable sharing of these benefits should instead be based on the more realistic measure of the power value of coordinated operations as compared to non-coordinated operations. Based on the present formula developed in the 1960s, the estimated value of the Canadian share of the downstream benefits in 2024 is significantly greater than anticipated, and far exceeds the value of coordinated power operations under the Treaty.

Flood risk management continues to be a vitally important aspect of coordinated operations with Canada. Recent high water events in 1996/1997 in the Portland/Vancouver area and in the Kootenai River Basin in 2006 and 2012 are examples of the effectiveness of coordinated operations that reduced flood impacts to the communities in both Canada and the United States. After the first 60 years of assured flood risk management operations in Canadian reservoirs, the Treaty shifts to "Called Upon" procedures for post-2024 flood risk management operations. As the nation and region develop a better understanding of the potential implications of climate change, future flood risk management procedures need to be resilient to provide for public safety.

Other important elements of a modernized Treaty are current and future water supply to help meet regional needs for irrigation, municipal and industrial use, in-stream flows, navigation, and recreation. In addition, the Treaty should include both short- and long-term mechanisms that allow for adapting the Treaty to build in flexibility of operations as conditions change (e.g., climate change, ESA listings or delistings, or as new information and technology become available).

Accordingly, the region's goal is for the United States and Canada to develop a modernized framework for the Treaty that ensures a more resilient and healthy ecosystem-based function throughout the Columbia River Basin while maintaining an acceptable level of flood risk² and assuring reliable and economic hydropower benefits. Therefore, it is important to achieve a modernized framework for the Treaty that balances power production, flood risk management, and ecosystem-based function as the primary purposes, while also recognizing and implementing all authorized purposes.³

It is essential to note in the reading of this recommendation that, while the inclusion of ecosystem-based function as a third primary purpose of this Treaty is being recommended, a very important balance of water management uses has been established in the Basin and its tributaries over the past 50 years. This recommendation respects the importance, complexity, and trade-offs of each of these many uses and the benefits that the region has strived to achieve.

In summary, this recommendation seeks to formalize, provide certainty, and build on the many ecosystem actions already undertaken through annual or seasonal mutual agreements between the countries, while also providing a net increase in U.S. power benefits based on the actual value of coordinated operations

² Throughout this document, "acceptable" flood risk is defined as "similar to the current level" of flood risk; however, the "acceptable" level of flood risk may change pending the outcome of a regional flood risk review process post-2013 as noted in item 1 listed in the *Domestic Matters to be Addressed Post-2013* section at the end of this document.

³ In this document, the "primary purposes" refers to the "benefits" to be achieved through the Treaty. Where noted, "authorized purposes" is used to connote those purposes that have been authorized in the Basin through the United States Congress.

with Canada, preserving an acceptable level of flood risk to the people of the Basin, and continuing to recognize and implement the other authorized purposes in the Basin.

In this document the term “modernization” of the Treaty refers to the construct of a post-2024 arrangement. This construct could include amendments or revisions to the existing Treaty, diplomatic notes or protocols, or other means resulting in a modernized Treaty.

General Principles

Nine key principles underlie this recommendation and a modern approach to the Columbia River Treaty. These General Principles are to be taken together with the intent that all of the interests addressed herein be improved.

1. Treaty provisions should enable the greatest possible shared benefits in the United States and Canada from the coordinated operation of Treaty reservoirs for ecosystem, hydropower, and flood risk management, as well as water supply, recreation, navigation, and other pertinent benefits and uses, as compared to no longer coordinating Treaty storage operations.
2. The health of the Columbia River ecosystem should be a shared benefit and cost of the United States and Canada.
3. The minimum duration of the Treaty post-2024 should be long enough to allow each country to rely on the Treaty’s planned operations and benefits for purposes of managing their long-range budgets, resource plans, and investments, but adaptable enough to allow responses to new information and changing conditions.
4. All operations of the Treaty should be based on the best available science, and, to the extent practicable, measurable outcomes.
5. U.S. federal reservoirs/projects will continue to meet authorized uses consistent with applicable legislation, Indian treaties and tribal rights, the U.S. Government’s trust responsibility to the tribes, and other U. S. laws such as the Clean Water Act and the Endangered Species Act. Non-federal U.S. projects will continue to meet their responsibilities pursuant to their Federal Energy Regulatory Commission licenses.
6. The United States and Canada should pursue a more coordinated use of Treaty and Canadian non-Treaty storage under the Treaty to increase the flexibility to, and benefits of, meeting ecosystem-based function, power, flood risk management, and other authorized water management purposes in both countries.
7. The region anticipates impacts from climate change to all of the elements described in this document. The strategy for adapting the Treaty to future changes in climate should be resilient, adaptable, flexible, and timely as conditions warrant.
8. It is recognized that modifications to the Treaty could result in new benefits and/or costs to both Canada and the United States. U.S. interests should ensure that costs associated with any Treaty operation are aligned with the appropriate party.
9. Implementation of ecosystem-based functions in the Treaty should be compatible with rebalancing the entitlement and reducing U.S. power costs.

Recommendation Details

Consistent with the intent of the general goals and principles, the following sections provide more specific recommendations for a modernized Treaty.

Hydropower

In order to maintain coordinated hydropower operations and a reliable, economically sustainable hydropower system in a modernized Treaty, the region recommends the following:

1. The United States should pursue rebalancing the power benefits between the two countries to reflect the actual value of coordinated operations. This rebalancing is necessary because the present Treaty power benefits are not equitably shared and Canada is deriving substantially greater value from coordinated power operations than the United States. Accordingly, for the Treaty to be sustainable after 2024, the United States should only provide benefits to Canada equivalent to one-half of the actual U.S. downstream capacity and energy benefits received from coordinated operations as compared to a non-coordinated operation.
2. The United States should renegotiate for the replacement of the present "Aspects of Delivery Agreement" to create the least-cost transmission strategy for both countries to return the Canadian Entitlement to Canada. This includes reconsidering the flexibility of the return.
3. A modernized Treaty should retain the ability for both the United States and Canada to maintain an economical and reliable power supply post-2024. This requires consideration of the implications of any reductions in generation capability for either country, including lost revenue, system reliability, substantial increases in loss-of-load probability, carbon emissions, renewable resource integration, energy efficiency and conservation, and shifts in streamflow quantity and timing due to climate change.
4. A modernized Treaty should avoid substantial changes in hydropower generation during peak load periods that result in lower system reliability or flexibility⁴.

Flood Risk Management

In order to maintain coordinated flood risk management, and to protect public safety and the region's economy, the region recommends the following:

1. The United States should pursue post-2024 Treaty flood risk management through a coordinated operation plan that provides for an acceptable level of flood risk. Unless modified based upon future review of flood risk management policy for the Columbia River, the level of risk will be similar to the level of risk existing prior to 2024 (see *Domestic Matters to be Addressed Post-2013* section).
2. The United States should pursue an assessment with Canada of potential alternatives for post-2024 operations to meet flood risk management objectives, including the possibility of using planned or assured Canadian Storage.
3. The United States and Canada should establish a common understanding of the methods and procedures for post-2024 Called Upon, which should reflect the following principles based on the

⁴ Flexibility in the hydropower system is the ability of hydropower generation to respond rapidly to changes in the balance between demand and system generation and is critical for integrating variable renewable power generation such as wind and solar.

U.S. Entity White Paper: *Columbia River Post-2024 Flood Risk Management Procedure*, September 2011:

- A. Called Upon should be considered only if coordinated Canadian power, flood control, and other operations do not provide sufficient storage in conjunction with the use of U.S. system flood storage or when needed during refill season to modify planned Canadian releases.
 - B. Draft U.S. projects according to their storage reservation diagrams (SRDs). Future flood risk management studies may evaluate alternative SRDs to include incorporation of ecosystem-based function such as dry year operating strategies.
 - C. Define “effective use” as applying to the eight U.S. reservoirs authorized for system flood control.
- 4. The United States and Canada should identify reasonable compensation to Canada for economic losses and operating costs associated with Called Upon. Any payments for Columbia River flood risk management should be consistent with the national flood risk funding policy of federal funding with applicable local beneficiaries sharing those costs as appropriate.
 - 5. A modernized Treaty should enable the necessary flexibility to adapt both to changing flood risk management objectives in the United States and Canada and climate change (such as the potential for more frequent and intense winter flood events) to avoid additional risks to authorized purposes.

Ecosystem-based Function

In order to achieve the goal of modernizing the Treaty to further ensure a more comprehensive ecosystem-based function approach throughout the Columbia River Basin watershed, the region recommends the following:

- 1. A modernized Treaty should provide streamflows from Canada with appropriate timing, quantity, and water quality to promote productive populations of anadromous and resident fish and provide reservoir conditions to promote productive populations of native fish and wildlife. While recognizing existing Treaty obligations, a modernized Treaty should: (a) incorporate existing Treaty flow augmentation operations and accommodate post-2024 modifications to flow augmentation; (b) incorporate a dry-year strategy; and (c) gain long-term assurance of ecosystem-based functions rather than negotiating for these functions on an annual basis.
- 2. A modernized Treaty should recognize and minimize adverse effects to tribal, First Nations, and other cultural resources in Canada and the United States. To the extent there are adverse effects to U.S. cultural resource interests, such changes should be addressed under the Federal Columbia River Power System (FCRPS) Cultural Resources Program. This Program has the ability to be amended and expanded as needed if there are effects on cultural resources resulting from changes due to future operations in a modernized Treaty.
- 3. A modernized Treaty should be designed to be adaptable to meeting ecosystem-based function requirements as new information becomes available or conditions change (e.g., climate change) based on the management priorities of both countries.
- 4. The United States should pursue a joint program with Canada, with shared costs, to investigate and, if warranted, implement restored fish passage and reintroduction of anadromous fish on the

main stem Columbia River to Canadian spawning grounds. This joint program would proceed on an incremental basis, beginning with a reconnaissance-level investigation, and continue with implementation actions. All such federal actions at the Chief Joseph and Grand Coulee projects are subject to congressional authorization and appropriation. Modernized Treaty operations should not interfere with other opportunities to restore fish passage and reintroduction of fish in other blocked areas of the Columbia River Basin.

5. The United States should continue to coordinate its operation of Libby Dam with Canada, with the goal of achieving mutually desirable ecosystem benefits on both sides of the border. VarQ at Libby and Hungry Horse dams, including any modifications to VarQ, balances the multiple uses of the dams and incorporates ecosystem-based function.

Water Supply

Treaty Review studies indicate the potential for a modernized Treaty to allow for additional storage of water in Canada during the fall and winter, and release in the spring and summer. The Treaty should allow the storage and release of water from Canada in the spring and summer for additional in-stream and out-of-stream uses, including irrigation and municipal/industrial uses.

Irrigation has a long and important history in the Columbia River Basin for crop production and other purposes. The need for irrigation will only increase as the region continues to grow and as food supply and security continue to grow in importance. Operations under a modernized Treaty should recognize irrigation as an important authorized purpose in the Basin.

Any future water supply allocation decisions associated with a modernized Treaty should be subject to the requirement that they not adversely affect the operation of upstream reservoirs such as VarQ, and be made through a future domestic process and be consistent with ecosystem-based function and water rights, including tribal reserved water rights (see *Domestic Matters to be Addressed Post-2013* section).

Navigation

Since the Treaty was ratified in 1964, the regional and national economic significance of Columbia River navigation has grown. Operations under a modernized Treaty should recognize navigation as an important authorized purpose in the Basin and provide river flows that do not undermine safe navigation, efficient cargo movement, or the ability of navigation infrastructure to be maintained. This will ensure the economic value of port and transportation facilities, including commercial import and export of agricultural, bulk and manufactured goods.

Recreation

The region recognizes and supports the recreational and cultural opportunities that are a significant outcome of the Columbia River watershed management processes. Operations under a modernized Treaty should strive toward the protection of these resources.

Climate Change

A modernized Treaty should consider impacts from climate change to all elements described above, and create new terms in the post-2024 Treaty to allow the adaptive management of coordinated Treaty operations to better mitigate any impacts associated with climate change. The United States and Canadian Entities' Hydro-meteorological Team should continue to collaborate and share the best available climate change data and information.

Recommendation Timeframe

The region recommends that the U.S. government make a decision by mid-2014 to proceed with a renegotiation of the Treaty with Canada in order to modernize the Treaty by incorporating the objectives in this regional recommendation. Further, the region recommends that the U.S. government seek to complete that effort no later than 2015. If the United States and Canada are unable to achieve agreement on key aspects of a modernized Treaty by 2015, other options to create a modernized post-2024 Treaty should be evaluated.

Domestic Matters to be Addressed Post-2013

In addition to the preceding recommendation to the U.S. Department of State, this section identifies domestic matters related to possible post-2024 modernized Treaty implementation for consideration by domestic interests. Some of these are appropriate for consideration once the United States Entity makes its recommendation to the U.S. Department of State in 2013 and others are more appropriate for consideration once the U.S. government has a better understanding of post-2024 circumstances.

1. **U.S. Columbia River Basin Flood Risk Policy Review:** Pacific Northwest states and tribes support the pursuit of Congressional authorization and appropriations for a region-wide public process to assess potential changes to the current level of flood risk protection in the Columbia River Basin to enhance spring and summer flows. Any such process should occur between 2014 and 2024. Post-2024 Treaty provisions, including Called Upon, will be designed to adapt to any such changes that may be authorized. If a process is initiated, it will be a comprehensive approach, subject to public input, that addresses all opportunities to manage high flow events, including floodplain management, Columbia River Basin reservoir operations, and strategic improvements to existing levees and the need for additional levees. Potential impacts to other river uses and infrastructure such as navigation, bridges and other transportation features, hydropower, irrigation, recreation, fish and wildlife, and cultural resources also will be evaluated and addressed.
2. **Water Supply Allocation:** Pacific Northwest states, tribes, and appropriate federal agencies will design and initiate a process to allocate and manage any additional spring or summer flows for in-stream, irrigation, and municipal/industrial purposes derived through post-2024 Treaty operations. All water rights interests should be represented in this process. The U.S. Entity will incorporate decisions from this process into their post-2024 Treaty planning and operations. It is recognized that the states have authority to allocate and manage water pursuant to state law and consistent with other applicable law.
3. **Assessment of Canadian Entitlement:** BPA will host a public process in which states, tribes, federal agencies, and stakeholders can participate. This process will take place between 2014 and 2024 to assess the expected potential changes to its annual revenue requirements and rates due to any redesign of the Treaty post-2024. BPA also will discuss with the region how to manage those costs and benefits consistent with BPA's statutory authorities.
4. **Plan for Post-2024 Treaty Implementation:** Following the conclusion of the United States and Canadian negotiations of the terms of the post-2024 Treaty, and subject to funding, the U.S. Entity will lead an effort in consultation with regional sovereigns and stakeholders to develop a plan identifying the steps necessary to implement the modern Treaty post-2024. This plan will define the appropriate work needed to incorporate and implement any new ecosystem-based function, flood risk management, hydropower, and any other expected new operational objectives under the Treaty.

5. **U.S. Flood Plain Reconnection:** Tribal, federal, and state sovereigns will work with the Northwest Power and Conservation Council's Fish and Wildlife Program and the National Oceanic and Atmospheric Administration/National Marine Fisheries' Recovery Planning process (particularly estuary actions) or any other identified process throughout the Basin to advance selective flood plain reconnection for the purpose of achieving additional benefits from a modernized Treaty.
6. **U.S. domestic advisory mechanism:** The U.S. Department of State should establish and resource a structured domestic advisory mechanism to assist, inform, and advise the Department of State in the negotiations phase of this process. The Department of State should seek to involve a broad cross-section of regional parties in this mechanism. This mechanism may also be used to provide advice regarding additional work needed to address ecosystem-based function, hydropower, flood risk management, and other beneficial water uses.
7. **Composition of U.S. Entity:** At an appropriate time, membership of the U.S. Entity should be reviewed by the Administration, with consideration given to assuring a composition and membership that is best suited to effectively and efficiently implement the Treaty post-2024.

Ecosystem-Based Function Integration Into the Columbia River Treaty

Columbia Basin Tribes' Concept to Modernize the Columbia River Treaty

Columbia River Gorge. Photo Laura Gephart

COLUMBIA BASIN TRIBES

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Coeur d'Alene Tribe

Confederated Salish and Kootenai Tribes of the Flathead Nation

Confederated Tribes of the Colville Reservation

Confederated Tribes of the Umatilla Indian Reservation

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Nez Perce Tribe

Fort McDermitt Paiute Shoshone Tribe

Shoshone-Bannock Tribes of the Fort Hall Reservation

Shoshone Paiute Tribes of the Duck Valley Indian Reservation

Spokane Tribe of Indians

As implemented in 1964, the Columbia River Treaty (Treaty) addresses two primary purposes – hydropower and flood risk management. During the Sovereign Participation Process, the Columbia Basin tribes (tribes) proposed integrating ecosystem-based function operations into Columbia River flood risk and hydropower management under a modernized Treaty. This proposal was adopted by regional sovereigns and stakeholders in the U.S. as integral to modernizing the Treaty and is a principle element of the U.S. Entity Regional Recommendation on the Future of the Columbia River Treaty after 2024. To implement this paradigm shift, the tribes also propose changes to Treaty governance, adaptations for climate change and structural upgrades for projects to better protect and enhance the tribes' trust and treaty rights and resources, rights and resources that were neglected when the Treaty was developed.

INTERTRIBAL ORGANIZATIONS

Columbia River Inter-Tribal
Fish Commission
700 NE Multnomah Street
Suite 1200
Portland, Oregon 97232

Upper Columbia United Tribes
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Spokane, WA 99201

Upper Snake River Tribes
413 W. Idaho Street
Suite 101
Boise, ID 83702



First Foods

The First Foods are water, salmon, deer, cous (or roots) and huckleberry. Each First Food consists of ecologically related foods. The salmon grouping includes the various salmon species, including steelhead, and also lamprey, freshwater mussels, trout and other fishes. The deer grouping includes mule deer, white-tailed deer and elk, among other four-legged, hoofed animals. The roots are cous, celery, camas and bitterroot. The berries are huckleberry and chokecherry. All First Foods, all life, depends on water and is always served first in our longhouse ceremonies. Our relationship to salmon and the First Foods is a reciprocal one. The First Foods nourish the native people, while the native people must protect them and the habitats that support them.

Since time immemorial, the rivers of the Columbia Basin have been, and continue to be, the life blood of the tribes. Columbia Basin tribes depend on the ecosystem of the Columbia Basin watershed for its ability to provide, protect and nurture cultural resources, traditions, values and landscapes throughout its length and breadth. Clean and abundant water that is sufficient to sustain healthy populations of fish, wildlife, and plants is vital to holistic ecosystem-based function and life itself. A restored, resilient and healthy watershed will include ecosystem-based function as defined by the Columbia Basin tribes on page 7 of this publication.

While much has been done to address the adverse effects of hydropower development and operations on Columbia Basin ecosystem-based function, achieving ecosystem-based function is not limited to managing the Columbia Basin to address fish and wildlife listed under the Endangered Species Act or the Northwest Power and Conservation Act. The tribes have explored a range of ecosystem-based function operations for integration into a modernized Treaty as represented by two modeled scenarios, 3Ea and 3Eb in the following figures. While additional collaborative work needs to be pursued to determine operations that are implemented under a modernized Treaty, these operations would support a broad suite of fish, wildlife and other natural resources. With Treaty modernization, ecosystem integration at these levels or greater could be aggressively achieved and provide adaptation for climate change with minimal disruption to current existing uses such as water supply, hydropower operations, and flood risk management. The tribes believe that a regional flood risk management study is essential to properly and fully balance flood risks with other flow management priorities and costs. The tribes are optimistic that the study could lead to outcomes that would maintain adequate levels of flood risk with minimal economic consequences from infrequent high flows. Integration of ecosystem-based function requires the implementation of operational rule curves that address ecosystem needs in balance with hydropower and flood risk management at key Columbia Basin projects, similar to what has been accomplished at Libby and Hungry Horse dams.

The following are necessary elements to achieve ecosystem-based function in the Columbia Basin:

Treaty Governance

- Expand the Treaty Entities to include expert knowledge and representation for ecosystem-based function in both the U.S. and Canada.
- Members of the sovereign tribal governments must participate as ecosystem representatives in the U.S. Entity.



High head fish passage at the 312-foot Upper Baker Dam is accomplished by a surface fish collector.

Photo courtesy Puget Sound Energy.

Structural Modifications

- Fish passage facilities must be immediately investigated and, if warranted, installed at Chief Joseph and Grand Coulee dams in the U.S., and at Keenleyside, Brilliant, Waneta and Seven Mile dams in Canada to allow reintroduction of salmon, steelhead and other fishes to historical habitats.
- Infrastructure, including the spill gates at Grand Coulee Dam, must be modified as needed to increase operational flexibility and preserve storage, particularly in drier water years.
- Investigate raising the elevation of the Banks Lake diversions to leave cooler water in the river, diverting warmer water for irrigation.
- Investigate potential for reducing the generation of total dissolved gas (TDG) at Grand Coulee Dam.
- Investigate and if feasible, implement selective temperature regulation from high head dams so long as this action will not increase reservoir water temperatures.

Beaver dam at Grand Teton National Park.

Photo: National Park Service.

Structural modifications at dams are just one aspect of improving ecosystem function throughout the entire Basin. By adding habitat restoration and conservation actions to our efforts, an even greater improvement to water temperatures and ecosystem health can be achieved. Part of integrating ecosystem-based function operations under the Treaty will be to investigate and implement all options for improving water quality and temperatures, including such actions as encouraging beaver dams in the headwaters of watersheds to store and deliver cooler water throughout the year.

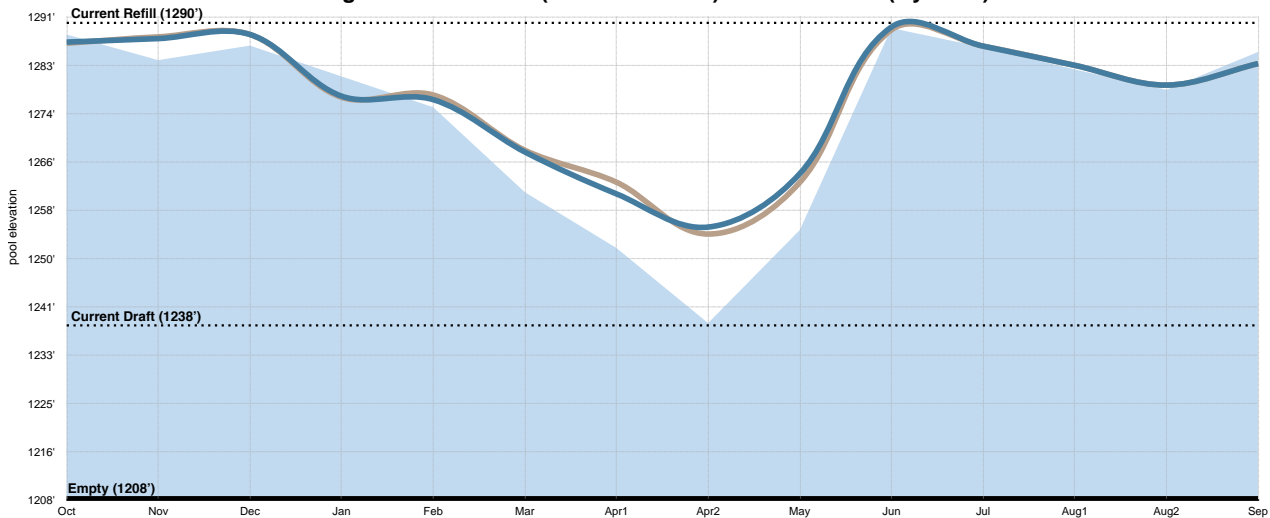


Ecosystem-based Function Operations

- Keep reservoirs fuller and more stable with cooler waters, particularly in drier water years (Fig 1).
- Restore spring and early summer freshet flows, particularly in drier water years (Fig. 2).
- Increase springtime fish spills at run-of-river dams in the U.S.
- Reduce drafts at Grand Coulee, Libby, Brownlee, and Dworshak dams in the U.S. and at Mica and Keenleyside dams in Canada in drier water years.

● Current Condition
● Ecosystem Scenario 3Ea
● Ecosystem Scenario 3Eb

Fig 1. Grand Coulee (Lake Roosevelt) Pool Elevation (wyr ALL)



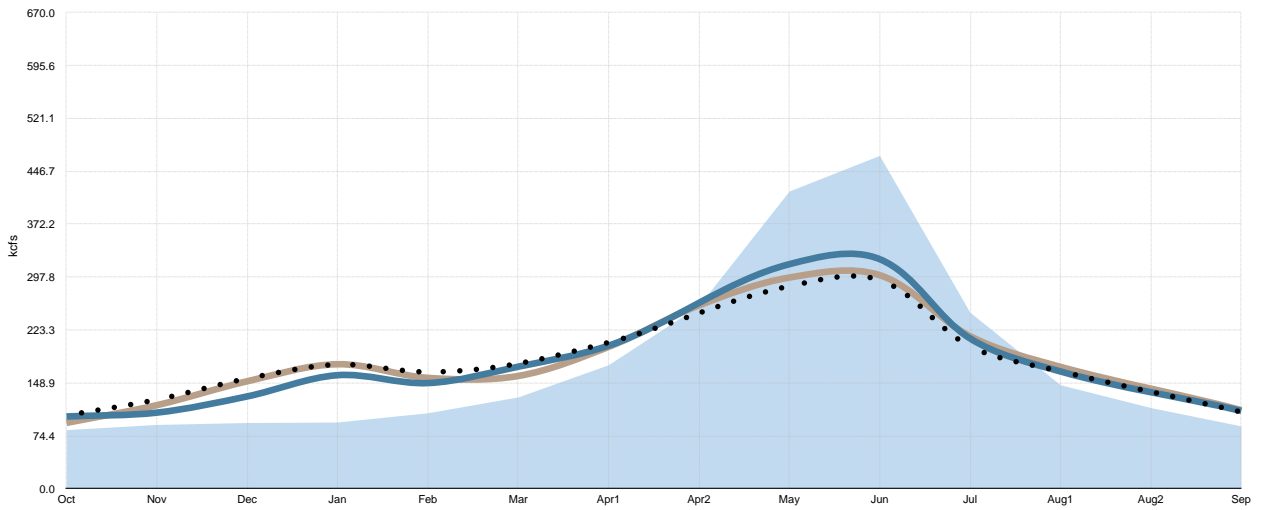
Ecosystem-based function reservoir and river operations scenarios

The two river operations scenarios described in this paper are the continuation of years of modeling work initiated in the Sovereign Participation Process (SPP). They are labeled 3Ea and 3Eb. The 3 denotes it is the third iteration of this modeling, the E denotes it is an ecosystem-focused model, and the 'a' and 'b' denote two scenarios within the range of possible operations. Scenario 3Eb was developed after the cessation of the SPP.

3Ea retains more winter and early spring storage at upstream reservoirs, releasing extra water in the spring and early summer to recreate a partial peaking hydrograph in dry and average runoff years with a sustained declining limb and implements higher fish spill levels.

3Eb retains less winter and early spring storage than 3Ea in dry and average runoff years but more than the current condition. This storage is also released in the spring and early summer to create a partial peaking hydrograph with a sustaining limb. Fish spill levels are the same as for 3Ea.

Fig 2. The Dalles: Modified vs. Regulated Flow (wyr ALL)



- Continue VarQ operations at Hungry Horse and Libby dams.
- Implement rule curves at system dams that integrate ecosystem-based function, hydropower and flood risk management for climate change adaptation.
- For a more comprehensive explanation of ecosystem-based function operations, please contact the individuals listed at the end of this paper for the tribes' detailed discussion paper.

● Current Condition
● Ecosystem Scenario 3Ea
● Ecosystem Scenario 3Eb



Lake Koocanusa

Created by Libby Dam in Montana, the 90-mile long Lake Koocanusa reaches 48 miles (77 km) to the Canadian border and 42 miles (68 km) further into British Columbia. The lake holds 13% of the water in the Columbia River system.

Photo courtesy US Forest Service.

Key Facts

- Tribes, without consultation or prior and informed consent, have contributed substantially to the initial development and continued operation of the Columbia Basin hydropower system including flood risk management for downriver investments in cities, ports and other infrastructure through substantial sacrifices to their cultural, health, social, religious and ecosystem resources.
- Tribes are requesting that the U.S. Department of State include them in negotiations and future governance with Canada for a modernized and resilient Treaty that integrates ecosystem-based function as an equal purpose along with flood risk and hydropower management.
- The region needs to conduct a U.S. flood risk management study to seek alternative means (i.e. levees and floodplain management) to reduce the consequences of high flows thereby increasing needed flexibility in reservoir operations.

Upper Arrow Lake.
Photo: wallpaperup.com



Definition of Ecosystem-based Function

Adopted by the Coalition of Columbia Basin Tribes, June 2013

Since time immemorial, the rivers of the Columbia Basin have been, and continue to be, the lifeblood of the Columbia Basin tribes. Columbia Basin tribes view ecosystem-based function of the Columbia Basin watershed as its ability to provide, protect and nurture cultural resources, traditions, values and landscapes throughout its length and breadth. Clean and abundant water that is sufficient to sustain healthy populations of fish, wildlife, and plants is vital to holistic ecosystem-based function and life itself. A restored, resilient and healthy watershed will include ecosystem-based function such as:

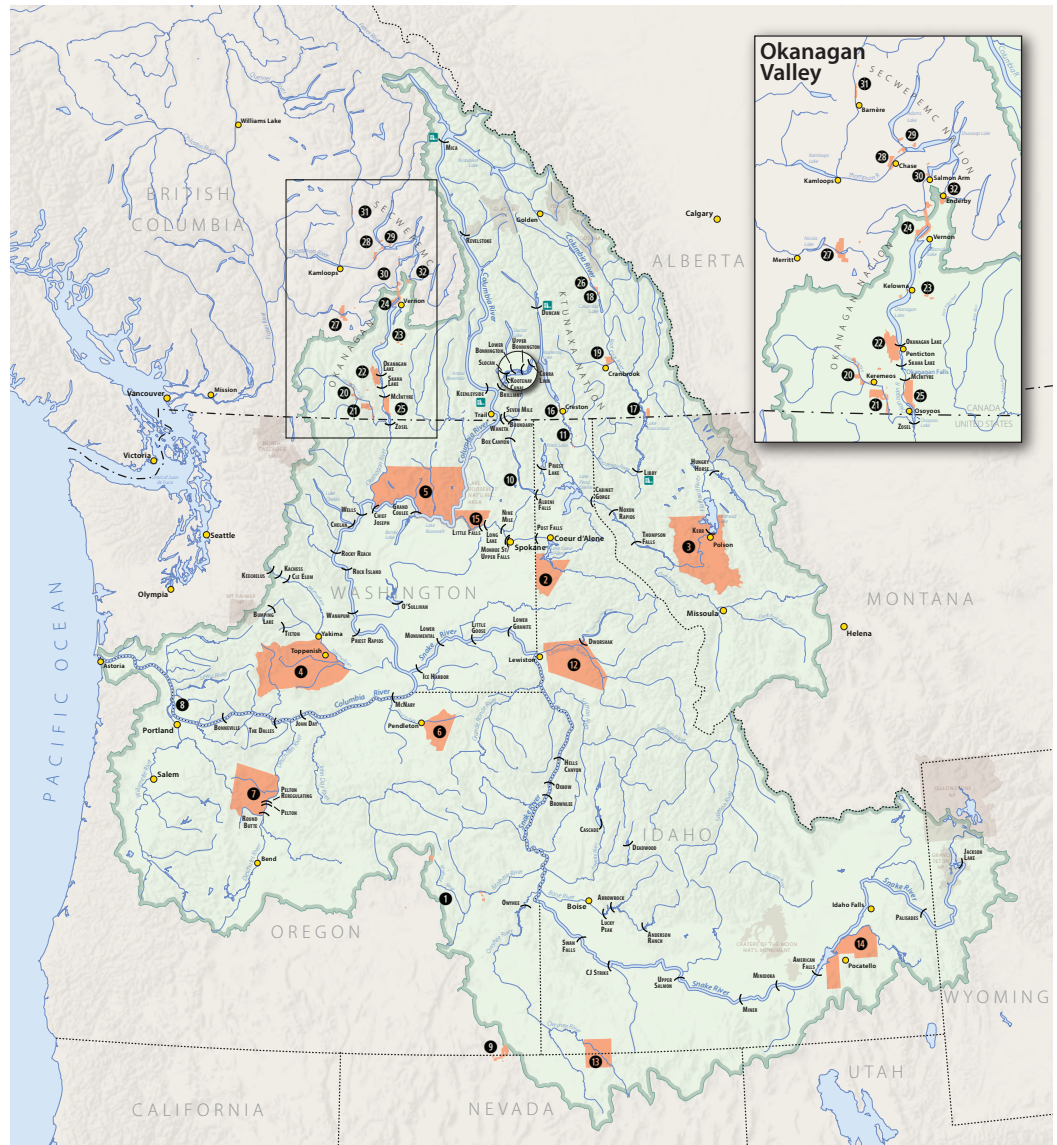
- Increased spring and summer flows resulting in a more natural hydrograph;
- Higher and more stable headwater reservoir levels;
- Restoring and maintaining fish passage to historical habitats;
- Higher river flows during dry years;
- Lower late summer water temperature;
- Reconnected floodplains throughout the river including a reconnected lower river estuary ecosystem as well as reduced salt water intrusion during summer and fall;
- Columbia River plume and near shore ocean enhanced through higher spring and summer flows and lessened duration of hypoxia; and,
- An adaptive and flexible suite of river operations responsive to a great variety of changing environmental conditions, such as climate change.

Improved ecosystem-based function in the Columbia Basin Watershed is expected to result in at least:

- Increased recognition, protection and preservation of tribal first foods and cultural/sacred sites and activities, First foods include water, salmon, other fish, wildlife, berries, roots, and other native medicinal plants;
- An estuary with an enhanced food web and increased juvenile fish survival;
- Increases in juvenile and adult salmon survival;
- Decreased mainstem travel time for migrating juvenile salmon;
- Increased resident fish productivity that provides stable, resilient populations;
- Increased wildlife productivity that provides stable, resilient populations; and,
- Salmon and other juvenile and adult fish passage to historical habitats in the Upper Columbia and Snake River basins, and into other currently blocked parts of the Columbia River Basin.

About this Paper

The Columbia Basin tribes prepared this paper after cessation of the Columbia River Treaty Review Sovereign Participation Process and the U.S. Entity's submission of the Regional Recommendation to the Department of State in December 2013. The contents of this paper are consistent with the consensus regional recommendation. In addition to governance and infrastructure aspects, it addresses operations that might be implemented under the Treaty to integrate three primary purposes (ecosystem-based function, flood risk management and hydropower production). This paper does not represent a position on specific Treaty operations, but rather the intent is to provide a range of scenarios for further analysis and consideration in a collaborative forum used to determine future Treaty operations. And while fish passage and reintroduction are an integral aspect of ecosystem-based function, a substantive discussion of that issue is provided in a separate paper. This paper was approved for distribution by tribal leaders on October 1, 2014 and may be amended following additional analysis and review.



Tribal Nations in the United States*

- 1 Burns Paiute Tribe
- 2 Coeur d'Alene Tribe
- 3 Conf. Salish and Kootenai Tribes of the Flathead Nation
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- 5 Conf. Tribes of the Colville Reservation
- 6 Conf. Tribes of the Umatilla Indian Res.
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- 11 Kootenai Tribe of Idaho
- 12 Nez Perce Tribe
- 13 Shoshone Paiute Tribe of the Duck Valley Indian Res.
- 14 Shoshone-Bannock Tribes of the Ft. Hall Res.
- 15 Spokane Tribe of Indians

* management authorities and responsibilities affected by the Columbia River treaty; does not include all tribes in the Columbia Basin

First Nations in Canada

Inside the Columbia Basin

- KTUNAKA NATION
- 16 Yaqan nu'kityi (Lower Kootenay Indian Band)
 - 17 Takikumsasnuqti'it (Tobacco Plains Indian Band)
 - 18 Takisnuuk (Columbia Lake Indian Band)
 - 19 Taqam (St. Mary's Indian Band)
- OKANAGAN NATION
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 - 22 snpintktn (Penticton Indian Band)
 - 23 stqa'itk'awit (Westbank First Nation)
 - 24 suknaxinX (Okanagan Indian Band)
 - 25 swiws (Dugoes Indian Band)
- SECWEPENC NATION
- 26 Kenpésq (Shuswap Indian Band)

Outside the Columbia Basin with Asserted Interests

- OKANAGAN NATION
- 27 spaxoman (Upper Nicola Band)
- SECWEPENC NATION
- 28 Qw'ewt (Little Shuswap Indian Band)
- 29 Sexqeltqin (Adams Lake Indian Band)
- 30 Simpaw (Simpaw First Nation)
- 31 Skemtsin (Nechelath Indian Band)
- 32 Splatstin (Splatstin First Nation)

Columbia River Treaty



Columbia River headwaters.

Contacts

Jim Heffernan, CRITFC (503) 238-0667, hefj@critfc.org

Keith Kutchins, UCUT (509) 209-2411, keith@ucut-nsn.org

Robert Austin, USRT (503) 880-8164, Bob@usrtf.org

Taylor Aalvik, Cowlitz, (360) 575-3306, taalvik@cowlitz.org

John Marsh, CSKT, (503) 341-6237, jhmarsh@comcast.net

Columbia Basin Tribes Coalition

on the

Columbia River Treaty 2014/2024 Review

TRIBES

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Flood Risk Management

Background: The U.S. and Canada signed the Columbia River Treaty in 1961 and began implementing the Treaty in 1964. The Treaty's current purposes are narrowly defined to optimize hydropower generation and coordinate flood risk management in the Columbia River Basin. The U.S. Entity (Bonneville Power Administration and the U.S. Army Corps of Engineers) is responsible for implementing the Columbia River Treaty with Canada. After several years of coordination and collaboration by the regional sovereigns, and with input by stakeholders, the *U.S. Entity Regional Recommendation for the Future of the Columbia River Treaty after 2024* was submitted to the U.S. Department of State in December 2013 for its review and consideration. The need for a flood risk management review was identified during the Sovereign Participation Process as a domestic matter to be undertaken in 2014, wholly separate from the Regional Recommendation.

Issue: Under the Columbia River Treaty (Treaty) with Canada, one of two principle benefits to the United States is assured flood storage and coordinated flood risk management. After 2024, unless the Treaty is modernized, the U.S. loses these benefits but retains the right to "call upon" Canada to provide flood storage once the U.S. has "effectively used" its reservoir capacity for flood risk management. This change in flood risk management after 2024 coupled with future climate change projections raises questions regarding the capacity and capability of flood prevention infrastructure (reservoirs, levees and other similar structures) and planning (e.g. reservoir storage diagrams, levee construction and maintenance and flood plain management) in the Columbia Basin, both for local flood risk management in the upper Basin and for system flood risk management throughout the Basin, but especially for areas of high economic value in the lower Basin.

The U.S. and Canadian Entities implementing the Treaty have different perspectives on how the called upon operation for coordinated flood risk management should be implemented after 2024. The U.S. Entity believes it can call upon Canada to prevent river flows from exceeding 450,000 cubic feet per second (cfs) as measured at The Dalles Dam and that only eight system storage reservoirs in the U.S. need to be effectively used before this call can be made. The Canadian Entity believes that it must respond to a call from the U.S. only to prevent flows at The Dalles from exceeding 600,000 cfs and only after the U.S. has effectively used all available storage in the Basin, not just the eight system storage reservoirs. The U.S. Army Corps of Engineers has determined that damages begin to occur at flow levels above 450,000 cfs as measured at The Dalles and that substantial damage occurs when flows exceed 600,000 cfs.

Neither perspective addresses the management of an 1894-type flood event, where the unregulated flow was estimated to exceed 1,200,000 cfs as measured at the current location of The Dalles Dam. The U.S. Army Corps of Engineers has indicated that in light of current reservoir capacity, which is substantially less than what Congress called for in authorizing legislation in the 1950s and 1960s, it would strive to manage such an event so as not to exceed 750,000 cfs at The Dalles Dam.

Tribal Concerns: The Columbia Basin tribes are also concerned that the default change to “called upon” and “effective use” after 2024 will adversely affect their efforts to enhance ecosystem-based function through a modernized Treaty because it may:

- require larger and more frequent drawdowns at Grand Coulee Dam (Lake Roosevelt) and other U.S. reservoirs in order to provide minimal flood risk prevention;
- adversely impact resident fish, cultural resources, navigation, recreation, riverbank stability and public safety through dramatic changes in reservoir elevation; and,
- limit system capability to provide necessary spring and summer flows for salmon.

Near-Term Recommendation: Because of the serious questions about the Basin’s capability of addressing major flood events and the limitations on ecosystem-based function from post-2024 called upon operations, **the tribes support the pursuit, if necessary to initiate this review, of congressional authorization and appropriations for a region-wide public process to assess potential changes to the current level of flood risk protection in the Columbia Basin. Such a process should be initiated in 2014, or as soon as possible thereafter, but must be completed before 2024. Congress should authorize a comprehensive approach open broadly to input from the public and stakeholders which addresses all options to manage both medium and high flow events.** The process needs to identify flood risk management vulnerabilities to climate change and potential adaptive management actions to address these vulnerabilities. The process should include a review of infrastructure capacities and capabilities, floodplain management, Columbia Basin reservoir operations, and levees - both strategic improvements to existing levees and the potential need for additional levees. The process should also evaluate and address potential impacts to other river uses and infrastructure such as navigation, bridges, and other transportation features, hydropower, irrigation, recreation, fish and wildlife, and cultural resources.

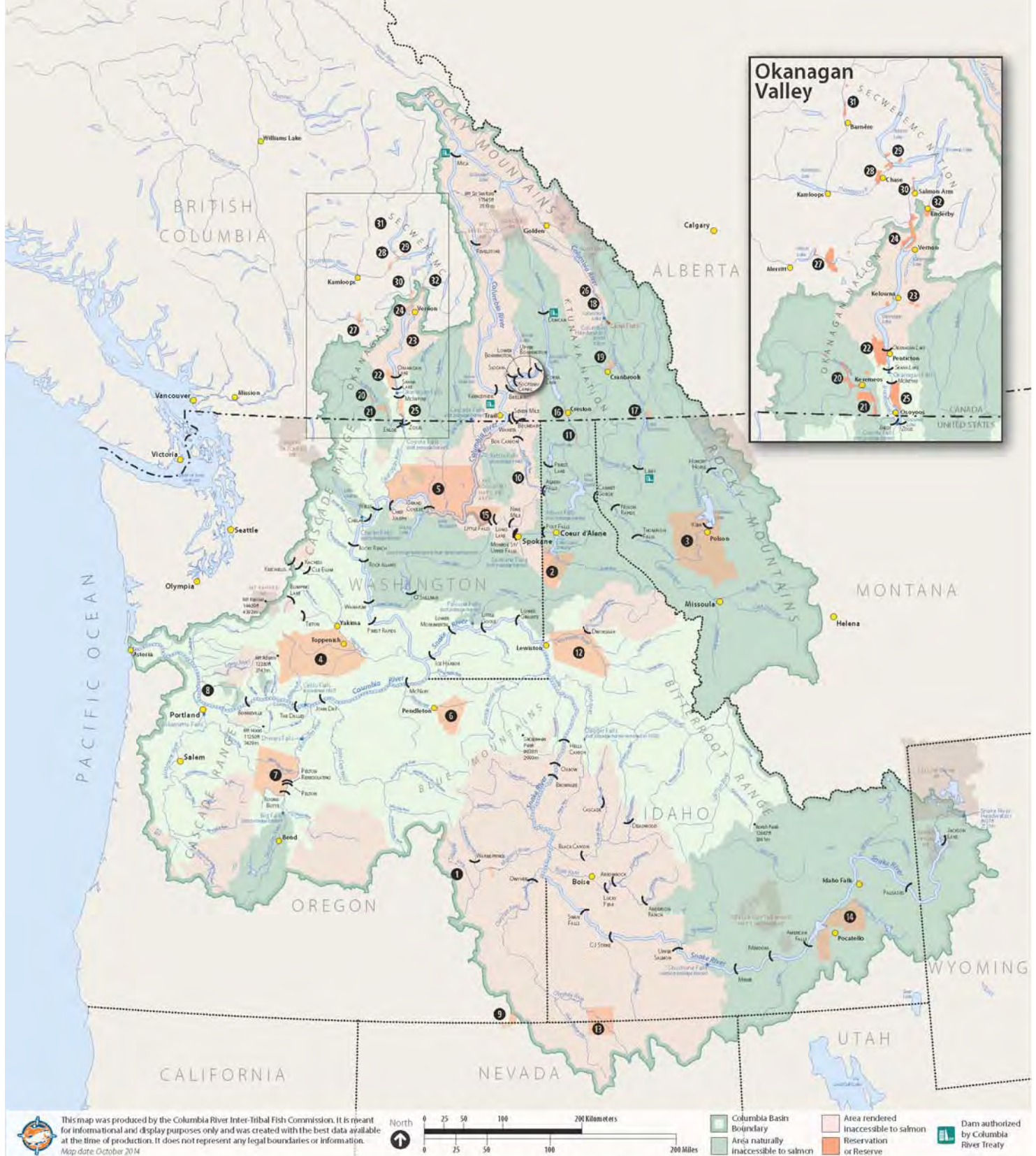
Contact:

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DRAFT - Thoughts on a Regional Summit/Forum on Flood Risk Management - DRAFT

[November 30, 2015 Version]

- **What** – **Columbia Basin Summit [Forum] on Flood Risk Management**, a three day policy summit, built upon earlier technical sessions, incorporating policy, legal and technical panels and sessions, as well as plenary sessions, with the goal of securing commitments for action/action plans. Address current state of **Flood Risk Management (FRM)** in the region and identify opportunities for improvements to the current approach that will achieve multiple objectives. This will bring the region together to start to address this important and timely issue and will enable the initiation of a regional conversation on this topic with specific follow-ups/results.
- **When** – October 2016.
- **Where** – Portland, Oregon, preceded by technical session(s) in Spokane (and other locations).
- **Who** – All regional interests – tribes, states, counties, federal agencies, cities, diking districts, conservation interests, ports, private and public utilities, navigation interests, conservation groups, NPCC, public, congressional delegation, irrigators, and potentially include B.C. and First Nations.
- **Why** – We need to modernize the regional approach to addressing flood risk in light of all that has happened and is happening – increased environmental awareness and knowledge, technological advances, legal interests, climate change, economic interests, learned lessons from flooding events elsewhere. We need to identify a better future by collaborative work and involvement from all regional interests with the goal of achieving a net-win outcome and sharing of benefits.
- **Potential Goals:**
 - Kick off the Regional FRM study.
 - Develop understanding of federal and other authorities for FRM including authorized levees built and not built.
 - Identify study elements needed to improve FRM overall including operations and maintenance activities, ecosystem-based functions (EbF), levees vs. reservoirs, institutional support, and modern approaches to multi-benefit projects.
 - Explore creating effective gateways between regional FRM strategy and related public policies (Columbia River Treaty, local zoning, and river management for EbF) and a framework for collaboration and synergy.
 - Understand new framework for floodplain insurance through FEMA, including levees to protect key economic areas.
 - Develop a thorough understanding of current U.S. Army Corps of Engineers and other FRM operations.
 - Develop a clear understanding of how flood control measures have been paid for and what potential future funding options might look like.
 - Identify potential non-federal funding share partner[s] for FRM study.



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 - 30 Simpcw (Simpson First Nation)
 - 31 Skemtsin (Neskonk Indian Band)
 - 32 Splitsin (Splitsin First Nation)

CHAPTER 2

Climate Change and Floodplain Resiliency

LARRY A. LARSON

Director Emeritus, Senior Policy Advisor, Association of State
Floodplain Managers, Madison, WI

GEORGE R. PESS

Watershed Program, Fish Ecology Division,
NOAA–NWFSC–NMFS, Seattle, WA

MONTY SCHMITT

Senior Scientist and San Joaquin River Restoration Project Manager,
Natural Resources Defense Council, San Francisco, CA

Chapter 2

CLIMATE CHANGE AND FLOODPLAIN RESILIENCY

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Chapter 2

CLIMATE CHANGE AND FLOODPLAIN RESILIENCY

PART A Larry Larson

I. CURRENT FLOODPLAIN MANAGEMENT SCHEME

A. Federal/State/Local Partnership and Individual Responsibility

1. Federal role; mapping; minimum standards, disaster relief, mitigation assistance
 - a. NFIP Maps flood hazard based on probability—focus 1% probability flood
 - b. NFIP Sets minimum development stds-elevate to 1% flood level base flood elevation (BFE)
 - c. Disaster relief: trend is fed taxpayers pays larger % of costs –more to those who do little
 - d. Katrina and Sandy were 100% fed payment for Public Assistance (PA)
 - e. Emphasis on structural flood control approaches—USACE and BuRec
 - f. HUD-CDBG has provided \$42 billion in post disaster tax funding over last 15 years
 - g. Mitigation cost sharing-Stafford Act HMGP and NIFP FMA—typically 75% Fed
2. State/Local roles; managing development to reduce flood damage and retain ecosystems
 - a. State authority for land use and building codes—usually delegated to communities
 - b. They SHOULD HAVE primary responsibility to manage flood risk; but think it is fed problem
 - c. Too often allow development for short term tax gain, but long term increase in risk
 - d. Few incentives for locals or states to manage flood risk for long term balance or use natural systems to reduce flood risk and enhance natural floodplain functions
 - e. Result is locals can get money in taxes, and can externalize disaster costs to federal taxpayers
3. Individual (and business) property owners responsibility
 - a. Not aware of risk, or unwilling to accept risk; esp residual risk behind levees
 - b. Very few understand probability of flooding—but we continue to use terms like 1% or “100 year” flood*
 - c. Most people are more concerned with having to buy flood insurance than being flooded

- d. Most homeowners do not build their home, but buy a home developers build; thus the key factor is where and how the community allows development

*A 1% chance flood has a 1% chance of occurring or being exceeded in any given year. It can occur 2 or 3 times in any given year.

B. Issues of Concern with Existing Floodplain Management Scheme

1. NFIP maps the 100 year (1% chance) floodplain
 - a. Only maps the hazard, not variable risk across the floodplain, until now
 - b. Maps show floodplain as floodway (supposedly no development) or flood fringe (can be filled and developed as long as building first floor at or above 100 year flood level Base flood elevation (BFE))
 - c. From 23 to 55% of nature's floodway can be developed because NFIP mapping pinches in the floodway lines to allow a 1 foot rise when setting floodway lines, but NFIP does not require community to adopt BFE that reflects that one foot higher—so the community is virtually guaranteed to eventually have a flood elevation one foot higher.
 - d. Entire flood fringe can be filled, with loss of flood storage causing higher flood levels and destroying natural flood storage and other natural floodplain functions like habitat, etc.
 - e. Nationally; NFIP maps do not consider floodplain resources, erosion or channel movement. This must be demanded/driven by communities or states—and some do.
2. People think NFIP 100 year flood is a safety standard; it is only for an insurance program, not a safety standard to protect property or lives.
 - a. Only in the 100 year floodplain is flood insurance required, and only if a mortgage on building
 - b. NFIP calls 1% standard adequate for flood control structures (e.g. levees), where failure or overtopping is catastrophic, but this is to indicate flood insurance is not required for buildings behind that levee; they are not saying the area is safe from flooding
3. Under the minimum NFIP standards, even *properly permitted development* allows these impacts:
 - Floodwaters to be diverted onto other properties
 - Channel and conveyance areas are reduced
 - Valley storage to be filled
 - Changes in water velocities
 - Thus, loss of natural ecosystem functions that used to reduce flooding
 - In general if the permitted development results in an adverse impact, your community may be liable for permitting the development that result in that impact! More on this later.

II. VISION FOR FUTURE INTEGRATED FLOODPLAIN MANAGEMENT SCHEME

A. Manage On Watershed, Not Community Basis to Better Utilize Natural Systems

1. Regional management authorities—requires authority from Legislature
2. MOUs between communities—may not be effective unless all communities collaborate

B. Communities Use The “No Adverse Impact” (NAI) Approach To Development, Defined As:

1. Mapping and activities that could adversely impact another property or community values are allowed only to the extent that the impacts are mitigated or have otherwise been accounted for within an adopted community based plan. More about NAI can be found at this link: <http://www.floods.org/index.asp?menuID=460&firstlevelmenuID=187&siteID=1>
2. Natural ecosystem functions and NAI work together
 - a. Rely on natural floodplain systems to store and dissipate floodwater with no adverse impacts on humans or built infrastructure.
 - b. Natural floodplains provide opportunities for open space, parks, recreation, habitat for wildlife and fish, hiking and biking trails, alternative agricultural crops, and add to quality of life.
3. Strength of NAI
 - a. **The true strength of the No Adverse Impact approach is that it encourages local decision making that ensures future development impacts will be identified, considered on a watershed-wide basis and mitigated before the development occurs**
 - b. This is a “Do No Harm; Good Neighbor Policy”
4. NAI outcome: if your community effectively uses NAI; then experiences a record rainfall:
 - No buildings are flooded;
 - No roads closed;
 - Emergency rescue teams not deployed;
 - No citizens are injured;
 - No rescue workers put at risk;
 - Erosion & Sedimentation are at a minimum;
 - Flood levels do not increase
5. Why use NAI? NFIP minimums have these limitations:
 - a. Only a few areas restricted from development under current systems/NFIP minimums:
 - i. Seaward of mean high tide

- ii. Floodways; except much of natural floodway lost due to allowable 1' rise
- b. NFIP limitations:
 - i. No requirement to protect natural functions of floodplains
 - ii. No limits on siting of critical facilities (hospitals, water supply, etc)
 - iii. Fill in floodplain is allowed and facilitated
- c. How to follow NAI
 - i. Identify ALL the impacts of a proposed development
 - Drainage, flood storage
 - Sediment, Erosion
 - Access during flood events
 - ii. Determine which properties will be impacted
 - iii. Notify impacted persons of the impacts of ANY proposed development
 - iv. Require impacts to be mitigated before develop occurs
- d. Mapping using NAI
 - i. NFIP allows 23-55% of natural floodway to be labeled flood fringe and filled/developed
 - ii. NAI uses no rise floodway, thus avoiding adversely impacting existing properties and future development with increased flood damage and risk
 - iii. Floodways provide a large share of floodplain ecosystem values
 - iv. Floodplains are the second ranked ecosystem type (behind estuaries) in per hectare value to society. Despite representing <2% of earth's terrestrial land surface area, floodplains provide about 25% of all terrestrial ecosystem service benefits ①
- e. NAI Process leads to:
 - i. Legally Acceptable and defensible Process
 - ii. Understandable Process for citizens
 - iii. Palatable to Community as a Whole
 - iv. Working in any community in the Nation
 - v. Non- Adversarial
 - Not Pro-Development
 - Not Anti-Development
- f. Positive results of following NAI:
 - i. Potentially impacted persons are notified

- ii. Impacted persons can voice concerns to community officials and must consent to any actions that increase damage to their property
- iii. Impacted persons are not victimized (usually unknowably) by improper development

III. COMMUNITY LIABILITY FOR DEVELOPMENT DECISIONS

A. Community Liability for Actions/Inactions in Development Process

1. *Government has an affirmative duty to prevent harm.* Even our system of law and government, going back thousands of years, revolves around the fact that people do not have the right to use their property in a way that harms other people. The idea is so old that there is a maxim of Roman Law – “sic utere tuo ut alienum non laedas” – use your property so that you don’t harm others.
2. Individuals damaged by flooding or erosion are increasingly filing lawsuits against governments claiming that the government has caused the damages by knowingly allowing actions that contributed to the damages, or failed to provide adequate warnings.
3. Courts and legislative bodies have expanded the basic rules of liability to make governments responsible for actions which result in, or increase, damages to others.
4. Technology to predict impacts is eliminating the “act of God” defense.
5. Communities are far more likely to be sued for issuing a permit that causes harm, than they are for denying a permit. See ASFPM legal publications on community liability regarding flood loss reduction [on the ASFPM web site here](http://www.floods.org/index.asp?menuID=301&firstlevelmenuID=188&siteID=1). <http://www.floods.org/index.asp?menuID=301&firstlevelmenuID=188&siteID=1>
6. In the case *Harris County Flood Control District v. Kerr (2015)* the Texas Supreme court confirmed that there was merit to the homeowners’ takings claim and rejected the local government’s motion for summary judgment, allowing the takings case to proceed. More than 400 residents and homeowners in the upper White Oak Bayou watershed in Harris County sued the county’s flood control district for a takings (inverse condemnation suit), arguing the district knew that harm would result to their homes when it approved subdivisions elsewhere in the watershed without mitigating their consequences. The district had many reports showing the impact of allowing the developments and permitted them anyway.
7. In *Columbia Venture, LLC v. Richland County (2015)* the South Carolina Supreme Court unanimously upheld local floodway restriction in regulations that far exceeded minimum NIFP regulations against a regulatory takings claim.
8. ASFPM filed an Amicus Curiae brief in the Columbia Venture which case can be seen here; <http://www.floods.org/index.asp?menuID=301&firstlevelmenuID=188&siteID=1>. It is recommended reading for any community’s legal counsel (and for practicing planners and floodplain managers) on the matter of land-use controls for flood loss reduction and takings. It provides an excellent review of previously existing case law and rationale supporting local regulatory standards.

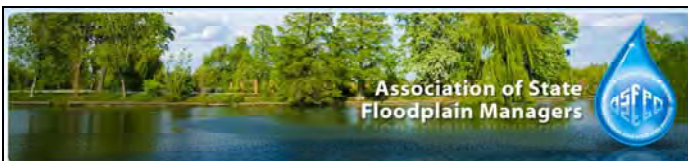
B. Future Conditions, Including Climate Change, and Flood Risk

1. Predicting future conditions is essential to effectively managing future flood risk (risk=probability x consequences). Conditions that impact future flood risk (either the probability or consequences part of flood risk) include watershed development,

changes in rainfall or precipitation patterns, (such as snowfall/spring melt replaced with winter rains and faster runoff), erosion, subsidence, movable stream beds, and sea level rise.


2. Options to manage future conditions by individuals or communities
 - a. Climate informed science—if the data is available. Sea level rise has best science; predicting rainfall rates are more problematic, but will improve over time
 - b. Utilize freeboard of 2 or 3 feet, with 3 feet for critical facilities that must be operable and accessible during major flood events or other emergencies
 - c. Map and regulate to the 500 year (0.02% chance flood) to give room for increases
 - d. Allow no development in the entire 100 year floodplain; used by some communities
 - e. Require compensatory storage if any fill/development in floodplain is allowed
3. Consequence of ignoring future and cumulative impacts can be drastic
 - a. Damages significantly increase as flood levels increase
 - b. Extensive loss of natural ecosystems
 - c. Floodplains footprint gets larger, putting more land/buildings in 100 year floodplain
 - d. Flood insurance premiums will go up as flood levels increase
4. How NAI benefits natural ecosystem functions
 - Improved water quality and reductions in non-point pollution impacts
 - Green corridors which also serve as additional areas for floodwater storage
 - Improved groundwater recharge
 - Better bank stabilization and better erosion control
 - Most NAI initiatives provide credits for the Community Rating System

① Opperman, Jeffrey, Luster, Ryan, et.al. 2010. Ecologically Functional Floodplains: Connectivity, Flow Regime, and Scale. Journal of the American Water Resources Association 46(2): 211-226.



INTEGRATING FLOODPLAIN MANAGEMENT POLICIES

Larry Larson, P.E., CFM
Association of State Floodplain Managers
Portland, Oregon
December 10, 2015
www.floods.org




Association of State Floodplain Managers


Mission: Mitigate the losses, costs, and human suffering caused by flooding.

and


Protect the natural and beneficial functions of floodplains.



ASFPM Chapters



16,100 members
■ 36 Chapters
■ State Assoc. & Pending Chapters

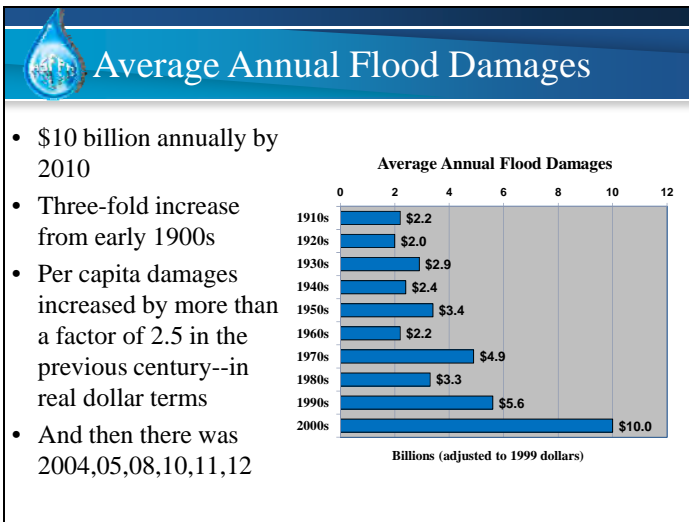


What is our national flood policy?

Gilbert F. White—in 1939 said:
U.S. National Flood Policy is essentially one of:

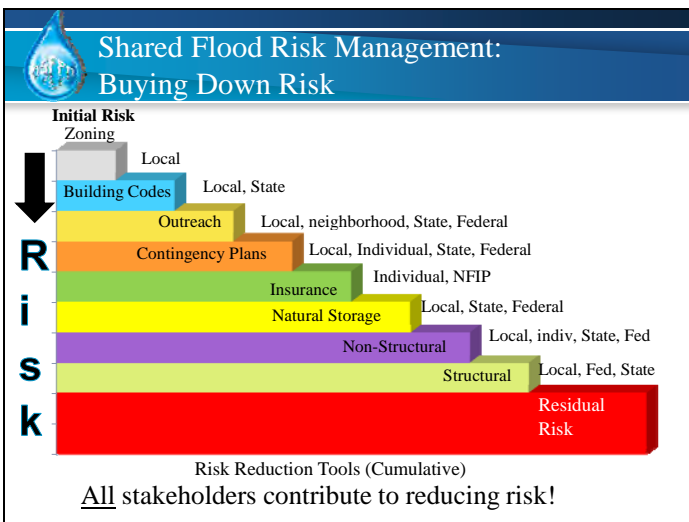
- **Protecting the occupants of the floodplain against floods;**
- **Aiding them when they suffer flood losses, and**
- **To encourage more intensive use of floodplains**


• **Has it changed in 70 years?? Is it working?**



Flood Risk Management: Roles & Responsibilities


- So, who manages flood risk, anyway?
- Federal Role
- State Role
- Local Role
- Personal Role






Flood Risk Management: Roles & Responsibilities

- Federal Role**
 - National Flood Insurance Program
 - FEMA, USACE, NRCS, NOAA, EPA & other federal agencies
 - Executive Orders 11988 & 11990 & 13690
 - Financial and Technical assistance from fed agencies







Flood Risk Management: Roles & Responsibilities

State Role--Law/Policies


- Constitutional authority for:**
 - Land Use and
 - Building codes
- Floodplain Management
- Emergency Management






Flood Risk Management: Roles & Responsibilities


- Community role**
 - Day to day decisions on development
 - Development Standards & Planning
 - Permitting & Codes Enforcement
 - Local Emergency Management Programs
 - NFIP & the Community Rating System
 - Locals choose their flood mitigation option and are responsible for O&M forever






Flood Risk Management: Roles & Responsibilities


- Personal Role (property owner)**
 - Be Informed & Prepared
 - Understand Risks--Buy/build and accept the consequences
 - Insure what you can't mitigate
 - Accept Responsibility & have Realistic Expectations





Policies that Contribute to Risk

Federal Policies	<ul style="list-style-type: none"> NFIP & the 100-Year Standard Emphasis on structural approaches Disaster relief environment
States & Communities	<ul style="list-style-type: none"> Control land use for short-term benefits Perceive flooding to be a federal problem Externalize the costs & consequences
Public	<ul style="list-style-type: none"> Unaware of – or unwilling to accept - residual risk Misplaced concern about having to obtain flood insurance



What to Do?

- Avoid development of high risk areas
 - Through planning and wise land use
- Better/smarter Regulations & Land Use
 - Map future floods, not Yesterday's flood
 - Avoid cumulative flood rise—no floodway development
 - Freeboard for new buildings above flood level
 - Critical Facilities—must be accessible and operable during the 500 year flood event



Community Planning

- Communities face/can reduce risk to:
 - A. Existing development
 - B. Future development
- Role of land use and planning
 - A. Retreat from highest risk areas, elevate or protect in lower risk areas
 - B. Use high risk areas for open space, which can pay for itself with increased value



Use Natural Systems

- Manage resources and plan on a watershed basis;
- Permanently restore and preserve flood-prone areas as open space, through land acquisition;
- Living next to open space demands a premium
- Development plans with ecological benefits gain stronger community support





Ecosystem Services

- **Environmental Values of Naturally Functioning Floodplains***
- "...floodplains were the second ranked ecosystem type, behind only estuaries, in terms of their per-hectare value to society.
- Despite representing <2% of Earth's terrestrial land surface area, floodplains provide approximately 25% of all terrestrial ecosystem service benefits."

* Opperman, Jeffrey, Luster, Ryan, et.al. 2010. Ecologically Functional Floodplains: Connectivity, Flow Regime, and Scale. Journal of the American Water Resources Association 46(2): 211-226.



What to do? ASFPM suggests

- Use Natural systems to reduce flooding, and manage on watershed basis
- Incentives for locals who reduce flood risk
 - sliding cost share for disaster relief
- Effective Community actions that are
 - Not just Resilient, but Sustainable e.g.

NO ADVERSE IMPACT (NAI)



What Is NAI?

No Adverse Impact (NAI) is a development approach that ensures that the action of any community or property owner, public or private, **does not adversely impact the property and rights of others.**



Strength of NAI

The true strength of the No Adverse Impact approach is that it encourages local decision making to ensure that future development **impacts will be identified, considered on a watershed-wide basis and mitigated**



It is a truly comprehensive strategy for reducing flood losses and costs.



Why use NAI?

- **Community is more likely to be successfully sued for permitting risky development than for preventing it.** (see recent cases)
- **Community has an affirmative duty to prevent harm**




Development Can't Harm Others

- No Right to be a Nuisance
- No Right to Violate the Property Rights of Others
- No Right to Trespass
- No Right to be Negligent
- No Right to Violate Laws of Reasonable Surface Water Use; or Riparian Laws
- No Right to Violate "Public Trust"




How to Follow NAI?


- **NAI Steps:**
 - Adopt higher standards tied to public safety and tailored to your community needs
 - Identify ALL the Impacts of a proposed development anywhere in watershed
 - Notify Potentially Impacted Property Owners and Communities of the Impacts of Any Proposed Development
 - Mitigate Impacts before developing



NAI Principle Leads to a Process


- Legally Acceptable Process
- Understandable Process
- Palatable to Community as a Whole
- Working around the Nation
- Non- Adversarial
 - Not Pro Development
 - Not Anti Development






NAI Floodplain Regulation


- Consistent with Sustainable Development
- Provides a Pragmatic Standard for Regulation
- Complements Good Wetland & Stormwater Regulation
- Works Equally on both a Local & Regional Basis
- Provides Points for FEMA Community Rating System (CRS) Program






NAI Benefits


- **Helps ensure the actions of any community or property owner do not adversely impact others, ecosystem resources/functions**
- **Incorporates multi-objective-management and watershed planning principles**



NAI Benefits

- Will reduce future flood damages
- Will reduce the community's liability and legal challenges
- Will protect the natural resources and ecosystems
- Will provide for more sustainable and resilient community





What is Sustainable?

- Development approaches must address Natural Hazards and all impacts
- **SMART GROWTH IN DUMB PLACES IS THE OPPOSITE OF SUSTAINABILITY***

* Lisa Dun, law prof at Utah who studied New Orleans
- Its all about—Location and natural systems



Thank you


**“Floods are Acts of Nature;
But Flood Losses Are Largely Acts of Man”**



Dr. Gilbert White

See ASFP web site for more info

www.floods.org



Questions??

More information will be available on the ASFPM website, future newsletters and member/chapter alerts!

www.floods.org

Saving the Puget Sound Wild Salmon Fishery

George William Van Cleave[†]

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I. INTRODUCTION: WHAT RESTORATION PATH WILL WASHINGTON CHOOSE?

The endangered Puget Sound wild salmon fishery is an exceptionally valuable natural and cultural resource for all of Washington State's people.¹ Today salmon are far more than part of the

[†] Distinguished Scholar in Residence, Seattle University School of Law. My thanks go to Rodney L. Brown, Jr. of Cascadia Law Group and Catherine O'Neill of Seattle University School of Law for thoughtful comments on the article. I thank Dr. George Pess for his helpful comments and research suggestions on Part II. I wish also to warmly thank the anonymous reviewers, SJEL, and its editors for their comments and suggestions. And I particularly want to thank Michael Withy, a J.D. candidate at the School of Law, for his extensive, perceptive, and helpful research assistance. I am solely responsible for any remaining errors.

1. The National Oceanic and Atmospheric Administration (NOAA) defines the Puget Sound as follows: "Puget Sound is a fjord-like estuary located in northwest Washington state and covers an area of about 2,330 km², including 3,700 km of coastline. It is subdivided into five basins or regions:

state's economy and heritage; they are a unique symbol of Washington's treasured ways of life and its commitment to protecting the environment. The fishery is a vital part of the culture of many of the Native American tribes in the state, and contributes the equivalent of millions of dollars to their annual income.² In recognition of the fishery's importance, the federal government agreed with the Treaty Tribes in the 1850s Stevens Treaties that in return for the tribes' willingness to relinquish most of their ancestral lands, the federal government would permanently protect the tribes' traditional fishing rights.³ Under the treaties, future generations of the tribes were to have a lasting share in a fishery at least ten times larger than it is today.⁴

But Puget Sound salmon fisheries have instead declined so dramatically from their historical levels that the federal government now classifies several species as threatened under the Endangered Species Act.⁵ Washington's citizens, the many tourists who visit Washington, and consumers around the world will lose from the collapse of this unique natural resource. The death of the Puget Sound salmon fishery will especially harm Washington's Native American tribes, both culturally

1) North Puget Sound, 2) Main Basin, 3) Whidbey Basin, 4) South Puget Sound, and 5) Hood Canal." Environmental History and Features of Puget Sound in R.G. Gustafson et al., U.S. Dep't Commerce, NOAA Technical Memo, NMFS-NWFSC-44, Status Review of Pacific Hake, Pacific Cod, and Walleye Pollock from Puget Sound, Washington (2000), <http://www.nwfsc.noaa.gov/publications/techmemos/tm44/environment.htm>. NOAA's definition includes most of the Strait of San Juan de Fuca, including the portion into which the Elwha River discharges. *Id.* For a map of these areas, see *id.* at fig.4, available at <http://www.nwfsc.noaa.gov/publications/techmemos/tm44/fig4.htm>.

2. In 2006, it provided approximately \$65 million in direct revenues to commercial non-native fishermen alone; the tribal share of the fishery would have a comparable market value. Mason D. Morisset & Carly A. Summers, *Clear Passage: The Culvert Case Decision as a Foundation for Habitat Protection and Preservation*, BELLWETHER: SEATTLE J. ENVTL. L. & POL'Y 29, 39 (2009).

3. The Stevens Treaties, a series of treaties entered into between 1854–55, reserved to the tribes their longstanding tribal fishing rights at all "usual and accustomed grounds" in common with non-tribal fishers. See, e.g., Treaty with the S'Klallam, Jan. 26, 1855, 12 Stat. 933, art. IV. The Treaty Tribes consist of the Hoh Indian Tribe, the Jamestown S'Klallam Tribe, the Lower Elwha Klallam Tribe, the Lummi Nation, the Makah Nation, the Muckleshoot Tribe, the Nisqually Indian Tribe, the Nooksack Tribe, the Port Gamble S'Klallam, the Puyallup Tribe of Indians, the Quileute Indian Tribe, the Quinault Indian Nation, the Sauk-Suiattle Tribe, the Skokomish Tribe, the Squaxin Island Tribe, the Stillaguamish Tribe, the Suquamish Tribe, the Swinomish Tribe, the Tulalip Tribes, and the Upper Skagit Tribe.

4. See NAT'L MARINE FISHERIES SERV., BIENNIAL REPORT TO CONGRESS ON THE RECOVERY PROGRAM FOR THREATENED AND ENDANGERED SPECIES: OCTOBER 1, 2006—SEPTEMBER 30, 2008, at 50 (2009); see also Ted Gresh et al., *An Estimation of Historic and Current Levels of Salmon Production in the Northeast Pacific Ecosystem: Evidence of a Nutrient Deficit in the Freshwater Systems of the Pacific Northwest*, 25 FISHERIES 15, 17–18 (2000) (discussing the general declines in Pacific Northwest salmon fisheries).

5. See 50 C.F.R. §§ 223.102, 224.101. These sections of the Code of Federal Regulations list all endangered species, including those within the Puget Sound area.

and economically.⁶ One of the major causes of salmon population decline is that an estimated eighty percent of available Puget Sound salmon habitat has been destroyed over the past century.⁷ And habitat loss continues despite federal, state and local government expenditures of tens of millions of dollars on habitat restoration.⁸

This article focuses on the prevention of future habitat losses.⁹ Part I explores flaws in how existing law deals with habitat protection and outlines alternative policies to improve it. Part II charts the decline of the Puget Sound salmon fishery and discusses the scientific support for the conclusion that habitat protection and restoration is a central element in restoring it. Part III considers how effective administrative action and related endangered species litigation are likely to be as means of protecting habitat. Since Native American tribes face very severe harm from the fishery's potential destruction, Part III also explores their distinctive legal authority to protect it. The article concludes that Native American treaty fishing rights could be a powerful tool for compelling federal, state, and local governments to preserve habitat for the salmon fishery. Part IV shows that adopting comprehensive federal legislation to resolve these conflicts would nevertheless be the best course of action.

Much of the litigation and legislation regarding the salmon fishery in the past decade in Washington State has sought to restore the fishery

6. See NW. INDIAN FISHERIES COMM'N, TREATY RIGHTS AT RISK: ONGOING HABITAT LOSS, THE DECLINE OF THE SALMON RESOURCE, AND RECOMMENDATIONS FOR CHANGE 6 (2011) (on file with journal) ("As the salmon disappear, our tribal cultures, communities and economies are threatened as never before. Some tribes have lost even their most basic ceremonial and subsistence fisheries—the cornerstone of tribal life.").

7. See NAT'L MARINE FISHERIES SERV., SHARED STRATEGY DEV. COMM., PUGET SOUND SALMON RECOVERY PLAN 73–75 (2007) [hereinafter NMFS, 2007 SALMON RECOVERY PLAN], available at <http://www.nwr.noaa.gov/Salmon-Recovery-Planning/Recovery-Domains/Puget-Sound/PS-Recovery-Plan.cfm> (prepared by the Shared Strategy Development Committee and adopted by the National Marine Fisheries Service as its official salmon recovery plan).

8. See NW. INDIAN FISHERIES COMM'N, *supra* note 6, at 8 (citing three main reasons for the continuing loss of habitat: (1) the failure to apply similar standards for harvest and habitat management, (2) the failure to fully exercise existing federal regulatory/legislative authority, and (3) the lack of concert in action between varying federal agencies).

9. In addition to habitat losses resulting from land development, other major factors in the decline according to scientists include hatcheries, harvest (including interception of migratory salmon on the high seas), and hydropower. See Jonathan M. Hoekstra et al., *Quantitative Threat Analysis for Management of an Imperiled Species: Chinook Salmon*, 17 ECOLOGICAL APPLICATIONS 2061 (2007). In limited parts of the Puget Sound region, poor water quality may also limit salmon populations. See Julann A. Spromberg & Nathaniel L. Scholz, *Estimating the Future Decline of Wild Coho Salmon Populations Resulting from Early Spawner Die-Offs in Urbanizing Watersheds of the Pacific Northwest, USA*, 7 INTEGRATED ENVTL. ASSESSMENT & MGMT. 648 (2011). Some observers would also include forest practices and agricultural activities as contributing factors. Factors other than habitat are outside the scope of this article, but it is important to appreciate that collectively they are quite significant, and that sound restoration policy must take varying factors that have contributed to decline into account. This issue is discussed further in Part IV.

by compelling improvements in environmental quality, including river restoration. Such litigation includes the pending federal "Culverts" litigation brought by the Treaty Tribes to compel the State of Washington to repair, replace, or remove culverts that are impeding fish passage, and to protect fish passage in the construction of new culverts.¹⁰ Legislative actions have included the removal of the dams on the Elwha River, a multiyear restoration effort estimated to cost hundreds of millions of dollars.¹¹ Improvements in water quality, such as those resulting from improved control of stormwater runoff, should also benefit fish populations over time.¹²

However, most of these laudable efforts will do little or nothing to stem the additional loss of habitat that is likely to result from poorly controlled future land development in the Puget Sound region. The region's population is estimated to increase approximately twenty-three percent—to 4.5 million people—by 2030.¹³ In light of Washington's past riparian and coastal land development patterns, it is reasonable to expect the region will lose a substantial portion of its remaining salmon habitat, even after gains from current restoration efforts are taken into account. Biologists have warned that preventing additional habitat losses is critical, but that doing so requires modifying and even limiting future land development patterns in riparian areas along the Puget Sound and its major tributary rivers.¹⁴

Many steps these scientists regard as necessary for salmon restoration will clash with powerful political and economic forces that

10. *United States v. Washington*, No. CV 9213RSM, 2007 WL 2437166, at *10 (W.D. Wash.) (Judge Martinez's issuance of a declaratory judgment imposing a duty on the state to refrain from building and operating culverts in a manner that would infringe on tribal treaty fishing entitlements). Other environmental restoration litigation includes *Skokomish Indian Tribe v. United States*, 410 F.3d 506 (9th Cir. 2005). See generally Morisett & Summers, *supra* note 2; Thane D. Somerville, *Tribes and Dams: Using Section 4(e) of the Federal Power Act to Protect Indian Tribes and Restore Reservation Resources*, BELLWETHER: SEATTLE J. ENVTL. L. & POL'Y 122 (2009).

11. See *Elwha River Ecosystem and Fisheries Restoration Act*, Pub. L. No. 102-495, §4, 106 Stat. 3173 (1992); see also *Economics of Dam Removal*, ELWHA WATERSHED INFO. RES., <http://www.elwhainfo.org/elwha-river-watershed/dam-removal/decisions-remove-dams/economics-dam-removal> (last visited Dec. 30, 2011).

12. See Spromberg & Scholz, *supra* note 9; see also PUGET SOUND P'SHIP, ACTION AGENDA, 21 (2009) (citing a lack of water quality, especially from stormwater runoff and low oxygen levels, as one of a number of areas that requires remediation).

13. See *Population, Households, and Employment Forecast*, PUGET SOUND REG'L COUNCIL, <http://psrc.org/data/forecasts/saf/> (download and open Microsoft Excel document "2006 Forecasts of Population, Households, and Employment"; scroll to tab "FAZ2030"; see column "TOTPOP").

14. See NMFS, 2007 SALMON RECOVERY PLAN, *supra* note 7, at 354 ("[P]rotecting existing habitat and the ecological processes that create it is the most important action needed in the short-term to increase the certainty of achieving plan outcomes."). Since other factors have contributed to salmon population decline, it will be necessary to address them as well; but habitat protection is the essential foundation for such efforts.

have spurred coastal development, especially over the past several decades. Therefore, if Washington State and federal policymakers want to save Puget Sound wild salmon they must ultimately transform the politics and economics of Puget Sound fishery habitat management. There are several possible ways to effect such a transformation, but to appreciate them fully one must understand the existing legal and political structure of Washington fisheries management.

A. Existing Legal and Political Structure

Today the State of Washington and the Native American tribes share responsibility for conservation management of the salmon fishery.¹⁵ At the same time, however, responsibility for managing salmon habitat is highly fragmented between a series of jurisdictions.¹⁶ At the state level, Washington has several statutes intended to manage growth in sensitive areas, in particular the Growth Management Act (GMA) and the Shoreline Management Act (SMA).¹⁷ However, these statutes assume that local jurisdictions will ultimately manage development of lands, except where the state or tribes actually own the land, subject to a theoretical state authority to prevent or object to local government's actions.¹⁸ The State of Washington possesses nominal legal authority over local growth-related action, especially at the land use planning level, as compared to the individual permit level. The state can refuse to

15. In the aftermath of the *Boldt* decision, *United States v. Washington*, 384 F. Supp. 312 (W.D. Wash. 1974), *aff'd*, 520 F.2d 676 (9th Cir. 1975), *aff'd sub nom. Washington v. Wash. State Commercial Passenger Fishing Vessel Ass'n*, 443 U.S. 658 (1979), the Washington tribes and the State of Washington ultimately entered into a co-management process with respect to the Puget Sound salmon fishery. *See generally Salmon & Steelhead Conservation*, WASH. DEP'T FISH & WILDLIFE, <http://wdfw.wa.gov/conservation/salmon/co-management/index.html> (last visited Feb. 20, 2012); NW. INDIAN FISHERIES COMM'N, TRIBAL FISHERIES MANAGEMENT, *available at* http://access.nwifc.org/fishmgmt/documents/2004_FishMgmt.pdf. A 2004 harvest management plan refers to the *Puget Sound Salmon Management Plan* (1985) as establishing the co-management obligations regarding Puget Sound fishery management. *See* PUGET SOUND INDIAN TRIBES & WASH. DEP'T FISH & WILDLIFE, COMPREHENSIVE MANAGEMENT PLAN FOR CHINOOK SALMON: HARVEST MANAGEMENT COMPONENT 20 (2004), *available at* <http://wdfw.wa.gov/publications/00099/wdfw00099.pdf>.

16. Jurisdiction is split amongst local governments and their respective land use regulations, the State of Washington, tribal governments and their harvest and hatchery management, and the federal government through the National Marine Fisheries Service (discussed further below).

17. WASH. REV. CODE §§ 36.70A, 90.58 (2011). The State of Washington also has environmental planning and compliance responsibilities under other state and federal laws, including the state and federal Clean Water Acts, *e.g.*, 33 U.S.C. §§ 1311 (2010), and the federal Coastal Zone Management Act, 16 U.S.C. § 1451 (2010).

18. *See* WASH. REV. CODE. § 36.70A.060 (2011) (giving county and city governments authority for enacting local development regulations within environmentally critical areas); *see also id.* § 36.70A.320 (stating that local development regulations enacted as part of the GMA are presumed valid until petitioned to the applicable Growth Management Hearing Board); WASH. ADMIN. CODE §§ 365-196-830, -190-080 (2011).

approve Shoreline Master Programs and can appeal GMA plans to the Growth Management Hearings Board. In practice, the state has only infrequently refused to approve programs or appealed plans, and there is no evidence that the state has ever done either for the purpose of protecting salmon. Thus, experience shows that in reality these statutes constitute largely aspirational legislative directions to local jurisdictions as to how they should carry out land management in sensitive areas, with local jurisdictions ultimately retaining considerable discretion for permitting development.¹⁹

Local jurisdictions have strong economic incentives to permit further development because they depend on property tax revenues to fund most of their government programs, from schools to public safety, and development can broaden their tax bases.²⁰ Ironically, these development incentives are often strongest in precisely the areas that are most environmentally sensitive because those places also are beautiful or provide unusually good recreation. And these sensitive areas are often located near existing riparian or shoreline development as a result of historical land use patterns in the region, adding to their economic value.

19. See 24 TIM BUTLER & MATTHEW KING, WASHINGTON PRACTICE, ENVIRONMENTAL LAW AND PRACTICE § 18.3 n.1 (2d ed. 2011) ("The GMA is founded on the premise that local governments rather than the state government have the primary duty and authority for growth management policy-making and further, that the choices made by those local governments may be different in different parts of the state. *City of Snoqualmie v. King County*, CPSGMHB Case No. 92-3-0004 (March 1, 1993). This approach to growth management, i.e., delegating broad authority and discretion to local governments, is characterized as unique among states in Aagaard, et al., v. *City of Bothell*, CPSGMHB Case No. 94-3-0011, (February 21, 1995)."). Some observers believe that this last quoted statement requires additional context. They note that most states do not even have growth management laws, and there are essentially no state limitations on local jurisdiction. In Washington, as noted in the text, there are state limitations on local discretion, especially under the Shoreline Management Act, but also under the Growth Management Act and other regulatory laws. For the contention that existing Washington state and local regulations are sufficient to protect ESA-listed species and their habitat, see Memorandum for Prop. Owners for Sensible Floodplain Regulations as Amicus Curiae at 41, *Nat'l Wildlife Fed. v. Fed. Emergency Mgmt. Agency*, No. 2:11-cv-02044-RSM (W.D. Wash. Dec. 8, 2011) [hereinafter POSFR Mem.]. However, the dispositive question is whether such state supervisory powers have been used—and, as a practical political matter, can actually be used—to protect salmon habitat. For further discussions pertaining to the GMA's "bottom up" approach of giving local jurisdictions discretion over the GMA's implementation, see Henry W. McGee, Jr., *Washington's Way: Dispersed Enforcement of Growth Management Controls and the Crucial Role of NGOs*, 31 SEATTLE U. L. REV. 1 (2007); Tadas Kisielius, *Revisiting "Bottom Up" Planning and Local Discretion: Voters Weigh in on Growth*, NW. LAND MATTERS (Sept. 30, 2010), <http://www.northwestlandmatters.com/growth-management-act/revisiting-bottom-up-planning-and-local-discretion-voters-weigh-in-on-growth/>.

20. Of course, many local jurisdictions have other sources of revenue, including sales tax revenue, but property tax revenue is one source of revenue that they can readily increase simply by permitting private property development, so it plays an important part in shaping local development policy.

At the federal level, several major programs strongly affect land development patterns in ways that damage habitat by subsidizing development in areas containing sensitive habitat. With taxpayer subsidies, development takes place that would otherwise not occur because it would be too expensive or risky to undertake without them. This occurs quite often in particularly environmentally sensitive areas such as lands immediately adjacent to rivers.²¹ Two federal programs are most significant in this respect. First, the National Flood Insurance Program (NFIP)²² subsidizes development by providing insurance for flood-prone areas at below-market costs.²³ Second, the flood control program managed by the U. S. Army Corps of Engineers (Army Corps) uses federal taxpayer funds to channelize rivers and construct flood control levees that make intensive riparian development possible in areas where it would otherwise be impossible or prohibitively expensive.²⁴ Over the past several decades the federal government has spent billions of dollars subsidizing local development through these two programs. The NFIP alone is nearly \$20 billion in debt at this writing due to its subsidization of flood insurance across the country.²⁵ Likewise, the Army Corps spends tens, if not hundreds, of millions of dollars per project on providing flood control infrastructure, and the Army Corps typically provides the infrastructure at little or no additional direct cost to those taxpayers who benefit most directly from it.²⁶

21. See NAT'L MARINE FISHERIES SERV., ENDANGERED SPECIES ACT—SECTION 7 CONSULTATION FINAL BIOLOGICAL OPINION 4 (2008) [hereinafter NMFS, BIOP] (“[M]ost of the literature related to the NFIP’s [National Flood Insurance Program’s] environmental and developmental impacts suggests that the program encourages, in some manner, the development and environmental transformation of wetlands and coastal areas, or that it does little to impede these impacts.”); see also WALTER ROSENBAUM, THE DEVELOPMENT AND ENVIRONMENTAL IMPACTS OF THE NATIONAL FLOOD INSURANCE PROGRAM: A SUMMARY REPORT 3 (2006).

22. In 1968 Congress passed the National Flood Insurance Act, 42 U.S.C. §§ 4001–4129 (2011). The purpose of the act was to make flood insurance “available on a nationwide basis through the cooperative efforts of the Federal Government and the private insurance industry . . . [based upon] workable methods of pooling risks, minimizing costs, and distributing burdens equitably among those who will be protected by flood insurance and the general public.” *Id.* § 4001(d). The act’s further purpose was to encourage “sound land use by minimizing exposure of property to flood losses.” *Id.* § 4001(c)(1). The act created the NFIP, now administered by FEMA, and issued to individuals whose communities meet FEMA’s minimum participation requirements/criteria. *Id.* § 4102(c).

23. *National Flood Insurance Program Continued Actions Needed to Address Financial and Operational Issues: Testimony Before the S. Comm. on Banking, Hous., and Urban Affairs*, 111th Cong. 1 (2010) (statement of Orice Williams Brown, Director of Fin. Markets and Cmty. Inv.), available at <http://www.gao.gov/assets/130/125283.pdf>.

24. 33 U.S.C. § 701 (2011).

25. Statement of Orice Williams Brown, *supra* note 23.

26. See 33 U.S.C. § 701t (only obligation on local governments for flood control improvements is to provide easements/access and future maintenance up to Army Corps standards).

The net result of this often-conflicting and fragmented array of federal, state, and local programs is that in the Puget Sound region, economic incentives for coastal development historically have been stronger than the political will to use existing environmental and growth management laws to restrain such development. And so the Puget Sound salmon fishery has been destroyed over time in significant part because salmon habitat essential to the fishery's continued existence has been destroyed (though as noted earlier, other factors have played important roles as well).²⁷

1. Effects of the Endangered Species Act

Federal development subsidy programs coexist uneasily with laws requiring the federal government to protect threatened or endangered species and to refrain from actions that will jeopardize their continued existence, particularly the Endangered Species Act.²⁸ Over the past several years, courts have increasingly concluded that federal agency duties under the Endangered Species Act must take precedence over the federal government's continued provision of development subsidies.²⁹ In Washington State, the National Wildlife Federation brought litigation in 2004 alleging a conflict between the federal flood insurance program and the protection of endangered fish species.³⁰ New litigation between the same parties concerning much the same set of issues began in late 2011 and is discussed in detail in Part III.³¹

Unless Congress amends the ESA, similar lawsuits can be expected to continue and to succeed if federal, state, and local governments do not

27. NMFS, 2007 SALMON RECOVERY PLAN, *supra* note 7, at 354 (“[T]here have already been substantial reductions in the types, quality and amounts of salmon habitat, and this is one of the main factors affecting fish populations.”).

28. The Endangered Species Act, 16 U.S.C. §§ 1531–1599 (2011). 16 U.S.C. § 1536(a)(2) (2011) requires federal agencies to ensure that their actions are “not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of habitat of such species” In theory, both the National Environmental Policy Act and the Clean Water Act might assist in limiting habitat damage, but so far at least they have played little practical role in that process in the Puget Sound region.

29. *See, e.g.*, Fla. Key Deer v. Paulison, 522 F.3d 1133, 1136 (11th Cir. 2008) (affirming lower court’s ruling that continued issuance of national flood insurance would cause jeopardy to listed species of Key Deer). For earlier challenges, see *Tenn. Valley Auth. v. Hill*, 437 U.S. 153, 172 (1978) (discovery of threat to endangered snail darter forced court to stop completion of the Tellico Dam, which Congress had already spent over \$100 million funding); *Sierra Club v. Marsh*, 816 F.2d 1376, 1389 (9th Cir. 1987) (holding that the Army Corps of Engineers must halt construction of a highway and flood control project and reinitiate consultation with U.S. Fish and Wildlife Service over continued harm to listed species).

30. *Nat’l Wildlife Fed. v. Fed. Emergency Mgmt. Agency*, 345 F. Supp.2d 1151, 1154 (W.D. Wash. 2004).

31. *See Complaint for Declaratory and Injunctive Relief*, *Nat’l Wildlife Fed. v. Fed. Emergency Mgmt. Agency*, No. 2:11-cv-02044 (W.D. Wash. Dec. 8, 2011).

take action to protect listed species. To date, the National Wildlife Federation litigation has had a limited practical effect on Puget Sound development patterns, but this could change dramatically over the next few years for reasons explained below. It is especially important to appreciate that as a result of this new litigation, the substantial economic costs of protecting the fishery could fall unevenly on different parts of the state and on individual property owners and communities, despite the fact that the resulting benefits would be enjoyed by Washington citizens and tribes as a whole.³²

B. Proposed Policy Approaches

From this brief sketch of the existing legal regime for Puget Sound wild salmon fishery management, it follows that theoretically there are three different policy approaches that (separately or in some combination) could be taken to restoring the fishery's habitat degradation and loss. They are:

First, eliminate the economic incentives that encourage local development and habitat destruction by, for example, using tax funding to acquire additional habitat or to replace local property tax revenues that local governments would lose by maintaining salmon habitat. Funding could theoretically come either from general revenues, from user fees, or from some combination of both;

Second, strengthen existing laws that are intended to protect habitat by removing or restricting local discretion to permit habitat destruction and by eliminating all direct and indirect federal subsidies for development, particularly those provided by flood insurance and taxpayer-funded levee construction. This could be done through legislation or, at least in some cases, through administrative action under existing law; or

Third, impose strict legal duties on government authorities at all levels to protect and restore salmon habitat, enforceable by substantial fines and penalties for noncompliance. This could be done either through legislation or, to the extent permitted by existing law, through litigation.

In order to make wise choices about these alternative policies, one must carefully examine and balance the costs and benefits of each approach. To provide the necessary background information for that

32. For example, if a court were to prohibit further issuance of flood insurance or forced serious changes to FEMA's insurance community eligibility requirements as a result of the new NWF litigation, the state's citizens as a whole would benefit because the fishery would be better protected, but at the same time, property owners in some communities might be denied development rights, or development financing, as a result, and local governments would then lose potential tax revenues. This problem is discussed further in Parts III and IV.

analysis, the next part of this article focuses in detail on the problem of salmon habitat restoration. Later parts of the article examine the costs and benefits of administrative action and litigation, the restoration paths chosen so far, and how those approaches compare to restoration achieved through comprehensive legislation.

II. THE ENDANGERED PUGET SOUND SALMON FISHERY

A. Salmon Population

Puget Sound salmon fisheries today are only a small fraction of their historical size—about ten percent or less of historical levels.³³ In a June 2009 report to Congress,³⁴ the National Oceanic and Atmospheric Administration (NOAA) estimated that historical Puget Sound Chinook salmon levels (circa 1900) were between 600,000 and 800,000 fish per season.³⁵ Recent Chinook salmon runs, however, suggest that there has been as much as a tenfold decrease in Puget Sound Chinook salmon populations.³⁶ That decline is in turn merely a facet of a broad century-long decline in wild salmon and other fish populations throughout the Pacific Northwest.³⁷ In a 2008 Biological Opinion (BiOp) the National Marine Fisheries Service (NMFS) stated that there was an average of 1500 natural (non-hatchery) spawners for each of the twenty-two populations of Puget Sound Chinook salmon.³⁸ This was a dramatic decrease from past numbers. NMFS noted that “currently observed abundances of natural spawners . . . are several orders of magnitude lower than estimated historical spawner capacity, and well below peak historical abundance (approximately 690,000 spawners in the early 1900s).”³⁹

33. See Gresh et al., *supra* note 4. I wish to thank Dr. George Pess of NOAA for his perceptive and helpful comments on the scientific issues in this section of the article, and for providing various scientific references. He bears no responsibility for any of the conclusions reached in this article, or for any remaining errors, however.

34. NAT'L MARINE FISHERIES SERV., BIENNIAL REPORT, *supra* note 4.

35. *Id.* at 50.

36. *Id.* (estimating that there were only an average of 58,000 natural Chinook spawners in Puget Sound per year between 1999 and 2005).

37. See Gresh et al., *supra* note 4.

38. NMFS, BiOp, *supra* note 21, at 26.

39. *Id.* The declines in wild salmon populations are of special concern because it is doubtful that they can be replaced successfully by hatchery-bred fish. There is scientific evidence that hatchery fish are inadequate replacements for wild salmon populations. There are two main reasons for this. First, hatchery born fish are less resistant to disease, including certain parasites and bacterial strains:

Chinook salmon are exposed to numerous bacterial, viral, and parasitic organisms during their life cycle. Native chinook salmon have evolved with certain of these organisms, but the widespread use of artificial propagation has introduced some exotic organisms not

The decline of the Puget Sound fisheries has now reached the critical point where the federal government has declared that various species of Puget Sound salmon and steelhead are threatened under ESA criteria.⁴⁰ After receiving petitions to list a number of Northwest salmon and steelhead species under the ESA,⁴¹ NMFS, which has jurisdiction over most marine and anadromous fish for ESA purposes, listed a number of Northwest salmon species as threatened—that is, in danger of future extinction. NMFS first listed Puget Sound Chinook salmon as a threatened species under the ESA in March 1999.⁴² The protected populations include all naturally spawned Chinook salmon residing below impassable natural barriers in the Puget Sound region from the North Fork Nooksack River to the Elwha River.⁴³ NMFS also listed the Hood Canal summer-run chum salmon as threatened in 1999⁴⁴ and listed southern resident killer whales (*Orcinus orca*) as an endangered species; the whales depend in part on salmon for food.⁴⁵ A 2008 Recovery Plan for the killer whales therefore focuses on rebuilding Chinook salmon

historically present in some watersheds. Some scientific studies may indicate that chinook salmon are more susceptible to disease organisms than other salmonids.

PROTECTED RES. DIV., NAT'L MARINE FISHERIES SERV., FACTORS CONTRIBUTING TO THE DECLINE OF CHINOOK SALMON: AN ADDENDUM TO THE 1996 WEST COAST STEELHEAD FACTORS OF DECLINE 7 (1998). Second and more important, evidence suggests that hatchery born fish (and even their natural born offspring) have substantially decreased reproduction rates compared to wild salmon populations. *See generally* Hitoshi Araki et al., *Carry-over effect of captive breeding reduces reproductive fitness of wild-born descendants in the wild*, 5 BIOLOGY LETTERS 629 (2009), available at <http://www.dfw.state.or.us/fish/OHRC/docs/2009/ArakiEtAl2009BiolLetters.pdf>; Hitoshi Araki, et al., *Genetic Effects of Captive Breeding Cause a Rapid, Cumulative Fitness Decline in the Wild*, 318 SCIENCE 100 (2007); *see also* *The Fish Hatchery Solution Leads to More Problems than Solutions*, MARINE SCIENCE TODAY (June 21, 2009), <http://marinesciencetoday.com/2009/06/24/the-fish-hatchery-solution-leads-to-more-problems-than-solutions/>.

40. Under this act, the Secretary of the Interior must determine whether a species is endangered or threatened due to any of the following five factors: (1) the present or threatened destruction, modification or curtailment of its habitat or range; (2) overutilization for commercial, recreational, scientific, or educational purposes; (3) disease or predation; (4) the inadequacy of existing regulatory mechanisms; or (5) other natural or manmade factors affecting its continued existence. 16 U.S.C. § 1533(a)(1)(A)-(E).

41. Listing Endangered and Threatened Species and Designating Critical Habitat, 59 Fed. Reg. 46,808-01 (proposed Sept. 12, 1992) (to be codified at 50 C.F.R. pt. 227).

42. Endangered and Threatened Species; Threatened Status for Three Chinook Salmon Evolutionarily Significant Units, 64 Fed. Reg. 14,308 (Mar. 24, 1999) (to be codified at 50 C.F.R. pt. 223, 224).

43. *Id.* at 14,313.

44. Endangered and Threatened Species: Threatened Status for Two ESUs of Chum Salmon, 64 Fed. Reg. 14,508, 14,512 (Mar. 25, 1999) (to be codified at 50 C.F.R. pt. 223).

45. Endangered and Threatened Wildlife and Plants: Endangered Status for Southern Resident Killer Whales, 70 Fed. Reg. 69,903 (Nov. 18, 2005) (to be codified at 50 C.F.R. pt. 224).

numbers to populations that can sustain killer whale populations in Puget Sound.⁴⁶

In 2005, NMFS concluded that the Chinook salmon and Hood Canal summer-run chum remain threatened under the ESA,⁴⁷ and subsequently the agency designated hundreds of river and stream miles in Puget Sound as critical habitat for the Chinook salmon and the chum.⁴⁸ In 2007, the agency listed Puget Sound steelhead as a threatened species.⁴⁹ NMFS concluded that the primary threat to the steelhead was habitat loss. It stated:

We concluded that the principal factor for decline for Puget Sound steelhead is the present or threatened destruction, modification, or curtailment of its habitat or range. . . . We concluded that existing regulatory mechanisms inadequately protect steelhead habitats as evidenced by the historical and continued threat posed by the loss and degradation of nearshore, estuarine, and lowland habitats due to agricultural activities and urbanization.⁵⁰

B. Habitat Loss

The 2007 Salmon Recovery plan adopted by NOAA was consistent with NMFS's conclusion that habitat is not adequately protected by existing legal mechanisms. The administration recognized that "protecting existing habitat and the ecological processes that create it is the most important action needed in the short term to increase the certainty of achieving [restoration] plan outcomes."⁵¹ The critical importance of adequate riparian habitat to salmon population development is apparent from recent scientific experiments by Carson A. Jeffres et al., some of whose key results are shown in Figure 1.⁵²

46. Endangered and Threatened Species; Recovery Plans; Final Recovery Plan for Southern Resident Killer Whales, 73 Fed. Reg. 4,176 (Jan. 24, 2008).

47. Endangered and Threatened Species: Final Listing Determinations for 16 ESUs of West Coast Salmon, and Final 4(d) Protective Regulations for Threatened Salmonid ESUs, 70 Fed. Reg. 37,160 (June 28, 2005) (to be codified at 50 C.F.R. pt. 223, 224).

48. Endangered and Threatened Species: Designation of Critical Habitat for 12 Evolutionarily Significant Units of West Coast Salmon and Steelhead, 70 Fed. Reg. 52,630 (Sept. 2, 2005) (to be codified at 50 C.F.R. pt. 226).

49. Endangered and Threatened Species: Final Listing Determination for Puget Sound Steelhead, 72 Fed. Reg. 26,722 (May 11, 2007) (to be codified at 50 C.F.R. pt. 223). "Steelhead is the name commonly applied to the anadromous form of the biological species *O. mykiss*. . . . The Puget Sound steelhead DPS (distinct population segment) includes more than 50 stocks of summer- and winter-run fish, the latter being the most widespread and numerous of the two run types." *Id.*

50. *Id.* at 26,732.

51. NMFS, BiOp, *supra* note 21, at 354.

52. *See, e.g.*, Carson A. Jeffres et al., Ephemeral Floodplain Habitats Provide Best Growth Conditions for Juvenile Chinook Salmon in a California River, 83 ENVTL. BIOLOGY FISHES 449 (2008).



Figure 1. Comparison of a single enclosure of fish reared in intertidal river habitat below floodplain (left) and a single enclosure of fish reared in the floodplain vegetation (right) after fifty-four days in respective habitats.⁵³

In their experiment Jeffres et al. compared fish of the same age, some of which had developed within an ephemeral floodplain zone (those on the right) and some of which had developed in a river mainstem (those on the left). The pictorial data show in striking fashion that fish with the ability to find floodplain refugia and diverse habitats are very likely to be bigger, healthier fish. Such refugia are eliminated by "channelized" rivers that destroy fish habitat (see Figure 2(a)). Figure 2(a) is an aerial photograph of a channelized river. As a result of channelization and associated increases in adjacent land development, a considerable part of the natural habitat that would previously have been available to salmon, especially juvenile fish, has been completely eliminated.

53. Photograph and caption reproduced from Jeffres et al., *supra* note 52, at 455 fig.7. Used by permission.



Figure 2. (a) Channelized river (Washington),⁵⁴ (b) unchannelized river (Alaska).⁵⁵

Figure 2(b) shows an unchannelized river that has been allowed to take its natural course and develop through and across an area that is referred to as its channel migration zone (CMZ).⁵⁶ The natural CMZ is typically a geographic area wider than the area normally defined as a "floodplain" under Federal Emergency Management Agency (FEMA) regulations.⁵⁷ An unchannelized river's ability to flow across its full CMZ results in creation of far greater habitat that is then available for juvenile fish spawning, in turn resulting in significantly higher survival rates and populations. The principal goal of riparian habitat restoration is

54. Photograph by David R. Montgomery, University of Washington. Used by permission. For further information, see David R. Montgomery et al., *Puget Sound Rivers and Salmon, in RESTORATION OF PUGET SOUND RIVERS 1–13* (David R. Montgomery et al. eds., Ctr. Water & Watershed Studies, Univ. Wash. Press 2003).

55. Photograph by Lauren Rogers, Post-doctoral Research Fellow, Ctr. Ecological & Evolutionary Synthesis, Univ. Oslo, Norway. Used by permission.

56. Washington law defines the term "channel migration zone" as follows: "[T]he area along a river within which the channel(s) can be reasonably predicted to migrate over time as a result of natural and normally occurring hydrological and related processes when considered with the characteristics of the river and its surroundings." WASH. ADMIN. CODE § 173-26-020(6) (2011).

57. FEMA defines "floodplain" as "any land area susceptible to being inundated by flood waters from any source." *Definitions*, FED. EMERGENCY MGMT. AGENCY, <http://www.fema.gov/business/nfip/19def2.shtm> (last visited Jan. 2, 2011).

to restore the full channel migration zone for each river as viable habitat for fish populations.⁵⁸

Scientists estimate that approximately eighty percent of the habitat historically available to fish and wildlife on the edge of Puget Sound was destroyed between 1870 and 1970. This process is described in the 2007 NOAA Puget Sound Salmon Recovery Plan, which states:

An 1885 survey estimated that there were 267 square kilometers of tidal marsh and swamps bordering Puget Sound. Tidelands extended 20 km inland from the shoreline in the Skagit and Stillaguamish watersheds. Approximately 100 years later, only 54.6 [square kilometers] of intertidal marine or vegetated habitat is estimated to occur in the Puget Sound basin. This represents a decline of 80 percent across the region due to agricultural and urban modification of the lowland landscape (NMFS/Chum BRT, 1997). In heavily industrialized watersheds, such as the Duwamish, intertidal habitat has been eliminated by 98 percent In addition to the high-intensity industrial and urban development at major river mouths in Puget Sound, intertidal and nearshore habitats throughout the Sound have been modified by shoreline armoring (e.g. construction of rock, concrete, and timber bulkheads or retaining walls). These modifications have a cumulative environmental impact that results in loss of riparian vegetation, obstruction of sediment movement along the shoreline, interference with wave action, and burial of upper beach areas.⁵⁹

As shown in Table 1, the habitat changes in certain parts of the Puget Sound have been even more drastic than the overall declines.

58. See NMFS, BiOP, *supra* note 21, at 151.

59. NMFS, 2007 SALMON RECOVERY PLAN, *supra* note 7, at 73–75. An area of 267 square kilometers is about 103 square miles.

Table 1. Changes in Areas of Selected Puget Sound Estuaries from the 1800s to the 1970s.⁶⁰

Estuary	Pre-development, 1800s, Area (ha)	Post- development, 1970s, Area (ha)	Change (%)
Nooksack	445	460	+3
Lummi	580	30	-95
Samish	190	40	-79
Skagit ⁶¹	1600	1200	-25
Stillaguamish	300	360	+20
Snohomish	3900	1000	-74
Duwamish	260	4	-98
Puyallup	1000	50	-95
Nisqually	570	410	-28
Skokomish	210	140	-33
Dungeness	50	50	0

As noted above, scientists agree that a series of manmade factors are implicated in wild salmon population decline, including hatcheries, harvest (including open seas interceptions), hydropower, and habitat degradation.⁶² Notwithstanding the clear evidence that maintaining, protecting, and expanding available habitat is critical to the survival and growth of wild salmon populations, the reality is that available habitat continues to decline in many parts of Puget Sound, despite habitat restoration efforts over the past decade. NMFS recently completed an ESA listing status review of several Puget Sound salmon and steelhead species.⁶³ The agency concluded that habitat had continued to decline, and that regulatory programs to protect habitat had not significantly

60. *Id.* at 73. A hectare (ha) is about 2.47 acres.

61. Later studies of habitat changes in the Skagit Delta indicate a loss of pristine estuarine delta habitat of approximately eighty percent. ERIC BEAMER ET AL., SKAGIT SYS. COOP. RESEARCH DEP'T, THE IMPORTANCE OF NON-NATAL POCKET ESTUARIES IN SKAGIT BAY TO WILD CHINOOK SALMON: AN EMERGING PRIORITY FOR RESTORATION 1 (2003), available at http://www.skagitcoop.org/documents/EB1579_Beamer_et_al_2003.pdf.

62. See discussion *supra* note 9; see also Hoekstra et al., *supra* note 9; Philip Roni, George Pess, Tim Beechie, & Sarah Morley, *Estimating Changes in Coho Salmon and Steelhead Abundance from Watershed Restoration: How Much Restoration is Needed to Measurably Increase Smolt Production?*, 30 N. AM. J. FISHERIES MGMT. 1469 (2010).

63. Endangered and Threatened Species, 5-Year Reviews for 17 Evolutionarily Significant Units and Distinct Population Segments of Pacific Salmon and Steelhead, 76 Fed. Reg. 50448 (proposed Aug. 15, 2011) (to be codified at 50 C.F.R. pt. 223, 224).

changed since the flawed 1990s efforts that contributed to the Chinook salmon's listing.⁶⁴ The report stated:

Key indicators addressed by the [Puget Sound Partnership's] 2009 State of the Sound Report tell us that important habitat for Chinook salmon is still declining, despite the ESA listing over 10 years ago.⁶⁵ As such, the region needs to increase its scrutiny of the sources of habitat decline, and the tools we use to protect habitat sites and ecosystem processes.⁶⁶

A 2011 white paper on fishery protection prepared by the Treaty Tribes in Western Washington argued that "stopping habitat degradation is the cornerstone of salmon recovery, but habitat is still declining."⁶⁷ The tribes noted that since the ESA listing of Puget Sound Chinook salmon in the fall of 1999, loss of sound shoreline habitat and function through shoreline armoring has continued at a rate of 1.5 miles per year.⁶⁸ Between 2004 and 2008 alone, the Washington Department of Fish and Wildlife granted 456 permits for new bulkheads in Puget Sound.⁶⁹ Meanwhile, the Washington Department of Fish and Wildlife recently disclosed that thirty percent of randomly sampled culverts, despite receiving a state permit in the last ten years, still resulted in blocked fish passage.⁷⁰ The Treaty Tribes concluded that as a result, "Today our [tribal] fishing rights have been rendered almost meaningless because the federal and state governments are allowing salmon habitat to be damaged and destroyed faster than it can be restored. Salmon populations have declined sharply because of the loss of spawning and rearing habitat."⁷¹

C. Salmon Restoration Funding

While salmon habitat losses continue, funding for salmon restoration projects over the past five years in Puget Sound has been only about one-half the estimated level necessary for large-scale salmon restoration. According to the Puget Sound Partnership's 2007 Salmon

64. NAT'L MARINE FISHERIES SERV., IMPLEMENTATION STATUS ASSESSMENT FINAL REPORT: A QUALITATIVE ASSESSMENT OF IMPLEMENTATION OF THE PUGET SOUND CHINOOK SALMON RECOVERY PLAN 6 (2011), available at <http://www.nwr.noaa.gov/Salmon-Recovery-Planning/Recovery-Domains/Puget-Sound/upload/implement-rpt.pdf>.

65. *Id.*

66. *Id.*

67. NW. INDIAN FISHERIES COMM'N, *supra* note 6, at 2. The tribes also expressed significant concern that harvest levels were being limited. *See id.* at 7.

68. *Id.* at 10 n.7.

69. *Id.* at 24 n.57.

70. *Id.* at n.55.

71. *Id.* at 6.

Recovery Plan, adequate salmon recovery and protection would cost \$120 million per year over the next decade.⁷² However, existing funding levels are currently less than half that amount.⁷³ Scientists recently estimated that about three times the current level of *total* annual salmon restoration funding, or approximately \$140 million (in 2011 dollars), would be needed to protect Coho salmon and steelhead through full restoration of a single model watershed, which represented only one of the eighteen separate watersheds in the Puget Sound basin.⁷⁴ In that study, Philip Roni et al. concluded that approximately eighty percent of the habitat in such a model watershed would need to be restored before scientists could be confident that salmon and steelhead production in the watershed would double.⁷⁵

Roni et al. used a probabilistic Monte Carlo analysis to test an alternative to such an intensive watershed-by-watershed restoration approach.⁷⁶ The team looked at what the results would be if instead of full restoration of a single watershed, limited available restoration funding were to be distributed among various watersheds so that only a relatively small amount of restoration occurred in each watershed.⁷⁷ The average amount of restoration under this alternative scenario was roughly eight percent, or the same amount on average that the authors

72. PUGET SOUND P'SHIP, *supra* note 12, at 132.

73. Although recovery efforts need an estimated \$120 million annually, the Puget Sound Partnership estimates that the total currently being spent on Puget Sound salmon restoration is approximately \$43 to \$48 million, an amount which generally fluctuates every year based upon budgets and politics. Memorandum from Michael Withy to author (Jan. 3, 2012) (on file with journal). For information regarding general grant awards and/or funding for these programs, see PUGET SOUND NEARSHORE, 2010 ESTUARY AND SALMON RESTORATION PROGRAM: ANNUAL REPORT 6 (2011), *available at* http://www.pugetsoundnearshore.org/esrp/2010_esrp_final.pdf; PUGET SOUND P'SHIP, PUGET SOUND ACQUISITION AND RESTORATION 2011–2013 BUDGET REQUEST: \$55 MILLION (2010), *available at* http://www.psp.wa.gov/downloads/PSAR/PSAR_2011-2013_full.pdf (showing both funding levels for 2009–2011 budget, the decrease from previous levels, and the increase in funds requested for the 2011–2013 budget); WASH. STATE RECREATION & CONSERVATION FUNDING BD., AQUATIC LANDS ENHANCEMENT ACCOUNT: GRANTS AWARDED FISCAL YEAR 2012 (2011), *available at* <http://www.rco.wa.gov/documents/rcfb/alea/ALEA2010GrantsFunded.pdf>; 2011 Grant Awards for the Watershed Protection and Restoration Grant, WASH. DEP'T ECOLOGY, http://www.ecy.wa.gov/puget_sound/index.html (showing EPA grants for Puget Sound ecological restoration). When viewing these data, it must be remembered that the amounts awarded/appropriated, unless specifically earmarked for salmon recovery, are going towards general ecosystem restoration. What is important for our discussion, however, is the fact that current funding levels are well below those anticipated as necessary under the 2007 Salmon Recovery Plan.

74. *See* Roni, *supra* note 62, at 1473, 1478.

75. *Id.* at 1478.

76. *Id.* at 1473. "Monte Carlo Analysis is a computer-based method of analysis developed in the 1940's that uses statistical sampling techniques in obtaining a probabilistic approximation to the solution of a mathematical equation or model." RISK ASSESSMENT FORUM, U.S. ENVTL. PROT. AGENCY, EPA/630/R-97/001, GUIDING PRINCIPLES FOR MONTE CARLO ANALYSIS 7 (1997).

77. Roni, *supra* note 62, at 1473–75.

concluded had occurred as a result of funding under the Pacific Coastal Salmon Recovery Fund from 2000 to 2009.⁷⁸ Through the Monte Carlo analysis the team found that it was possible that such limited restoration would yield only a small net increase in salmon or steelhead population, and that the resulting increase would probably be too small to measure using available techniques even if it did occur.⁷⁹ The authors concluded that their study suggested the need for greater prioritization in salmon and steelhead restoration project funding, both within individual watersheds and between watersheds.⁸⁰

The failure of well-intentioned restoration efforts to protect riparian habitat against further decline, and the strong likelihood of increasing future population growth and land development in the Puget Sound region, both suggest that it is not realistic to expect local governments to protect salmon habitat unless they are required to do so by laws that are rigorously enforced, or unless their incentives are fundamentally changed.⁸¹ Strong pro-development economic incentives combined with limited political will to enforce laws designed to protect salmon habitat against development are leading to a collapse of the Puget Sound fishery.

III. THE DIFFERING CONTOURS OF ENVIRONMENTAL LAW AND TREATY RIGHTS AS MEANS TO COMPEL ENDANGERED SPECIES PROTECTION

A. Administrative Paralysis

In many cases, Federal and state administrative officials already have the necessary legal authority to lessen the conflict between endangered species habitat preservation and restoration on the one hand, and Puget Sound development pressures on the other. This authority is found in the powerful and flexible provisions of the Clean Water Act, the

78. *Id.* at 1473.

79. *Id.* at 1478.

80. *Id.* ("In the absence of a plan to concentrate and complete restoration efforts in a few key basins or dramatically increase the total amount of restoration, it is unlikely that even the most rigorous basin-scale monitoring program will be able to detect a change in coho salmon or steelhead abundance at a watershed or population scale. This also suggests that if the desire is to recover whole watersheds or fish populations, basins and populations should be prioritized for restoration potential and restoration efforts concentrated in those areas rather than spread across the region.").

81. For example, by having local governments reimbursed or compensated for potential losses in tax revenue as a result of future declines in or limits on floodplain development. Some observers suggest that one possible means of achieving this would be to impose a tax on all salmon catches, the proceeds of which would be devoted to restoration; others might support providing general taxpayer funding for restoration. The choice between funding mechanisms is a good example of the kind of choice best made through the legislative process rather than through litigation. *See* discussion *infra* Part IV.

ESA, and the NFIP. But as extensive litigation between environmental groups and federal agencies in various parts of the United States has shown, over the past several decades federal officials have been very reluctant—indeed, largely unwilling—to use their full measure of authority to resolve this conflict, no matter which president held office.⁸² Remarkably, federal agency officials have contended that they had no legal authority to act to protect endangered species, until they were forced by courts to acknowledge that they did possess such authority and were required by law to exercise it.⁸³ The continuing reluctance of administrative agency officials to enforce the ESA and related laws means that administrative action appears to be an unpromising approach to habitat protection nationally. The situation is no different in Washington, as shown by FEMA's response to efforts designed to force it to protect habitat under the ESA in the Puget Sound region, discussed below.

B. The National Wildlife Federation Litigation History—2004 to 2011

One possible approach to improved salmon habitat protection is to impose binding legal duties through court action against federal, state, and local governments to protect habitat. Many public interest environmental advocacy groups have chosen this path. The most important question facing the litigation approach is whether it will be successful not just in the short-term, but in the long-term. In other words, assuming for the moment that environmental plaintiffs will ultimately prevail on the merits of their claims, is effective long-term enforcement possible using the court judgments they obtain? In order to understand this problem, one must review the litigation in this area in detail.

1. The National Wildlife Federation's First Action and Its Aftermath

In an effort to prevent further habitat destruction, protect fisheries, and prevent unnecessary damage from flooding, environmental organizations have increasingly sought to force federal agencies to refrain from subsidizing development through means like flood

82. *See, e.g.*, Fla. Key Deer v. Brown, 364 F. Supp. 2d 1345, 1356 (S.D. Fla. 2005), *aff'd*, 522 F.3d 1133 (11th Cir. 2008) (showing FEMA's obligation to consult with U.S. Fish and Wildlife Services and that FEMA is required to ensure issuance of flood insurance causes no jeopardy to ESA-listed species); Nat'l Wildlife Fed. v. Fed. Emergency Mgmt. Agency, 345 F. Supp.2d 1151, 1172–73 (W.D. Wash. 2004) (forcing FEMA into Section 7 consultation due to the flood insurance program's likelihood of harm to ESA-listed species).

83. *See, e.g.*, Fla. Key Deer v. Paulison, 522 F.3d 1133, 1141–42 (11th Cir. 2008) (FEMA argued that it did not have discretion under its enabling legislation to not issue flood insurance); Coal. for a Sustainable Delta v. Fed. Emergency Mgmt. Agency, No. 1:09-cv-02024 OWW GSA, 2011 WL 3665108 (E.D. Cal. 2011).

insurance provided through the NFIP. The National Wildlife Federation brought a successful action in a Washington federal court against FEMA in 2004, forcing FEMA to consult with NMFS about whether the NFIP, which is administered by FEMA, violated the ESA by jeopardizing protected Puget Sound fish species.⁸⁴ The court concluded that further implementation of the NFIP might adversely affect a listed species or its critical habitat, thus violating the ESA.⁸⁵ Pursuant to the court's order, this consultation had to be a formal consultation under Section 7 of the ESA.⁸⁶

As the result of the required Section 7 consultation, on September 22, 2008, NMFS issued a formal BiOp to FEMA.⁸⁷ In the BiOp, NMFS analyzed known information about the biology, particularly the life history, of the relevant fish species, and then analyzed the likelihood that the fish would survive under current management conditions. NMFS concluded that continued implementation of the NFIP would likely have adverse effects upon floodplain habitats of ESA listed Puget Sound area species of Chinook salmon, Hood Canal summer chum salmon, steelhead, and southern resident killer whales. The agency stated that “[w]hen the anticipated effects of NFIP implementation, including indirect effects, are added to the baseline condition, the trends for habitat will be accelerated degradation, negatively impacting conservation values of habitat in most watersheds, and negatively impacting trends in all VSP parameters for most salmonid populations.”⁸⁸ The agency concluded that this is of particular concern because “[o]f the four ESA listed salmonid ESUs and DPSs in the action area, Chinook salmon, and steelhead both have life history strategies that rely on floodplains during juvenile life stages.”⁸⁹ Nevertheless, FEMA has issued 7,600 flood insurance policies to Puget Sound development projects in areas subject to its minimum eligibility criteria between 2000 and 2008, and has issued 800 such policies between issuance of the BiOp in 2008 and December 2010.⁹⁰ Since 2000, FEMA has issued flood insurance to more than 42,000 new structures in the Puget Sound area.

84. *Nat'l Wildlife Fed.*, 345 F. Supp.2d 1151.

85. *Id.* at 1164 (“FEMA’s promulgation of minimum eligibility criteria and its sale of flood insurance both enable development in the floodplain that negatively impacts salmon”).

86. *See* 16 U.S.C. § 1536(a)(2) (2011).

87. NMFS, BiOp, *supra* note 21.

88. *See id.* at 145.

89. *Id.* at 22.

90. Complaint for Injunctive and Declaratory Relief, *supra* note 31, at 10. In that litigation, amicus curiae POSFR asserts that only 220 of the 800 policies issued after 2008 were for new development. POSFR Mem., *supra* note 19, at 41. Whether that claim is correct, and its significance if correct, are uncertain at this writing.

Three specific elements of the NFIP that adversely affect anadromous fish habitats were listed in the BiOp: (1) floodplain mapping, particularly the ability under existing regulations to place fill within a designated floodplain in order to raise the land and remove the property or development from the NFIP's floodplain map and insurance requirements;⁹¹ (2) minimum floodplain criteria; and (3) FEMA's Community Rating System (CRS). According to the BiOp, both the NFIP's floodplain mapping and minimum floodplain criteria elements incentivize floodplain development using fill and levee construction.⁹² After concluding that existing FEMA regulations under the NFIP jeopardize various threatened salmon species, NMFS set forth a multi-element "reasonable and prudent alternative" (RPA), as required by federal regulations, that FEMA could adopt to avoid jeopardizing listed fish and the resulting civil and criminal liabilities.⁹³

These RPA requirements meant in effect that FEMA would be required to deny flood insurance to local communities that did not

91. NMFS, BiOp, *supra* note 21, at 85 ("Placing fill to elevate properties and building levees to trigger floodplain map revisions are detrimental to floodplain and channel function. Lands that are periodically flooded provide safe off-channel refugia, with abundant food items, for rearing juvenile salmonids during periods of high flow when mainstem channels cannot be occupied, functions essential to decrease mortality in juvenile salmonids. Filling in floodplains to remove them from the mapped floodplain decreases the extent of off channel habitat and impairs the natural processes that create and maintain these habitats, removing these functions. Fill in floodplains also reduces flood water storage. This causes higher water levels downstream, greater water velocity during high flow events, and increased erosion, which have adverse effects on salmon. Channels that are unconfined by floodplain fill have more diverse habitat complexity that supports salmon survival. Both natural floodplains and unaltered stream channels support listed species by providing increased juvenile to adult survival, which is essential for recovery of listed species."). The BiOp further concludes that

Placing fill in the floodplain diminishes the functional condition of floodplain processes that create and maintain salmonid habitat. Fill eliminates wetlands, wetland and riparian vegetation, and limits channel dynamics. Fill constrains floodwater flow into smaller spaces, increasing flood flow velocity and concomitant erosive damage and scour. The FEMA itself acknowledges that filling in the floodplain is highly likely to have adverse effects on habitat of listed and endangered species.

Id. at 92.

92. In order to earn eligibility for the NFIP, communities must have their levees certified by engineers as meeting the Army Corps' requirements. 33 C.F.R. § 203.48 (2011); *see also* NMFS, BiOp, *supra* note 21, at 12–13. The Army Corps' strict riparian vegetation requirements cause habitat and channel-migration degradation. NMFS, BiOp, *supra* note 21, at 86–87. According to the BiOp, the Army Corps' "vegetation standards" for levee certification, funding, and emergency relief effectively require the removal of riparian vegetation – vegetation that supports fish growth and survival. *See id.* ("[L]evees cause additional adverse effects to salmon due to bank stabilization methods and channel confinement. Riprap displaces vegetation and decreases survival and growth as soil is not available for root establishment. In addition, riprap is generally uniform and lacks bank irregularities needed to provide velocity refuge for fish and their prey . . . Levees also confine rivers, limiting the potential for creating or re-establishing complex and diverse habitats that are important for juvenile salmon rearing and refuge, such as side channels, oxbows, and floodplain wetlands").

93. 50 C.F.R. § 402.14(g)(5) (2012) (requiring the consulting agency to issue a reasonable and prudent alternative so as to allow the action agency to avoid future violations of the ESA).

implement major new restrictions on riparian development in the Puget Sound region. Under the BiOp, NMFS emphasized that it sought stringent protection for core habitat areas referred to as Riparian Buffer Zones (RBZs):⁹⁴ "The RBZ is a no-disturbance zone, other than for activities that will not adversely affect habitat function."⁹⁵ This effectively means that pursuant to the BiOp's RPA communities with land use regulations that permit development within RBZs should be denied flood insurance. Thus, compliance with the RPA's numerous elements would sharply restrict FEMA's issuance of new flood insurance coverage in the Puget Sound region and consequently reduce environmentally harmful development. It is also very likely that such RPA-imposed development restrictions would significantly reduce property values for undeveloped or partially developed properties either because development would be prohibited entirely, or because previously permitted development would be far more expensive to undertake.

The RPA contained several key steps that NMFS concluded were necessary for FEMA to take in order to avoid jeopardizing Puget Sound wild salmon and steelhead fisheries through the flood insurance program. The key steps included, *inter alia*, revisions to FEMA's mapping program to limit habitat damage, revisions to floodplain management criteria to limit habitat damage, changes in the Community Rating System (CRS), and addressing the effects of levee vegetation. A brief description of these major steps, referred to as "Elements" in the BiOp's terminology, follows.

Element 2: Revisions to FEMA's Mapping Program to Limit Habitat Damage

The RPA provided that FEMA shall approve Letters of Map Change (LOMC) resulting from development alterations only when the applicant:

has factored in the effects of the alterations on channel and floodplain habitat function for listed salmon, and has demonstrated that the alteration avoids habitat functional changes, or the proponent has mitigated for the habitat functional changes . . . with

94. The Riparian Buffer Zone is the greater of the following: (1) 150 feet measured perpendicularly from ordinary high water for Type S (Shorelines of the State) and F (fish-bearing) streams; 100 feet for N (nonsalmonid-bearing) streams, lakes and marine shorelines, and 50 feet for U (untyped) streams; (2) the Channel Migration Zone plus 50 feet; and (3) the mapped Floodway. NMFS, BiOp, *supra* note 21, at 222. As explained in the BiOp, "[t]he Riparian Buffer Zone is an overlay zone that encompasses lands as defined above on either side of all streams, and for all other watercourses including off channel areas." *Id.*

95. *Id.*

appropriate habitat measures that benefit the affected salmonid populations.⁹⁶

Element 3: Revise Floodplain Management Criteria to Limit Habitat Damage

The RPA provided for revision of floodplain management criteria in two key respects summarized below:

(1) FEMA shall allow no development in the floodway, CMZ plus fifty feet, and RBZ, or local jurisdictions must demonstrate to FEMA that any development in the floodway, CMZ plus fifty feet, and RBZ does not “adversely affect water quality, water quantity, flood volumes, flood velocities, spawning substrate, and/or floodplain refugia” for listed salmonids.⁹⁷

(2) FEMA shall prohibit development in the 100-year floodplain, or if development within the 100-year floodplain (but outside RBZ) is permitted, local jurisdictions and FEMA must demonstrate that any loss of floodplain storage will be “avoided, rectified, or compensated for.”⁹⁸ Additionally, indirect adverse effects on stormwater, riparian vegetation, bank stability, and channel migration, must also be mitigated so as to provide salmon habitat protection.⁹⁹

Element 4: Changes in the Community Rating System (CRS)

The BiOp requires that FEMA change the CRS so that FEMA’s points/credit system rewards actions that benefit salmonid habitat, not just actions that improve flood and repeat-claimant controls.¹⁰⁰

Element 5: Address the Effects of Levee Vegetation

The RPA provided that FEMA shall no longer recognize Army Corps certified levees unless they cause no adverse effects to habitat.¹⁰¹ It required FEMA to revise its procedures so that levee owners who opt for increased levee vegetation will not be disqualified from emergency

96. *Id.* at 152.

97. *Id.* at 154.

98. *Id.*

99. *Id.* at 157. POSFR attacks the validity of RPA Element 3 in its submission in the NWF lawsuit against FEMA. It contends that RPA 3 is “dysfunctional in the Puget Sound” because, for example, it is “unreasonable to apply a 250-foot ‘no adverse effect’ buffer to the Green River as it runs through the Kent Valley . . . one of the largest industrial districts in the country.” POSFR Mem., *supra* note 19, 30–32.

100. NMFS, BiOp, *supra* note 21, at 158–59. Under the National Flood Insurance Act, FEMA is required to provide the CRS, which grants lower-priced insurance policy prices to participating jurisdictions that decide to voluntarily adopt floodplain management regulations that exceed FEMA’s minimum eligibility criteria. *See id.* at 20.

101. *Id.* at 160.

funding, and to recognize new levees only when they meet new habitat-friendly criteria.

2. The Federal Emergency Management Agency's Three-Door Approach to RPA Compliance

In theory, FEMA had the legal authority to impose all of the development restrictions contained in the RPA, either by denying flood insurance to any community that did not agree to observe the requirements of the RPA, or by demanding the right to review all development applications in sensitive habitat areas to determine whether they were consistent with the RPA as a condition of providing flood insurance to communities. Reviewing development applications would have required FEMA either to bear the substantial costs of administering the RPA with respect to hundreds, if not thousands, of Puget Sound region development permit applications, or to have created a user-fee system of some sort to recover its costs.¹⁰² And perhaps equally importantly, acting directly would have made FEMA the legal and political "culprit" when development rights were denied.

Instead of undertaking direct administration, in October 2010 FEMA offered Puget Sound area local governments a so-called three-door approach to RPA compliance. The agency said they would need to choose one of the doors to achieve compliance in order to maintain eligibility for flood insurance.¹⁰³ FEMA viewed this approach as an alternate and legally sufficient means to comply with the RPA's land use elements. Under FEMA's proposal, local governments could select from one of the following doors:

(1) Adopt FEMA's *Floodplain Management and the Endangered Species Act: A Model Ordinance*¹⁰⁴ (imposing development restrictions and requiring their enforcement);

102. This is not intended to assert that FEMA has authority to create a user-fee system under existing law (though it may); but it could have sought such authority from Congress, and it has not done so.

103. See FED. EMERGENCY MGMT. AGENCY, REGION 10 ANNUAL REPORT TO NATIONAL MARINE FISHERIES SERVICE 2-3 (2010) (stating that, as of October 2010, FEMA gave the 122 communities affected by the BiOp the two programmatic options for compliance, adoption of FEMA's model ordinance or the existing regulations checklist approach, or in the alternative the permit-by-permit approach of showing compliance). For a presentation available to local communities explaining the three-door approach, see Fed. Emergency Mgmt Agency, Overview of Compliance Options: Implementing a Salmon Friendly Program 14 (2011), http://www.fema.gov/pdf/about/regions/regionx/Compliance_Options.pdf.

104. FED. EMERGENCY MGMT. AGENCY, FLOODPLAIN MANAGEMENT AND THE ENDANGERED SPECIES ACT: A MODEL ORDINANCE (Jan. 2012), available at http://www.fema.gov/pdf/about/regions/regionx/nfip_esa_faq/nfip_esa_model_ordinance_final.pdf.

(2) Adopt a community-by-community approach, under which communities could make a submittal to FEMA showing that existing state and local ordinances are in compliance with the BiOp's ESA compliance recommendations; or

(3) Adopt a permit-by-permit approach, under which individual developers seeking permits would be required to make habitat assessment submittals to local communities (or local communities could conduct such assessments), after which ESA consultation would have to occur if there was a possibility of adverse effects on protected species or habitat.

FEMA's three-door proposal shifted part of the cost and all of the political responsibility for ESA compliance—and the resulting likely imposition of potentially severe development restrictions—to approximately 120 Puget Sound local governments. Now, the ultimate responsibility for bearing the substantial economic costs of obtaining the extensive scientific, environmental, and engineering evidence necessary to show that a particular development complied with the ESA, which could amount to thousands, if not tens of thousands, of dollars per permit, would vary with which door was chosen by the local community. In some cases, the burden of obtaining part of the evidence might be with a local government; in others, most or all of the burden would be with local developers. But FEMA's approach essentially shifted most of these environmental permitting costs to either local governments or the private sector, rather than imposing the costs on federal taxpayers. The approach also effectively shifted the responsibility for permit denial and development restrictions to local governments or other federal agencies such as NMFS. In other words, FEMA passed the political hot potato. At the same time, FEMA's approach amounted to a grudging acceptance of the reality that Puget Sound salmon habitat needs further protections of the kind proposed by NMFS in the BiOp's RPA. By adopting the three-door approach FEMA did not challenge NMFS's scientific conclusion that protecting salmon habitat was essential to preserving threatened species, or its conclusion that the RPA elements were necessary to that protection. Instead, FEMA tried to shift to others the responsibility and costs associated with providing habitat protection.

For several years after the issuance of the BiOp, FEMA and NMFS engaged in some dialogue with local governments and other interested parties about how to implement the RPA elements, but mainly the federal agencies waited for local governments to decide how they were going to comply with the RPA requirements. By the compliance deadline, which had eventually been extended to September 22, 2011, an overwhelming majority of local governments had chosen door three, the

permit-by-permit approach administered by local governments. By the deadline, four Puget Sound local governments had adopted the FEMA Model Ordinance, at least in some form, and FEMA had certified six local governments' existing regulations as compliant. Approximately eighty local governments that responded to FEMA chose the door three, permit-by-permit approach.¹⁰⁵

3. The National Wildlife Federation's Second Action: The Three-Door Litigation

When the RPA compliance deadline expired, the National Wildlife Federation (NWF) delivered notice of its intention to sue FEMA and several other federal agencies for what it asserted was their failure to implement the requirements of the 2008 BiOp.¹⁰⁶ The federation filed its suit on December 8, 2011, not long after the statutorily required notice period of sixty days expired.¹⁰⁷ In the lawsuit, assigned to Judge Martinez of the Western Washington Federal District Court, NWF seeks both declaratory and injunctive relief. In particular, NWF seeks to enjoin "FEMA's issuance and/or authorization of insurance policies for new development through the NFIP within the geographic boundaries of the species identified in the BiOp until FEMA complies with the ESA."¹⁰⁸ In late December, 2011, NWF moved for a preliminary injunction barring FEMA from providing flood insurance in parts of the Puget Sound region containing particularly sensitive habitat until the merits of its claims are determined.¹⁰⁹ The federation's motion for preliminary injunction was opposed by defendant FEMA and by amicus curiae Property Owners for Sensible Floodplain Regulations (POSFR). Sixteen

105. Fed. Emergency Mgmt. Agency, Status of Communities (2011), http://www.fema.gov/pdf/about/regions/regionx/status_of_communities_web.pdf. As these statistics show, of the eighty-one Puget Sound area communities that submitted plans under the permit-by-permit approach, all of them have had their plans approved by FEMA. Of the thirty-six communities that submitted plans showing their existing regulations are sufficient, only six have had their plans approved. NMFS informed FEMA that the existing regulations approach should be the preferred approach due to the difficulties and costs of implementing and assessing a permit-by-permit plan. See Letter from William W. Stelle, Jr., Reg'l Adm'r, Nat'l Marine Fisheries Serv., to Kenneth Murphy, Reg'l Adm'r, Fed. Emergency Mgmt. Agency 3 (Sept. 26, 2011) (on file with journal).

106. Letter from EarthJustice, on behalf of the Nat'l Wildlife Fed'n, to Janet Napolitano, Sec'y, U.S. Dep't of Homeland Sec. et al., 60-Day Notice (Sept. 22, 2011), *available at* http://www.fema.gov/pdf/about/regions/regionx/nfip_esa_guidance_docs/nfip_ps_biop_sixty_day_notice_9_22_11.pdf.

107. Complaint for Declaratory and Injunctive Relief, *supra* note 31.

108. *Id.* at 16.

109. Plaintiff's Motion for a Preliminary Injunction, Nat'l Wildlife Fed. v. Fed. Emergency Mgmt. Agency, No. 2:11-cv-02044-RSM (W.D. Wash. Dec. 21 2011).

cities have moved to intervene in the NWF litigation, claiming that they will be adversely affected by the relief sought by NWF.¹¹⁰

In its complaint, NWF argues that even the jurisdictions that have adopted the first two approaches described above—the FEMA Model Ordinance or a showing of equivalent state and local laws—still have not complied with the ESA.¹¹¹ With respect to the Model Ordinance, NWF argues that there is no evidence to show that the ordinance complies with the BiOp or the ESA, and that the ordinance “authorizes virtually any development in floodplain[s] as long as it is supported by vague and undefined habitat analysis and mitigation.”¹¹² The federation also rejects the second door existing-regulations approach, arguing that FEMA is effectively still allowing development standards that permit “significant new development that may result in additional cumulative habitat degradation and don’t meet RPA standards.”¹¹³ Further, NWF contends that the third door permit-by-permit review, chosen by a large majority of Puget Sound jurisdictions, is legally flawed because it “is not an adequate substitute for landscape-level consideration of impacts,” because “NFIP communities lack the expertise, funding, or incentives to carry out adequate habitat assessments on individual projects,” and also because FEMA has not effectively guided local jurisdictions in their administration of the permitting process.¹¹⁴ Finally, NWF argues that “a uniform flaw in all three approaches to BiOp compliance is FEMA’s failure to address the interaction between state vesting law and ESA requirements.”¹¹⁵

The federation’s overall legal critique of FEMA’s three-door approach to ESA compliance is that “FEMA has declined entirely to adopt major components of the RPA, and has implemented others only partially or inadequately in a manner that simply shifts the burden to other parties without standards or oversight, and involves voluntary actions and weaker standards.”¹¹⁶ NWF argues that just such an approach by FEMA has previously been held unlawful in other, similar contexts.¹¹⁷

110. Cities’ Motion to Intervene, *Nat’l Wildlife Fed. v. Fed. Emergency Mgmt. Agency*, No. 2:11-cv-02044-RSM (W.D. Wash. Jan. 26, 2012). No other parties or amici had filed with the court as of February 6, 2011.

111. See Complaint for Declaratory and Injunctive Relief, *supra* note 31, at 11.

112. *Id.*

113. *Id.*

114. *Id.* at 12.

115. *Id.*

116. *Id.* at 10.

117. See *Fla. Key Deer v. Brown*, 364 F. Supp. 2d 1345, 1356–58 (S.D. Fla. 2005), *aff’d*, 522 F.3d 1133 (11th Cir. 2008); see also Plaintiff’s Motion for a Preliminary Injunction, *supra* note 109, at 30–31.

The litigation is largely an attack on a series of discretionary decisions made by FEMA about how and by whom the BiOp's land management regulatory requirements should be enforced. As a consequence, the court is likely to analyze much of NWF's challenge to FEMA's NFIP decision making under the standards of the Administrative Procedure Act (APA). The APA requires courts to set aside agency action that is "arbitrary, capricious, or otherwise not in accordance with law."¹¹⁸ This may be particularly true of FEMA's willingness to delegate to local jurisdictions in Puget Sound the authority to review large numbers of permit applications on a case-by-case basis and to determine whether the permits comply with ESA requirements. By challenging FEMA's delegation, the litigation raises questions about whether courts should impose legal duties on local communities to conduct cumulative impact analysis before granting permits, and whether courts should review the competence of local communities to conduct ESA reviews on the basis of their existing expertise and resources.¹¹⁹ Another contention NWF may make, of course, is that as a matter of law, FEMA cannot delegate its duty to enforce the requirements of the ESA in administering its programs to the state of Washington or to its local governments.¹²⁰

Wholly apart from the merits of NWF's claims, a further issue must be considered in assessing the potential long-term impact of this litigation. If NWF prevails, the court will have to shape an appropriate permanent remedy. This remedy could take the form of an injunction similar to NWF's request to preliminarily enjoin FEMA from issuing flood control insurance to local communities—at least prospectively.¹²¹ NWF also challenges the vesting of development permits under state law in its complaint, raising the important question whether ESA requirements can be imposed on development permits that might be deemed to have vested previously under state law.¹²²

118. See, e.g., *Fla. Key Deer*, 364 F. Supp. 2d at 1349.

119. At the time this is written, the record is unclear about the extent to which the federal government has actually examined the capability of local governments to make such determinations.

120. NWF appears to make this kind of argument about the door three approach. See Complaint for Declaratory and Injunctive Relief, *supra* note 31, at 12.

121. Plaintiff's Motion for a Preliminary Injunction, *supra* note 109, at 1. NWF argues in its motion for preliminary injunction that the court has no discretion—that it must grant injunctive relief if it finds a violation of the ESA. See *id.* at 39.

122. Under Washington State law, development permits vest earlier than they do in some other jurisdictions. See, e.g., *W. Main Assocs. v. City of Bellevue*, 720 P.2d 782 (Wash. 1986); *Erickson & Assocs., Inc. v. McLerran*, 872 P.2d 1090 (Wash. 1994); see WASH. REV. CODE §§ 19.27.095, 58.17.033, 36.70B.180 (2011). One of the critical issues underlying the litigation will be the extent to which federal law can trump such state law vesting. Historically, FEMA has deferred to state law vesting in situations where its maps have been challenged (whether this was legally required is a

FEMA opposes the preliminary injunctive relief requested by NWF on several grounds.¹²³ FEMA argues that a preliminary injunction is not warranted because NWF will not prevail on the merits and that NWF has failed to make a legally required showing of irreparable harm to listed species from the alleged violations.¹²⁴ Additionally, FEMA argues that the court should deny injunctive relief that would cut off the sale of flood insurance, and instead grant narrower relief for any perceived noncompliance with the RPA.¹²⁵ The amicus curiae property owners, POSFR, argue that existing state and local laws provide sufficient protection for ESA-listed species habitat. The property owners assert that NWF has provided no evidence of irreparable harm from FEMA's current implementation of the NFIP and that state and local regulations will "ensure no irreparable harm" occurs before the court's decision on the merits.¹²⁶ The property owners ask the court to wait for more concrete evidence of ESA violations, such as specific failures of local governments to make or require appropriate ESA-related permit reviews, before enjoining FEMA from issuing flood control insurance.¹²⁷

In response, NWF can be expected to argue that the court should not be willing to tolerate further noncompliance with the ESA after years of delay. It is uncertain what the court will decide about the critical remedy issue. But if a court were to grant the injunctive relief requested by NWF, it is reasonable to foresee substantial public opposition to its decision based on the concern that it could have severe detrimental effects on local property values, both for existing homes and for

different matter), but it is unclear that the same deference is warranted under the ESA. NWF argues that permits cannot successfully vest against ESA compliance obligations. *See* Plaintiff's Motion for a Preliminary Injunction, *supra* note 109, at 29 ("NMFS developed the RPA standards to meet the requirements of the ESA, not land use law, based on the biological needs of the species and the federal duty to ensure against jeopardy.").

123. A group of sixteen Washington cities has sought permission to intervene in the NWF litigation. Among the issues that seems most salient to them is the relation between vested development rights and NWF's claims. Cities' Motion to Intervene, *supra* note 110, at 1–2.

124. Defendant's Opposition to Plaintiff's Motion for a Preliminary Injunction at 1–2, 10–29, 30, Nat'l Wildlife Fed. v. Fed. Emergency Mgmt. Agency, No. 2:11-cv-02044-RSM (W.D. Wash. Dec. 8, 2011).

125. *Id.* at 31–33.

126. POSFR Mem., *supra* note 19, at 8, 35–38, 43–46.

127. *Id.* at 34–36. It is also particularly noteworthy that amicus POSFR also argues that a central part of the RPA (Element 3) is itself legally defective. *Id.* at 37–39. Critics of FEMA's regulations and the NWF had previously argued that NWF could not provide substantial evidence of actual ESA violations in the permitting process in Puget Sound. *See* Donna Gordon Blankinship, *Environmental Group Sues US over Flood Management*, SEATTLE P.I., Dec. 21, 2011, <http://www.seattlepi.com/news/article/Environmental-groups-sue-US-over-flood-management-2417940.php> (quoting attorney Molly Lawrence of Seattle law firm Gordon Derr as saying, "From my perspective, the real story is that, to date, NWF has not challenged one local jurisdiction's development regulations as violating the Endangered Species Act.").

undeveloped land, at least in certain areas of the Puget Sound region. If the court rules in favor of NWF, we can expect to see an immediate appeal accompanied by a political firestorm.¹²⁸

C. Tribal Treaty Fishing Rights Litigation

Instead, let us suppose purely as a hypothetical matter that one or more of the Washington Native American tribes decided to challenge FEMA's actions in response to the BiOp as a violation of their treaty fishing rights. How would such a challenge differ legally from the nature of the NWF challenge under the Endangered Species Act? To understand this, it is necessary to appreciate some of the distinctive features of tribal treaty fishing rights.

In 1905, the U.S. Supreme Court held in *United States v. Winans* that Native American fishing rights established by treaties were a form of permanent property rights.¹²⁹ The Court stated that the treaties

reserved rights, however, to every individual Indian, as though named therein. They imposed a servitude upon every piece of land as though described therein. There was an exclusive right of fishing reserved within certain boundaries. There was a right outside of those boundaries reserved "in common with citizens of the territory." As a mere right, it was not exclusive in the Indians. Citizens might share it, but the Indians were secured in its enjoyment by a special provision of means for its exercise. They were given "the right of taking fish at all usual and accustomed places," and the right "of erecting temporary buildings for curing them." The contingency of the future ownership of the lands, therefore, was foreseen and provided for; in other words, the Indians were given a right in the land, —the right of crossing it to the river,—the right to occupy it to the extent and for the purpose mentioned. No other conclusion would give effect to the treaty. And the right was intended to be continuing against the United States and its grantees as well as against the state and its grantees.¹³⁰

128. A somewhat analogous situation occurred in the case of the ESA delisting of the Rocky Mountain gray wolf. The environmental community successfully opposed that proposed delisting in court, but public reaction by wolf opponents was so strong that Congress chose to overturn the court action. Congress delisted this wolf population by a legislative rider. For background on this controversy and links to court rulings on the issue, see Steve Davies, *Congressional Delisting of Wolf Upheld by Federal Judge*, ENDANGERED SPECIES & WETLANDS REPORT, Aug. 4, 2011, <http://www.eswr.com/2011/08/congressional-delisting-of-wolf-upheld-by-federal-judge/>.

129. *United States v. Winans* 198 U.S. 371, 381 (1905). In *Winans*, the tribal fishing rights were held to defeat exclusive possession of the fishery by white fishermen using fishing wheels, and the case was remanded to the circuit court for a determination of how the Native American rights were to be protected.

130. *Id.* at 381.

The Court's determination in *Winans* that treaty fishing rights were property rights was not the end of the controversy. Litigation over the exercise of treaty rights has continued and courts have since clarified many aspects of these rights.¹³¹ One particularly contentious issue for the past several decades has been the extent to which tribes can use treaty fishing rights to compel governments to undertake environmental improvements to protect the fishery. The most recent significant litigation in this respect is the pending federal Culverts litigation, in which the Treaty Tribes seek to compel the State of Washington to repair or remove culverts in order to permit added fish passage.¹³²

In the Culverts litigation, the tribes assert that such culvert modifications would significantly increase salmon populations. Although a 1997 state report seemed to accept the tribes' position, the state chose to attack it in its post-trial brief, contending that the link between culverts and harm to salmon population levels remained unproven. Nevertheless, the tribes persuaded the federal district court that their claims had legal merit and won a summary judgment motion against the state.¹³³ But as of this writing, nearly two years after the conclusion of the remedy trial—whose beginning was itself substantially delayed by the parties' efforts to negotiate a remedy—the court has still not issued a remedy decision.¹³⁴

In some ways, a challenge by the tribes regarding ESA issues and FEMA's flood insurance program would be legally similar to their claims in the Culverts litigation, since both claims seek an environmental protection remedy to protect tribal rights. The ESA action would be based on a specific, enforceable legal duty created by federal statute, not a general "environmental servitude" to protect tribal rights of the kind

131. See, e.g., *United States v. Washington*, 384 F. Supp. 312, 343 (W.D. Wash. 1974) (holding that treaty tribes have right to fifty percent harvestable share of Puget Sound fisheries, and regulation of off-reservation fishing only allowed if reasonably necessary for conservation); *United States v. Washington*, 759 F.2d 1353, 1357 (9th Cir. 1985) (holding that courts' powers to enjoin state actions that violate tribal treaty rights by causing alleged environmental harm must be supported by a showing of concrete facts of particular violations and injuries).

132. See *United States v. Washington*, No. CV 9213RSM, 2007 WL 2437166, at *1 (W.D. Wash. 2007).

133. *Id.* The major issue that divided the parties was the cost of implementing the remedy sought by the tribes, which could involve tens of millions of dollars per year of funding for culvert repair and replacement. See State of Washington's Post-Trial Brief at 19, *United States v. Washington*, No. C70-9213, 2010 WL 2193058 (W.D. Wash. Feb. 5, 2010) (arguing that repair/replacement of state-owned culverts throughout Washington could cost upward of \$2 billion, or approximately \$90 million per year). The pace of culvert repair also significantly divided the parties.

134. For previous articles discussing the Culverts litigation, see Morisett & Summers, *supra* note 2; William Fisher, *The Culverts Opinion and the Need for a Broader Property-Based Construct*, 23 J. ENVTL. L. & LITIG. 491 (2009).

previously rejected by the Ninth Circuit.¹³⁵ However, the two actions would also fundamentally differ in ways that could strengthen the tribes' legal position in habitat protection litigation.

The first difference between a tribal challenge and NWF's claims is that rather than being forced to argue about whether FEMA's actions were arbitrary, whether FEMA or local governments bear the responsibility for conducting ESA reviews, and whether FEMA's three-door delegation of authority was legally permissible, the tribes could assert that federal, state, and Puget Sound local governments should each be held independently liable for ESA compliance to the full extent necessary to protect their property rights created by treaty.¹³⁶ Analysis of the Ninth Circuit decision in *Skokomish Indian Tribe v. United States* helps to illuminate the basis for such a tribal contention. In *Skokomish*, the Skokomish Indian Tribe claimed that operation of a federally licensed power plant had depleted flows from the Skokomish River, harming local fish populations and damaging tribal property, thereby breaching a Stevens Treaty. The tribe sought monetary damages and injunctive relief from various government defendants and a municipal utility.

The Ninth Circuit held on appeal in *Skokomish* that money damages, as opposed to injunctive relief, for alleged breach of a Stevens Treaty were not available against entities other than the United States. Nevertheless, one important implication of the decision is that each level of government still has an independent affirmative duty under the Stevens Treaties to protect tribal rights. This is so because the treaties are federal law, and rights under them are therefore entitled to protection by state and local governments just as any other federal right would be under the Supremacy Clause of the U.S. Constitution.¹³⁷ If the tribes brought an action for injunctive relief only, they could properly bring their action against all relevant state, local, and federal governments, notwithstanding the Ninth Circuit's holding regarding money damages.¹³⁸

135. For the Ninth Circuit per curiam decision reversing the district's court's declaratory judgment that the Stevens Treaties created a general environmental servitude or right of environmental protection for the treaty fishery against various harms caused by the State of Washington, see *United States v. Washington*, 759 F.2d 1353, 1354 (9th Cir. 1985).

136. Alternatively, the tribes might choose to contend that the United States' treaty obligations to the tribes meant that the United States has a non-delegable duty to protect them against ESA violations, thus rendering FEMA's three-door approach to compliance legally invalid.

137. See *Skokomish Indian Tribe v. United States*, 410 F.3d 506, 512–13 (9th Cir. 2005); accord *United States v. Washington*, 759 F.2d 1353, 1357 (9th Cir. 1986) (discussing the State of Washington's obligations).

138. See *Skokomish*, 410 F.3d at 512–13. Bringing an action for injunctive relief only would also avoid a challenge under the prohibition of some simultaneous actions established by *United States v. Tohono O'Odham Nation*, 131 S.Ct. 1723, 1731 (2011) (holding that tribes cannot bring

Because the tribes could contend that each defendant government has an independent legal duty to observe and enforce tribal fishing rights, each government would, arguably, also have the responsibility to take steps to compensate for either inaction or inadequate action under the ESA by any other government engaged in ESA permit review, or related actions such as the provision of flood insurance, in order to ensure that treaty rights are adequately protected. The tribes accordingly could seek to have injunctive relief imposed separately on each of these governments requiring it to ensure that ESA compliance occurred with respect to any future permit to be granted that would affect any area designated as an area of concern for habitat maintenance and restoration under the BiOp and the RPAs, including all river CMZs, RBZs, critical habitat, and similar areas.¹³⁹ Unlike the partly retrospective and restorative remedy being sought by the tribes in the Culverts litigation, in an action against FEMA and state and local governments the tribes might choose to seek injunctive relief limited to maintaining the status quo by preventing any further habitat degradation or loss. With that limitation on the scope of relief, it would be far more difficult for any defendant government to argue successfully that it had no enforceable legal duty to the tribes to protect the status quo in conducting future permit reviews for ESA compliance.

The tribes' action would not seek to vindicate a common public interest in the proper enforcement of federal laws such as the ESA.¹⁴⁰ Instead, the tribes would seek to enforce a specific legal duty to protect their private property rights, just as they are in the pending Culverts litigation.¹⁴¹ This would make it more difficult for defendants to challenge the tribes' standing. More importantly, it should permit the tribes to argue for the strictest possible standard of judicial review of government actions that infringe on property rights, including raising potential takings claims.¹⁴²

The distinctive legal nature of the tribal property rights in fishing also has important consequences for the critical issue of when and if local development permits vest. Tribal treaty property rights have existed

simultaneous actions for injunctive relief in the district court and monetary relief in the Court of Federal Claims in certain cases based on the same operative facts).

139. NMFS, BiOp, *supra* note 21, at 153–54.

140. 16 U.S.C. § 1540(g) (2011).

141. *United States v. Washington*, No. CV 9213RSM, 2007 WL 2437166 (W.D. Wash. 2007). The tribes' claim as to the federal government might also be that it had breached a fiduciary duty it owed to them. *See, e.g., United States v. Mitchell*, 463 U.S. 206, 225 (1983) (“[A] fiduciary relationship necessarily arises when the Government assumes such elaborate control over . . . property belonging to Indians.”).

142. For a general discussion of the law related to such claims, see discussion *infra* note 151.

and been recognized by the United States since the Stevens Treaties were ratified in the 1850s, and thus pre-date the permits that would be involved in any future ESA-related permit challenge. As a result, the tribes might choose to argue that state and local authorities could not allow such permits to vest against their tribal fishing rights under state law if an inadequate ESA review had been conducted with respect to the permit, jeopardizing existing salmon habitat. Such a contention would differ markedly from NWF's challenge to vesting.

If their action for injunctive relief were to be successful, the tribes, like NWF, could request that the federal court create an enforcement mechanism to carry out its decree, such as the appointment of a special master or an expert committee responsible for resolving most disputes, subject to an appeal to the court.¹⁴³ A master or an expert committee could be empowered by the district court to test independently the ongoing compliance of the covered governments with the court's decree, and to hear alleged violations of the decree and then make findings and recommendations to the court regarding them. The court could also establish stiff penalties for noncompliance with its injunctive decree. It would be within the court's discretion to award attorney's fees against parties found in contempt of court as a result of a violation of the injunction.¹⁴⁴ It is possible, of course, that the tribes' efforts to obtain injunctive relief would be met with arguments similar to those that may be made in opposition to NWF's efforts to obtain such relief. But as the history of court-supervised enforcement under the *Boldt* decision suggests, it is quite possible that a court would be more sympathetic to awarding such supervisory relief to protect tribal treaty-based property rights.¹⁴⁵

By bringing an action for prospective injunctive relief only, the tribes would not waive or limit their claims in the pending culverts litigation.¹⁴⁶ Nor would they waive the possibility of ultimately seeking money damages from the United States for breach of trust responsibility, or further equitable relief from various parties for past habitat damage, if

143. See FED. R. CIV. P. 53.

144. *Jakes, Ltd., Inc. v. City of Coates*, 356 F.3d 896, 900 (8th Cir. 2004) (district court has discretion to award attorney's fees as punishment for contempt through violation of injunction); *N.Y. State Nat'l Org. of Women v. Terry*, 159 F.3d 86, 96 (2nd Cir. 1998); *MacDermid, Inc. v. Selle*, 577 F. Supp. 2d 599, 602 (D. Conn. 2008).

145. Opponents of continuing relief would doubtless argue that it was unnecessary, burdensome, and intrusive, but granting such relief would be a matter for the court's sound discretion on these facts.

146. There is no significant overlap between the facts and relief sought in the culverts action and the facts and relief in the hypothetical action to protect habitat discussed here, so there would be no preclusive effect on the culverts action stemming from the habitat action.

they chose to seek such relief at a later time.¹⁴⁷ On balance, the legally distinctive nature of tribal treaty-based claims for habitat protection suggests that, if brought, such claims would have the strength to contribute substantially to a speedy and effective resolution of legitimate challenges to FEMA's approach to ESA compliance. At the same time, if successful, such tribal litigation would face some of the same political resistance outlined above that would result from litigation by others such as NWF, and it would also have some of the same side effects discussed below in Part IV.

IV. FEDERAL LEGISLATION AS A BETTER APPROACH TO RESTORATION

A comprehensive federal legislative solution to the problem of Puget Sound salmon fishery restoration has much to recommend it as an equitable and socially cost-efficient approach to habitat protection, whatever may be the ultimate legal merit of claims by NWF, and of potential claims by the tribes, seeking restoration. As discussed in Part I, the basic goal of legislation should be either to eliminate the existing pro-development political and economic incentives that lead to habitat destruction, or to create a set of stronger legal rights to habitat protection that can be effectively enforced even in the face of such incentives. In either case, there are multiple jurisdictions that claim lawmaking authority over the affected habitat, and they have conflicting constituencies and interests. Only Congress has the power through legislation fundamentally to change incentives, restructure federal law enforcement, and to cut decisively through the claims of conflicting federal, state, and local jurisdictions.

Federal legislation can be comprehensive in its effects in ways that state laws and local ordinances can never be because it can bind all potential parties and finally resolve all potential claims concerning habitat protection, precluding subsequent litigation. A good example of the way in which federal legislation can achieve this kind of binding effect is the settlement of Indian water rights claims implemented through legislation.¹⁴⁸ Such legislation covers all potential water resources claims within a defined area, and binds all potential parties to the results. Where appropriate in settlement legislation, Congress has

147. See *United States v. Tohono O'Odham*, 131 S.Ct. 1723, 1731–32 (2011). Proper attention would, of course, need to be given to state and federal statutes of limitation governing such claims; no opinion is expressed here about whether such money damages would be available. See *id.*; see also *Skokomish Indian Tribe v. United States*, 410 F.3d 506, 516–18 (9th Cir. 2005).

148. For background on Indian water rights settlements including extended discussion of a fairly recent settlement in the Pacific Northwest, see Robert T. Anderson, *Indian Water Rights: Litigation and Settlements*, 42 TULSA L. REV. 23 (2006). According to the article, Congress had passed legislation regarding approximately twenty such disputes by 2006.

also resolved conflicting claims to water resources by providing compensation to affected parties. In addition, federal legislation to protect habitat has clear advantages over both administrative action and litigation.

Unlike litigation, thoughtful legislation can achieve two key goals that are essential to a successful restoration program. First, Congress can decide based on expert information after hearings which of the several causes of salmon population decline are most significant and which, therefore, should be the focus of new public regulation and restoration investments, even in a world of scarce resources. Second, Congress can establish scientifically well-grounded priorities for habitat management and protection projects throughout the Puget Sound region. As discussed above, recent scientific studies strongly suggest that at existing funding levels, such prioritization could achieve far better results in terms of salmon population growth than those provided by current geographically widely dispersed restoration funding programs provide.¹⁴⁹ And there are several other important benefits that can be provided by legislation that cannot be achieved by litigation or administrative action.

First, legislation can provide clear authority and responsibility for salmon habitat protection, cutting decisively and permanently through various conflicting layers of government and bureaucracy. There is little question that well-crafted legislation would be superior to continued reliance on FEMA or other federal agencies' actions to achieve restoration. It is essential that the federal government abandon its divided approach to protection of the endangered Puget Sound fishery, with one agency committed to protect the fishery while another pursues policies destructive of the fishery and disclaims responsibility for the outcome. A divided policy cannot command respect and will encourage continued obstruction. Since it is apparent from the history of administrative action, particularly in the Puget Sound region, that the executive branch of the federal government is content to continue its divided approach to the problem of salmon habitat protection, it is up to Congress to create a uniform policy and real accountability. Legislation would ultimately lead to increases in wild salmon populations more quickly and less expensively than current policies relying on administrative action because it could avoid the extensive delay and political vacillation inherent in contested administrative action, and could truncate or eliminate the expensive and time-consuming litigation which quite often accompanies such administrative action.

149. See Roni, *supra* note 62, at 1469–70.

Second, legislation can eliminate existing incentives that encourage local governments to favor habitat destruction over salmon population growth. This can be done by providing tax funding for habitat acquisition, and by replacing tax revenues lost by such acquisition or other limitations on development where appropriate. Whether habitat acquisition and revenue replacement (a "carrot") is a more effective policy approach than creating more powerful tools for stricter and swifter citizen enforcement of existing law (a "stick") is a matter Congress is best placed to decide after hearings. Congress is also best able to decide after hearings whether such tax funding should consist of "user fees"—such as taxes imposed on salmon catches, on pollution or other habitat damage sources, or on other contributors to salmon population decline—of general revenues, or of some combination of funds from different sources.¹⁵⁰

Third, federal legislation can provide certainty for property owners and property developers, and thus cut development costs. Congress can approve maps as part of the legislation that will conclusively determine the boundaries of appropriately protected habitat, eliminating the need for years of dispute over the propriety of particular boundaries at the state and local level followed by the kind of dilatory and expensive litigation over such boundaries that often occurs under the existing NFIP program. Congress could also approve certain types of structures or designs for use in or adjacent to environmentally protected areas, to avoid disputes over such issues in the permitting process. Congress can resolve ongoing disputes over whether levee designs—where levees are permitted—must meet Army Corps standards or alternative environmental engineering requirements, again providing needed certainty. All of these legislative decisions could reduce development costs and speed up the development process in areas where development is permitted.

Finally, legislation can provide for effective enforcement by citizens and Treaty Tribes of the law's provisions, by including substantial penalties for noncompliance and by awarding attorney's fees and a share of those penalties to prevailing parties in enforcement litigation. Congress undoubtedly has the authority to strengthen ESA enforcement by providing far more powerful citizen enforcement tools than exist under present law if it chooses to do so. Congress is in the best position to decide how much to strengthen enforcement powers as part of comprehensive legislation.

150. Proper choices on the funding issue are important both for reasons of environmental policy, such as promoting economic efficiency, and for reasons of fairness.

At the same time, it is important for Congress to address possible concerns about the fairness and disproportionate impact of ESA-related development limitations. Development restrictions under the ESA have the potential to diminish sharply at least some individual property values. In some cases, the ESA may impose a disproportionate part of the cost of protecting habitat either on individual landowners who may have purchased (or inherited) property when its value was unaffected by the need to provide habitat protection. The cost also could be disproportionately placed on local communities with substantial amounts of undeveloped property. Such instances could occur even when the landowners or communities are not wholly (or in some cases even primarily) responsible for creating the environmental conditions at issue. If such development restrictions are substantial enough, it is reasonable to expect that those adversely affected by them will seek to prevent them in court or the legislature. Failing that, they will seek compensation for their losses, perhaps by claiming that an unconstitutional taking without just compensation has occurred.¹⁵¹ The important point here is that whether or not existing law would require compensation, such fairness questions are best addressed by legislation, since legislation, unlike litigation, can provide that the economic costs of regulatory action that benefits society generally will be borne by society as a whole. Legislation on such issues can also avoid large unnecessary transaction costs such as attorneys' fees and years of delay, as well as providing a degree of certainty not often found in the administrative decision-making or litigation processes.

V.CONCLUSION

Despite the possibility that litigation by environmental groups, or tribal plaintiffs if they choose to sue, will ultimately succeed in obtaining court-mandated imposition of RPA-driven ESA development restrictions to protect existing Puget Sound salmon habitat, any such judgment

151. Since the restrictions at issue here would not be likely to involve physical intrusions on landowners' property, but would instead restrict its use, they would probably be analyzed under the line of Supreme Court regulatory takings cases dating back to *Penn Central Transportation Co. v. New York City*, 438 U.S. 104 (1978), *Lucas v. South Carolina Coastal Council*, 505 U.S. 1003 (1992), and the subsequent development of the law in *Lingle v. Chevron U.S.A., Inc.*, 544 U.S. 528 (2005). The key point to grasp for our purposes is not whether such ESA-related takings claims will ultimately be upheld by the courts, but rather that property owners whose property values are damaged by ESA restrictions will have an enormous incentive to engage in political and legal resistance to ESA-dictated changes wholly apart from bringing takings claims. This is evident from the amount of recent litigation surrounding the politically analogous problem of water rights restrictions due to the ESA. *See, e.g.*, *Tulare Lake Basin Water Storage Dist. v. United States*, 49 Fed. Cl. 313 (2001); *Klamath Irrigation Dist. v. United States*, 67 Fed. Cl. 504 (2005); *Casitas Mun. Water Dist. v. United States*, 543 F.3d 1276 (Fed. Cir. 2008).

would require long-term enforcement in a divided and potentially fairly hostile climate of public opinion. In such circumstances, a realistic appraisal of the limited long-range political and economic capacity of litigation to effectuate meaningful change in the management of Puget Sound wild salmon strongly suggests the wisdom and desirability of adopting comprehensive federal legislation to protect salmon for future generations while also meeting community concerns for efficiency and fairness.

State and local officials, local citizens and pro-development interests are likely to resist legislative changes of the kind suggested for consideration above. Additional habitat acquisition and restoration funding to minimize or eliminate pro-development incentives may be difficult to provide in an increasingly tough federal and state budget climate. Strengthening existing laws may also be difficult due to resistance to some loss of local control over land use management. Further, ending federal subsidies for development such as flood control projects has historically proven difficult because of their popularity, despite their unquestionably adverse side effects, such as habitat destruction, flood damage and predictable loss of life, and demonstrable economic inefficiency. Some observers will dislike the precedents that might be set by such comprehensive legislation. These difficulties are all foreseeable, but they are not valid reasons to avoid undertaking legislation to provide needed habitat protection for Puget Sound's endangered fishery. Legislation has important benefits that cannot be provided by litigation or administrative action, both of which also have significant costs that legislation does not impose.

The history of administrative action and litigation to enforce laws protecting salmon in Washington shows unequivocally that today Washington's citizens face an important choice. A thriving wild salmon population can be part of Washington's future even as the state grows, but this will happen only if Washington's people choose the right means of protecting salmon habitat. Despite its unavoidably contentious nature, legislation is nevertheless the alternative that would best serve the shared interests of all of Washington State's people and the common good.

The Importance of Floodplains to Functioning River Ecosystems



Photo courtesy of Lauren Rogers

George Pess
NOAA – NWFSC
Watershed program
2725 Montlake Blvd East
Seattle, WA 98112
george.pess@noaa.gov
206-860-3450

<http://www.nwfsc.noaa.gov/research/divisions/fed/wpi/index.cfm>

Today's talk

- What is a floodplain?
- What features are associated with floodplains?
- What creates and maintains floodplains?
- Why are floodplains important to aquatic ecosystem health and function?
- How do we disturb and alter floodplains?
- Why and how do floodplains provide resiliency with respect to flooding and climate change?
- How do we restore floodplains?

What is a floodplain?

- Geomorphology
 - Flat, depositional feature of river valley
 - Adjoins river channel
 - Formed under current climate regime
- Hydrology
 - Land subject to 100 year flood event

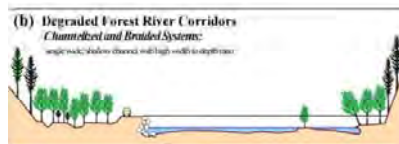
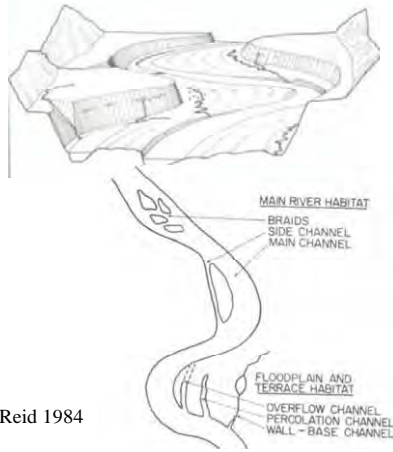


Photo and schematic courtesy of Tim Abbe

What is a floodplain?

- Ecology
 - Areas periodically flooded by lateral overflow of river or lakes.
 - Biota respond to change in environment
 - Individual
 - Community



Schematic courtesy of Petersen and Reid 1984

What features are associated with floodplains?

- Main channels
- Logjams
- Meander bends & scrolls
- Floodplain channels
- Beaver ponds
- Mid-channel islands









What creates and maintains floodplains?

- High flows help to create and maintain floodplains
- Flows which inundate features that typically do not convey water on a regular basis.
- Flows that form channel conditions are not present throughout the majority of a flow year.



High flows create & maintain floodplain habitats

- The recruitment of water, wood, sediment, & nutrients during high flows creates aquatic & terrestrial floodplain habitat



- The recruitment & increased residence time of inputs in floodplains increases the likelihood of more complex habitats.



- Stream ecosystems & their biota have adapted & evolved to the complexity in floodplain habitats.



Why are floodplains important to aquatic ecosystem health and function?



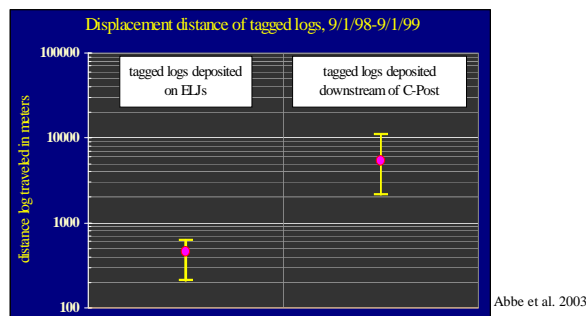
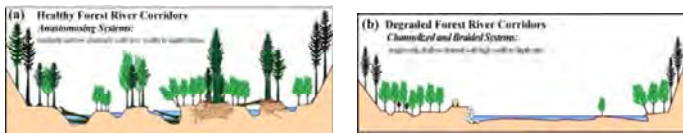
Photo courtesy of Dave Montgomery



Photo courtesy of Lauren Rogers

The development of floodplain habitat complexity

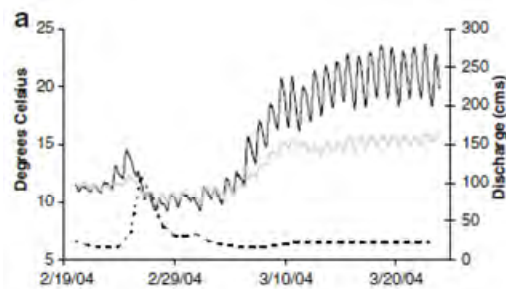
Shorter travel distance for inputs



The development of floodplain habitat complexity

Increased residence time of inputs

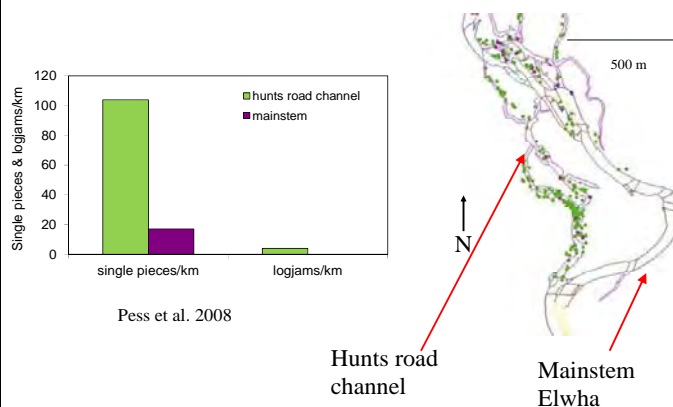
Dashed line – discharge, light grey – river, solid black - floodplain



Jeffres et al. 2008.

The development of floodplain habitat complexity

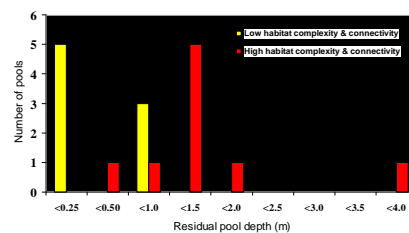
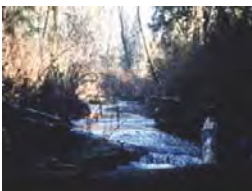
Greater accumulation of inputs



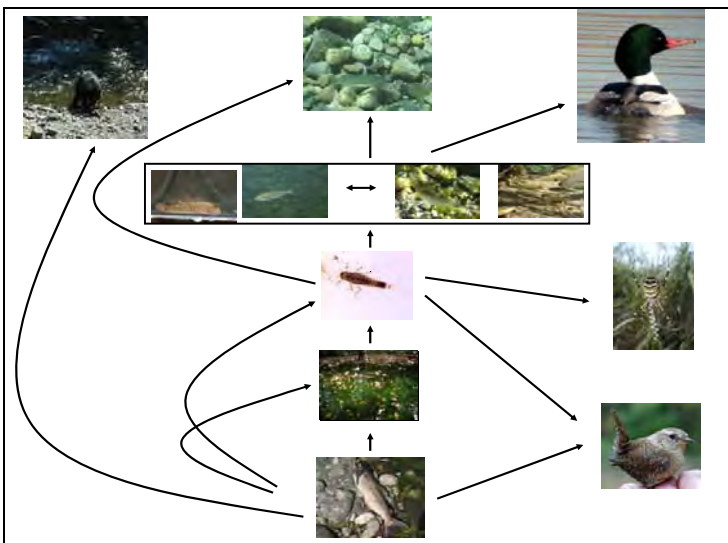
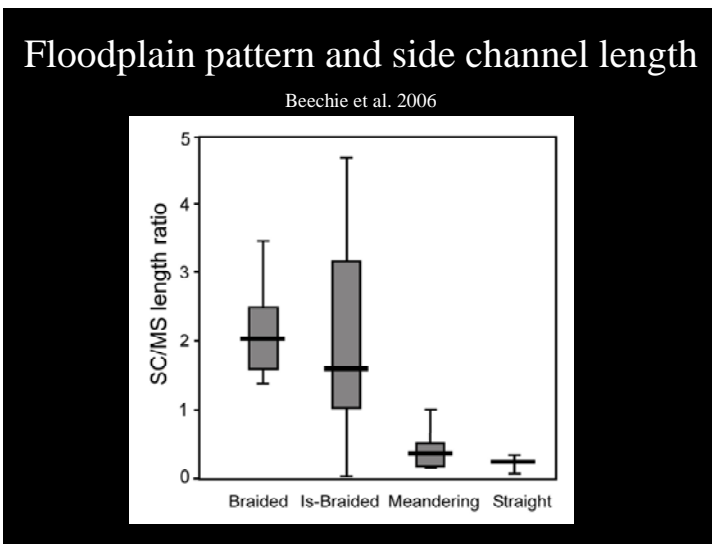
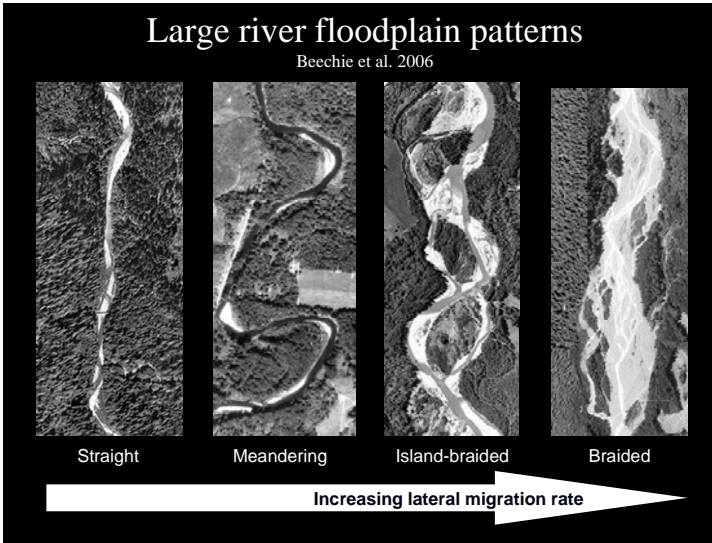
Pess et al. 2008

The development of floodplain habitat complexity

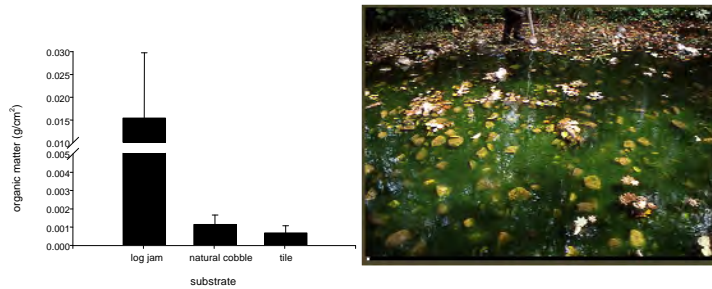
Greater chance for inputs to create & maintain favorable habitats



Abbe et al. 2003

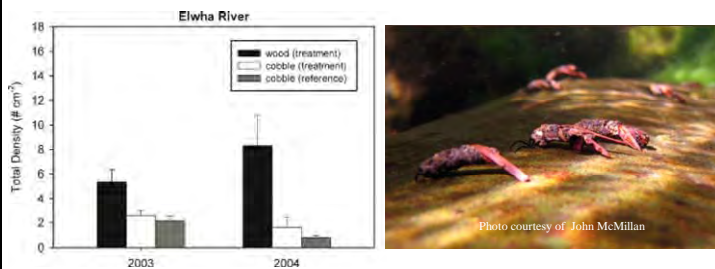


Biological response to floodplain habitat complexity Greater density of periphyton



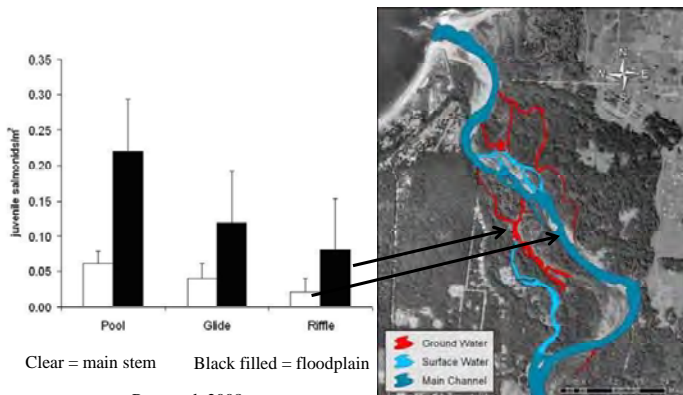
Coe et al. 2006, 2009

Biological response to floodplain habitat complexity Greater density of aquatic invertebrates



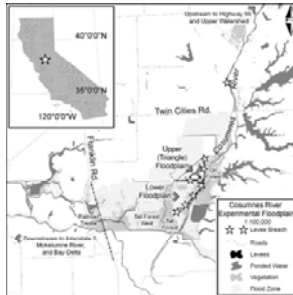
Coe et al. 2009

Biological response to floodplain habitat complexity Greater density of salmonids



Pess et al. 2008

Biological response to floodplain habitat complexity Greater condition factor for salmonids



Below floodplain Floodplain
Jeffres et al. 2008
Enclosed experiment, same age Chinook

How do we disturb and alter floodplains?



Photo courtesy of Dave Montgomery



Photo courtesy of Lauren Rogers

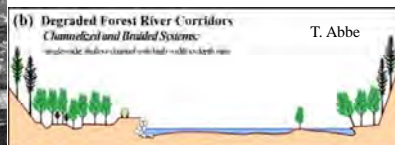
Levees alter flow patterns & vegetative succession



T. Abbe

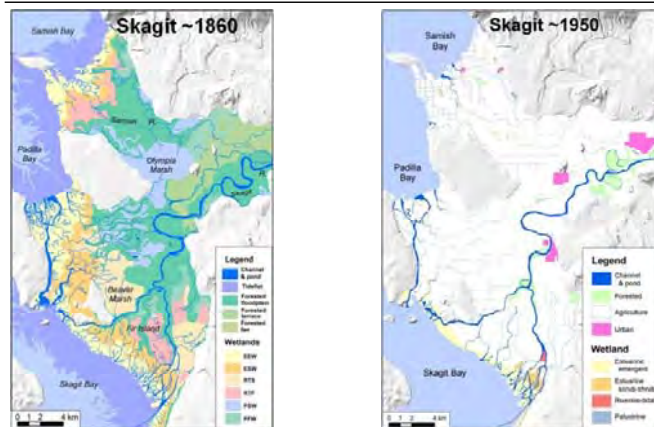


Walla Walla ~ 1960s



T. Abbe

Floodplain development can lead to loss or isolation of floodplain habitats

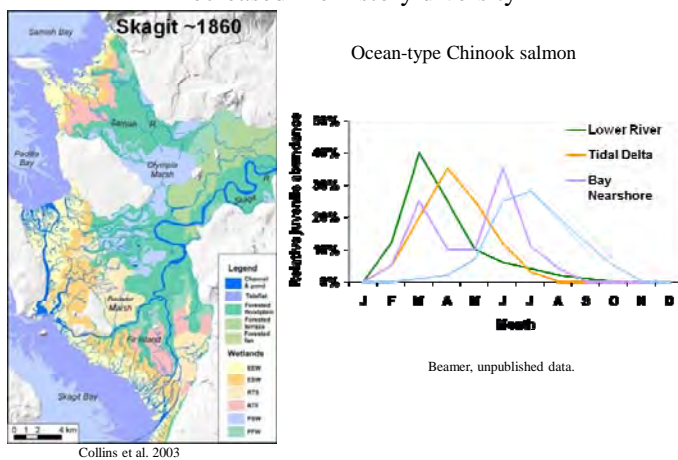


Figures courtesy of Brian Collins – University of Washington

Habitat removal & isolation

Decreased life history diversity

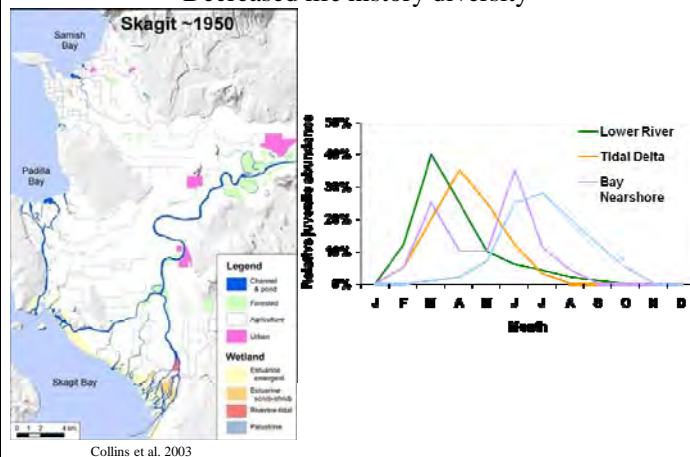
Ocean-type Chinook salmon



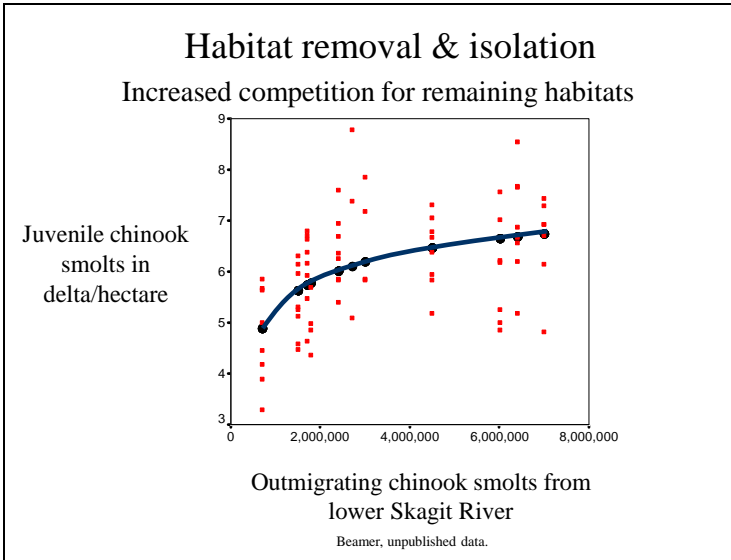
Collins et al. 2003

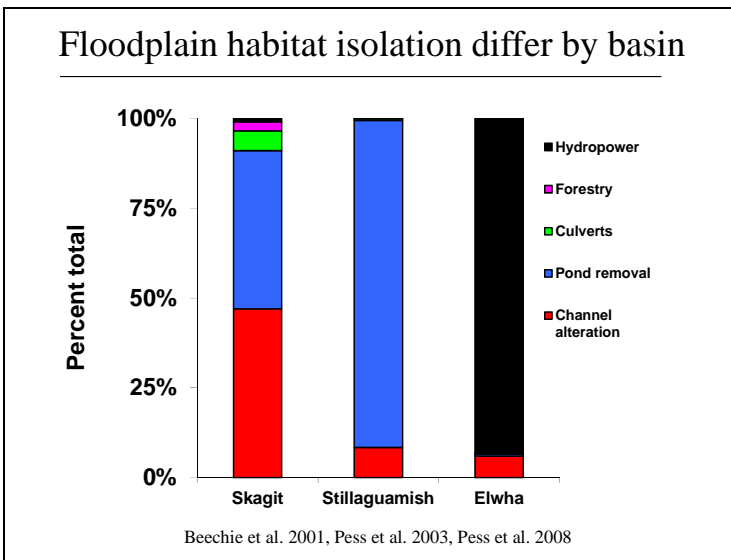
Habitat removal & isolation

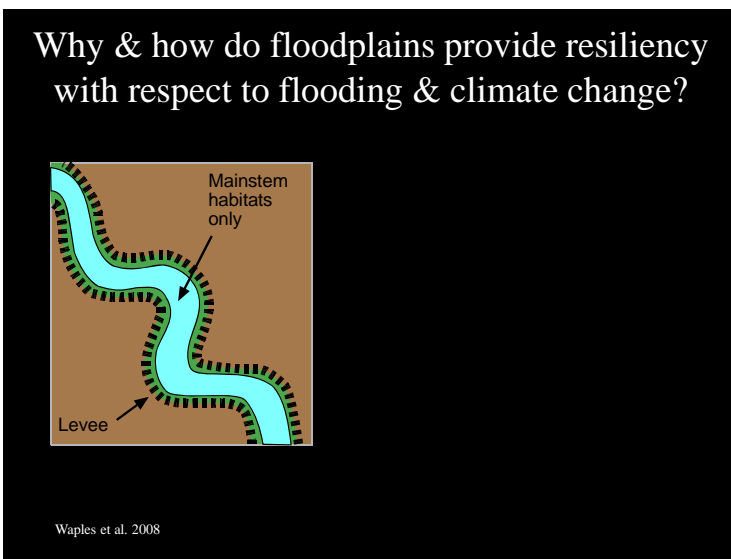
Decreased life history diversity



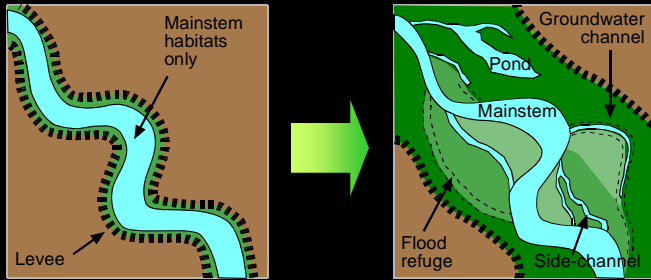
Collins et al. 2003





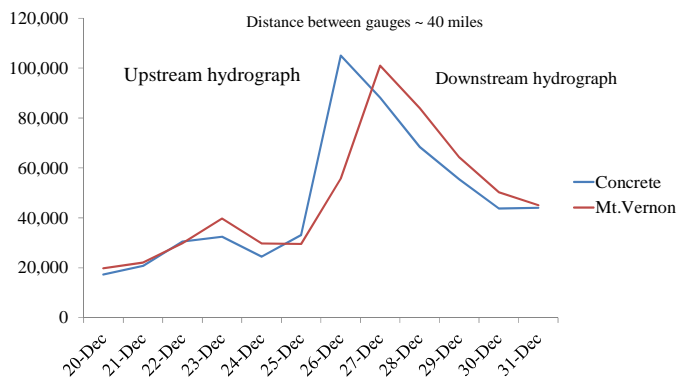


Why & how do floodplains provide resiliency with respect to flooding & climate change?



Waples et al. 2008

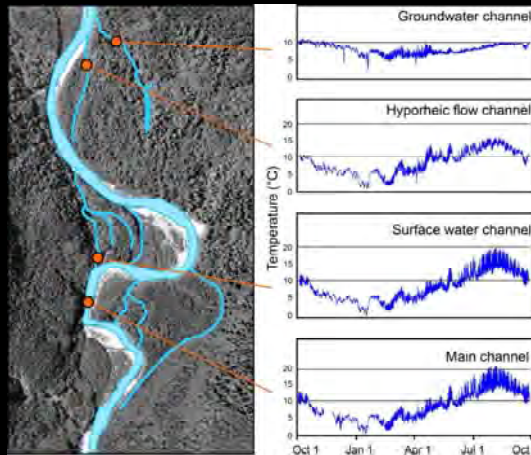
Attenuate peak flows



1980 Skagit River flood example



Thermal diversity



Climate adaptation options

Restoration action	Reduce temperature	Increase low flow	Decrease peak flow	Increase resilience
Longitudinal connectivity	Y	Y	N	Y
Floodplain connectivity	Y	N	Y	Y
Restore incised channel	Y	Y	Y	Y
Restore in-stream flow	Y	Y	N	N/Y
Riparian rehabilitation	Y	N/Y	N	N
Sediment reduction	N	N	N	N
In-stream habitat	N	N	N	N
Nutrient enrichment	N	N	N	N

Condensed from Beechie et al. 2013

Summary

- What is a floodplain?
 - Geomorphic
 - Hydrologic
 - Ecological
- What features are associated with floodplains?
 - Slower water areas, accompanying vegetation & obstructions
- What creates and maintains floodplains?
 - High flow events that allow for the natural processes of sedimentation, water, wood, and nutrient recruitment.

Summary

- Why are floodplains important to aquatic ecosystem function?
 - The creation of complex habitat through the deposition and increased residence time of water, wood, & nutrients
 - Slower water environments for juvenile salmonids during critical times of their life cycle

Summary

- How do we disturb and alter floodplains?
 - Isolate or disconnect the floodplain from its main channel
 - Habitat loss or reduced habitat diversity alters species distribution, increases competition, & can decrease overall salmonid survival at a particular life stage.

Summary

- Why and how do floodplains provide resiliency with respect to flooding and climate change?
 - Attenuate peak flows, enhance low flows
 - Dampen changes to stream temperature
 - Creates habitat refuge at various life stages for salmonids

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- Abbe, T. B., G. R. Pess, D. R. Montgomery, and K. L. Fetherston. 2003. Integrating log jam technology into river rehabilitation. Pages 443-482 in S. Bolton, D. R. Montgomery, and D. Booth, editors. Restoration of Puget Sound rivers. University of Washington Press, Seattle.
- Eric Beamer – Contact Skagit River System Cooperative Phone: 360.466.7241.; e-mail: ebeamer@skagitcoop.org. [Skagit River documents http://www.skagitcoop.org/index.php/welcome/](http://www.skagitcoop.org/index.php/welcome/)
- Beechie, T. J., B. D. Collins, and G. R. Pess. 2001. Holocene and recent geomorphic processes, land use, and salmonid habitat in two north Puget Sound river basins. Pages 37-54 in J. B. Dorava, D. R. Montgomery, F. Fitzpatrick, and B. Palcsak, editors. Geomorphic processes and riverine habitat—water science and application, volume 4. American Geophysical Union, Washington D.C.

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- Pess, G. R., M. L. McHenry, T. J. Beechie, and J. Davies. 2008. Biological impacts of the Elwha River dams and potential salmonid responses to dam removal. *Northwest Science* 82 (Special Issue):72-90.
- Pess, G.R., T.J. Beechie, J.E. Williams, D.R. Whittall, J.I. Lange, and J.R. Klochak. 2003. Chapter 8. Watershed assessment techniques and the success of aquatic restoration activities. Pages 185-201 in R.C. Wissmar and P.A. Bisson, editors, *Strategies for Restoring River Ecosystems: Sources of Variability and Uncertainty in Natural and Managed Systems*. American Fisheries Society, Bethesda, Maryland.

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- Peterson, N. P., and L. M. Reid. 1984. Wall-base channels: their evolution, distribution, and use by juvenile coho salmon in the Clearwater River, Washington. Pages 215-225 in J. M. Walton and D. B. Houston, editors. *Proceedings of the Olympic Wild Fish Conference*, March 23-25, 1983, Port Angeles, Washington. Fisheries Technology Program, Peninsula College, Port Angeles.
- Waples, R. S., G. R. Pess, and T. Beechie. 2008. Evolutionary history of Pacific salmon in dynamic environments. *Evolutionary Applications* 1:189-206.

PART C
FLOODPLAIN MANAGEMENT
A CLIMATE CHANGE RESILIENCY TOOL FOR
INTEGRATED WATER RESOURCE MANAGEMENT
Monty Schmitt

Floodplain Management
A Climate Change Resiliency Tool For
Integrated Water Resource Management

Presentation to
Oregon Law Institute of Lewis and Clark
Columbia River Inter Tribal Fish Commission

Integrating Floodplain Management Policies

December 10 2015

Monty Schmitt
Senior Water Resources Scientist
Natural Resources Defense Council

Overview

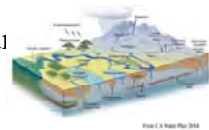
1. Water resource management challenges (water supply, riverine ecosystems, flood management, etc.) are interrelated.
2. Climate change will exacerbate existing water resource management challenges and impact the effectiveness of water management tools.
3. Floodplain management is a climate change resiliency tool that provides multiple benefits.
4. Case study: California Central Valley Flood Protection Plan

The Arid West

- Precipitation
 - Mostly winter and early spring
 - Drier the rest of the year
- Water Supply Tools:
 - Snowpack
 - Surface storage and infrastructure
 - Instream diversions
 - Groundwater



Groundwater and Surface Water



From CA Water Plan 2010

The Arid West

- Water Resource Needs:
 - Water Supply
 - Urban
 - Industrial
 - Agriculture
 - Environment
 - Flood Management

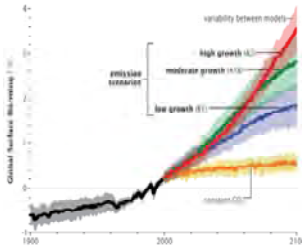


Climate Change Impacts

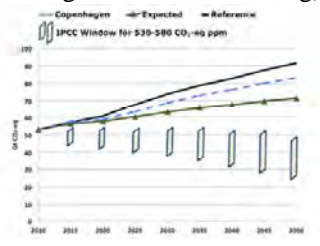
Climate change is happening and will get worse

Window for global emissions reductions necessary to achieve 530-580 ppm carbon dioxide (~2 degrees Celsius warming)

Emission Scenarios



NASA Earth Observatory, 2015.



Expectations of a New Climate Agreement, MIT, August 2014.

Climate Change Impacts

▪ Impact key water supply tools

- Snowpack loss
- Surface storage
 - Earlier runoff, increased evaporation, tension between flood protection vs water supply, etc.



▪ Exacerbate existing water resource management challenges

- Longer and drier summers
- More extreme droughts
- Increased urban/ag demand



Climate Change Impacts

▪ Degrade aquatic ecosystems

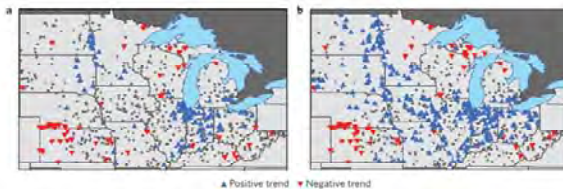
- Increased temperatures
- Decreased water quality
- Lower summer flows
- Habitat loss



Climate Change Impacts

▪ Reduce effectiveness of existing flood management systems

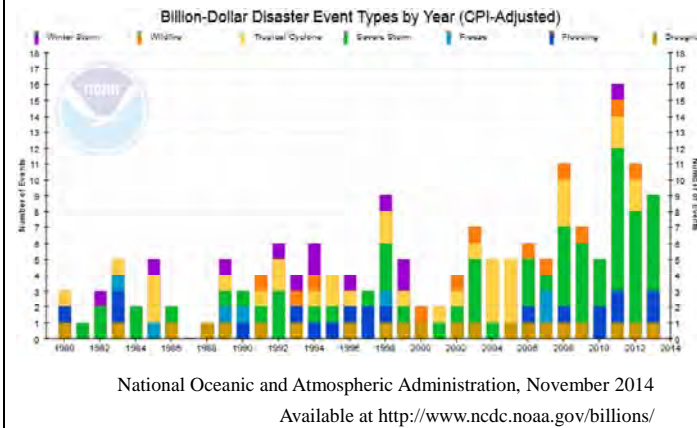
- More frequent severe storms
- Increased rain on snow pack
- Increase peak stream flows
- Sea level rise



Observed changes in flood (a) magnitude and (b) frequency

"The changing nature of flooding across the central U.S.," *Nature Climate Change*, 2015.

Climate Change Impacts



Climate Change Adaptation Strategies

Successful climate change adaptation strategies will require using tools that are resilient.

Surface storage vs

Managed floodplains



- Increased evaporation
- More frequent storm events
- Tension between water supply and flood protection.
- Increase conveyance and storage
- Reduce flood risk to development
- Increase groundwater recharge and flexibility of dam operations
- Habitat for fish and wildlife

Climate Change Adaptation Strategies

Floodplain Management

- Land use development
 - Protecting undeveloped floodplains
 - Restoring floodplain functions
- ...One tool with multiple benefits



Case Study: California Central Valley Flood Protection Plan

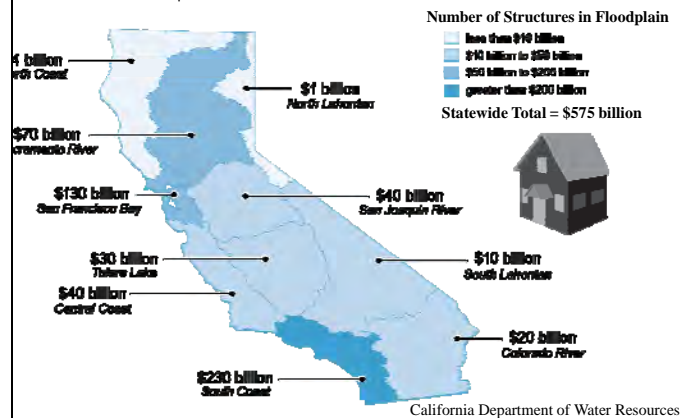
Central Valley Flood Protection Plan

- Flood protection improvements
- Restore riverine ecosystems
- Permitting and maintenance
- Climate adaptation
- Estimated cost \$17 Billion



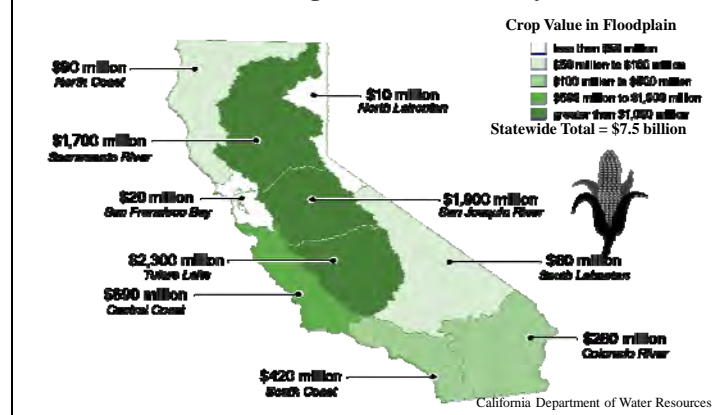
Case Study: California Central Valley Flood Protection Plan

\$575 billion in structures are at risk



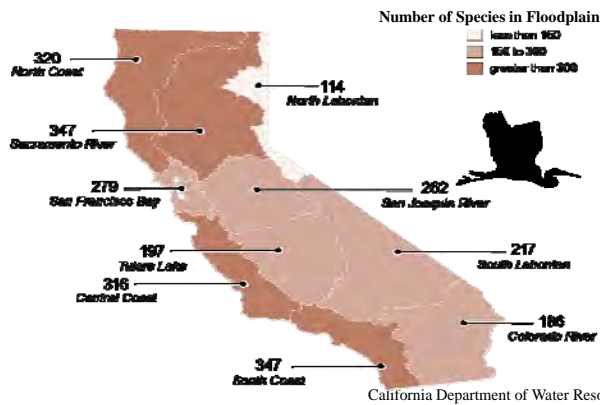
Case Study: California Central Valley Flood Protection Plan

California's agricultural economy is at risk



Case Study: California Central Valley
Flood Protection Plan

Floodplain environmental resources



Case Study: California Central Valley
Flood Protection Plan

CVFPP “Integrated Water Management” approach

- Combines flood protection, water supply, ag land preservation and ecosystem actions
- Integrate system-wide and regional planning
- Stakeholder collaboration and cooperation
- Develop multi-benefit projects with broad support to access an array of funding sources

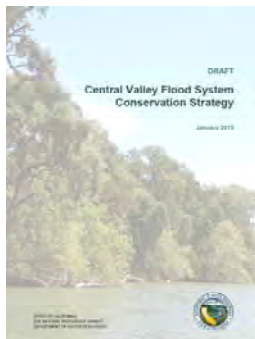


Photo credit UC Davis

Case Study: California Central Valley
Flood Protection Plan

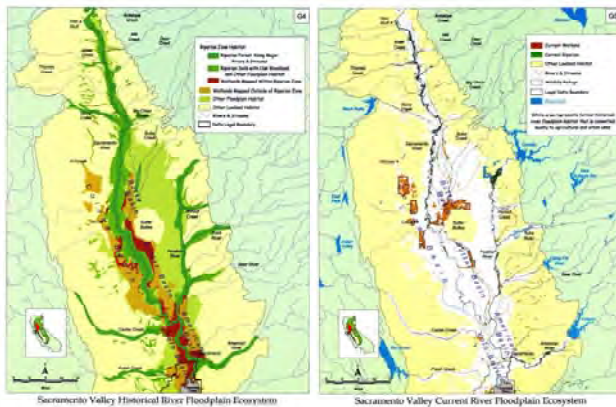
Conservation Strategy Plan

- Flood system impacts
- Floodplain habitat
 - Historic vs. current
 - Potential
 - Flood system footprint
 - Suitable floodplain elevations
- Quantitative objectives
 - Based on existing species and habitat conservation objectives
 - (e.g. Salmon Doubling Goal)
- Integrate objectives into system-wide and regional flood project improvements



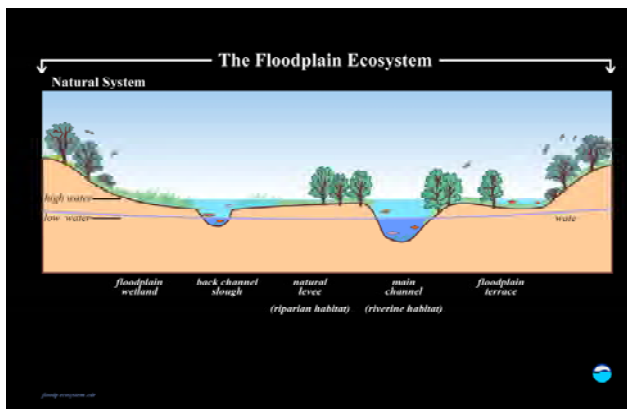
Restoring Floodplain Habitat

The Sacramento River's Floodplains: Then and Now



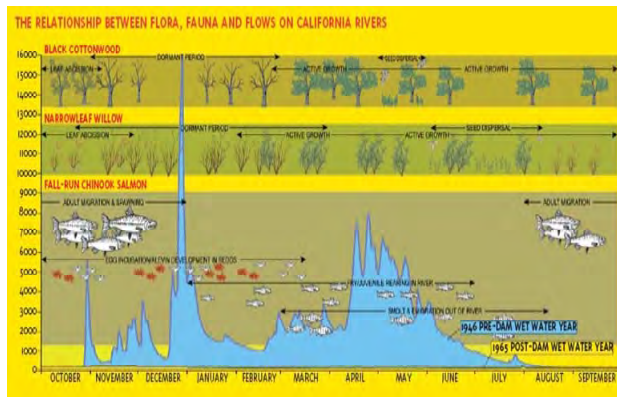
Restoring Floodplain Habitat

Functional Floodplain



Restoring Floodplain Habitat

Functional Floodplains: A Continuum of Processes



- Stage
- Duration
- Timing
- Frequency



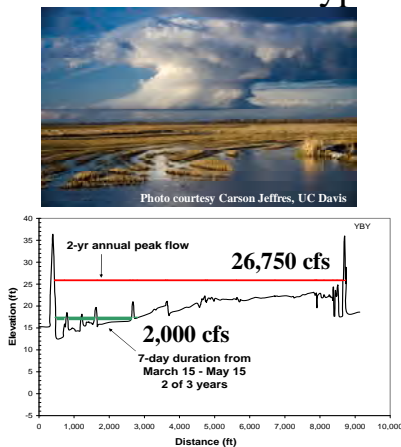
“Floodplain inundation for at least 7 days, during the period March 15th to May 15th, in at least 2 out of 3 years”

UC Davis, PWA, 2006

The diagram illustrates a river channel cross-section. The top part shows the water surface, labeled 'high water' on the left and 'low water' on the right. The channel bed is shown with a 'vegetational bed' in the center and a 'sand bed' in the middle. The channel is flanked by 'sand banks' on both sides. The channel is labeled 'river channel' at the top. The bed profile is labeled 'bed level' at the bottom. The channel is labeled 'river' at the bottom. The channel is labeled 'river' at the bottom.



Photo courtesy CA Department of Water Resources



Multi-Benefit Flood Protection: Yolo Flood Bypass

Juvenile salmon reared in
the main channel of the
Sacramento River vs the
Yolo Flood Bypass



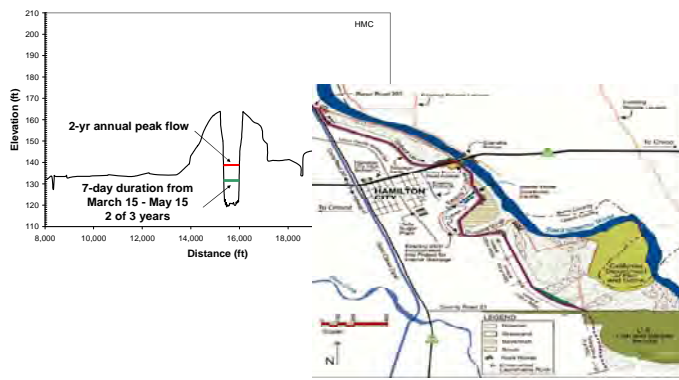
Photo courtesy Carson Jeffres, UC Davis



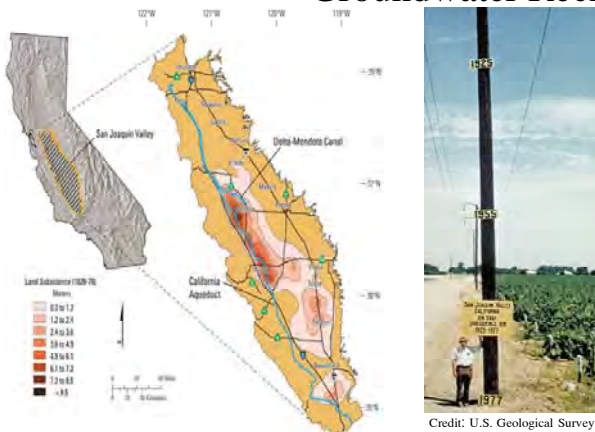
**Ray of hope: Fish,
farms both thrive**

Multi-Benefit Flood Protection: Levee Setbacks

Hamilton City Floodplain Restoration Project



Multi-Benefit Flood Protection: Groundwater Recharge



Credit: U.S. Geological Survey

Conclusions

1. Climate Change will exacerbate existing water resource management challenges and the effectiveness of water management tools
2. Floodplain management is a climate change resiliency tool that provides multiple benefits:
 - Flood protection/public safety
 - Healthy riverine ecosystems
 - Improved water quality and supply
 - Economic stability
 - Agricultural land preservation
 - Open space and recreation
3. Flood protection improvements are costly
4. The key to success – Multi-benefit projects

For More Information

Monty Schmitt

Senior Scientist

Natural Resources Defense Council

111 Sutter St., 20th Floor

San Francisco, CA 94104

(415) 875-6100

Email: mschmitt@nrdc.org

CHAPTER 3

Floodplain Management Policies

LORRI BODI

Vice President, Environment, Fish and Wildlife,
Bonneville Power Administration, Portland

KAITLIN LOVELL

Senior Manager, Science, Fish and Wildlife,
City of Portland Environmental Services, Portland

BONNIE S. SHORIN

Program Analyst, National Marine Fisheries Service, Lacey, WA

Chapter 3

FLOODPLAIN MANAGEMENT POLICIES

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NOTES

Chapter 3

FLOODPLAIN MANAGEMENT POLICIES

PART A

Kaitlin Lovell

IGNACIA S. MORENO, Assistant Attorney General
SETH M. BARSKY, Acting Section Chief
BRADLEY H. OLIPHANT, Trial Attorney (Cal. Bar No. 216468)
United States Department of Justice
Environment & Natural Resources Division
Wildlife & Marine Resources Section
Ben Franklin Station
P.O. Box 7369
Washington, DC 20044-7369
Phone: (202) 305-0500
Fax: (202) 305-0275
Email: bradley.oliphant@usdoj.gov

Attorneys for Defendant

**UNITED STATES DISTRICT COURT
DISTRICT OF OREGON**

AUDUBON SOCIETY OF PORTLAND,)	
NATIONAL WILDLIFE FEDERATION,)	CASE NO. 3:09-cv-729-HA
NORTHWEST ENVIRONMENTAL)	
DEFENSE CENTER, ASSOCIATION OF)	
NORTHWEST STEELHEADERS,)	
)	SETTLEMENT AGREEMENT
Plaintiffs,)	AND [PROPOSED] ORDER
)	
v.)	
)	
FEDERAL EMERGENCY)	
MANAGEMENT AGENCY,)	
)	
Defendant.)	

Plaintiffs, Audubon Society of Portland, National Wildlife Federation, Northwest Environmental Defense Center, and Association of Northwest Steelheaders, and Defendant, the

Federal Emergency Management Agency (“FEMA”), by and through their undersigned counsel, state as follows:

WHEREAS, FEMA is the federal agency charged with administering the National Flood Insurance Program (“NFIP”), a federal flood insurance program created by Congress in 1968, and amended in 1973 and 1994 (42 U.S.C. §§ 4001, et seq.);

WHEREAS, on June 25, 2009, Plaintiffs brought this Endangered Species Act (“ESA”) lawsuit against FEMA, alleging that FEMA violated Section 7 of the ESA by not consulting with the National Marine Fisheries Service (“NMFS”) on the impacts of the NFIP in Oregon on the following fifteen salmon and steelhead listed as threatened and endangered under the ESA in Oregon: (1) Snake River sockeye, (2) Oregon Coast Coho, (3) Upper Willamette River Chinook, (4) Lower Columbia River Chinook, (5) Upper Columbia River Chinook, (6) Snake River Spring/Summer Chinook; (7) Snake River Fall Chinook, (8) Lower Columbia River Coho, (9) Southern Oregon/Northern California Coho, (10) Columbia River Chum, (11) Upper Willamette River steelhead, (12) Lower Columbia River steelhead, (13) Middle Columbia River steelhead, (14) Snake River Basin steelhead, and (15) Upper Columbia River steelhead; WHEREAS, the parties, through their authorized representatives, and without any admission or final adjudication of the issues of fact or law with respect to Plaintiffs’ claims, have reached a settlement that they consider to be a just, fair, adequate, and equitable resolution of the disputes set forth in Plaintiffs’ complaint;

WHEREAS, the parties agree that settlement of this action in this manner is in the public interest and is an appropriate way to resolve the dispute between them;

NOW, THEREFORE, the parties hereby stipulate and agree as follows:

1. Within fifteen (15) days of entry of an Order on this Settlement Agreement (“Agreement”) FEMA shall provide the Director of the NMFS a written request to initiate informal consultation, pursuant to 16 U.S.C. § 1536(a)(2); 50 C.F.R. § 402.13, on the impacts to the fifteen ESA-listed species identified in Plaintiffs’ complaint of (i) FEMA’s implementation of 42 U.S.C. § 4102(c); (ii) the mapping of the floodplains and revisions thereof 42 U.S.C. § 4101(a)(1), (a)(2), and (iii) the implementation of the Community Rating System (“CRS”), a voluntary program through which Congress mandated that FEMA provide discounts on flood insurance premiums to communities that implement flood management regulations that exceed FEMA’s minimum criteria, 42 U.S.C. § 4022(b)(1).

2. Within one (1) year of entry of an Order on this Agreement FEMA shall provide the Director of the NMFS a written request to initiate formal consultation, pursuant to 16 U.S.C. § 1536(a)(2); 50 C.F.R. § 402.14(c), on the impacts to the fifteen ESA-listed species identified in Plaintiffs’ complaint of (i) FEMA’s implementation of 42 U.S.C. § 4102(c); (ii) the mapping of the floodplains and revisions thereof 42 U.S.C. § 4101(a)(1), (a)(2), and (iii) the implementation

of the CRS, 42 U.S.C. § 4022(b)(1). This written request shall include a document, which may at FEMA's discretion be titled as a biological assessment pursuant to 50 C.F.R. § 402.12, which contains the information specified in 50 C.F.R. § 402.14(c)(1) through 402.14(c)(6). This Agreement does not limit the substantive outcome of consultation. To challenge the biological opinion resulting from the initiated consultation in accordance with this Agreement, Plaintiffs will be required to file a separate action. FEMA will not withdraw its biological assessment or from consultation.

3. Should NMFS request additional information from FEMA pursuant to 40 C.F.R. §§ 402.14(c), (d), and/or (f), FEMA shall provide such information, if available, to NMFS within sixty (60) days, or by such time as NMFS directs.

4. Within thirty (30) days of entry of an Order on this Agreement, FEMA shall begin to notify all participating communities in Oregon in writing by sending them a letter materially similar to that attached hereto as Exhibit 1 and will diligently continue notifying communities by letter materially similar to that attached hereto as Exhibit 1 until all participating communities have received such notification.

5. During the pendency of FEMA's consultation with NMFS, FEMA shall implement the following changes to the administration of the NFIP in Oregon:

a. Mapping. Upon entry of an Order on this Agreement, FEMA shall immediately institute the following elements:

i. FEMA shall process Conditional Letters of Map Change (CLOMC) caused by manmade alterations only when the proponent has factored in the effects on channel and floodplain habitat function for ESA-listed salmon and steelhead, and has demonstrated that the alteration avoids habitat functional changes, or that the proponent has mitigated for the habitat functional changes resulting from the alteration with appropriate habitat measures, such that the alterations do not cause a net loss of habitat function and value.

ii. FEMA shall ensure that floodplain modeling incorporates on-the-ground data as is readily available to increase the accuracy of maps depicting the floodplain. In addition, FEMA will use a 2-dimensional model in estuarine floodplains and in other areas as applicable.

Any challenge to any determination made by FEMA pursuant to this paragraph shall be reviewed under the standard of review set out in the Administrative Procedure Act, 5 U.S.C. § 706(2)(A).

6. Either party may seek to modify the terms of the Agreement specified in Paragraph 1 for good cause shown, consistent with the Federal Rules of Civil Procedure. In that event, or in the event that either party believes the other party has failed to comply with any term or condition

of this Agreement, the parties shall use the dispute resolution procedures specified in Paragraph 7 below.

7. This Agreement may be modified by the Court upon good cause shown, consistent with the Federal Rules of Civil Procedure, by (i) written stipulation between the parties filed with and approved by the Court, or (ii) upon written motion filed by one of the parties and granted by the Court. In the event that either party seeks to modify the terms of this Agreement, including the deadline specified in Paragraph 1, or in the event of a dispute arising out of or relating to this Agreement, or in the event that either party believes that the other party has failed to comply with any term or condition of this Agreement, the party seeking the modification, raising the dispute, or seeking enforcement shall provide the other party with notice of the claim. The parties agree that they will meet and confer (telephonically or in person) at the earliest possible time in a good-faith effort to resolve the claim before seeking relief from the Court. If the parties are unable to resolve the claim themselves, either party may seek relief from the Court. In the event that Plaintiffs believe FEMA has failed to comply with a term of this Agreement and has not sought to modify it, Plaintiffs' first remedy shall be a motion to enforce the terms of this Agreement. This Agreement shall not, in the first instance, be enforceable through a proceeding for contempt of court.

8. No party shall use this Agreement or the terms herein as evidence that FEMA is required to initiate consultation with NMFS on the impacts of any portion of the NFIP, in any other proceeding involving FEMA's implementation of the NFIP or compliance with the ESA.

9. FEMA agrees that Plaintiffs are the "prevailing parties" in this action, and agrees to pay to Plaintiffs reasonable attorneys' fees and costs, pursuant to Section 11(g) of the ESA, 16 U.S.C. § 1540 (g). The parties agree to attempt to resolve Plaintiffs' claims for fees and costs expeditiously and without the need for Court intervention. The Court shall retain jurisdiction over the case for the purpose of resolving any dispute between the parties regarding Plaintiffs' claims for an award of fees and costs. If the parties are unable to resolve attorneys' fees and costs among themselves, Plaintiffs shall file a motion seeking such award. By this Agreement, FEMA does not waive any right to contest fees claimed by Plaintiffs, including the hourly rate, in any continuation of the present action or any future litigation.

10. The parties agree that Plaintiffs reserve the right to seek additional fees and costs incurred subsequent to this Agreement arising from a need to enforce or defend against efforts to modify terms of this Agreement or for any other continuation of this action. By this Agreement, FEMA does not waive any right to contest fees claimed by Plaintiffs or Plaintiffs' counsel, including the hourly rate, in any future litigation or continuation of the present action. Further, this Agreement as to attorneys' fees and costs has no precedential value and shall not be used as evidence in any other attorneys' fees litigation.

11. No provision of this Agreement shall be interpreted as, or constitute, a commitment or requirement that FEMA take action in contravention of the ESA, the Administrative Procedure Act (“APA”), or any other law or regulation, either substantive or procedural. Nothing in this Agreement shall be construed to limit or modify the discretion accorded to the FEMA by the ESA, the APA, or general principles of administrative law with respect to the procedures to be followed in making any determination required herein, or as to the substance of any final determination.

12. This Agreement is being entered into so as to avoid further litigation of the Plaintiffs’ pending lawsuit. Nothing in this Agreement shall be construed to constitute an admission of any issue of fact, law or liability by any of the parties. Except as expressly provided in this Agreement, none of the parties waives or relinquishes any legal rights, claims or defenses it may have.

13. Nothing in this Agreement shall be interpreted as, or shall constitute, a requirement that FEMA is obligated to pay any funds exceeding those available, or take any action in contravention of the Anti-Deficiency Act, 31 U.S.C. § 1341, or any other appropriations law.

14. The parties agree that this Agreement was negotiated in good faith and that this Agreement constitutes a settlement of claims that were denied and disputed by the parties. By entering into this Agreement, the parties do not waive any claim or defense.

15. The undersigned representatives of each party certify that they are fully authorized by the party or parties they represent to agree to the Court’s entry of the terms and conditions of this Agreement and do hereby agree to the terms herein.

16. The terms of this Agreement shall become effective upon entry of an order by the Court ratifying the Agreement.

17. Upon approval of this Agreement by the Court, Plaintiffs’ First Claim for Relief that FEMA has violated the requirements of the ESA and its implementing regulations failing to initiate and/or complete consultation with NMFS shall be dismissed with prejudice. Nothing in this agreement shall prevent Plaintiffs from filing, at the conclusion of formal consultation between FEMA and NMFS, contemplated in this agreement, a separate action challenging FEMA’s substantive compliance with 16 U.S.C. §1536(a)(2) to ensure the agency’s actions authorized, funded, or carried out pursuant to the NFIP are “not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of habitat of such species which is determined by the Secretary . . . to be critical . . .” 16 U.S.C. § 1536(a)(2). Upon approval of this Agreement by the Court, Plaintiffs’ Second Claim for Relief shall be dismissed without prejudice. Upon approval of this Agreement by the Court Plaintiff shall withdraw any and all pending Freedom of Information Act requests related to this litigation. The parties hereby stipulate and respectfully request that the Court retain jurisdiction to oversee compliance with the terms of this Agreement and to resolve any motions to modify such terms.

See Kokkonen v. Guardian Life Ins. Co. of Am., 511 U.S. 375 (1994). This Agreement shall terminate automatically upon conclusion of formal consultation.

Dated: July 9, 2010

Respectfully submitted,

s/ Daniel J. Rohlf

Daniel J. Rohlf (OR Bar No. 99006)
PACIFIC ENVIRONMENTAL
ADVOCACY CENTER
10015 S.W. Terwilliger Blvd.
Portland, OR 97219
Phone: (503) 768-6707
Fax: (503) 768-6642
Email: Rohlf@lclark.edu
Attorneys for Plaintiffs

IGNACIA S. MORENO, Assistant Attorney
General Environment & Natural Resources
Division
SETH M. BARSKY, Acting Section Chief

/s/ Bradley H. Oliphant

BRADLEY H. OLIPHANT, Trial Attorney
(California Bar No. 216468)
U.S. Department of Justice
Environment & Natural Resources Division
Wildlife and Marine Resources Section
Ben Franklin Station, P.O. Box 7369
Washington, D.C. 20044-7369
Phone: (202) 305-0500
Fax: (202) 305-0275
Email: bradley.oliphant@usdoj.gov
Attorneys for Defendants

**UNITED STATES DISTRICT COURT
DISTRICT OF OREGON**

AUDUBON SOCIETY OF PORTLAND, NATIONAL WILDLIFE FEDERATION, NORTHWEST ENVIRONMENTAL DEFENSE CENTER, ASSOCIATION OF NORTHWEST STEELHEADERS,)
Plaintiffs,)
v.)
FEDERAL EMERGENCY MANAGEMENT AGENCY,)
Defendant.)

CASE NO. 3:09-cv-729-HA

**CERTIFICATE OF
SERVICE**

I hereby certify that on July 9, 2010, I electronically filed the foregoing with the Clerk of the Court via the CM/ECF system, which will send notification of such to the attorneys of record.

/s/ **Bradley H. Oliphant**

BRADLEY H. OLIPHANT

OF COUNSEL:

Barbara Montoya, Dep. Assoc. Chief Counsel
Litigation Division
Federal Emergency Management Agency
U.S. Department of Homeland Security
409 3rd Street, SW Room 206
Washington, DC 20472-3800

EXHIBIT 1

The Honorable Participant, Mayor
Address

Dear Mayor Participant:

In 2009, Audubon Society of Portland, National Wildlife Federation, Northwest Environmental Defense Center and the Association of Northwest Steelheaders (collectively, Audubon) sued the U.S. Department of Homeland Security's Federal Emergency Management Agency (FEMA) for failure to consult under the Endangered Species Act (ESA) with respect to administration of the National Flood Insurance Program (NFIP). On July 9, 2010, FEMA entered into an agreement with Audubon settling this lawsuit. The agreement requires FEMA to request the initiation of formal consultation with the National Marine Fisheries Service (NMFS) on the impacts of certain aspects the NFIP was having on ESA-listed salmon and steelhead. The agreement further provided that communities participating in the NFIP would receive this letter notifying them of the agreement and relevant provisions of the ESA.

Under section 7 of the ESA, Federal Agencies are prohibited from causing jeopardy to a listed ESA species or adversely modifying its critical habitat. Certain portions of the ESA are applicable to everyone, whether a federal agency, state agency, local jurisdiction or individual. We all have a responsibility to ensure our actions do not cause a take (harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, collect, or attempt to engage in any such conduct) to ESA-listed threatened and endangered species. Under section 9 of the ESA, actions or decisions enacted by you and your officials are subject to this prohibition regardless of federal involvement. Additionally, any person can be subject to criminal or civil penalties for causing a take.

During the consultation FEMA will process Conditional Letters of Map Change (CLOMC) caused by manmade alterations only when the requestor has demonstrated compliance with the ESA. In addition, FEMA will also ensure that floodplain modeling incorporates on-the-ground data as is readily available to increase the accuracy of maps depicting the floodplain.

FEMA recognizes that many of you have already been implementing measures which protect/mitigate floodplain development actions affecting ESA-listed species and their habitat. For those that may need assistance in designing and implementing such measures, FEMA will work diligently with you, the state resource agencies, and NMFS to provide as much assistance as possible and to facilitate favorable opportunities for complying with the ESA.

Sincerely,

Regional Administrator

Overcoming uncertainty and barriers to adoption of Blue-Green Infrastructure for urban flood risk management

C.R. Thorne¹, E.C. Lawson¹, C. Ozawa², S.L. Hamlin³ and L.A. Smith⁴

¹ School of Geography, University of Nottingham, Nottingham, UK

² Nohad A. Toulon School of Urban Studies and Planning, Portland State University, Portland, OR, USA

³ School of the Environment and Institute for Sustainable Solutions, Portland State University, Portland, OR, USA

⁴ Centre for the Analysis of Time Series, London School of Economics and Political Science, London, UK

Correspondence

Emily C. Lawson, School of Geography,
University of Nottingham, University Park,
Nottingham NG7 2RD, UK
Email: emily.lawson@nottingham.ac.uk

DOI: 10.1111/jfr3.12218

Key words

Best management practices; blue-green cities; confidence; sustainable drainage systems; uncertainty; urban flood risk management.

Abstract

Blue-Green Infrastructure (BGI) and Sustainable Drainage Systems (SuDS) are increasingly recognised as vital components of urban flood risk management. However, uncertainty regarding their hydrologic performance and lack of confidence concerning their public acceptability create concerns and challenges that limit their widespread adoption. This paper investigates barriers to implementation of BGI in Portland, Oregon, using the Relevant Dominant Uncertainty (RDU) approach. Two types of RDU are identified: scientific RDUs related to physical processes that affect infrastructure performance and service provision, and socio-political RDUs that reflect a lack of confidence in socio-political structures and public preferences for BGI. We find that socio-political RDUs currently exert the strongest negative influences on BGI decision making in Portland. We conclude that identification and management of both biophysical and socio-political uncertainties are essential to broadening the implementation of BGI and sustainable urban flood risk management solutions that are practical, scientifically sound, and supported by local stakeholders.

Introduction

This paper examines the sources of uncertainty responsible for current concerns and challenges to widespread adoption of Blue-Green Infrastructure (BGI) in urban flood risk management. This is significant because many urban flood risk management professionals still perceive uncertainties concerning service delivery to be greater for BG compared with grey infrastructure, whereas decision makers and urban planners question the appetites of communities and their elected representatives for increasing a city or neighbourhood's reliance on BGI. The fact is that uptake of BGI, in the form of Sustainable Drainage Systems (SuDS) or Best Management Practices, remains stubbornly sluggish, despite the proven advantages of BG over grey infrastructure (Ellis, 2013; Casal-Campos *et al.*, 2015).

These issues were investigated through research conducted in Portland, Oregon, United States. We hypothesized that: 1) adoption of BGI in Portland is currently limited by concerns fuelled by the perception that scientific uncertainty (in hydrological processes) is greater for BG than the equivalent grey infrastructure; and 2) uncertainties associated with

forecasting future social conditions, and challenges related to the lack of confidence that beneficiary communities recognise, value, and are willing to pay for the additional benefits of using BGI, are likely to inhibit action to a degree equal to, or greater than, scientific uncertainties.

Encompassing the social dimensions of urban flooding is essential to enable effective environmental-technical discourse concerning sustainable stormwater management (Cettner *et al.*, 2014) and consideration of the environmental and social uncertainties generated outside the engineered system (Geldof, 1995a, b). These issues are manifest in the form of technical barriers to uptake that cite uncertainties concerning the long-term performance of BGI versus grey infrastructure and the perception that maintenance of BGI is more expensive and difficult to deliver. These issues are compounded by doubt in the minds of project designers and decision makers that future leadership and community buy-in can be relied upon to champion, support, accept, and take ownership of BGI. Overarching these challenges, which relate specifically to BGI, are broader challenges related to the impacts of climate change, the need to deliver urban flood risk management that is socially equitable and the

difficulty of communicating with publics on the complex technical and planning issues that relate to all infrastructure projects.

In researching these issues, we use the outcomes of semi-structured interviews to identify key concerns and challenges faced by a range of institutional stakeholders working in different governmental departments and bureaus in the City of Portland. We draw out the uncertainties and classify them as relating to hydrological and biophysical processes or socio-political factors, based on the Relevant Dominant Uncertainty (RDU) approach pioneered by Smith and Petersen (2014). We define a new type of RDU; the socio-political RDU (RDUs), which reflects the lack of confidence that the current high levels of political backing, public support and community willingness to pay for BGI in Portland will continue into the future. We then discuss the importance of overcoming such socio-political uncertainties

to successfully broaden implementation of BGI: a course of action that is physically/scientifically optimal. Finally, we apply the knowledge created and insights gained from our research to address how decision makers can reduce their levels of concern and overcome the associated challenges to widen the implementation of BGI. In essence, this requires reducing those RDUs that are reducible, accounting for the irreducible ones, and building the confidence necessary to unlock Portland's currently unfulfilled potential to become a *Blue-Green City*.

Study location and governance

Portland is located at the confluence of the Columbia and Willamette Rivers (Figure 1). It is the largest city in Oregon, with an area of around 376 km² and population of circa 609 456 (US Census Bureau, 2013). The city falls primarily

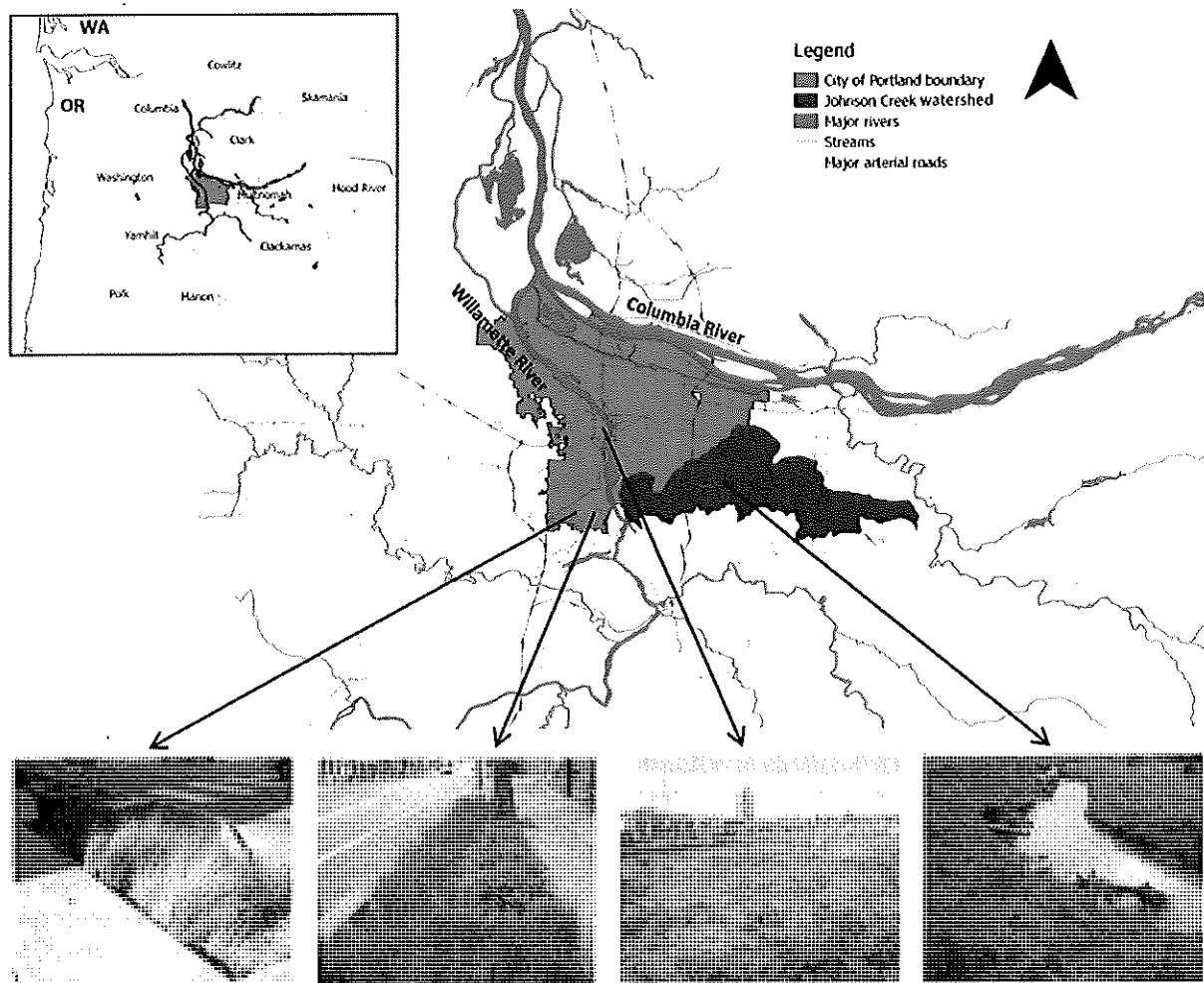


Figure 1 Study area: Portland, OR. Photographs from left to right; City of Portland green street installations, Multnomah County Ecoroof, Foster Floodplain natural area. The maps were created using QGIS Desktop software v2.2.0. Photo credits: Emily Lawson.

within Multnomah County, though small portions are in Clackamas and Washington counties, all within the wider Portland Metropolitan Area. The climate features wet, mild winters and dry, warm summers. Between 1950 and 2009, annual precipitation in Portland averaged 1401 mm/y (Velpuri and Senay, 2013), generating about 450 000 m³/y of stormwater runoff (BES, 2015a). Climate projections for the Pacific Northwest predict wetter, warmer winters and drier summers, with a trend towards greater annual precipitation that will become noticeable by the 2040s (Mote and Salathe, 2010). It has also been predicted that Portland will experience reduced snowmelt runoff, more frequent extreme rainfall events, and a stressing of the water supply system during hotter, drier summers (Chang *et al.*, 2010). Here, we focus on the City of Portland's jurisdictional area, which is becoming increasingly vulnerable to the potential impacts of climate and land-use change.

City of Portland bureaus with specific roles in city governance and the provision and maintenance of services are presided over by the mayor and four elected commissioners. The adoption and implementation of BGI spans multiple agencies, each with specific approaches to dealing with uncertainties. The Bureau of Environmental Services (BES) is tasked with providing sewage and stormwater collection and treatment services, managing water quality and the environment, and promoting healthy ecosystems. BES currently accounts for uncertainty in urban drainage and flood risk management projects using conventional approaches based on 'design standards', which apply simplified hydrologic and hydraulic analyses and factors of safety, coupled with experience, sound engineering judgement, and guidance from the Oregon Department of Environmental Quality (DEQ). The Bureau of Planning and Sustainability (BPS) is charged with enhancing liveability by planning for a resilient future and leads development of the long-range Comprehensive Plan (BPS, 2011), the Climate Change Preparation Strategy (BPS, 2014), and the Climate Action Plan (BPS, 2015). Uncertainties related to future population and economic growth are dealt with in the Comprehensive Plan. With respect to uncertainty resulting from climate change and its environmental impacts when planning and designing urban flood risk management projects, both BPS and BES rely on climate change predictions provided in the Climate Action Plan, which has been updated twice since 1993 (Dalton, 2013). The Bureau of Transportation (BoT) provides the transport infrastructure to meet the demands of a growing city. Maintenance of streets and sidewalks comes under the remit of BoT and overlaps with BES when stormwater systems are installed or updated. Working in partnership with these city bureaus is Metro, an elected regional government organisation responsible for land-use planning and coordinating city and county plans to ensure a continuing supply of land suitable for development.

BES and BPS work together, and with other bureaus, to plan, design, and deliver Portland's BGI and other natural assets. BGI has long featured in urban water management in Portland and expanded during the 1990s to help reduce the frequency of Combined Sewer Overflows (CSOs) into the Willamette River, a key watercourse for listed and endangered species of salmonids (DEQ, 2010a; BES, 2012). In 1991, the City of Portland and DEQ reached an agreement that the frequency of CSO events would be substantially reduced by 2011. Specifically, this required the City to reduce annual CSO volume into the Willamette River by 96% and reduce the number of CSO events from about fifty to four annually during the rainy season, and one every three years during the dry season. Part of the solution involved major investment in grey infrastructure through the \$1.2 billion Columbia Slough and Willamette River CSO Projects, designed to convey storm and wastewater to improved treatment facilities instead of discharging into natural watercourses (BES, 2012). This included the three 'Big Pipe' Projects (East Side, West Side and Columbia Slough) that collectively were designed to control 48 outfalls to the Willamette River. Subsequently, DEQ, under advisement of BES, forecasted that Green Infrastructure (GI) could further reduce the frequency of CSOs to only two per rainy season (DEQ, 2010b), and the City responded by implementing GI projects to manage stormwater while providing a range of biophysical, ecological, and social benefits (BES, 2010a, 2012). In this context, GI is defined by the US Environmental Protection Agency (US EPA) as '*an approach to wet weather management that uses soils and vegetation to utilise, enhance and/or mimic the natural hydrological cycle processes of infiltration, evapotranspiration and reuse*' (US EPA, 2008), which embraces the *Blue-Green* ideals of reconfiguring the urban water cycle to more closely resemble the natural water cycle and using urban green spaces to help manage stormwater.

Portland is recognised as a leader in green stormwater management (Lukes and Kloss, 2008; Water Environment Research Foundation, 2009; Rottle, 2015). Portland's experience in using GI alongside grey infrastructure demonstrates the significantly lower cost of GI compared with grey assets. For instance, the 'Grey to Green' project (2008–2013) was allotted \$55 million for stormwater management, including planting trees, installing eco-roofs, purchasing land to create green assets, removing culverts, and citywide construction of green streets (BES, 2010a; US EPA, 2010). The City estimated that investment of \$9 million on GI for stormwater management saves ratepayers (who are currently still paying for the 'Big Pipe' projects) \$224 million in CSO maintenance and repair costs (US EPA, 2010). However, the City's implementation of GI has been largely opportunistic and voluntary. For example, in the city's largest project, 'Tabor to the River', sites selected for GI assets were quickly revised if a property owner opposed a planned installation. Portland's GI has also

been demonstrated to deliver ancillary benefits not generated by grey infrastructure including: improved air quality, enhanced physical and mental health, energy savings, reduced greenhouse gas emissions, amenity and aesthetic improvements, higher property values, enhanced community cohesion and community relationships, decreases in crime, improvements in environmental equity, and better access to nature (BES, 2010b). The City's Charter, however, only recognises some of these ecosystem services benefits (e.g. clean air and temperature moderation) and hence, the full scope of benefits cannot be used as first-tier criteria for funding GI schemes (City of Portland, 2015). GI for stormwater management must meet conditions set in the Stormwater Management Manual (City of Portland, 2014); yet there is still no formal requirement to implement anything better than standard 'most economical' solutions.

Methods

RDU conceptual framework

We framed our investigation of barriers to the implementation of BGI by a heuristic developed from work by Smith and Petersen (2014): the notion of a hierarchy of uncertainty and identification of 'Relevant Dominant Uncertainties' (RDUs). Smith and Petersen originally cast RDUs purely in terms of uncertainties in physical science, using climate modelling as an example. They define an RDU as the most likely known unknown limiting our ability to make a more informative scientific probability distribution for an outcome of interest. An RDU may be (or may be thought to be) reducible or irreducible, but it is always an uncertainty related to physical processes and their impacts (Smith and Petersen, 2014). This type of RDU is referred to here as an RDU_{Physical} (RDU_P). Our research suggests this definition of an RDU is incomplete. We build on the original approach by recognising the RDU_{Socio-political} (RDU_S). An RDU_S is *addressable* if it can be reduced by education, confidence building exercises, or

trusted legal sanctions. However, an RDU_S may be *unaddressable* when it hinges on future political governance, valid differences of opinion, or community values. Independently, RDUs may also be *reducible*, when enhanced research could yield the findings necessary within a practical time-scale, or *irreducible*, when arising from the inherent natural variability (Samuels et al., 2009; Smith and Stern, 2011).

Interviews

A semi-structured interview approach (Wengraf, 2001) was adopted to allow respondents to talk around a set of open-ended questions designed to elicit understanding of their perspectives on urban stormwater management and BGI. Interviews were conducted with twelve respondents from BES, BPS, BoT, and Metro (Table 1). Interviewees were selected based on their knowledge and involvement in stormwater management, climate change adaptation, urban planning, and/or BGI design. The sample population consisted of mid-level managers and BGI practitioners with diverse educational backgrounds and professional remits, providing a wide range of perspectives on the uncertainties associated with BGI. A core set of overarching questions was put to all respondents, including questions about their experience and perception of BGI, challenges and uncertainties that they associate with BGI (based on past projects or future implementation), and the principal risks and uncertainties for future urban water management, climate change adaptation and city growth, together with additional questions specific to the respondents' professional remit. The 45- to 75-min interviews were conducted between 7th May and 30th June 2014. To maintain confidentiality, respondents are referred to according to their professional remit and employer, e.g. *Green Streets Designer*, *BES*.

Intersubjective construct validity approach to classify RDUs

Four of the five researchers listened to the recorded interviews and/or read the transcripts in order to identify and

Table 1 Summary of the interview respondent's characteristics

Employment	Profession and educational background	Professional remit	Number of respondents
Bureau of Environmental Services (BES)	Hydraulic modelling and engineering	Stormwater system modelling, and water resource engineering	3
	Landscape architecture	Green streets designer	1
	Environmental law, regulations and policies	Portland climate change preparation strategy	2
	Environmental management and planning	Watershed manager/programme coordinator	2
Bureau of Planning and Sustainability (BPS)	Urban planning	Portland Comprehensive Plan	2
Bureau of Transportation (BoT)	Infrastructure management	Transport asset manager	1
Metro	Urban planning	Planning and development	1

rank RDUs. Rankings were based on the frequency and intensity with which each interviewee referred to each RDU. This independent assessment allowed each researcher to identify RDUs based on their individual interpretations of the interviews without the crosswinds of influence inevitable in a more interactive approach. The researchers then shared and discussed their findings through a Delphi-like sequence of exchanges and debates, where individual data analysis was followed by collective discussion that was repeated until consensus was reached regarding uncertainty classifications and rankings. This enabled the geographically dispersed researchers to systematically classify uncertainties and gradually refine their views. The outcome was classification and ranking of RDUs that the researchers recognised as achieving an acceptable level of intersubjective construct validity. The fifth researcher then separated the RDUs into RDU_{ps} and RDU_{ss}. All five researchers then re-examined the outcomes. This intense, discursive process led the researchers to conclude that many of the uncertainties were not RDUs *per se* but were better defined as recurring *concerns* (issues

respondents are worried about) or *challenges* (which result from these concerns and may act as barriers to implementation of BGI).

Results

Thirteen concerns, eleven challenges, and fifteen RDUs were identified, ranked from high to low and classified as being *widely recognised* or *recognised* based on the frequency and intensity with which they were mentioned during the interviews (Table 2). The concerns and challenges that influence implementation of BGI fall into two categories:

1. general project management issues that affect all aspects of local governance and infrastructure management, such as future maintenance and service provision (shaded orange in Table 2); and
2. issues specific to BGI, e.g. community perceptions and understanding of its particular costs, benefits and risks (shaded blue in Table 2).

Table 2 Identifying and classifying concerns, challenges, and RDUs

Relevant Dominant Uncertainties		Concerns		Challenges	
Widely recognised	Recognised	Widely recognised	Recognised	Widely recognised	Recognised
Impacts of climate change	Modelling	Leadership, political will and vision	How to change policy to support BGI	Securing effective leadership	Multiple risk management
Appropriate responses to the impacts of climate change	Climate change	Future infrastructure maintenance requirements	Future population	Effective future governance	Delivering infrastructure
Maintaining infrastructure performance and provision of services	Natural hazards	Community perceptions and understanding of BGI	Future land-use	Delivering future maintenance and level of service	Keeping BGI on the agenda and promoting interagency working
Public preferences	Population	Community buy-in	Impact of natural hazards	Community ownership and buy-in	Communicating effectively
Stewardship of BGI	Urban/economic development	Social equity	Future governance of BGI	Including climate change in policy/design standards	Using climate science in policy making
	Economic resilience to climate change	Willingness to pay/sell	Interagency fragmentation	Ensuring social equity	
	Level of interagency working		Who benefits/who pays		
	Capital costs				
	Recognition of the multiple benefits of BGI				
	Downscaling climate projections				

Notes: Green = reducible, yellow = irreducible, orange = general project management concerns and challenges, blue = concerns and challenges specific to implementation of Blue-Green Infrastructure (BGI).

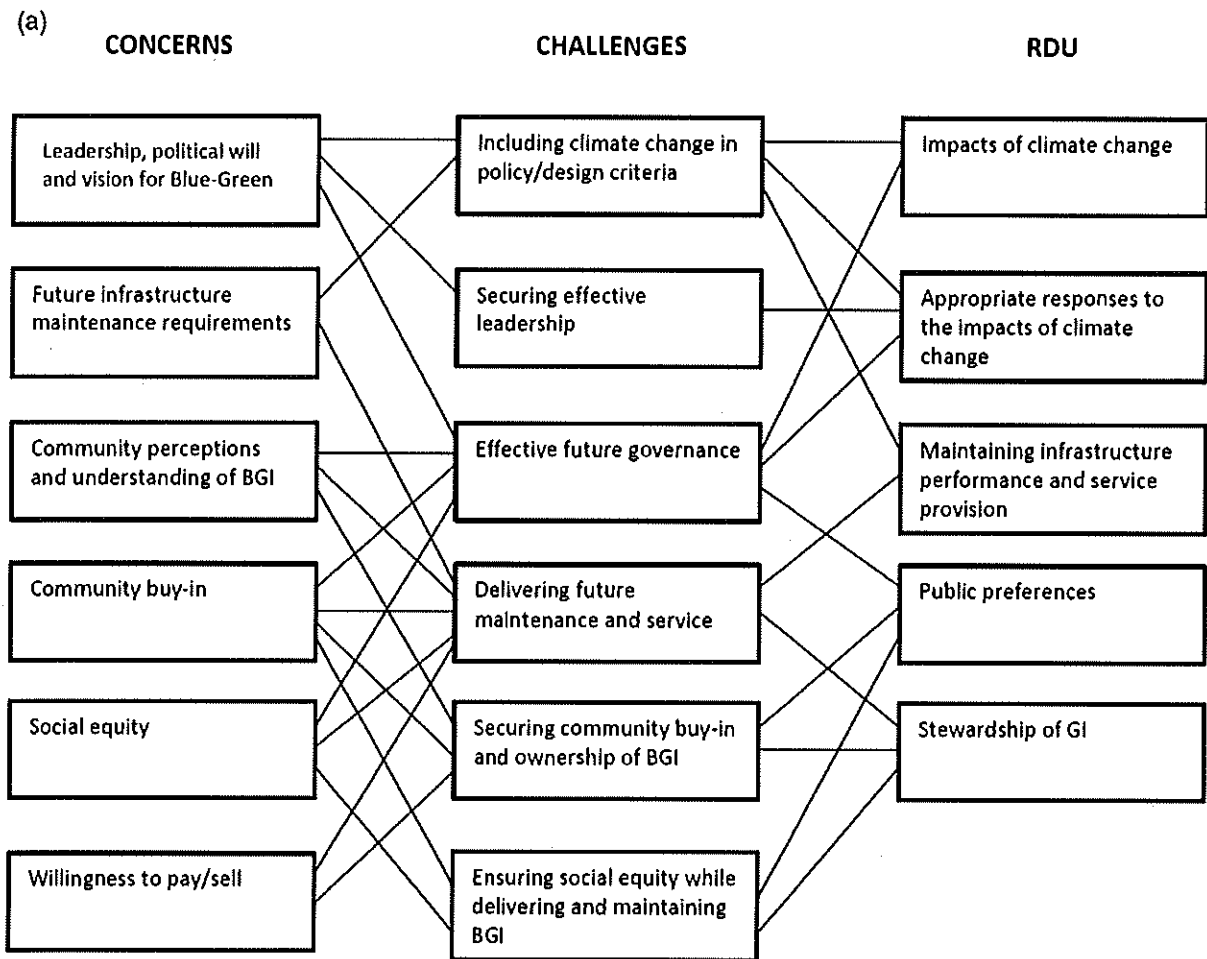


Figure 2 Linking concerns and challenges to (a) widely recognised and (b) recognised biophysical and socio-political RDUs.

Concerns and challenges that are *addressable* are those that it may be possible to resolve and overcome through investment in improving public education, social learning, and/or community engagement. This implies action, intervention, and coping capacity, and includes concerns such as understanding community preferences for stormwater infrastructure, overcoming challenges to communicating effectively, and developing engagement strategies appropriate to different demographics. *Non-addressable* concerns and challenges relate to lack of confidence on issues that we cannot expect to resolve (without a significant increase in the risk appetites of citizens) even if progress is made in better understanding them, such as lack of confidence that the individuals and parties governing Portland in the 2020s will continue to provide political support for BGI, and the ongoing challenge of delivering water and flood risk management that is socially equitable for future populations whose ethnicities and demographics are unknown. Recognising these confounding factors, Figure 2 indicates the links

through which it may be possible to reduce, or at least better understand each of the concerns and overcome the resulting challenges, by identifying and reducing the underlying RDUs.

As indicated in Figure 2 and Table 2, widely recognised RDUs span both biophysical (RDU_F) and socio-political spheres (RDU_S). RDU_F s comprise six uncertainties (listed in order of ranked importance): impacts of climate change (e.g. the detrimental impact of increased air temperatures and/or changing precipitation regimes on river health), maintaining infrastructure performance and provision of services (as the asset ages and environmental conditions change), modelling, climate change, natural hazards, and downscaling climate projections. RDU_S s outnumber RDU_F s (being nine in total, listed in order of ranked importance): appropriate responses to the impacts of climate change, public preferences, stewardship of BGI, population, urban/economic development, economic resilience to climate change, level of interagency working, capital costs, and recognition of the

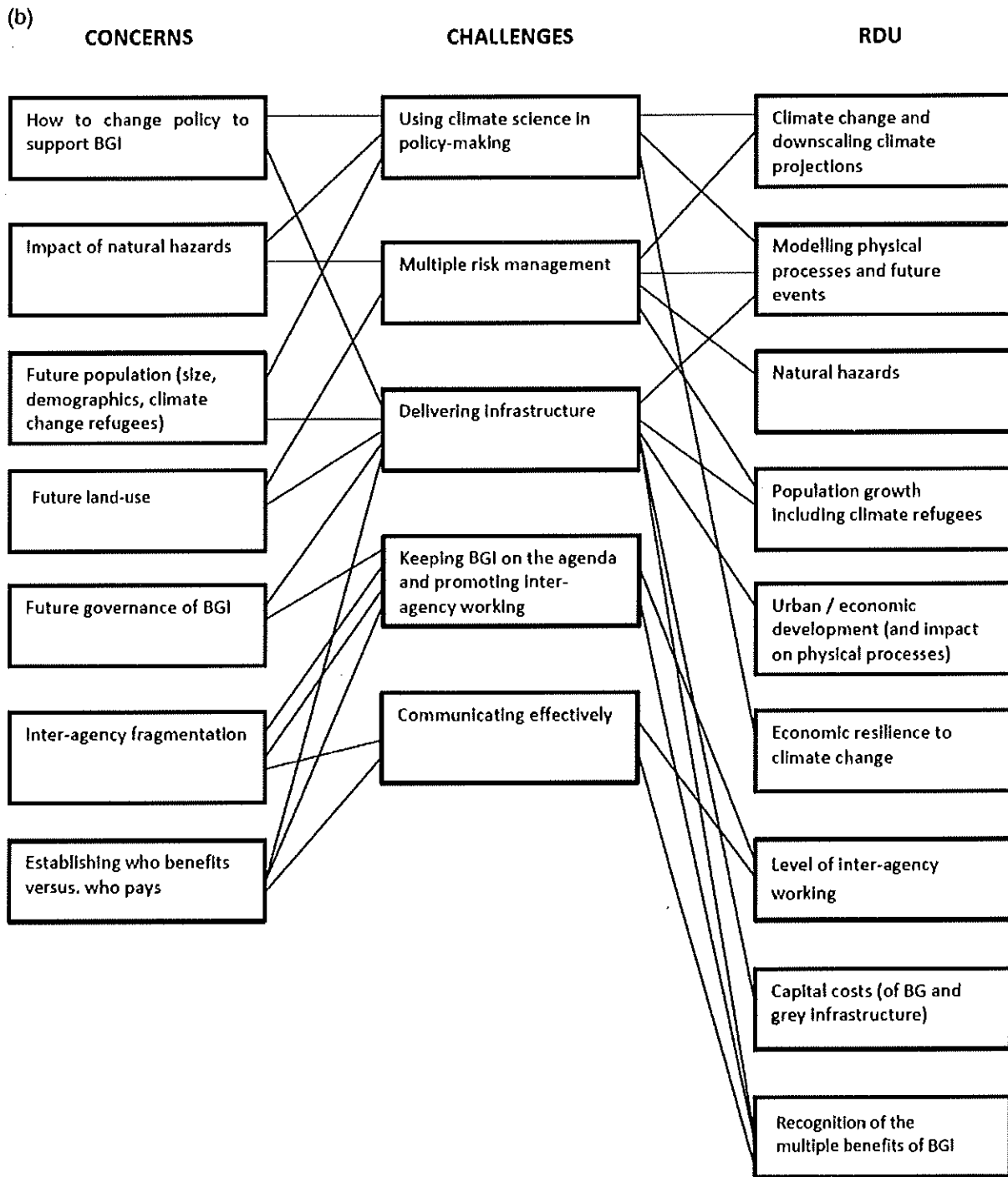


Figure 2 Continued

multiple benefits of BGI. In Table 2, RDUs are shaded as green (*reducible*) or yellow (*irreducible*) depending on whether further research would be a feasible way to reduce them, or whether infrastructure design and implementation must learn to cope with the current level of uncertainty.

The highest ranked RDU is uncertainty in the impact of climate change on the environment, society (including health), and economy, rather than the uncertainty in changes in temperature, precipitation and sea level *per se*. This RDU₁ is irreducible. Maintaining infrastructure performance and

service provision was another key RDU_r for which many respondents expressed deep concern, particularly those working in stormwater modelling and water resource engineering:

... another large uncertainty is we just don't know how these (green streets) facilities are going to function over time, our oldest one is 10 years old and we presume the design life is 30 years and so just based on other vegetative facilities, we don't know, so we are just extrapolating out to say we think it is going to last for 30 years. ...

(Water Resource Engineer, BES)

... we don't know how frequently we will have to replace the soils.

(Water Resource Engineer, BES)

This RDU is reducible, however, and it extends to grey as well as BGI. Multiple respondents mentioned a lack of knowledge of how infrastructure functionality (e.g. infiltration capacity) may change over time and in response to different magnitudes and frequencies of rainfall events. The cost of future maintenance was also highlighted as a key unknown:

I think the biggest one, and I would be surprised if not every single one of your interviewees had the same answer, is adequate funding for long term maintenance.

(Watershed Programme Coordinator, BES)

... it's not just the perception or the ability to maintain things, it is also what level of maintenance and where are the costs associated with that level of maintenance ... maintenance is a huge fraction of the cost. ...

(Water Resource Engineer, BES)

... one of the biggest things we are faced with, with these stormwater facilities, is the cost to maintain them. If you want the public to embrace them you need to keep them looking good and keep them functional, but in order to do that you need to spend money.

(Water Resource Engineer, BES)

Uncertainty in hydraulic and hydrological modelling, climate change projections, and natural hazards (e.g. the impact of the next big earthquake and the risk interface between natural hazards) were lower ranked RDU_rs:

For some people, it could be that it [climate change] seems so uncertain and so big that they don't want to deal with it. For some people it may be that they are more interested in doing near-term projects.

(Watershed Programme Coordinator, BES)

And I would say, just from observation, that we haven't yet incorporated climate change into our sort of day-to-

day planning activities ... we haven't developed the systematic approach yet for evaluating the uncertainties, the risks, the potential changes in river levels. ...

(Urban Planner, BPS)

Public preferences were a high-ranking RDU_s and can be shaped by forces external to the local context as well as by the legitimacy of local leadership and attitudes towards BGI. Uncertainties regarding public preferences were mentioned by many respondents in connection with concerns about continued political support from elected leaders for continued planning, implementation, and maintenance of BGI, especially in the context of climate change mitigation (Figure 2), demonstrating that none of these uncertainties operate independently. Concern for political leadership and social equity, which are issues applicable to general project management, were also widely recognised. The interviews revealed that local managers and planners are aware of, and highly sensitive to, the impact of local politics;

There are political uncertainties as we are working in the planning realm ... we literally can be told 'don't do that anymore, now do this, I don't want you to work with transportation anymore to do green streets, that's a waste of money'. It's a little far-fetched but it could happen.

(Watershed Manager, BES)

A contextual note must be added here: the interviews were conducted just before a hotly contested local ballot (held on 20th May 2014) on a proposal to create an independent board to oversee the City's water and sewer agencies: the Bureaus of Water and Environmental Services. Anxieties related to the ballot may have focused the minds of respondents on the political dimension of municipal water governance to some extent, bearing in mind the push by property rights activists and Tea Party followers to privatise management of these bureaus.

Social equity, which is regarded as being critical to urban sustainability and a focal point of the City's Comprehensive Plan update, was a widely recognised concern. Given that social equity is an issue universally referred to in public discourse throughout the city, it is not surprising that respondents mentioned it as a salient concern:

How do you measure whether or not you're doing your climate work in a more equitable way? We're really struggling to figure out how do we do that, how to know that we're planting trees more equitably ...?

(Urban Planner, BPS)

Additional concerns and challenges specific to BGI include community perceptions of BGI, understanding BGI effectiveness and the willingness of beneficiaries to pay for it, local support and buy-in, and ongoing commitment to

interagency coordination. These issues are influenced by factors that are beyond the City's control, such as the political leadership, but they can be reduced to some extent by appropriate actions and interventions. For example, community perceptions, understanding, and ownership of BGI may be shaped through improving access to information and education, and as a result of experiencing benefits of BGI. Even if the political will to promote widespread uptake of BGI is lacking, the likelihood of future community support will be higher if the public are informed and engaged. Ongoing interagency coordination is similarly a challenge that is only partially contingent on strong political leadership as bureau directors, managers, and technical staff can communicate across bureaus with, or without, directives to do so. That said, identifying the incentives for cross-bureau communication, such as the sharing of technical expertise or successful mechanisms for public engagement, would certainly help overcome future challenge to interagency coordination.

In summary, in Portland, asset performance and service provision (including the uncertainty surrounding capital and maintenance costs and perceived costs), community expectations and behavioural change, and environmental change and hazards, represent the key areas of concern that adversely influence implementation of BGI. These concerns are to a degree insulated from overarching concerns about climate change by the City's Comprehensive Plan and by the regulatory environment within which decision making takes place (Figure 3).

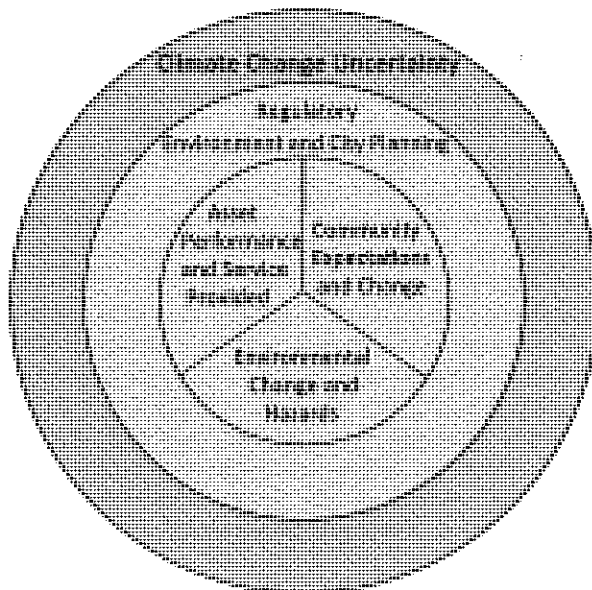


Figure 3 The factors that influence the implementation of Blue-Green Infrastructure in Portland.

Discussion

The RDUs derived in this study provide immediate new insights into the contrasting natures of the uncertainties that condition and limit implementation of BGI in Portland. Uncertainties relating to future climate, climate impacts, assumptions and inaccuracies in modelling BG (and grey) infrastructure, and long-term maintenance required to sustain maximum functionality fit within the original framework of RDUs proposed by Smith and Petersen (2014). However, other important uncertainties are unrelated to the scientific uncertainty that currently clouds our ability to forecast future BGI performance and service provision. They relate instead to local socio-political contexts, preferences, responses to impacts of environmental processes, and limited recognition of the multiple benefits of BGI. This insight led naturally to the decision to broaden Smith and Petersen's definition of RDUs by adding a new genre: the RDUs defined above. A further insight gained through this research is that although socio-political in nature, RDUs may still overshadow scientific known unknowns (RDU_{ps}) and limit effective action. This is important for (at least) two reasons. First, the research, actions, and interventions needed to reduce and thereby mitigate RDUs differ between RDU_{ss} and RDU_{ps}. Second, reducing RDU_{ps} alone is insufficient to unlock the potential for wider uptake of BGI unless a parallel investment is made in resolving (or at least better understanding) concerns and challenges that stem directly from RDU_{ss}. The implications of widening the basis for RDUs extend beyond selecting the appropriate mix of BG and grey infrastructure. Recognition and consideration of socio-political uncertainties related to, for example, citizens' appetites to accept the risk that their lifestyles may be detrimental to future generations, demonstrate why inaction is likely to continue even if the scientific uncertainties that are the focus of current debate (RDU_{ps}) are substantially reduced. It follows that effective action (i.e. taking the steps necessary to reduce the chance of near-certain catastrophe by making difficult decisions that benefit future generations) does not depend solely on our ability to forecast future conditions. Planners, politicians, and the publics they serve must also learn: first, to recognise socio-political uncertainties that manifest as concerns and challenges to evidence-based decision making; second, reduce those uncertainties that are reducible, and; third, address concerns and overcome challenges related to those uncertainties that are, in practice, irreducible.

Returning to decision making with regard to sustainable urban flood risk management, it emerges that consideration of *both* RDU_{ps} and RDU_{ss} is essential: the first in order that things are done right and the second in order that the right things are done. Stringent efforts to reduce scientific and engineering uncertainties related to the performance and

maintenance of BGI and the hydrological stresses with which urban communities will have to cope must continue. Many RDU_s are addressable and some are reducible, indicating that public engagement, education, and co-production of the knowledge upon which evidence-based decision making relies can lead to consensual decision making. Alternatively, the concept of adaptive management practices that intentionally acknowledge and embrace uncertainty could suggest a way to deal with the irreducible and non-addressable uncertainties (Pahl-Wostl, 2007). The risk appetites and tolerances of communities and their elected representatives may inform the degree to which precautionary principles are applied or future increases in flood risk are accepted. An important corollary is that these two remedies: improving our ability to forecast future flood risks and their management; and developing a common view of what levels of public investment and flood risk are acceptable, are very different undertakings. The risk is that preoccupation with the need to generate consensus on the scientific, technical, and engineering aspects of alternative stormwater management strategies may obscure other equally important determinants (Pahl-Wostl *et al.*, 2008). Accurate identification of which types and sources of uncertainty dominate is therefore crucial, and it must be recognised that these will differ not only between cities but also between neighbourhoods.

A surprising outcome of our research is that uncertainty regarding the identification of hydrological stresses that infrastructure built today will have to cope with over the next 50 years is not the highest ranking concern. We expected that engineers would be exercised by the need to implement integrated urban drainage systems with the adaptive capacity necessary to deal with rainstorms of progressively greater, but unknown, intensities and durations (i.e. a classic RDU_p). The empirical evidence that emerged indicates a deeper concern regarding the likelihood of getting *any* long-term infrastructure plans to implementation, due to socio-political uncertainties (i.e. RDU_s). The effect is to promote short-term, reactive thinking, with designers and engineers persistently responding to changes in hydrology and flood risk (and politics) rather than planning for them. Denying the space within which to conceive and refine long-term solutions negates even the possibility of delivering integrated BG and grey systems needed to ensure adequate service provision in an uncertain future. Flood risk management solutions bounded by design standards that are historically referenced leads, at best, to wasted investment in infrastructure that is abandoned early in its design life or, at worst, technical lock-in that burdens future generations with systems that have neither the hydrologic nor adaptive capacities necessary to continue delivering adequate stormwater management throughout their design lives. The wider point that this example illustrates is that it may be necessary to

address a relatively obscure RDU_s before a more obvious and tractable RDU_p can be tackled.

Building confidence in BGI

The findings of this research demonstrate that broadening the consensus on technical and engineering aspects of flood risk management and reducing the scientific uncertainties is not sufficient to trigger the public support and political backing needed to sustain actions that must be coordinated across multiple agencies, implemented over a wide area, or sustained for a long period (Morss *et al.*, 2005; Cettner *et al.*, 2014; Ashley *et al.*, 2015). The difficulties experienced in turning *Blue-Green ideals*, where the urban water cycle is reconfigured to more closely resemble the natural water cycle, into real changes to neighbourhoods and cities suggests that uncertainty related to setting priorities for public investment may be as limiting as uncertainties associated with the long-term functionality of BGI. BGI and sustainable drainage systems have typically been perceived as serving a single drainage need and judged solely on abilities to manage stormwater and contribute to reducing flood risk. Communicating the multiple benefits of BGI, which extend into the socio-cultural, ecological, and economic spheres, could greatly increase confidence in BGI as a preferred strategy, potentially opening avenues for co-funding schemes that simultaneously meet a range of City objectives (Ashley *et al.*, 2015). This presents a pivotal challenge for water management professionals in devising effective strategies for communicating the benefits of future implementation of BGI and motivating decision makers to champion such approaches (Fratini *et al.*, 2012). Moreover, although BGI is especially vulnerable, the paralysing effects of RDU_s may be pervasive, sapping the capacity of cities and the confidence of their decision makers to invest in *any* infrastructure that promises a long-term return on that investment, with preference given to schemes offering short-term benefits that are also short lived.

Although the impacts of RDU_s are similar to those of RDU_ps, there is a critical difference between them: publics can influence social-political uncertainties at the city and neighbourhood scales. Many interviewees expressed concern over community buy-in and, based on their or their colleagues' experiences, perceived gaining community support for BGI implementation as a significant challenge. This stresses the importance of initiatives involving engagement, ongoing dialogue, public education, social learning, and participatory modelling to co-produce knowledge through which citizens can develop new understandings that create the social contexts of the future (Pahl-Wostl, 2007; Pahl-Wostl *et al.*, 2008; Landström *et al.*, 2011; Everett *et al.*, 2015).

Recognising the different frames of reference of institutional and private actors and developing shared practices

that foster collaboration would help address the risk of interagency fragmentation and ineffective communication (Lems *et al.*, 2011). Although science education helps people and communities to understand the choices they are making, the key to helping them make better choices lies in clarifying the whole-life costs and benefits associated with each option, recognising that the values placed on costs and benefits are contingent on social context, environmental setting and, above all, *who benefits* and *who pays*. Fragmentation in social and political values and preferences must be overcome by pragmatic consensus if acceptable levels and distributions of risk, cost, and benefit are to be negotiated. Stakeholders assign numerous values to urban water infrastructure (Fratini *et al.*, 2012) and hence, engaging with citizens in developing shared understandings of the functionality and benefits of BGI provides the basis for negotiating these values, leading naturally to options appraisal that is accessible to well-informed *water literate* citizens. The outcome should be beneficiary communities that are more inclined to support implementation of BGI and increasingly willing to maintain and even take ownership of BGI in the future, both of which are key to reducing physical uncertainties related to future maintenance costs and service provision. Therefore, RDU_s are not only amenable to reduction through public engagement but capable of leveraging reductions in RDU_ps that appear to be serious barriers to BGI uptake when considered in isolation.

Addressing RDUs in order to widen implementation of BGI in Portland

Uptake of BGI in Portland demonstrates that barriers associated with biophysical and socio-political RDUs are not insurmountable. Our research highlights that, while concerns about BGI remain, BGI projects continue to be implemented despite the resulting impediments, as demonstrated by a range of highly successful initiatives and Portland's recognition as a leader in green stormwater management (Lukes and Kloss, 2008; Water Environment Research Foundation, 2009; Rottle, 2015). For instance, over 32 200 new street trees, 867 green street planters and 398 eco-roofs have been built as part of the 'Grey to Green' initiative (BES, 2015b). In designing urban drainage and flood risk management projects, uncertainty is dealt with using conventional approaches based on 'design standards', experience, and sound engineering judgement. Design standards and requirements for new and retrofit BGI defined in the Stormwater Management Manual (City of Portland, 2014) are modified as necessary to accommodate site-specific factors that would otherwise limit their utility, such as low soil infiltration capacity. Practitioners inclined to maximise uptake of BGI can thus work with the relevant design standards. Furthermore, all infiltration facilities must retain the

10-year storm, remove 70% total suspended solids, and manage 90% of the average annual runoff (City of Portland, 2014). This provides City engineers and designers with the regulatory leverage to enhance the longevity of new installations by accounting for potential changes in climate, land-use, and population that current design standards might not adequately cover. This is possible because, in Portland, planning for climate change is hard-wired into the City's Comprehensive Plan (BPS, 2011). The engineers and designers interviewed, however, do not over-rely on the Comprehensive Plan, and some climate change uncertainty does leak through the regulatory and planning membrane in Figure 3. For instance, uncertainty concerning the characteristics of future design storms and droughts affects the design of grey and BG infrastructure, and concerns about future immigration (due to unknowable numbers of climate change refugees moving to Portland) reduce the confidence in future population projections.

Conclusions and recommendations

The widespread adoption of BGI in Portland is currently limited by uncertainty regarding its hydrologic performance and lack of confidence in political acceptability and public preferences. We classified these uncertainties as RDUs and broadened the initial concept of RDUs that previously considered uncertainties purely in terms of the physical science (RDU_p) (Smith and Petersen, 2014). A range of biophysical RDUs that affect infrastructure performance are recognised by institutional stakeholders, notably the impacts of climate change on hydrological performance, service provision and infrastructure maintenance requirements. Socio-political RDUs (RDU_s), which refer to a lack of confidence that decision makers and publics will continue to support, understand, and pay for BGI (particularly in light of future climate and land-use change), were found to have the greatest adverse influences on decision making. Thus, the RDU_s significantly hinder Portland on its path towards becoming a *Blue-Green City*.

We conclude that to widen implementation of BGI, both the biophysical and socio-political RDUs must be identified and managed. This is because key stakeholders involved in designing and delivering sustainable urban flood risk management projects must have greater confidence that BGI components are both scientifically sound and supported by communities and their elected representatives. The actions and interventions needed to mitigate RDUs differ between RDU_s and RDU_ps. We may attempt to reduce those RDUs that are reducible through extended scientific research capable of yielding the findings necessary within a practical timescale, such as monitoring and modelling BGI assets, to determine long-term maintenance requirements. We may also promote initiatives that will build confidence among key

stakeholders and communities and thus account for irreducible uncertainties such as future stewardship, political leadership, and motivation for BGI. Investment in social learning and community engagement may help uncover the reasons behind differing public preferences for BGI, whereas changes in the risk appetite of citizens and communities may be needed before non-addressable challenges and concerns, such as delivering socially equitable water and management for future, unknown populations, can be addressed and confidence in BGI improved. Our research provides clear evidence of the need for stronger cross-sector integration and partnership in delivering sustainable urban flood risk management. Flood risk managers, planners, and other water-sector stakeholders must engage, together developing strategies to understand and overcome socio-political as well as biophysical challenges to broadening the uptake of BGI. Reducing scientific uncertainties alone will be insufficient to unlock the potential for widespread uptake of BGI in Portland and other conurbations aspiring to become *Blue-Green Cities*.

Acknowledgements

This research was performed as part of an interdisciplinary project undertaken by the Blue-Green Cities (B-GC) Research Consortium (<http://www.bluegreencities.ac.uk>) with the Portland-Vancouver ULTRA (Urban Long-term Research Area) project (PVU, <http://www.fsl.orst.edu/eco-p/ultra/>), as part of the 'Clean Water for All' initiative (<http://www.epsrc.ac.uk/funding/calls/cleanwaterforall/>).

The B-GC Consortium is funded by the UK Engineering and Physical Sciences Research Council under grant EP/K013661/1, with additional contributions from the Environment Agency and Rivers Agency (Northern Ireland). PVU is funded by the National Science Foundation award #0948983. We thank the City of Portland Bureaus of Environmental Services, Planning and Sustainability and Transport, Metro, and the Johnson Creek Watershed Council for their generous support and sharing of data, field equipment, time, and expertise. The Portland State University Office of Research Integrity provided approval for use of US human subjects (IRB 143040). For ethical reasons, the transcripts and audio files cannot be made openly available. Parties interested in this data should in the first instance contact the corresponding author. The associated metadata is available at <http://dx.doi.org/10.17639/nott.24>.

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American adaptation: Social factors affecting new developments to address climate change



Kathleen Carlson*, Sabrina McCormick

George Washington University, Milken Institute School of Public Health, 950 New Hampshire Ave, Suite 400, Washington, DC 20052, United States

ARTICLE INFO

Article history:

Received 14 December 2014

Received in revised form 13 September 2015

Accepted 21 September 2015

Available online xxx

Keywords:

Climate change

Adaptation

Urban

Social factors

ABSTRACT

Climate change and extreme weather events are expected to increase in frequency and intensity in the United States. The social factors that drive cities to adapt to and/or prepare for these impacts are largely unknown. Sixty-five qualitative interviews were conducted with multi-sectoral decision-makers to assess factors driving adaptation in six cities across the United States: Tucson, Arizona; Tampa, Florida; Raleigh, North Carolina; Boston, Massachusetts; Portland, Oregon; and Los Angeles, California. We find that there are three type of factors that affect adaptation: (1) swing—characteristics of or events within localities that can lead toward or away from action; (2) inhibitors—ways of thinking and framing climate change available to decision-makers that slow, but do not necessarily stop change; and (3) resource catalysts—types of information and moral grounding that provide a rationale for change. These factors often intersect such that swing factors are only influential in cities with some political acceptance of climate change. In cities where public acceptance of climate change is slowly shifting, resource catalysts are more influential. This is the first qualitative study of climate change adaptation in American cities.

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1. Introduction

Increases in the global surface temperature are expected to continue for decades, regardless of mitigation strategies currently being implemented (Patz et al., 2000; Bernardi 2008; Ebi and Semenza, 2008; Kjellstrom and McMichael, 2013). These changes will affect the United States in dramatic ways (Melillo and Richmond, 2014). As a result, climate change adaptation and preparedness for extreme weather events is necessary at all scales. Yet, creating such action is a distinctly challenging social problem. Climate change is often perceived as spatially and temporally distant (Moser and Dilling 2007; Norgaard, 2011), is characterized by uncertain outcomes, and has been highly politicized in the United States (McRight and Dunlap, 2000). Additionally, it is very difficult to say that any particular event can be directly attributed to climate change in order to generate concern. There are also entrenched social institutions, processes, and economic interests that work against its address (McRight and Dunlap, 2000). These challenges are a part of what hinders action at the federal, state and local levels.

Cities are often the unit of greatest risk since they contain areas of concentrated development and are populated by vulnerable groups (Dodman and Satterthwaite, 2008). In some parts of the world, the majority of the population is already urbanized. In other parts, urbanization is rapidly expanding such that the majority population will soon live there. In the United States, an estimated 249 million, or over 80% of the population, live in urban areas. The urban climate is particularly important for health (Reid et al., 2009) with a wide variety of infrastructural and environmental factors influencing outcomes (Rainham and Smoyer-Tomic, 2002).

It is particularly important to investigate the actions of cities to address climate change since city-scale planning may also be more amenable to adaptation than actions at the federal level (Cutter et al., 2012), and policy instruments used there are critical to protection of these populations from climate impacts (Zahran et al., 2008). The city is one scale at which climate action has been the most facile (Betsill and Bulkeley, 2007), and at which emissions are the greatest (Betsill, 2001). Cities in the United States and many other countries have adopted climate mitigation actions – the reduction of greenhouse gases (GHGs) – for some time (Fussler, 2007). Adaptation has become more important relative to mitigation in some areas, often when weather-related extreme event damages are catastrophic and planning horizon increases (McMichael and Kovats, 2000; Burton et al., 2006). Cities have joined international networks geared toward motivating both

* Corresponding author.

E-mail addresses: kathleencarl@gwmail.gwu.edu (K. Carlson), sabrina.mccormick@gmail.com (S. McCormick).

mitigation and adaptation, making them some of the most progressive units of change (Kern and Alber, 2008).

However, while cities around the world have been experiencing the impacts of climate-related events and taking some action, few have begun institutionalizing adaptation measures (Carmin and Zhang, 2009). This lack of preparedness appears to be the case for American cities, although reports have documented sporadic implementation of particular measures with little explanation for their motivators (Poyar and Beller-Simms, 2010). Chicago, which is well-known for being advanced in climate awareness, has a pilot adaptation program that uses porous surfacing to improve flood risk management and better protection of groundwater while also benefiting biodiversity and increasing urban amenities. Early assessments of potential climate impacts in Boston have led to awareness about climate change, but apparently been institutionalization only to a limited degree (Kirshen et al., 2008a,b). New York City began addressing infrastructure risks from climate change in 2008 (The City of New York, 2008), and has implemented a variety of programs addressing the urban heat island effect and other climate risks. A wide range of cities has developed climate adaptation plans, often which overlap with disaster preparedness plans, but to date, there appears to be limited implementation of plans.

In other developed nations, such as Australia, the European Union, and the United Kingdom, adaptation plans have been moving forward rapidly in recent years, but still remain largely underdeveloped (Preston et al., 2011; Baker et al., 2012). Research into climate risks has often been the largest form of investment (Tompkins et al., 2010). Gaps in planning include limited consideration for non-climatic factors and neglect of issues pertaining to adaptive capacity, such as forms of capital needed for effective adaptation (Preston et al., 2011). Overall, action on climate change varies widely across cities and localities, and there is little explanation of why it occurs in some places and not others (Brooks, 2003; O'Neill et al., 2010).

Adaptation measures are often focused around land use planning and emergency management, although they are also frequently multi-sectoral and multi-dimensional, crossing multiple systems and institutional boundaries (Kirshen et al., 2008a,b). The maintenance and protection of infrastructure to sustain impacts of climate change is one piece of this planning (Revi, 2008). In addition, other sectors such as transportation and energy are engaged in adaptation planning in many cities, resulting in ripple effects across a variety of policy domains (Viguié and Hallegatte, 2012). Cities make decisions about adaptation within the context of these and other disaster-specific needs. For instance, Los Angeles has a long history of planning for and risk of earthquake events. Decision-making regarding the investment of funds in preparedness for these events may be weighed with climate-related events that are more or less likely. This is true of all

the cities in this study. However, while emergency planning and land use experts were interviewed for this research, they are part of the overall picture of climate adaptation that includes multiple other sectors (Lemmen and Warren, 2004). This approach is based on the argument that diverse sectors must be integrated for the most effective adaptation measures (Fussel, 2007).

This research takes a multi-sectoral approach to investigating the factors affecting climate adaptation in six cities across the United States with the aim of beginning to explain why there are varying levels of action. We interview decision-makers who are often the social actors assessing risk and making decisions about preparedness. We maintain a greater focus on public sector stakeholders since policy instruments are often critical to climate mitigation and resilience (Zahran et al., 2008). By conducting in-depth interviews in multiple study sites, this research identifies factors driving change within a particular locale and also validates the importance of these factors across urban locale. We find that there are three type of factors that we label in the following ways: (1) swing—characteristics of or events within localities that can lead toward or away from action; (2) inhibitors—ways of thinking and framing climate change available to decision-makers that slow, but do not necessarily stop change; and (3) resource catalysts—types of information and moral grounding that provide a rationale for change.

This article seeks to advance adaptation knowledge and practice by articulating the social, political, and economic problems that stand in its way while also offering insight into related factors that can help move adaptation forward. It is one of the first studies to analyze climate adaptation actions in American cities and to provide evidence for what factors influence implementation.

2. Material and methods

This study was based on sixty-five in-depth, semi-structured qualitative interviews of local decision-makers working in the cities of Tucson, Arizona; Tampa, Florida; Raleigh, North Carolina; Boston, Massachusetts; Portland, Oregon; and Los Angeles, California. Interviews were conducted during the winter of 2011–2012. Cities were selected based on their diversity of size, geographic region, stage of planning for climate change (see Table 1).

Interviewees were identified through a purposive sample where specific individuals are asked for an interview (Oliver, 2006), beginning with key local government officials and non-governmental representatives involved in climate change or environmental planning. These interviewees were supplemented by a snowball sample to identify individuals across sectors who participate in climate adaptation activities in each city. A snowball sample allows the first set of interviewees to identify subsequent research subjects with relevant knowledge and experience. As

Table 1
City characteristics.

City	Population	Major disaster declarations through 2013	Reported level of public concern	Reported level of academic resources	Reported political leaning	Planning stage ^a
Portland	603,000	29	Very high	Medium	Democrat	Advanced
Boston	630,000	29	Medium	High	Democrat	Mid–Adv
Los Angeles	3.8 mill	79	High	Medium	Democrat	Mid
Raleigh	423,000	43	Medium	High	Conservative democrat	Early–Mid
Tucson	524,000	23	Low–Med	High	Conservative democrat	Early–Mid
Tampa	347,000	67	Low	Low	Republican	Early

^a Stage of planning was qualitatively determined based on how much planning and implementation had been executed. Early = little to no planning; mid = some planning, but no implementation; advanced = planning and some implementation, at minimum. Planning includes adaptive plans only. Mitigation measures were not considered.

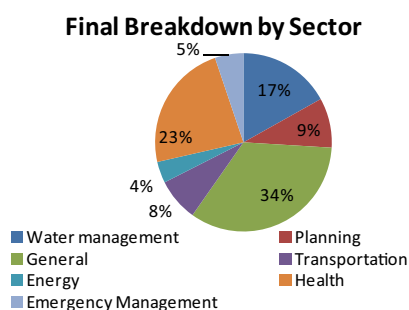


Fig. 1. Interviewee characteristics.

Atkinson and Flint (2001) describe, this method allows a researcher to access a particular social network, especially in a situation where the potential interviewee group is small or difficult to access. This approach may also result in more honest answers to research questions since interviewees are more likely to trust a researcher referred to them by a friend or colleague (NSF, 2005). There were a total of 65 interviewees who crossed sectors and affiliation. (see Fig. 1 for areas of work.) Interviewees were fairly evenly situated in five sectors – non-governmental organizations (25%), city government (23%), county or regional governments (18%), academia (18%), state government (13%) – with an additional 3% in the private sector. This limited number of interviewees in the private sector is one of the central limitations of this research, which may mean some types of adaptive measures have not been fully explored. Overall, the limited number of interviewees in each city means that the range of the adaptation experience within each city may not be fully represented.

Interviews were conducted in person and over the phone when necessary. Each interview was recorded and subsequently transcribed. All 65 transcripts were then imported into the qualitative software program QSR NVivo Version 10. Transcripts were simultaneously coded and cross-checked by three analysts from May to July 2014. Transcripts were coded using nodes, which organize selected information into categories. In total (across all three researchers and projects), there were 45 nodes. This analysis utilized 20 of the 45 codes (numbered below) (see Table 2 for a list of interview codes).

Analysis was conducted using NVivo 10. Transcripts were coded then common themes and interesting findings were identified based on the frequency or relevance with which similar phrases/concepts were mentioned across sectors working in the same cities. All uncited quotes in the results section are drawn from these interviews.

3. Theory

Assessments of how adaptation occurs in industrialized nations only preliminarily account for the social processes that might drive such measures. Factors functioning on the scale of the locality and on the scale of the individual are both potentially influential factors shaping adaptation outcomes. Social factors have been broadly acknowledge as equally important to ecological factors in shaping adaptation outcomes (Moser, 2010). For example, researchers have claimed that demographic, cultural, and economic exchange affect adaptation (Adger, 2000). Additionally, internal resources, incentives, ideas and knowledge motivate adaptation (Carmin et al., 2009). Fussel, (2007) and others have demonstrated that awareness of the problem, availability of effective adaptation measures, information about these measures, availability of resources for implementing measures, cultural acceptability of adaptation, and incentives for implementing measures all affect how adaptation takes place (Fankhauser et al., 1999). Values also

influence which adaptation options are considered desirable and prioritized (O'Brien, 2009), and so policy-makers face challenges in their need to account for multiple value systems within their constituency (O'Brien et al., 2009). Broader responses to climate change may also affect the capacity of adaptation programs. For example, in developing countries, international policies and pressures have long been seen as the primary drivers of local climate measures (Anguelovski and Carmin, 2011).

Public awareness of and perception of climate risks has also represented an important dimension of influence. Research in Mozambique demonstrated that the level of information received, the number of sources from which information is received, and whether people have access to a reputable daily newspaper influenced the likelihood of implementing adaptive measures (Patt and Schröter, 2008). In addition, psychological factors such as feelings of control, optimism, and fatalism appeared to have an effect on likelihood of implementation (Patt and Schröter, 2008). More generally, perceptions of climate change and its associated risks affect willingness to accept adaptation and mitigation strategies (Semenza et al., 2008). This may mean that popular opinion on climate or political affiliation could be potentially important factors in adaptation measures.

Extreme weather events have often been cited as a motivator for political action, yet little research has yet to investigate how these events might drive adaptation actions (Linnenluecke et al., 2011). Some research has shown that an increased risk of experiencing extreme weather events may encourage the implementation of adaptive measures (Berkhout, 2005; Næss, et al., 2005). For example, research from Norway based on responses to a series of severe floods that took place in 1995 found that extreme events inspired the implementation of over \$73 million worth of adaptive measures (Næss et al., 2005; Amundsen et al., 2010). Other findings demonstrate that such events actually decrease the likelihood of adaptation (Patt and Schröter, 2008).

Moser and Ekstrom (2010) have offered a theoretical model that outlines the appearance and address of climate adaptation obstacles. Their complex, multi-phased process focuses on five factors that are critical throughout the process: the role of leadership, access to both financial and technical resources, the need for effective communication, and the role of values and beliefs that can shape cognition and actions. We see these factors being important in both the lay public that attempts to influence decision-makers through advocacy and in scientists or experts

Table 2
Interview codes.

Major code	Sub-code
Interviewee background	(1) Area of expertise/work (2) Sector
Limitations and obstacles	(3) Knowledge (4) Competing agendas (49) Communication (6) Other
Collaboration	(7) Scientists and/or experts (8) Cross-institutional (9) Stakeholder engagement
Leadership	
Awareness of and/or advocacy for climate change	
Extreme events	(12) Perception (13) Impacts and/or perception of impacts (14) Severity of events
Motivation for change	(15) Frequency of events (16) Economic resources (17) Other
Planning	(18) Current (50) Future (20) Implementation of plans

who might advise decision-makers. The lay public perceptions of climate are influenced by a variety of psychological and social factors including personal experience and emotion as well as moral, economic, institutional, and cultural processes (Leiserowitz, 2005). Policymakers are influenced by these social factors characterizing the lay public. Local decision-makers also receive advice from scientists or experts who could be classified as “boundary actors” and the institutions in which they work, “boundary organizations,” a set of institutions otherwise suggested as playing an important role in the iterative process of designing and implementing adaptation efforts in cities (Corfee-Morlot et al., 2011). It is important to note, however, that scientific presentations of climate change may be quite different from that of the lay public (Leiserowitz, 2005). They may influence stakeholder and policy-maker perceptions of danger by identifying quantifiable, measurable goals for estimating risk and risk reduction associated with mitigation and adaptation (Leiserowitz, 2005). In this research, we investigate how these factors of perception, politics, scientific resources and other factors may drive adaptation.

4. Results

4.1. Climate planning status in the case study cities

Our study sites, like most cities across the United States, have varying levels and types of climate planning. Based on what interviews revealed about the past and current climate planning, these cities can currently be categorized as most advanced to least in the following order: Portland, Boston, Los Angeles, Tucson, Raleigh and Tampa. This ranking is based on a qualitative assessment of climate mitigation and adaptation planning, as well as implementation of these plans. Portland and Boston have been conducting work on climate change since the early 1990s, first focusing on climate mitigation. Both cities have conducted greenhouse gas (GHG) inventories and implemented policies to reduce GHG emissions. Both cities began adaptation planning in the early 2000s. Los Angeles began mitigation planning and implementation about a decade after Boston and Portland, and followed up more rapidly with investigating how adaptation might be added on. None of these cities have implemented their adaptation plans, although all of them have begun specific measures that fall inside the realm of adaptation.

The other three cities lag in their adaptation efforts. Tucson has invested in some climate mitigation work and has begun the initial stages of adaptation planning, while Raleigh and Tampa have executed very little in climate mitigation or adaptation planning. Yet, the formal representation of each city belies a more nuanced set of social processes. In Tucson, interviewees expressed great concern about the impacts of climate change, and local NGO leaders are particularly exploring how to address risks such as species migration and food scarcity. For Raleigh, innovations in mitigation and adaptation have taken place in the state of North Carolina more broadly, especially regarding sea level rise and water scarcity. For Tampa, some adaptation has occurred without official approval of the city, particularly around water and health affects of climate change.

In these cities, action on climate change generally began with mitigation activities then developed into adaptation. However, even in places where public officials were generally concerned about climate change, most effort has gone into mitigation. We begin to explain why this might be in the sections below.

4.2. Swing factors

4.2.1. Extreme weather events

Previous research has shown extreme weather to both encourage and inhibit adaptation responses. This research helps

explain why such events can lead in both directions. Comparing the cases of Tampa and Los Angeles demonstrates that extreme weather events alone do not drive climate adaptation. Although Tampa has not experienced a hurricane in 93 years, it is the most vulnerable city to hurricanes in the United States (Freedman 2012). Over 125,000 Tampa area residents live below the 100-year flood height of approximately 6.5 feet (Freedman 2012), placing every person and building in the area at a severe risk of flooding in the case of a hurricane. The odds that Tampa will experience a hurricane that exceeds the flood height are estimated at over 20%, and likely within the next five years (Freedman 2012). Tampa's last hurricane, which occurred in 1921, reached a maximum storm surge of over 10.5 feet (Freedman 2012). Despite this evidence suggesting impending hurricanes in the Tampa area, residents and local decision-makers remain largely unalarmed. One interviewee explained that the threat is normalized:

People just don't believe. They just flat outright don not believe it. [. . .] Here you have whole government systems in denial because it's insidious; it's so slow that it becomes normal over the course of time. I think that we tend to be reactive in what we do, that we have some sort of adverse outcomes. But I think it is going to take large events of certain magnitude in order to hit a trip wire.

Interviewees claimed that hurricanes are viewed as normal aspect of life in Florida, and, as a whole, citizens of the Tampa area are still largely undecided about whether climate change even exists. One interviewee expressed this perspective:

Almost three or four years ago, we had four hurricanes that hit Florida. I think we had three weeks when we had no power in our house. But when you live here, you get used to that. People are in just massive denial.

Because hurricanes have historically always been an issue in Florida, decision-makers deny that climate change exacerbates the effects of these storms and, for the most part, deny that climate change exists entirely.

The public doesn't pay attention to it because of the controversy of whether it's real or not. The fact that they called it global warming for so long was a complete misnomer, and that detracted from what was really happening.

Los Angeles, California is also similarly disaster-prone to droughts and subsequent wildfires simply due to its semi-arid climate and natural vegetation coverage. Historically, the Los Angeles region has experienced some of the most costly and deadly wildfires ever recorded in the U.S., and recent modeling predicts that the Los Angeles area will continue to experience regular wildfires (CALFIRE, 2013). In 2009 alone, the state of California experienced over 8200 wildfires that burned a total of over 93,000 acres, and estimates through the year 2020 suggest that wildfire incidence will increase significantly as the average global surface temperature continues to rise (CALFIRE, 2013). Unlike Tampa, however, Los Angeles's predisposition for natural disasters like drought, wildfires, and even earthquakes has not desensitized decision-makers but rather has inspired them to make adaptive changes via the creation of numerous climate action plans and policies.

Within Los Angeles County, we're developing three separate climate action plans [. . .] We included in that plan emergency preparedness—and a part of emergency preparedness was climate adaptation and climate change. [. . .] In addition to climate action plans for the entire region, cities and counties have now taken the attorney general's actions and everybody is accounting for greenhouse gas mitigation in their local jurisdictional general plan.

Interviewees claimed that at least partially because of the regularity with which Los Angeles experiences disasters, the city is well prepared to react, and many sectors (such as the fire department, public health departments, and hospitals) are highly integrated and informed of their specific roles in disasters.

We have a really, really well developed emergency management system because [we] know we're going to have a huge earthquake that is probably going to demolish downtown . . . A lot of this work has been going on for years and years, but now we're trying to build adaptation and mitigation considerations into the emergency planning as well.

The dichotomy of Tampa and Los Angeles – two disaster-prone cities – and their adaptive plans poses a key question in regards to what motivates decision makers to implement adaptive disaster strategies. These findings suggest that geographic predisposition/increased risk of climate-related disasters is not the sole determinant of adaptive capacity or even the main factor influencing a city's likelihood to adapt. It also suggests that risk is perceived differently depending on the climate change culture of the individual city (among other factors). In the following sections, we explore some of these factors.

4.2.2. Political Culture

Research suggests that political culture has a strong influence on a community's likelihood of implementing adaptive measures (Dunlap 2008). Interviewees in all cities often mentioned political will and local political culture as an important motivating factor to consider. These interviews offer the beginnings of an assessment of how politics and political culture affect adaptation; however much more data would be required to capture the full breadth of how this works in any one city. Therefore, two of our cases – Tampa and Portland – offer a basic understanding of how some multi-sectoral stakeholders see political culture affecting their work.

As previously discussed, the city of Tampa is vulnerable to climate change and associated extreme weather events. Despite this risk, Florida's political representatives are largely unconcerned about climate change. As a historically republican state, politicians in Florida often create campaign platforms based on conservative values. Interviewees in political positions suggested that politicians and leaders rarely discuss the existence of climate change or make environmental issues central to their platforms. One said:

Local governments do not acknowledge that climate change is going to cause problems. I think that the way we start to transform it, you have to have a change in political will. [. . .] With election season, people who are a certain type of Republican are going to hold to the party line, especially on something like that [(climate change)]. It is too controversial.

Non-governmental decision-makers often felt that without some level of political openness, their capabilities were limited. Interviewees in Tampa stated that political leadership there had a significant influence on the media, and citizens are exposed to large-scale denial campaigns that are politically supported and corporate-funded.

I think when it's climate change and you are trying to advocate, you've got a whole group of people who are very vocal and are very articulate about [how] it's a huge myth. And my sense is they are a lot better organized, because they are funded by various groups to get out there and make those cases. [. . .] If you can't counter the message of the conservative media and the corporate control of it, then there's nothing you can do.

Interviewees in Tampa overwhelmingly claimed that, mainly due to the lack of political buy-in regarding climate change, their city remains one of the most vulnerable and least prepared cities in the country.

Portland offers an alternative example to Tampa in terms of public support, advocacy and action on climate. Interviewees described its political culture as the opposite of Tampa. It is a historically democratic region with environmentalism and climate change adaptation being openly discussed by Portland political leaders and citizens.

There's a high expectation on the part of the public that their elected officials take these issues seriously, and there's just a very strong environmental ethic. There's an expectation on the part of the public that our elected officials are adopting policies and moving programs forward that are progressive. And [if] no one has ever done this before, [it] is usually seen as a sign that we're on the right track.

Politicians bring climate change mitigation and adaptation to the forefront of policy because Portland citizens view them as important topics despite their low risk of experiencing extreme weather events. The city has been steadily implementing climate change mitigation measures for almost twenty years. They have engaged in the following activities: setting aside farm/forestland, implementing green spaces and community gardens in the city, ensuring walkable neighborhoods, providing public transportation choices, all in an effort to "go green".

There's sort of a natural thing in Portland that we try and do a lot of this stuff anyway. [. . .] It started 20 years ago. They [(decision-makers)] try to set it up so that the city emerges and grows in a way that is what is envisioned to be a good city.

Portland's geographic location in the Pacific Northwest is protective against climate-related extreme weather events, and local decision makers acknowledge there they are at very low risk for disaster. Despite this, interviewees argued that Portland's political leaders aim to be the nation's leader in climate change preparedness and adaptation, partly for the benefits that "going green" can have on their property values and their job market.

Other case study cities reflected that, like in these two cities, political culture is an important social factor that affects climate adaptation. Simply put, while the largely politically conservative cities of Tucson and Raleigh have a low level of climate activity and high risks of climate-related water risks, the more liberal cities of Boston and Los Angeles have a much larger climate adaptation portfolio. Other factors intervene in climate adaptation as well. The following sections investigate some of these factors.

4.3. Inhibitors

Our interviewees highlighted two interrelated inhibitors to climate adaptation: scientific uncertainty and politicization of climate change. This supports previous research showing that scientific uncertainty a common challenge in addressing climate change (Dessai and Hulme, 2004). Interviewee data demonstrated more specificity to this overall challenge. Interviewees focused specifically on the need for particular kinds of science like localized data, case studies that reflected success stories they could follow, and concrete cost-benefit assessments that would allow them to justify adaptation-related expenditures. Politicization of climate change was also often raised. This finding adds a new dimension to adaptation research. Politicization was generally related to lack of broad public understanding of the issue and lack of political support within government institutions.

4.3.1. Scientific uncertainty

Adaptation programs and policies generally stem from scientific assessments that outline adaptation needs (Carmin

et al., 2011). Yet, these types of assessments are often unavailable to those who need them. In addition, when scientific assessments are available, scientific uncertainty is often a problem. Such uncertainty was mentioned in every city as a challenge to implementing adaptation. Uncertainty was often raised first when interviewees were asked why adaptation programs were not moving forward. For example, when asked about why his local government had not implemented adaptation programs, one interviewee said: “It was hard to get people past that ‘Well, we do not know what the impacts are going to be, so why are we talking about this right now? We should wait.’” Another interviewee in Boston said: “adaptation is trickier [than mitigation], and there’s not a clear science of adaptation yet.”

Even in cities where interviewees were cognizant of and acknowledged the pending impacts of climate change, they felt unable to identify what, exactly, would happen in their locale. As one interviewee said in an attempt to explain his city’s inaction:

We don’t have a vast amount of data and information available to us that is at a regional or local level so we still have a lot of fairly big generalities and pretty wide ranges and a lot of uncertainty about what exactly we think is going to happen.

Alternative approaches to adaptation, such as vulnerability assessments, developing flexible response systems, and engaging with experts who can advise officials even before scientific assessments, are available and have been attempted in many locations (Dodman and Carmin, 2011). In this research, of the above options, interviewees only mentioned the role of scientists as advisors on adaptation as a viable option for planning adaptation.

4.3.2. Politicization

Denial and politicization has been cited as a critical problem inhibiting the formation of action on climate change (Norgaard, 2011). In every of the case study cities, interviewees talked about the influence of climate change politicization both within government agencies and amongst the general public. They identified both types as inhibitors to adaptation. Politicization was defined as decision-makers who either questioned the existence of climate change or who did not know much about it. The factors of ignorance and disbelief often appeared to be interrelated. As one official in Tampa said:

We don’t know enough about it. There’s just not enough information and it’s become so politicized, that it’s difficult to—in this environment, with the political landscape the way it is, it’s difficult to know who’s telling the truth, or who’s using propaganda and this is just their method of a scare tactic.

She continued to say that these factors affected her ability or interest in incorporating climate change into city planning.

In other instances, interviewees were skeptical of adaptation programs because they felt that climate change was too contentious an issue for the broader public to believe much of the existing evidence. Interviewees felt that the politically-debated nature of climate change made it difficult for them to advance new programs or policies in their cities. Even in Portland where there was wide-scale support for climate, one interviewee said it was difficult to develop climate adaptation:

...especially with the climate that we have here in America about the, you know, the paid disinformation campaigns that are going on. So I think that’s one of the challenges, and we try to respond to it, and I guess the saving grace is, as I said at the beginning, is that the actions we’ve taken to improve our quality of life . . . have a huge support from the public...

4.4. Resource catalysts

4.4.1. Advocacy and political engagement

A common theme across interviews was the importance of public values in environmentalism and beliefs regarding climate change. Often, public buy-in was encouraged by historical public awareness of environmental issues. This was most clearly the case in Portland and Los Angeles, and was cited as playing an important role in both cities becoming leaders in climate change adaptation and mitigation. As one interviewee in Los Angeles said:

In terms of political influence, environmentalism is a close second to labor in terms of its relevance to the region . . . The politics aren’t as big a deal and environmentalism is a very strong value.

Similarly, a Portland interviewee said: “I think a community that understands this issue and demands action from leadership is really a huge part of it. [. . .] We have a very engaged public.”

Interviewees from Los Angeles and Portland discussed climate change action being a moral imperative, rather than simply a protective measure. They often stated that that adopting policies and taking part in activities that reduce risks for current and future generations was simply the right thing to do. As one Los Angeles interviewee described: “There seems to also be a moral imperative of what are we doing for the future: ‘What is the legacy we’re passing on to our children and their children?’” Very similarly, an interviewee from Portland described how this moral imperative is a constant motivation for action:

People do want to do the right thing. People here recycle at huge rates; we have pretty high bicycling ridership for America. We have a good transit system that the public supports over and over again, and the question is, you know, how do we take the next step?

Portland has been taking steps to mitigate climate change for roughly 20 years, and the state of California enforces some of the strictest emission rules in the country. Both Portland and Los Angeles have implemented plans for adaptation and are continuing to plan for future events.

Interviewees stated that the high level of interest and involvement in climate change issues stems from public acceptance of climate change as an important issue and subsequent pressure on decision-makers. This was true across other cities as well. Yet, there were obstacles to the role of advocacy in other cities. In some cases, interviewees stated that citizens tended to accept and understand climate change, but that they perceived it as a global issue with few consequences that would affect them personally. For example, one interviewee in Boston said in regards to the assessment he had done of local perceptions:

People were fairly well aware of climate change and the global issues, although there were the standard misconceptions. We found that they seemed to understand its impact and [that] it also has impacts on society, but there was really not much of an understanding of what it meant locally to them individually and what they should do about it.

4.4.2. Academic resources as a motivating factor for change

Researchers have called for increased linkage between decision-makers and scientific information in order to facilitate adaptation (Moser et al., 2008). The development of relationships between local experts with government agencies involved in adaptation has been suggested as an intermediary approach to adaptation before solid scientific evidence is available to pinpoint specific climate outcomes (Dodman and Carmin, 2011). This research attests to the importance of these kinds of resources. Local experts who could advise government institutions were referred to as critical in facilitating adaptation efforts in several ways. Local

universities where researchers specialize in climate change and local non-governmental organizations that conduct research were the most common points of reference by government officials working on adaptation planning. For example, in Boston the work done by Massachusetts Institute of Technology and the Union of Concerned Scientists played important catalyzing roles in helping local officials understand what might happen in their city.

Academic resources such as nearby universities and research centers influenced the development of adaptive measures. This was particularly evident in Boston, Raleigh, and Tucson. Research produced by institutions in our case study cities, such as Harvard University, the University of North Carolina, and the University of Arizona, for example, was often mentioned as invaluable to surrounding communities in assessment of risk, vulnerability, and adaptive capacities. Many interviewees cited specific institutions as contributing factors to implementation of adaptation measures occurring within their cities. For example, in Boston, one interviewee said:

I think having the Union of Concerned Scientists and several major universities in the area is also a really big driver. You know the fact that there are studies that specifically looked at the city, that really sort of provides detailed information is a helpful driver as well.

Despite the generally low level of preparedness in Raleigh, interviewees pointed to local academic resources as one of the most important factors in moving them closer to addressing climate change. Participants also often made a link between the presence of academic institutions and a consequently more educated general population. In several cities, interviewees cited academic resources as a reason climate change is now becoming an issue of interest among their citizens. For example, one interviewee in Raleigh said:

There's a high level of education and so I think that creates a higher awareness level, if you will. I could honestly say that you would probably be able to find a higher percentage of people in this region who would be willing to agree [that climate change poses an immediate threat] just because of the education.

However, academic resources can also fall on deaf ears. When there was a general disregard for climate change by political leaders, experts felt as though their work was disregarded. As one expert interviewee said:

Unless you have a champion of a certain level, all professors are viewed by the legislature as being in ivory towers . . . we 'aren't in touch with policy issues' . . . we 'don't understand the implications [of] how it affects populations'. It's easy, in some ways, to discredit what we put out there.

5. Discussion

We find that there are three types of factors that play a role in urban climate adaptation in the United States: swing factors, inhibitors, and resource catalysts. First, swing factors, including extreme weather events and political culture, can play a role in motivating or inhibiting action. We name these factors swing factors because their role in supporting or inhibiting change depends on their context. This finding supports both sides of past research that demonstrate extreme weather events motivating or inhibiting climate change. These events drive change when they interpreted as threats. This was the case in areas with more liberal climate attitudes. These events inhibit change when they are normalized and not interpreted as climate-related, as took place in Tampa. Extreme events were therefore a swing factor that interacted with the second swing factor we identified—political culture. Political culture also acted both as an inhibitor or catalyst for climate adaptation with

conservative areas being less likely to adapt and liberal areas being more likely to undertake such activities. While this is possibly unsurprising, it is important to note that this may mean that conservative areas will be less prepared for the impacts of climate, and therefore sustain more costs from these events.

Second, inhibitors, or scientific uncertainty and politicization that affect the thinking of decision-makers and framing of climate change, may slow, but do not necessarily stop change. Politicization was often cited in Tucson, Tampa, and Raleigh, in particular. Interviewees often referred to this as climate change becoming a political, rather than a scientific issue, and then referred to as a possible, but not definitive problem. Scientific uncertainty and politicization often overlapped as interviewees claimed that one might lead to the other, and that both resulted in the slowing of action on climate adaptation. A central concern was a lack of trusted information regarding clear outcomes of climate change for which decision-makers could plan.

Third, resource catalysts were public interest or advocacy and academic resources that provided a scientific rationale or moral grounding for change. The results of this study suggest the critical importance of resource catalysts such as public engagement. Our interview data demonstrates that a city's stage of climate change adaptation may correspond to the public's engagement in the issue. For example, in Los Angeles and Portland, decision-makers generally felt that a majority of the citizens accepted the existence of climate change, often pressuring politicians and decision-makers to address, which gave them the support to plan for adaptation. Boston, Raleigh, and Tucson, in contrast, were in the early to mid stages of public acceptance of climate change, and decision-makers in these three cities stated that public perceptions vary greatly throughout their populations. Our findings regarding resource catalysts also suggest that academic buy-in may precede public buy-in in places that are historically less environmentally-friendly/more politically conservative.

Overall, swing factors, inhibitors, and resource catalysts often interact, although the specific pattern of interaction varies.

6. Conclusions

This research demonstrates several important social factors that affect adaptation planning and implementation. They include the interpretation of extreme weather events, the role of political context, public awareness, politicization of climate change, and scientific uncertainty. As such, it offers a broadened conceptualization of what drives or inhibits cities to adapt. It also represents the first extensive qualitative investigation of American urban adaptation. While its scope is limited both in case study numbers and depth of investigation per city, it offers several findings useful to practitioners in advancing climate adaptation. First, since politicization of climate change can be directly related to scientific uncertainty, advisory scientists who can work across the boundaries of science and policy-making may play a critical to adaptation programming. In the case study cities, these kinds of experts were more useful than alternative vulnerability assessments or other experimental approaches to identifying climate impacts. On a related note, public education that leads to awareness and understanding of climate change may play a critical role in supporting adaptation measures at the city level. Second, interviewees demonstrated that extreme events can be moments in which there is motivation to address potential climate impacts, if they are interpreted as representing future risks by policy-makers. This interpretation may depend, however, on the aforementioned understanding of climate change by policy-makers and the public. Third, these findings indicate that conservative cities may be slower to adapt, resulting in higher risks of climate impacts.

This research is only an initial investigation of the social factors relevant to climate adaptation. There are many others to which future researchers might draw attention. Overall, the results of this study suggest that a city's likelihood for implementing adaptive measures is influenced by several previously unexplored social factors. This study also begins to indicate which cities in the U.S. are likely to adapt, and which are likely to be worst off, simply because of the social factors that affect the likelihood that they will adopt adaptation measures. Considering findings in this research may help guide where and how resources should be directed when attempting to prepare for climate impacts.

Acknowledgements

The authors would like to acknowledge the support of the Environmental Protection Agency (EPA Contract #IP-C-09-009, Work Assignment #2-63) for this research, and the insights of one anonymous reviewer.

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CITY OF PORTLAND, OREGON

April 9, 2015

William Stelle Jr., Regional Administrator
NOAA
NMFS
1201 NE Lloyd Boulevard, Suite 1100
Portland, OR 97232

Dear Mr. Stelle,

We received a copy of the March 9, 2015, *Draft Reasonable and Prudent Alternative and Incidental Take Statement for our Biological Opinion on Implementation of the National Flood Insurance Program in the State of Oregon* (RPA). We know that it is not out for public review but we would like to take this opportunity to provide you with some initial feedback. In addition, we would like to request a meeting to clarify elements of the RPA and discuss other possible approaches to compliance (e.g., a 4(d) limit or Section 10 permit).

The City of Portland is committed to assisting in the recovery of endangered species. We are currently updating our Comprehensive Plan, Central City Plan and Climate Action Plan and recently adopted its first Climate Change Preparation Strategy. These plans call for improved resilience to climate change and natural hazards and recognize the floodplain as providing significant ecological function. They also call for improving the Willamette riverfront to further multiple city goals and comply with statewide planning goals.

We support NOAA and FEMA in formulating effective RPAs that are both protective of endangered species, and that can be implemented and enforced in a consistent manner across multiple jurisdictions. The proposed RPAs will have a significant impact on property owners and National Flood Insurance Program (NFIP) communities. It is important that the RPAs are clear and that they can be effectively implemented and enforced. Toward this end, NFIP communities can provide valuable input that will ultimately result in better and more consistent outcomes for endangered species.

Portland has a unique perspective on the relationship between floodplain regulations and salmon recovery. As a Class 5 CRS community, we take steps to manage development, preserve and restore floodplains as open space and provide information to the community about the importance of floodplain functions. The City also coordinates the review of all city projects along its rivers with a team of City, state and federal agency staff to ensure that our actions are consistent with the suite of permits required for salmon recovery. The City has been exploring ways to host a similar forum for private development applications in our continued commitment to achieve smarter development and healthy watersheds.

This letter includes feedback on the three questions outlined in your March 9 letter to Mark Carey. These questions relate to application of the RPA to built out/developed floodplains, how

to describe the extent of incidental take associated with these regulations, and how to determine the channel migration zone within highly developed areas.

In addition, we offer some suggestions to help clarify the document, highlight some of the issues that we envision facing with implementing the document as written, and raise some concerns we would like to discuss with you.

Responses to questions presented in the March 9 letter

RPA Question 1: NOAA is looking for feedback on how to apply the RPAs to built out/developed floodplains vs more intact/less developed floodplains.

Portland Response: We agree that already developed floodplains should be regulated differently than undeveloped areas. We also support including provisions that would result in incremental improvement of floodplain function through redevelopment.

The City of Portland has adopted a Natural Resource Inventory (NRI), which identifies specific functions and assigns relative ranks to significant natural resources in the city, including flood areas. The NRI has helped inform policy discussions and decisions regarding the appropriate level of protection for different flood areas. The City's NRI is based on a regional NRI adopted by Metro in conjunction with Title 13 of the Regional Urban Growth Management Functional Plan. The NRI assigns different scores for riparian functions and relative ranks, depending on the condition of the floodplain — primarily whether it is forested or otherwise vegetated, or non-vegetated (aka "developed").

Further, the City's existing environmental regulations contain exemptions for development in natural resource areas if the development project would be located within existing paved areas and would not exceed the existing development footprint. These environmental regulations also provide an incentive for enhancement on development sites where disturbance standards have already been exceeded. The environmental site enhancement standards allow development within existing disturbed areas without a discretionary land use review if the project will also include site enhancements (e.g., removing invasive plants and planting native trees and plants, reducing pavement or upgrading stormwater systems or paying into a fund for revegetation). We believe that this approach can lead to improvements in floodplain function and flood fringe vegetation.

The RPA could incorporate similar types of enhancement standards or streamlining approaches that would leverage development projects to incrementally improve floodplain conditions over time. The RPA could also incorporate provisions requiring a certain percentage of project cost be committed for floodplain restoration.

RPA Question 2: NOAA is looking for feedback on what metrics to use to describe the extent of incidental take, and whether the draft acreages by county reflect the amount of development likely to occur.

Portland Response: We appreciate the candid explanation of how difficult it is to estimate "take" and proposing the concept of clear metrics as a proxy. This will reduce uncertainty and unintended liability.

But first, it seems appropriate to establish metrics related to watersheds or hydrologic units with the appropriate Evolutionarily Significant Unit(s) (ESU) rather than to jurisdictional (i.e., county or city) boundaries. Once established, the acreage limits could be allocated to and

reported on by county or city, if desirable from an administrative perspective. It will be important for FEMA to provide tracking/reporting protocols and tools that are simple to use, even for small jurisdictions. Otherwise, the data collected will be inconsistent in terms of content, format, quality and comparability, and it will not be useful for monitoring or enforcement. The approach by county also dilutes differences/impacts, particularly in the Portland Metro region where three counties cover 26 distinct jurisdictions each with their own land use and development standards.

Second, it is challenging to estimate the acreage of total floodplain development expected over time and to compare that estimate with the acres provided in Table 2.9-2. It is unclear whether the acreage limits apply to new development of undeveloped floodplain, or if they also apply to new development or redevelopment on the existing developed floodplain. For example, in the Portland Harbor and Central City, much of the floodplain is developed and has been filled or highly disturbed. It is unclear how development or redevelopment within the developed floodplain, which could potentially be leveraged to improve floodplain function, should be counted against this acreage.

We are currently doing some analysis of potential future development within the floodway, 100-year floodplain and 500-year floodplain to get a sense of development potential over the next 20 years as part of the update of our Comprehensive Plan. However, it is difficult to estimate development beyond that timeframe.

Third, while we recognize the need to limit harm, we ask NOAA to consider providing development credit for proactive restoration. It would have to be partial credit in order to sustain an improved condition; however, such a credit might provide a real incentive for restoration. It could also provide flexibility to prioritize restoration of critical habitat areas, while allowing new or redevelopment, or redevelopment in less critical habitat areas. New development, of course, can be held to higher design standards than existing development.

RPA Question 3: NOAA is requesting feedback on how to depict the Channel Migration Zone in a developed area.

Portland Response: We agree that defining a Channel Migration Zone (CMZ) is a challenge in an urbanized area such as Portland. Having a sound methodology that is applied consistently throughout the state will support the quality of the program and reduce the burden on local jurisdictions that do not have the resources or expertise to conduct the mapping. We recommend federal authorization and funding for one or more qualified agencies, (e.g., the Oregon Department of Geology and Mineral Industries, U.S. Army Corps of Engineers, FEMA, NOAA-NMFS and others), to develop CMZ maps for the Columbia and Willamette Rivers. The methodology will need to recognize and address the correlation between river levels and federal dam operation, as well as the tidal influence on river levels in the Columbia River below Bonneville Dam and in the Willamette River below Willamette Falls. The methodology should be peer reviewed for viability from ecological and engineering perspectives.

We would like the opportunity to consult with FEMA, NOAA/NMFS and others to help develop criteria and methodology that would identify and incorporate CMZ interruptions into this mapping process, including barriers created by development, transportation facilities, and levees or other flood control structures.


Additional comments

The RPA raises many issues and questions, just a few of which we set out below. We hope to meet with you to explore these and other questions.

- Please provide diagrams and/or example maps to show the scale and relationships between the different referenced areas (e.g., high hazard areas, channel migration areas, erosion hazard areas, areas of future conditions flood hazard, special hazards area). It is unclear from reading the RPAs how far they would apply beyond the currently regulated floodplain.
- Please review the RPA for consistent use of terms and include definitions for all key terms (e.g., erosion hazard areas, E Zones) to reduce confusion about areas and designations.
- The RPA recommends suspension of all permitting of any floodplain development until a determination is made that the development does not reduce or degrade remaining natural floodplain functions. Is this until the interim measures are in place? Clarification would be helpful.
- The implications of prohibiting the creation of lots that are fewer than five acres in Portland, and Oregon's more urban areas are unclear. Also, it is unclear whether the draft RPA will allow replacement of damaged structures on lots smaller than five acres.
- The RPA calls for self-sustaining mitigation. The City of Portland has a considerable amount of experience with mitigation and believes that self-sustaining mitigation would be very hard--if not impossible--to achieve, especially in urban areas.

The City of Portland would like to meet with you to talk about the details and implications of the RPA. Our Office of Governmental Relations will follow up with your office to try to schedule a meeting.

Sincerely,



Susan Anderson, Director, Bureau of Planning and Sustainability
1900 SW 4th Avenue, Suite 7100, Portland, Oregon 97201
Susan.Anderson@portlandoregon.gov, 503-823-6800



Paul L. Scarlett, Director, Bureau of Development Services
1900 SW 4th Avenue, Suite 5000, Portland, Oregon 97201
Paul.Scarlett@portlandoregon.gov, 503-823-7308



Jim Hagerman, Acting Director, Bureau of Environmental Services
1120 SW 5th Avenue, Room 1000, Portland, Oregon 97204
James.Hagerman@portlandoregon.gov, 503-823-7196

C: Federal Government
 Mark Carey, FEMA Region X

State Government
 Richard Whitman, Office of the Governor
 Jim Rue, Department of Land Conservation and Development
 Amanda Punton, Department of Land Conservation and Development

Portland City Council Offices
 Jackie Dingfelder, Office of Mayor Charlie Hales
 Matt Grumm, Office of Commissioner Dan Saltzman
 Jim Blackwood, Office of Commissioner Nick Fish
 Dora Perry, Office of Commissioner Amanda Fritz
 Timur Ender, Office of Commissioner Steve Novick

City of Portland Bureaus/Offices
 Martha Pellegrino, Office of Government Relations
 Nils Tillstrom, Office of Government Relations
 Tracy Reeve, City Attorney's Office
 Kathryn Beaumont, City Attorney's Office
 Terry Thatcher, City Attorney's Office
 Eric Shaffner, City Attorney's Office
 Linly Rees, City Attorney's Office
 Carmen Merlo, Bureau of Emergency Management
 Jonna Papaefthimiou, Bureau of Emergency Management
 Sallie Edmunds, Portland Bureau of Planning and Sustainability
 Roberta Jortner, Portland Bureau of Planning and Sustainability
 Kaitlin Lovell, Portland Bureau of Environmental Services
 Maggie Skenderian, Portland Bureau of Environmental Services
 Doug Morgan, Portland Bureau of Development Services
 Kim Tallant, Portland Bureau of Development Services

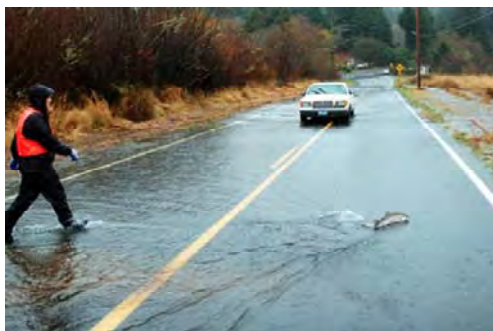
PART B
Bonnie S. Shorin

Bonnie Shorin

- Currently - Program Analyst with the National Marine Fisheries Service.
- 11 years at Ecology - Shoreline Management, Coastal Zone Management, Section 401 of the Clean Water Act, and Floodplain Management.
- Juris Doctorate from University of Oregon School of Law, certificates in Natural Resources Law and in Ocean and Coastal Law



Natural and Beneficial Functions



The NFIP's Forgotten Mandate

Which Beneficial Functions?

- Habitat Features
- Ecosystem Function
- Carrying Capacity
- Population Dynamics
- Conservation Potential

All evaluated under the Endangered Species Act

What Requirement?

Executive Order 11988 (1977)

Executive Order 13690 (2015)

Unified National Program for Flood Insurance
(1986)

Unified National Program for Flood Insurance
(1994)

44 CFR Part 9

ESA Findings Purpose and Policy

Natural and Beneficial Functions

Executive Order 11988 signed by President
Carter, states:

*Each agency shall provide leadership and shall take action to reduce the risk of flood loss, to minimize the impact of floods on human safety, health and welfare, and to **restore and preserve the natural and beneficial values served by floodplains** in carrying out its responsibilities...*

Natural and Beneficial Values

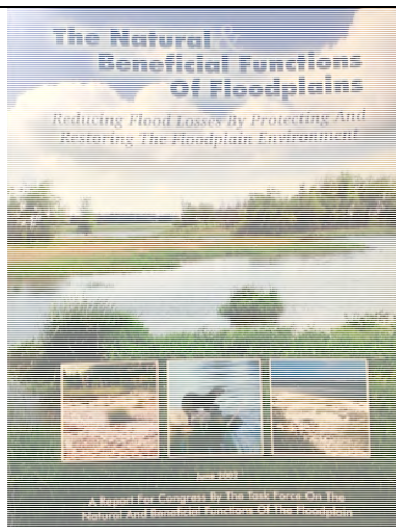
42 USC 4121(a)(12) the term “natural and beneficial floodplain functions” means (a) the functions associated with the natural or relatively undisturbed floodplain that (i) moderate flooding, *retain flood waters*, reduce erosion and sedimentation, and mitigate the effect of waves and storm surge from storms and (ii) reduce flood related damage; and (B) ancillary beneficial functions including *maintenance of water quality and recharge of groundwater*, that reduce flood-related damage...



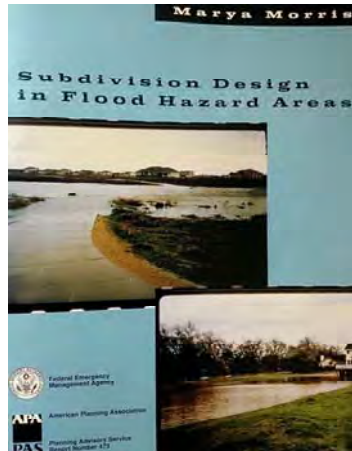
Natural and Beneficial Values

44 CFR 9.4 Natural Values of Floodplains and Wetlands means the qualities of or functions served by floodplains and wetlands which include but are not limited to:

- (a) Water resource values (natural moderation of floods, water quality maintenance, groundwater recharge);
- (b) *living resource values (fish, wildlife, plant resources and habitats)*
- (...and a couple of others on enjoyment and agricultural uses)



But they haven't really taken the concept to heart.



FEMA has stated that EO11988 and 44 CFR Part 9 do not apply to the NFIP because the program is not considered an "action"



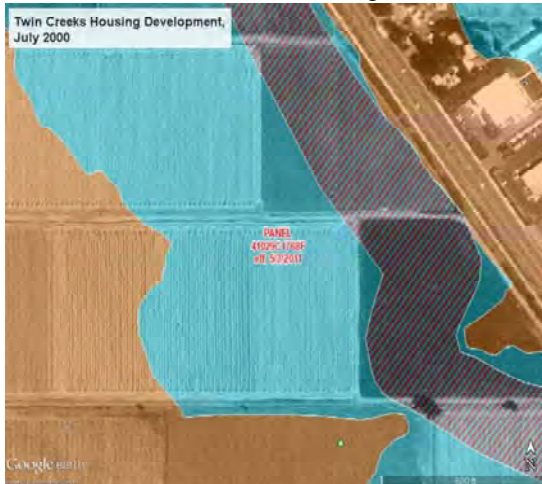
What's an "Action"

- 11988 – includes "program"
- 13690 – as defined in 11988
- ESA – includes program; includes rulemaking

What's in the Program?

- Development can occur so long as it doesn't raise the Base Flood Elevation More than 1 foot
- Development shall not include living space below the level of the base flood
- Development elevated on fill can be mapped out of the floodplain
- Development should stay out of the floodway

Central Point, Oregon





Yolo Basin, CA



Agricultural floodplains can be pretty good habitat

Industrial floodplains are pretty bad habitat

Puyallup River, WA



U.S. Department of Commerce | National Oceanic and Atmospheric Administration | NOAA Fisheries | Page 15

Juvenile Chinook
mainstem rearing

Juvenile Chinook
floodplain rearing



Fig. 7 Comparison of a single enclosure of fish reared in intertidal river habitat below floodplain (*left*) and a single enclosure of fish reared in the floodplain vegetation (*right*) after 54 days in respective habitats at the end of the second year of the study

Photo from "Ephemeral floodplain habitats provide best growth conditions for juvenile Chinook salmon in a California river" Jeffres et al 2008

So far, 29 Species Jeopardized
by the FEMA's NFIP

What's Jeopardized?

In Washington (Puget Sound) – Puget Sound Chinook, Puget Sound steelhead, Hood Canal Summer Run Chum, Southern Resident Killer Whale (SRKW)



What's Jeopardized?

In Oregon – 17 species of anadromous fish, & SRKW



What's Jeopardized?

In Florida – Key deer, Key Largo Cotton mouse, Key Largo Woodrat, Key tree cactus, Lower Keys marsh rabbit; Schaus' swallowtail butterfly, silver rice rat, Stock Island tree snail



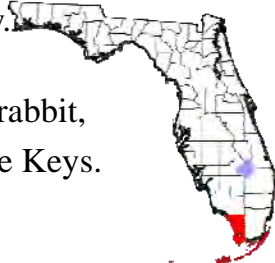
How do we get protection of natural and beneficial values into the NFIP?



Under ESA, when a Federal action Jeopardizes listed species, or Destroys or Adversely Modifies habitat designated as critical for that listed species, the Service provides its recommended **Reasonable and Prudent Alternative** to that action.

Florida RPA (per 2010 settlement)

- Monroe County, revised its permitting code, each land use project is reviewed against habitat assessment guides to ascertain areas of potential effect, and LAA projects are sent to USFWS for review.
- HCP for Key deer, marsh rabbit, and indigo snake in 2 of the Keys.



Washington RPA



12 counties, plus communities therein = 122 total participating jurisdictions

more restrictions on use of
floodplains/erosion areas

mitigation for impacts on floodplains



- 3-43

“Here, **FEMA has the authority** in its administration of the NFIP, as discussed above, **to prevent the indirect effects** of its issuance of flood insurance **by, for example, tailoring the eligibility criteria** that it develops **to prevent jeopardy to listed species**. Therefore, its administration of the NFIP is a relevant cause of jeopardy to the listed species.”

Key Deer v Paulison, 11th Circuit Court of Appeals, 2008

FEMA's (land use) Authorities

42 USC 4001(e) the further purpose of this chapter to (1) encourage State and local governments to **make appropriate land use adjustments to constrict the development of land which is exposed to flood damage...**(2) **guide the development of proposed future construction, where practicable away from locations threatened by flood hazards**

FEMA's (land use) Authorities

42 USC 4023. Properties in violation of State and local law. No new flood insurance coverage shall be provided under this chapter for any property which the Director finds has been declared by a duly constituted State or local zoning authority, or other authorized public body, to be in violation of State or local laws, regulations, or ordinances which are **intended to discourage or otherwise restrict land development or occupancy in floodprone areas**.

FEMA's (mapping) Authorities

- 42 USC 4101(b)(1)(C) the administrator shall include any relevant information on land subsidence...and **other flood-related hazards.**



FEMA's Authorities

42 USC 4121(c) the term “**flood**” shall also include **the collapse or subsidence of land along the shore of a lake or other body of water as a result of erosion** or undermining caused by waves or currents of water exceeding anticipated cyclical levels...



Sound Environmental Policy in:

- Presidential Executive Order
- FEMA's Statutes
- FEMA's Regulations
- Endangered Species Act Conservation Mandate
- Endangered Species Act Consultation Outcomes
- Common Sense (in staying out of harm's way)

Applying the NFIP criteria does not appear to reduce or avoid future flood losses



Q - If adopting minimum criteria to avoid development in floodplains 1) keeps development reasonably safe (NFIP mandate) 2) avoids costs of damage (NFIP mandate) 3) preserves natural and beneficial values and 4) avoids jeopardy, why is it so hard to get these criteria adopted?

A – Because we measure our national health by housing starts, and we manage our local government based on tax revenues generated by converting open space to development. We don't favor behavior that deals in ounces of prevention because it is hard to tally, we forge ahead, and later opine about the easily tallied pounds of cure.



CHAPTER 4

Local Flooplain Management Programs

JACKIE DINGFELDER

Policy Director for Planning and the Environment,
Mayor's Office, Portland

CHRISTINE SHIRLEY

Natural Hazards and Floodplain Specialist, Oregon Department of
Land Conservation and Development, Salem

Chapter 4

LOCAL FLOODPLAIN MANAGEMENT PROGRAMS

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Christine Shirley**

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Chapter 4

LOCAL FLOODPLAIN MANAGEMENT PROGRAMS

PART A

LOCAL FLOODPLAIN MANAGEMENT PROGRAMS IN OREGON AND THE ENDANGERED SPECIES ACT

Christine Shirley

I. INTRODUCTION

Congress intended the National Flood Insurance Program (NFIP) to encourage States and local governments to recognize and incorporate flood hazards in their land use and development decisions. The NFIP is administered by the Federal Emergency Management Agency (FEMA). While land use was a strong theme in the initial, and follow on discussions¹ (Table 1), the regulations promulgated to implement the program at the local government level focused on measures intended to minimize flood damage to the built environment, rather than on directing development away from flood prone areas. Indeed, as a condition for participation in the NFIP local government must adopt regulations that meet or exceed minimum standards set forth in 44 CFR Part 60.3, which address permitting requirements in the Special Flood Hazard Areas for buildings and other development. Optional section 44 CFR Part 60.22 addresses land use planning considerations for flood prone area. A result of this regulatory focus on the built environment is that most FEMA's guidance to local government discusses on how to permit flood resistant development in the regulated Special Flood Hazard Area (SFHA), rather than on how to avoid these areas altogether.

Also as a result of this focus on protecting the built environment from flood damage, when the ESA lawsuits were settled in the Pacific Northwest FEMA was not prepared to offer advice on how local government should address the Endangered Species Act (ESA), except to point to a provision in 44 CFR Part 60.3(a)(2) which states, "Review proposed development to assure that all necessary permits have been received from those governmental agencies from which approval is required by Federal or State law, including section 404 of the Federal Water Pollution Control Act Amendments of 1972, 33 USC 1334." In FEMA's view, this paragraph squarely places the burden of compliance with other environmental laws and regulations on the shoulders of local government.

This paper describes what the NFIP requires of local government to remain in good standing with the Program. Then we will examine the challenges of integrating these requirements with the Endangered Species Act. We end by showing how Kevin Rogerson, came to conclude, "the primary focus [of the ESA lawsuits directed at FEMA] is to force a local jurisdiction to amend its land use regulations through threatening their removal from the NFIP and inability to obtain federally backed flood insurance."²

¹ James M. Wright (2000) *The Nation's Responses to Flood Disasters: A Historical Account*. Association of State Floodplain Managers, Madison, WI

² *NWF v. FEMA* Case No. 2:11-cv-02044-RSM: *Local Impacts Resulting in the Federal Collision Between FEMA's National Flood Insurance Program and the Endangered Species Act* by: Kevin Rogerson; City Attorney for Mount Vernon, WA.*

Table 1: Floodplain Management Strategies

Strategy 1: Modify human susceptibility to flood damage: Reduce disruption by avoiding hazardous, uneconomic or unwise use of floodplains.

- ◆ Regulating floodplain use
- ◆ Establishing development and redevelopment policies
- ◆ Acquiring land to preserve open space
- ◆ Elevating or floodproofing new buildings
- ◆ Retrofitting existing buildings
- ◆ Forecasting, warning systems and emergency plans
- ◆ Restoring and preserving the natural functions of floodplains

Strategy 2: Modify the impact of flooding: Assist individuals and communities to prepare for, respond to and recover from a flood.

- ◆ Information and education to assist self-help and protection measures
- ◆ Flood emergency measures during a flood
- ◆ Disaster assistance, flood insurance and tax adjustments
- ◆ Post-flood recovery plans and programs to protect against future floods

Strategy 3: Modify flooding itself: Develop projects that control floodwater.

- ◆ Dams and reservoirs that store excess water
- ◆ Dikes, levees and floodwalls to keep water away from developed areas
- ◆ Altering channels to make them more efficient
- ◆ Diverting high flows around developed areas
- ◆ Treating land to hold as much rain as possible where it falls
- ◆ Storing excess runoff with on-site detention measures
- ◆ Protecting inland development with shoreline protection measures
- ◆ Controlling runoff from areas under development outside the floodplain

Strategy 4: Preserve and restore natural resources: Renew the vitality and purpose of floodplains by reestablishing and maintaining floodplain environments in their natural state.

- ◆ Regulations to steer development away from sensitive or natural areas
- ◆ Development and redevelopment policies
- ◆ Land acquisition and open space preservation
- ◆ Information and education on how to protect natural floodplain resources
- ◆ Tax adjustments for preserving or restoring lands to their natural state
- ◆ Beach nourishment and dune building

Figure 3-2: Floodplain Management Strategies and Tools

Source: *Unified National Program for Floodplain Management*,
FEMA 100, 1986

A. NFIP Responsibilities and Consequences of Non-Participation

While local government participation is voluntary, in order for NFIP flood insurance to be sold within the jurisdiction, cities and counties must affirmatively join the program³ and agree to undertake a set of responsibilities:

- Designate an official to implement the program (aka floodplain manager)⁴
- Adopt and enforce minimum NFIP standards as articulated in 44 CFR Part 60.3⁵
- Notify FEMA of changes made to jurisdictional boundaries⁶
- Notify FEMA of changes to drainage patterns that cause changes to the extent of mapped Special Flood Hazard Areas, Floodways, or Base Flood Elevation⁷
- Cooperate with FEMA as they undertake FIRM revisions⁸
- Agree to participate in periodic community assistance visits where FEMA assesses compliance with NFIP flood plain management requirements (42 USC Sec 4102(a))⁹.

Failure to perform these responsibilities can result in suspension of the community from the NFIP at which point Federally-backed flood insurance and Federal grants and loans in SFHA would no longer be available. The SFHA is an area inundated by the 1% annual chance flood, and is regulated by the NFIP. Residents of suspended communities may find it difficult to retain and enter into mortgages and local government would not be able to take advantage of Federal loan and grant programs to repair infrastructure located in the SFHA damaged by flood or other natural disasters. FEMA and State Coordinating agencies evaluate compliance with these responsibilities with periodic Community Assistance Visits (CAVs). FEMA expects these CAVs to be conducted about every 5 years for each participating community.

B. Summary of Minimum NFIP Standards

To remain in good standing with the NFIP participating communities must enforce the following minimum standards, summarized below from 44 CFR Part 60.3 *Flood plain management criteria for flood-prone areas*:

- Require development permits for all proposed construction and other developments within the community's designated SFHA.
- Ensure all other permits required by local, State and Federal laws are obtained.
- Maintain for public inspection records of all development permits.
- Review the permit to ensure that sites are reasonably safe from flooding.
- Review subdivision proposals to determine whether the project is safe from flooding and provides for adequate drainage.

³ 44 CFR 59.22

⁴ Ibid.

⁵ 44 CFR 59.24

⁶ 44 CFR 59.22

⁷ 44 CFR 65.3

⁸ 44 CFR 59.22

⁹ Ibid.

- Require residential structures to have the lowest floor (including basement) elevated at least to or above the Base Flood Elevation (BFE).
- Require non-residential structures to have the first floor elevated or flood proofed one foot above the BFE.
- Require manufactured homes be elevated and anchored.
- Require water supply systems be designed to eliminate infiltration of flood waters.
- Require new and replacement sanitary sewage systems be designed to minimize or eliminate infiltration of flood waters.
- Ensure flood carrying capacity of altered or relocated watercourses is maintained.
- Verify/document lowest floor elevations of new or substantially improved structures.
- Determine whether structures in the SFHA have been substantially damaged. If a substantial damage determination is made, the repairs must include bringing the structure up to current flood hazard area building standards.

Notice that nowhere in these minimum standards are communities required to direct development away from flood prone areas, despite the fact that title of 44 CFR Part 60.3 indicates that the standards relate to land management and use.

A community may at their option adopt standards found in 44 CFR Part 60.22 *Additional Considerations in Managing Flood-Prone, Mudslide (i.e. Mud-flow)-Prone and Flood-Related Erosion-Prone Areas*. These optional planning considerations focus on adopting regulations that guide development away from flood prone areas for the purpose of avoiding damage to the built environment and for human safety.

II. ESA AND THE NFIP

A. Floodplain Development Permits and ESA

NFIP member communities must issue a permit for all development located in the SFHA¹⁰. Development is defined in the NFIP as “[a]ny man-made change to improved or unimproved real estate, including but not limited to buildings or other structures, mining, dredging, filling, grading, paving, excavation or drilling operations or storage of equipment or materials”¹¹. Furthermore, 44 CFR Part 60.3(a)(2) requires that NFIP member communities, “[r]eview proposed development to assure that all necessary permits have been received from those governmental agencies from which approval is required by Federal or State law, including section 404 of the Federal Water Pollution Control Act Amendments of 1972, 33 USC 1334.” NFIP requires that these provisions be adopted into municipal codes as a condition of participation in the program¹².

ESA compliance was not considered at the time the NFIP regulations were promulgated in 1976. Courts have recently found that FEMA violated ESA by failing to consult with NOAA-F about, among other things, minimum eligibility criteria for participation in the NFIP as set forth in 44 CFR Part 60.3.

¹⁰ 44 CFR Part 60.3(a)(1)

¹¹ 44 CFR Part 59.1

¹² 44 CFR Part 60.2

FEMA posits that it does not have land use authority and that it can only provide guidance, technical assistance, require reporting and institute enforcement actions consistent with the National Flood Insurance Act U.S.C § 4102[c]¹³. Enforcement actions would be taken if local government's fails to enforce the part of their municipal code that reflects the requirements of 44 CFR Part 60.3(a)(2).

Unfortunately NOAA doesn't issue "permits" for individual projects in the same way permits are issued under the Clean Water Act. So it is very unclear what local governments need from applicants to assure compliance with ESA. Landowners can provide a biological assessment that finds their project does not have the potential to result in "taking" or harming of an endangered species, thus avoiding the need for an ESA "permit." Or, they can avoid the SFHA. But without changes to local land use codes it is difficult for local government to require actions that reduce the potential for "take."

What's more, biological assessments are not conducted according to specific protocols, so their conclusions can be subjective. This creates a problem for Oregon cities and counties, who must allow for public input when their decisions are not based on clear and objective standards. The net effect is that some floodplain development permits may not be issued as ministerial decisions¹⁴, but rather require quasi-judicial or even legislative public hearings¹⁵. A letter from Oregon Fish and Wildlife, or NOAA-Fisheries determining that the action will not result in take could allow for the permit to be issued without a public hearing, but these are untested waters. Nonetheless it is clear that FEMA's position places the burden on local government to evaluate ESA compliance before they issue floodplain development permits.

B. Letters of Map Change

The SFHA can change over time as a result of longer hydrologic records or changes in land use and land cover. FEMA has a Letter of Map Change process for changing Flood Insurance Rate Maps. Changes can range from correcting simple inadvertent inclusions in the SFHA via a Letter of Map Amendment (LOMA) to complex revisions made via Letters of Map Revision (LOMR). Land owners may make changes to their property that modifies SFHA boundaries or base flood elevations. In cases where fill has been placed to elevate building pads above the base flood elevation, landowners may apply to FEMA for a Letter of Map Revision based on Fill (LOMR-F) to have a building, parcels or portion of a parcels removed from the SFHA. FEMA can review project plans before a project starts, as a conditional LOMR-F (CLOMR-F). Until recently CLOMR-Fs and LOMR-Fs were processed by FEMA without ESA review.

This changed in October 2010 when FEMA published Procedure Memorandum 64 – Compliance with Endangered Species Act (ESA) for Letters of Map Change. PM 64 requires applicants to demonstrate to FEMA that the proposed project will cause no adverse effect to endangered species or else obtain compliance through the Section 10 process of ESA, including applying for an incidental take permit and preparing a habitat conservation plan. Although not explicitly stated in PM-64, applicants were under the impression that the CLOMR-F review was a federal action and that FEMA would consult with NOAA-F under Section 7 using a biological assessment provided by the applicant. But the CLOMR-F is a comment, not an authorization. So,

¹³ Letter to Kim Kratz, NOAA-Fisheries from John Graves, FEMA Region X, dated January 14, 2015.

¹⁴ Ministerial Decision—A non-discretionary decision on a proposed use of land, often made by staff. An example is a building permit for a structure that is an outright permitted use in the zone (see "outright permitted use").

¹⁵ See *LUBA No. 2009-007*

on October 19, 2015 FEMA clarified their position in memorandum¹⁶ stating that they would consult under Section 7 of the ESA only when FEMA is directly involved with the project's construction or funding. The 2015 memorandum explicitly states that FEMA will not "facilitate consultation with Federal agencies for a requestor in dealing with the Services under ESA for any CLOMR or CLOMR-F."

At about the same time as publication of PM 64, FEMA modified their application forms for C/LOMRs to require that communities certify that fill, stream bed alterations and other projects that result in changes to flood zone boundaries or base flood elevations were conducted in compliance with ESA (Table 2).

Table 2: Community Acknowledgement Form

A. REQUESTS INVOLVING THE PLACEMENT OF FILL

As the community official responsible for floodplain management, I hereby acknowledge that we have received and reviewed this Letter of Map Revision Based on Fill (LOMR-F) or Conditional LOMR-F request. Based upon the community's review, we find the completed or proposed project meets or is designed to meet all of the community floodplain management requirements, including the requirement that no fill be placed in the regulatory floodway, and that all necessary Federal, State, and local permits have been, or in the case of a Conditional LOMR-F, will be obtained. For Conditional LOMR-F requests, the applicant has or will document Endangered Species Act (ESA) compliance to FEMA prior to issuance of the Conditional LOMR-F determination. For LOMR-F requests, I acknowledge that compliance with Sections 9 and 10 of the ESA has been achieved independently of FEMA's process. Section 9 of the ESA prohibits anyone from "taking" or harming an endangered species. If an action might harm an endangered species, a permit is required from U.S. Fish and Wildlife Service or National Marine Fisheries Service under Section 10 of the ESA. For actions authorized, funded, or being carried out by Federal or State agencies, documentation from the agency showing its compliance with Section 7(a)(2) of the ESA will be submitted. In addition, we have determined that the land and any existing or proposed structures to be removed from the SFHA are or will be reasonably safe from flooding as defined in 44CFR 65.2(c), and that we have available upon request by DHS-FEMA, all analyses and documentation used to make this determination. For LOMR-F requests, we understand that this request is being forwarded to DHS-FEMA for a possible map revision.

Even though the statement shown in Table 2 implies that local government is responsible for ensuring that ESA obligations are met when they issue floodplain development permits, FEMA still requires applicants for CLOMR-Fs to supply evidence in the form of an Incidental Take Permit, an Incidental Take Statement, a "not likely to adversely affect" determination from the National Marine Fisheries Service (NMFS) or the U.S. Fish and Wildlife Service (USFWS), or an official letter from NMFS or USFWS concurring that the project has "No Effect" on proposed or listed species or designated critical habitat. Similar evidence is not required for FEMA to process LOMR-Fs, but the city or county must sign and submit with the LOMR-F application the Community Acknowledgement Form confirming ESA compliance was achieved.¹⁷ FEMA will monitor compliance with ESA requirements for LOMR-Fs during Community Assistance Visits.

¹⁶ Paul Huang, Division Director, Risk Analysis Division, FEMA, *Endangered Species Act and Review/Processing of CLOMR-Fs and CLOMRs*, October 19, 2015

¹⁷ MT-1 Application Forms and Instructions for Conditional and Final Letters of Map Amendment and Letters of Map Revision Based on Fill, <http://www.fema.gov/media-library/assets/documents/31858>, accessed November 17, 2015.

III. CONCLUSIONS

As we have seen, local government is being asked to shoulder much of the responsibility for ESA compliance in the SFHA even before FEMA's consultation with NOAA-Fisheries is complete. Using 44 CFR Part 60.2(a)(2) FEMA has, in addition, linked ESA compliance with NFIP compliance, especially when land owners have or wish to place fill in the SFHA to elevate the ground surface above the base flood elevation, which until recently was touted by FEMA as a legitimate flood hazard mitigation technique.

FEMA enforces local government compliance with Enforcement using the CAV process. On paper, anyway, a FEMA finding of failure to enforce local codes adopted as set forth in 44 CFR Part 60.3(a)(2), which requires assurance that all necessary permits from other Federal and State agencies have been obtained, would be grounds for probation or even suspension from the NFIP. No community has yet to be put on probation or suspended on these grounds.

Local government will need to modify their flood hazard codes to comply with these ESA requirements. Otherwise they lack the legal authority to compel landowners to supply pertinent information, or to take actions to avoid "take" of endangered species. So it appears to be the case that, "the primary focus [of the ESA lawsuits directed at FEMA] is to force a local jurisdiction to amend its land use regulations through threatening their removal from the NFIP and inability to obtain federally backed flood insurance."¹⁸

¹⁸ Kevin Rogerson, Mt. Vernon, WA

PART B

Jackie Dingfelder

1. Federal regulatory changes (Corps, ESA, CRT) provide *opportunities* to address historic and legacy issues that have been gorillas in the room with respect to floodplain management and climate change for many years.
 - a. Case in point – Vanport flood in 1948 was caused by a breach in the railroad berm. While there have been lots of critical upgrades to the levee system and to the management of water within the levee system, the railroad berm was never adequately evaluated and remediated. The region was unaware that they were simply riding on borrowed time before another flood and another failure affected the same location.
 - b. The changes in the regulatory environment really force us to look at the problems systematically. As a result we are now asking the questions: What are we trying to protect? People, property and natural resources. Are we providing the right level of protection? Climate change, development and international treaties are changing our assumptions. Are we resilient into the future? And what impacts have we/will we have that we can avoid, minimize or mitigate moving forward? For example, all of the Columbia Slough watershed was Columbia River floodplain. That is not coming back, but what can we restore at different scales so that they work together to improve ecosystem functions through this and other processes?
2. To adequately address these issues we needed a much larger conversation. While the regulatory environment forced the conversation, the Oregon Solutions process created the table for a dialogue and alternatives analysis.
3. Initiation of the process, the players, the desired goals

In 2013, the Drainage Districts, overwhelmed by the new federal regulations for accreditation, and facing an imminent expiration of their certification by the US Army Corps of Engineers, approached the Port of Portland, City of Portland, and other parties benefitting from the levee system about the idea of a regional cooperative approach, through the Oregon Solutions Program. The regional collaboration officially began in December of 2013, focused on identifying what issues or shortcomings in the levee system need to be addressed in Peninsula Drainage District No. 1 (PEN 1) and Peninsula Drainage District No. 2 (PEN 2). The Oregon Solutions Team participants also engaged in a learning process, about both the FEMA accreditation requirements and USACE Rehabilitation and Inspection Program (RIP).

The key objectives of the initial stage of the project were:

- Identify, fund, and implement necessary improvements to the Peninsula 1 and Peninsula 2 levees, so that they are certified by a consulting engineer as being protective of a 1% chance flood.
- Achieve FEMA accreditation on a timeline and in a manner that will prevent the area from being designated on the City's FEMA Flood Insurance Rate Map as a "Significant Flood Hazard Area."
- Create transparency in the process, so that residents and property owners are kept informed and are provided with opportunities for input and involvement.

- Meet US Army Corps of Engineers standards to stay in the Corps' Rehabilitation and Inspection Program (RIP).

4. Where do we go from here?

Over the next 12-18 months, the next phase of work (Phase II) will expand the geographic scope to complete similar assessments for the Multnomah County Drainage District No. 1 (MCDD) and the Sandy Drainage Improvement Company (SDIC), and also to complete physical inventories that will set the stage for evaluating alternative solutions to the issues and shortcomings identified in all four districts. We will also incorporate similar work in the Sauvie Island Drainage Improvement Company (SIDIC), as all five districts are likely to be re-mapped as a unit by FEMA.

- Develop inventories of the specific economic, community, and environmental resources protected by the regional levee system.
- Complete engineering assessments in MCDD, SDIC, and SIDIC consistent with those done for PEN 1 and PEN 2.
- Maintain active status in the USACE's Rehabilitation and Inspection Program (RIP).
- Initiate work to develop longer term governance options.
- Initiate discussion on longer term funding and financing of levee and drainage system options.
- Review potential impacts of climate change on Columbia River elevation levels and the safety of the levee system, including the evaluation of potential solutions.
- Implement a communications strategy with the general public and targeted audiences such as neighborhood groups about the project.
- Develop a process and criteria for evaluation and selection of preferred solutions.

CHAPTER 5

Economic Considerations in Floodplain Management

NOAH ENELOW

Senior Economist, Ecotrust, Portland

GREGORY HALLER

Conservation Director, Pacific Rivers Council, Portland

JOSHUA REYNEVELD

Co-Founder and Managing Director, Earth Economics, Tacoma, WA

Chapter 5

ECONOMIC CONSIDERATION IN FLOODPLAIN MANAGEMENT

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NOTES

Chapter 5

ECONOMIC CONSIDERATION IN FLOODPLAIN MANAGEMENT

PART A THE RESTORATION ECONOMY Noah Enelow

The Restoration Economy

Investing in natural capital for the benefit of communities and salmon

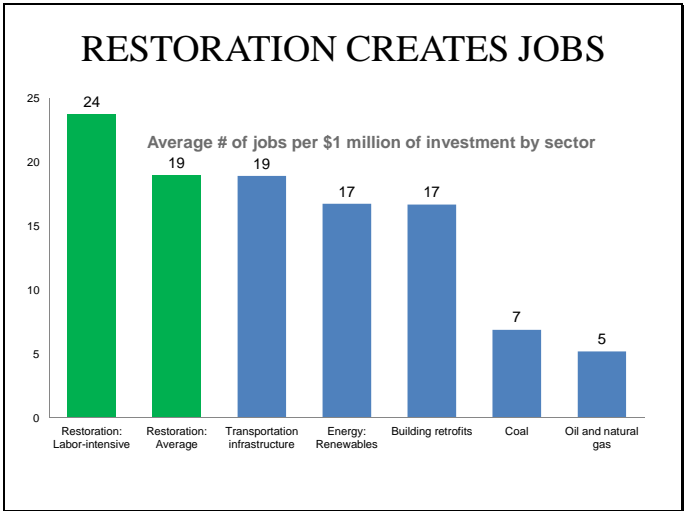


Restoration Economy

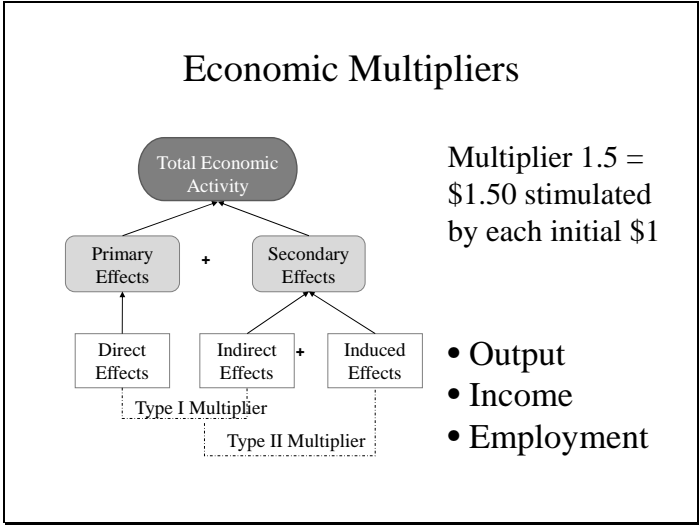


Restoration is an investment in local economies that pays out over time.

- Contributes to new and existing industries (e.g. fisheries, recreation, tourism, biomass)
- Restored ecosystem functions generate many community development benefits and savings
- Creates demand for local labor and materials
- Stimulates economic activity in unrelated sectors



- ### RESTORATION ACTIVITIES
- Activities involve varied skill sets (landscape, engineering, heavy equipment, project management, construction).
 - Typically very labor intensive
 - Source locally for labor and materials
 - Spending on restoration activities stays local
 - \$.80 of every \$1.00 stays in county where project is located;
 - \$.90 of every \$1.00 stays in OR
- (Hibbard and Lurie, 2006)

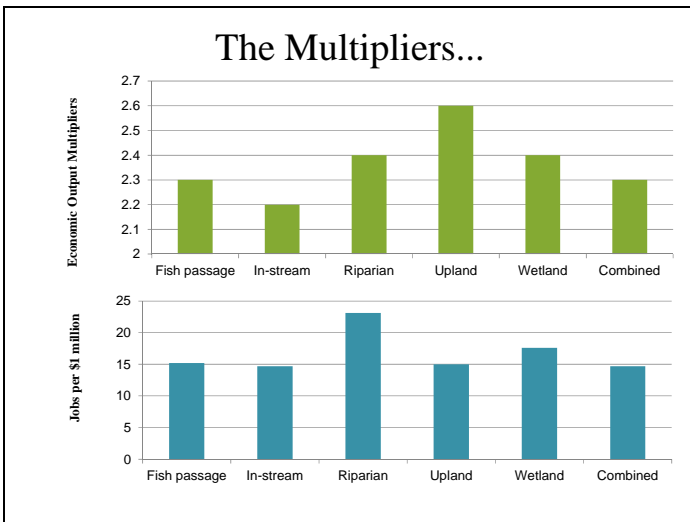


OUTPUT AND EMPLOYMENT EFFECTS

Restoration generates additional spending and economic activity in the economy as the initial dollars are spent and re-spent.

Every dollar spent on restoration generates an additional \$1.20-\$1.40 in economic activity, for a total economic impact of \$2.20-\$2.40.

This “multiplier effect” captures the direct, indirect, and induced effects of restoration spending.



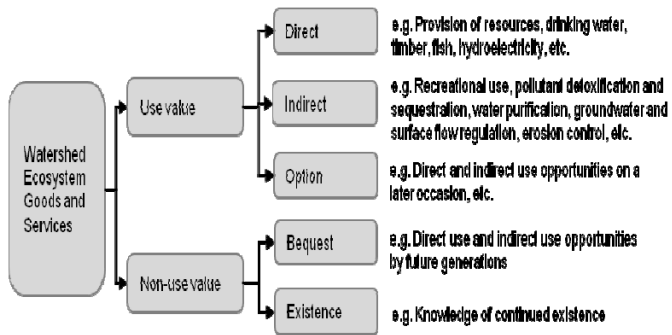
Restoration Employment & Economic Output Estimates



Figure 3. Oregon restoration projects by county:
estimated employment and economic output, 2001-2009



NON-MARKET VALUES



"Salmon recovery begins and ends with habitat. No amount of fishery restrictions can restore the resource unless salmon have good spawning and rearing habitat." — TREATY INDIAN TRIBES IN WESTERN WASHINGTON



PART B
VALUING NATURE’S BENEFITS WITHIN
THE COLUMBIA RIVER BASIN
Gregory Haller



“Valuing Nature’s Benefits within
the Columbia River Basin”

Gregory Haller
Conservation Director

Study Sponsors

- Upper Columbia United Tribes
- Columbia River Intertribal Fish Commission
- Pacific Rivers
- WaterWatch of Oregon
- Save Our Wild Salmon

Context and Need For Environmental Economic Analysis

- Counter the arguments made by utilities and others that say:
 - “The region can’t afford to do more for salmon”
 - We’ve spent \$12 billion salmon recovery since 1992
 - “Salmon runs are doing just fine”
 - “Primary Objective of Treaty negotiations should be to rebalance the Canadian Entitlement”
 - The U.S obligation under the Treaty exceeds the power benefits: 450 average megawatts & 1300mw of capacity, valued at \$250-300 million go to Canada
 - Electrical consumers will provide over \$2 billion over the next 10 years but U.S. Entity estimates the benefit to the U.S is \$25-30 million

Context and Need

- Deliver clear and concise economic information to aid decision makers and negotiators with regard to dividends – ecological and economic- produced from a healthy river basin
- There is no current environmental economic analysis at the basin-level scope
 - Simon Frazer University Study: doesn’t cover the entire basin, only the U.S side; no estimation of future benefits to fisheries or water quality

Study Purpose

Define the economic and social benefits of the the ecosystem services provided by the Columbia River Basin, and the impact of investments in the conservation of these natural assets, including fisheries, water quality, flood risk reduction and electrical power.

Scope of Study

- Columbia River Basin (U.S. and Canadian portions)
- Will compare continued development trends vs. a natural resource alternative scenario, including cultural impacts, ecosystem degradation and resiliency to climate change from investments and changes to hydropower operations and the restoration of floodplains.

Analysis

- Discussion of the natural economy within the watershed
- Quantitative and monetary estimate of the economic value provided by the natural assets of the Basin, including the value of electrical power and flood risk reduction
- A comparison of the present trend in watershed development to a natural resource scenario that includes alternative assumptions that embrace the restoration of natural resources.

Use of Study

- As agreed by the partners in this study, an oversight committee will determine how, when and where the findings of the study can be utilized.
- At the very least, the analysis will be forwarded to decision makers in the U.S State Department, Canadian federal and provincial governments and U.S congressional delegation from OR, WA, ID and MT.

Questions?



CHAPTER 6

The Past, Present and Future of Floodplain Protection and Environmental Protection

MARY LOU SOSCIA

Columbia River Coordinator, Oregon Operations Office – Region 10
U.S. Environmental Protection Agency, Portland

Chapter 6

THE PAST, PRESENT AND FUTURE OF FLOODPLAIN PROTECTION AND ENVIRONMENTAL PROTECTION

Mary Lou Soscia

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NOTES

Chapter 6

THE PAST, PRESENT AND FUTURE OF FLOODPLAIN PROTECTION AND ENVIRONMENTAL PROTECTION

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A. The History of Floodplain Management Is Important As We Look to the Future

1. Mississippi River Flood of 1928 – the most destructive river flood in the history of the United States with 27,000 square miles inundated up to a depth of 30 feet. To try to prevent future floods, the federal government built the world's longest system of levees and floodways. Ninety – four percent of the more than 630,000 people affected by the flood lived in the states of Arkansas, Mississippi and Louisiana, most in the Mississippi Delta. More than 200,000 African Americans were displaced from their homes along the Lower Mississippi River and had to live for lengthy periods in relief camps. As a result of this disruption, many joined the Great Migration from the South to northern and Midwestern industrial cities rather than return to rural agricultural labor. This massive population movement increased from World War II until 1970.
2. In response, the federal government took responsibility for the Mississippi River and built the world's longest system of levees and floodways. The law set a national precedent to provide direct and comprehensive federal involvement in local affairs.
3. Flood Control Act of 1936 – The law in response to the Mississippi River flood increased federal assumption of flood control costs.
4. Flood Control Act of 1938 – Congress changed cost sharing provisions.
5. Watershed Protection and Flood Prevention Act, P.L. 566 – authorized Department of Agriculture to participate in comprehensive watershed management projects.
6. Tennessee Valley Authority created in 1933, embarked on a plan, in 1953, to tackle local flood problems; as a result became convinced that floodplain management assistance had merit and was key for local communities.
7. Flood Control Act of 1960 – The US Army Corps of Engineers, US Geological Survey and SCS started preparing local floodplain information reports.
8. Task Force on Federal Flood Control Policy – This task force recognized mounting flood losses, advocated a broader perspective on flood control.
9. National Flood Insurance Program in 1968 – The passage of this law reflected an important goal to shift burden from taxpayer and instead put the financial responsibility on the floodplain resident for the cost of the locational decision.
10. National Environmental Policy Act of 1969 – recognized the environmental values of Floodplains and incorporated in the federal decision making process.

B. Focus on Human Hazard and Property Loss

While the NFIP initially focused on the natural values of floodplains, politics and response to horrific flooding events way before Hurricane Katrina caused the major focus to be focused on

loss of human life and property. However, there is an increasing shift, made more pressing by climate change to focus attention on the extremely important role that floodplains provide in natural functions including surface water, groundwater, and wetlands.

C. The Environmental Benefits of Floodplains and the Economic Value of Protecting Floodplains Must Be Emphasized As We Grapple With the Effects of Climate Change

In 1979, the US Water Resources Council developed a Unified Program for Floodplain Management, which identified the significant environmental benefits of floodplains, still valid today.

1. Floodplains provide natural erosion control, flood storage and conveyance. Floodplains can reduce flood velocities, flood peaks, and reduce sedimentation. One acre of floodplain land flooded one foot deep holds 330,000 gallons of water.
2. Flood protection – Riverine and coastal floodplains act as a buffer against the powerful forces of flood flows, storm surges, and waves.
3. Water quality – Floodplains act as a natural filter for public drinking water supplies by removing pollutants including those related to storm runoff.
4. Water supply – Inundated floodplains help to recharge groundwater aquifers that can provide water supplies during dryer times. Giving rivers more room to convey flood flows increases the ability to operate reservoirs for greater water supplies.
5. Groundwater recharge.
6. Biological productivity.
7. Fish and wildlife habitat – In the Pacific Northwest more than 80% of all wildlife depends on riparian and wetland floodplain areas at some point in their lives.
8. Wild Harvest and preserving high value farmlands – Floodplains often have nutrient rich soils that are great for farming. Preserving agricultural floodplains can prevent the loss of valuable farmlands to development pressures.
9. Open space and recreation – Especially in urban areas, floodplains can meet an important public need for public parks and recreation areas. They can also provide valuable connection to natural ecosystems not otherwise available to urban residents.
10. Outdoor education.

D. Predicted Effect of Climate Change on River Systems

The Pacific Northwest will experience increased winter precipitation, which will cause increased winter streamflow and decreased summer streamflow. Both the extent and frequency of flooding is predicted to increase. Warmer streams, ocean acidification, and lower summer stream flows will negatively affect salmon. The presence of “Cold Water Refugia” will be critical.

E. EPA Tools for Climate Resiliency

EPA has many tools that we are providing to communities to deal with floodplain resilience in the face of climate change impacts.

1. EPA/FEMA 2010 MOU – Smart Growth Tools for Floodplain Resiliency – planning for flood recovery and long term resilience, workshops, vulnerability assessment, technical assistance to states, local communities and Tribal Governments. Green infrastructure is an important mitigation tool for communities. <http://www2.epa.gov/smartgrowth/smart – growth – strategies – disaster – resilience – and – recovery>
2. Urban Waters Federal Partnership and grants. <http://www2.epa.gov/urbanwaters>
3. Green Infrastructure Technical Assistance. <http://www2.epa.gov/green – infrastructure/what – epa – doing – support – green – infrastructure>
4. Climate Ready Water Utilities. 2012. Adaptation Strategies Guide for Water Utilities. <http://water.epa.gov/infrastructure/watersecurity/climate/upload/epa817k11003.pdf>
5. Local Government Climate Adaptation Training: Discusses the impacts climate change can have on local government services, adaptation strategies and examples of adaptation activities. <http://www2.epa.gov/communityhealth/local – government – climate – adaptation – training>

F. Future Opportunities

We will continue to see floods as damaging as Katrina and Sandy, and similar to the massive federal response to the Mississippi River flooding of 1927, we must have an equally significant response built on partnership, science and adaptive management.

1. NFIP Reauthorization – Reauthorization is due in 2017, FEMA should include modifications to provide climate resiliency to communities: protect floodplain habitat for listed species, and flood mapping protocols that include future conditions including those related to climate change.
2. Columbia River Treaty – The modified Columbia River Treaty must include an ecosystem function approach to acknowledge future climate change impacts on the Columbia River Basin. This approach must include a modern approach for floodplain management throughout the Columbia River basin which recognizes the significant environmental values of floodplains protecting the Basin’s ecosystem which includes people, fish and wildlife, from future climate change impacts.

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