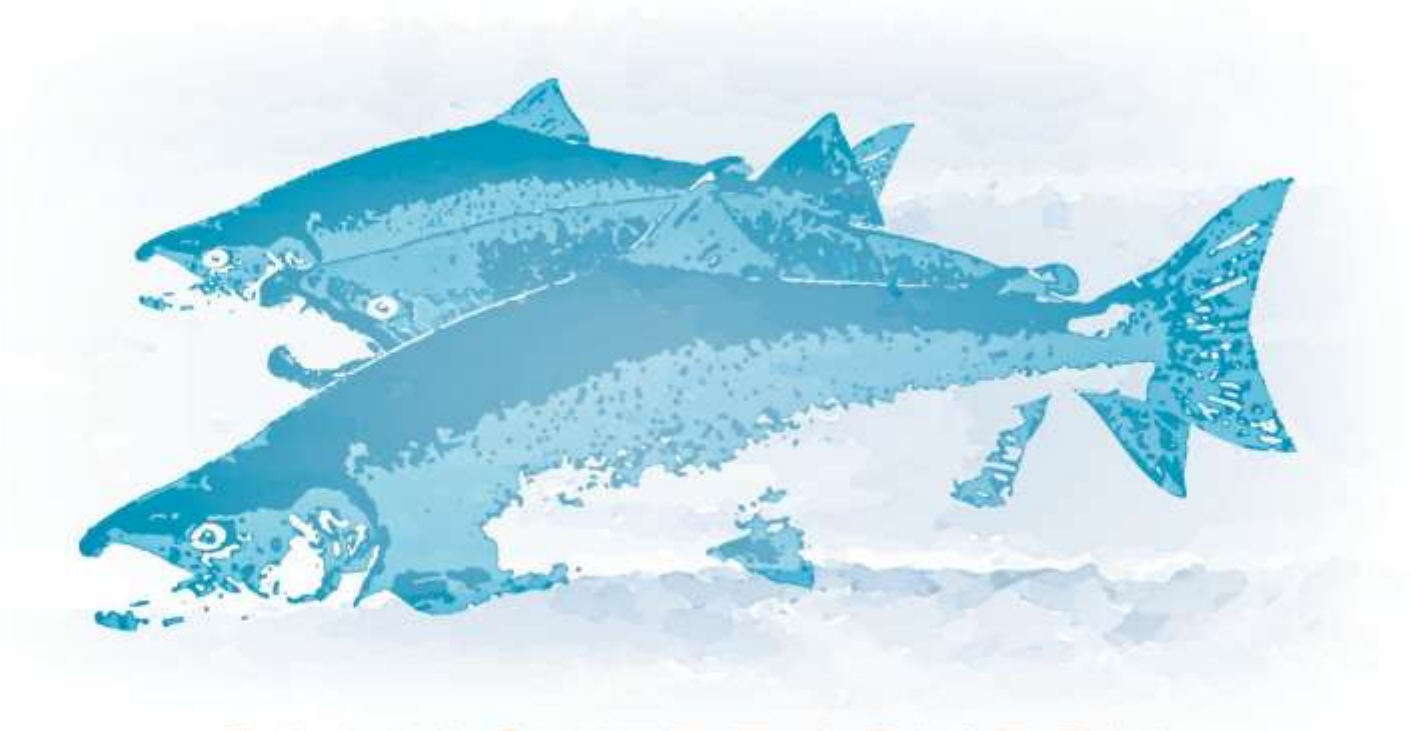

SALMON RECOVERY CONFERENCE

May 27-29, 2015

Vancouver Convention Center

Vancouver, Washington

EXCITING DOOR PRIZES

How does the Door Prize Drawing Work?

Here's what you need to do:

- Visit exhibits, chat with exhibitors, and pick up tickets from them.
- Examine door prizes, which are groups of items donated by exhibitors.
- Deposit your tickets by the prizes you would like to win. You may put all your tickets by one prize or distribute them among several prizes.
- Cross your fingers that your ticket is the lucky one drawn!

Drawings will be held during meals throughout the conference. You must be present to win.

Follow the Salmon Recovery Funding Board on Facebook

Use hashtags #salmonrecovery and #SRC2015 on Twitter

WELCOME

Welcome to the Washington State Salmon Recovery Funding Board's fifth biennial conference. This year the Washington Department of Fish and Wildlife and Long Live the Kings are joining us in co-hosting the conference. Many other agencies, organizations, and businesses are helping to sponsor this year's conference with financial and in-kind support.

Our past conferences have proved to be an important way to exchange information and look at lessons learned from more than 1,600 projects across the state.

During the past 15 years, salmon recovery has accomplished a great deal. This conference allows us to pause and think about our successes and to focus on building even better salmon recovery projects. Over these two and a half days, we'll:

- Showcase salmon recovery projects in Washington State and the Pacific coast, with special emphasis on open exchange about experiences and lessons from the field.
- Cover many aspects of salmon recovery, including habitat restoration, preservation, and hatchery reform.
- Assess and reflect on 15 years of salmon recovery work.
- Learn ways to improve the quality and cost-effectiveness of projects, examine what could work better, and celebrate what is working well.

Many thanks to the conference work group and advisory committee, which helped guide agenda development and conference design, and to all of you — the speakers, presenters, panel members, moderators, poster participants, student volunteers, exhibitors, sponsors, and attendees who are sharing your experiences, lessons learned, and expertise about Pacific salmon recovery. Your generous contributions of time and knowledge are what make these conferences such rich learning experiences.

WASHINGTON STATE
RECREATION AND CONSERVATION OFFICE
Salmon Recovery
Funding Board

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SALMON FILM AND FUN NIGHT

Thursday, May 28
Kiggins Theatre
1011 Main Street
(8 blocks from Hilton)

6:30 P.M.
Doors open
no-host bar and pizza slices

7:30 P.M.
Screening of three salmon recovery shorts, including a new Long Live the Kings video

7:50 P.M.
PRIZES

8:00 P.M.
Feature presentation of
Return of the River

Seats are free but limited
Please pick up a ticket at the Long Live the Kings booth in the exhibit hall or ask staff

LONG LIVE THE KINGS

WEDNESDAY AT A GLANCE

8

Exhibits Open All Day (Discovery Ballroom)

Registration and Continental Breakfast (Heritage Ballroom)

9

Welcome (Heritage Ballroom)
David Troutt, chairman, Salmon Recovery Funding Board
Kaleen Cottingham, director, Recreation and Conservation Office
Bill Iyall, chairman, Cowlitz Indian Tribe
Jeff Breckel, executive director, Lower Columbia Fish Recovery Board
Jim Unsworth, director, Washington Department of Fish and Wildlife
Representative Steve Tharinger (D-Dungeness)

Keynote
Norm Dicks, former U.S. Congressman

10:15

Break

10:30

Hemlock-Oak	Heritage E	Cedar	Heritage F	Spruce	Pine	Ash	Birch
Reconnecting Floodplains: Side Channels and More	Nearshore Restoration: Not Just Another Day at the Beach	How's that Working? Effectiveness Monitoring of Restoration Projects	Integrated Management: There's More to Salmon Recovery than Salmon	Fish Passage: Getting Around It	Regional Monitoring and Adaptive Management Panel	Project Management and Planning: Measure Twice, Cut Once	Innovative Partnerships: Farms, Fish, and the Future

12:30

Break

12:45

Lunch and Keynotes (Heritage Ballroom)
Phil Rockefeller, member, Northwest Power and Conservation Council
Ron Judd, columnist, Seattle Times

1:30

Panel (Heritage Ballroom)
Our Story Thus Far: Perspectives on the History of Salmon Recovery and H-integration
Hosted by **Phil Anderson**, former director of the Washington Department of Fish and Wildlife

Panelists
Irene Martin,Salmon for All
Sara LaBorde, Wild Salmon Center
Phil Rigdon, Confederated Tribes and Bands of the Yakama Nation
David Trout, Nisqually Indian Tribe
James C. Waldo Gordon Thomas Honeywell LLP

2:30

Break

2:45

Hemlock-Oak	Heritage E	Cedar	Heritage F	Spruce	Pine	Ash	Birch
Reconnecting Floodplains: Get Back to Where You Once Belonged	Estuary Reconnection: Worth its Salt	Intensively Monitored Watersheds: What We're Learning	Evolution of Hatchery and Harvest Practices in Advancing Recovery	Fish Passage: Water Under the Bridge	Recovery Planning in Different Settings	Project Management and Planning: Organize, Don't Agonize	Innovative Partnerships: Whose Water?

4:45

Networking and Free Time

6

Dinner and Keynote (Heritage Ballroom)
Steelhead: Fish of a Thousand Faces
John McMillan, Trout Unlimited

THURSDAY AT A GLANCE

8:15

Exhibits Open All Day (Discovery Ballroom)

Registration and Continental Breakfast (Heritage Ballroom)

Welcome

David Troutt, chairman, Salmon Recovery Funding Board
Kaleen Cottingham, director, Recreation and Conservation Office
Jacques White, executive director, Long Live the Kings

9

Panel (Heritage Ballroom)

Climate Change and the Future of Salmon in the Northwest
Hosted by **John Stein**, director, National Oceanic and Atmospheric Administration's (NOAA) Northwest Fisheries Science Center

Panelists
Guillaume Mauger, University of Washington Climate Impacts Group
Tim Beechie, NOAA Northwest Fisheries Science Center
Michelle McClure, NOAA Northwest Fisheries Science Center

10

Break

10:15

Hemlock-Oak	Heritage E	Cedar	Heritage F	Spruce	Pine	Ash	Birch
Large Scale Floodplain Projects: Reaches and Basins	Estuary Restoration: The Tide Waits for No One	Salish Sea Marine Survival Project 1	Evolution of Hatchery and Harvest Practices in Advancing Recovery 2	Fish Passage: Can't Cross the Same River Twice	Data Analysis and Prioritization Tools: Something Old, Something New	Managing Salmon Recovery in a Changing Climate	Innovative Partnerships: Infrastructure Insights

12:15

Break

12:30

Lunch and Keynote (Heritage Ballroom)

Bill Bradbury, Northwest Power and Conservation Council, former Oregon Secretary of State

1:45

Break

2

Hemlock-Oak	Heritage E	Cedar	Heritage F	Spruce	Pine	Ash	Birch
Floodplains: In-stream Projects	Planning, Constructing, and Monitoring Outcomes: Reviewing the Full Arch of Estuary Restoration	Salish Sea Marine Survival Project 2	Emerging Science from the Washington Department of Fish and Wildlife	Fish Passage Projects: And the Salmon Sing	Data Analysis and Prioritization Tools: Something Borrowed, Something Blue	Storytelling for Salmon Recovery	What We Talk About When We Talk About Partnerships

4

Break

4:15

Poster Session (Outside Discovery Ballroom)

No-host Happy Hour

5:30

Dinner on Own

6:30

Long Live the Kings Film Night (Kiggins Theatre, Vancouver)

Return of the River, three short films, and a raffle!
Admission is free. Pick up a ticket at the Long Live the Kings booth in the Exhibit Hall
Pizza, beer, and other beverages available for purchase at the theatre.

FRIDAY AT A GLANCE

8

Exhibitors Open until Noon (Discovery Ballroom)

Registration Open until 9:30 A.M. (Heritage Ballroom)

Breakfast

Welcome

David Troutt, chairman, Salmon Recovery Funding Board
Kaleen Cottingham, director, Recreation and Conservation Office

Keynote

Will Stelle, regional administrator, NOAA

9

Break

9:30

Hemlock-Oak	Heritage E	Cedar	Heritage F	Spruce	Pine	Ash	Birch
Habitat Complexity: It's Complicated	Floodplains by Design	Orca and Salmon Recovery Workshop	Working with Beavers to Restore Habitat for Salmonids	Show Me the Money: Financing Projects	Setting Long-term Goals for Columbia Basin and Steelhead	Social Marketing: Bait a Hook	Data Selfies: The How and Why of Data

11:45

Conference Wrap-Up (Heritage Ballroom)

WEDNESDAY MORNING SESSIONS

RECONNECTING FLOODPLAINS: SIDE CHANNELS AND MORE

ROOM
Hemlock-Oak

MODERATOR
Paul Schlenger

Clearwater River Restoration: An Unconstrained Design Approach to Restoring Floodplain Connection and Channel Migration Processes

PRESENTER: Kristin Williamson and Ian Mostrekno, South Puget Sound Salmon Enhancement Group

The Clearwater River channel and floodplain restoration project on the upper White River in Pierce County illustrates how an unconstrained design approach to engineered log structures can lead to immediate and profound benefits, allowing for restoration of fluvial processes and floodplain connectivity at a relatively low cost. Historically, the Clearwater River meandered through a forested valley floor with large trees, a dense canopy, and a system of branching channels. Logging and construction of a road across the floodplain in the early 1900s removed critical riparian structure from the valley floor and confined channel migration. Project partners worked together to remove logging roads in the river's migration zone and implement restoration projects that virtually were unconstrained by infrastructure and recreational concerns, enabling placement of stable, valley-spanning logjams paired with smaller floodplain treatments to restore natural channel and floodplain processes. This presentation will provide an overview of the project site, restoration objectives, project design elements, associated design considerations, construction challenges, and post-construction results of reach-scale channel evolution and related habitat formation.

Using Engineered Logjams to Reconnect Floodplain Side Channels in the Dosewallips River

PRESENTER: Micah Wait, Wild Fish Conservancy

The Boundary Reach Engineered Logjam project in the Dosewallips River was constructed in 2013 and was the first phase of an ongoing effort to restore floodplain connectivity and habitat complexity in the upper Dosewallips River using logjams. Habitat assessments conducted by the Port Gamble S'Klallam Tribe had shown a deficit of key sized large woody materials throughout the Olympic National Forest reaches of the Dosewallips River. In 2009, Wild Fish Conservancy, in partnership with the U.S. Forest Service and the Hood Canal Coordinating Council, developed plans for engineered logjams in a number of reaches in the upper Dosewallips Valley. The first treatment was planned for the Boundary Reach and we observed a rapid response to the restoration treatment, with the reconnection of perennial flow to a relict floodplain side channel within a few weeks of project construction. Recent high water events have further scoured the side channel and a significant portion of the main stem flow now occupies this route. Large woody materials projects and engineered logjams often are considered in-stream treatments with localized habitat effects. Here, we have seen how logjams cannot only have a localized habitat benefit, but also can restore habitat forming processes to entire floodplains.

Methow River 1890s Side Channel Restoration: Creating and Optimizing Salmonid Rearing Habitat Using Ground Water

PRESENTER: Hans Smith, Yakama Nation Fisheries

Reconnecting and restoring side channel habitats for juvenile salmonid rearing is a major focus in the Methow subbasin. Development and land use trends have diminished the quality and abundance of side channel habitats in broad swaths of the valley floodplain. Restoration practitioners are finding side channel restoration to be difficult because of social constraints and insufficient hydrologic conditions. Last summer, Yakama Nation Fisheries restored perennial surface flows in a large abandoned side channel of the Methow River next to Twisp using an

innovative spring channel design. This project developed on-site groundwater resources using precision excavation and a gravity-fed groundwater infiltration gallery to rehydrate the disconnected river channel. The project resulted in a spring-fed channel being created, which was immediately used by adult coho salmon for spawning and by juvenile spring Chinook and steelhead for winter rearing. Developing groundwater as the principal hydrologic source had multiple benefits, including regulating surface water temperatures towards optimal rearing conditions and preventing ice from impacting the available rearing habitat. Using a spring water source also helped gain the trust of the dozen private landowners participating in the project who saw that their properties would not be adversely impacted by restoring flow in the side channel. This presentation will review the development and implementation of the Yakama Nation project.

Salmon Recovery Funding Board Review Panel:

Engineering and Biological Considerations for Designing Off-Channel and Floodplain Habitats in the Freshwater Tidal Columbia River Estuary – Lessons Learned and Case Studies

PRESENTERS: Marjorie Wolfe, Wolf Water Resources, and Kelley Jorgenson, Plas Newydd LCC

The Columbia River basin is unique in many ways (drainage area, hydropower capacity, historic abundance, and diversity of native fish runs and wildlife, etc.). The lower Columbia River, 146 river miles of tidally influenced freshwater reaches between the Bonneville Dam and Pacific Ocean, offers its own unique design challenges for those restoring fish and wildlife habitats. We will discuss biological and engineering considerations and lessons learned from several habitat restoration projects in the dynamic and hydrologically complex lower Columbia River estuary floodplain. Parameters to be discussed include: The importance of tidal prism and tidal footprint; rethinking flow velocities without unidirectional flow; surface and groundwater freshwater inflows; surface elevation in a subsided vs. aggrading site; accretion and plant community relationships as an ecological process; planning for habitat succession and dynamic floral and faunal species composition; and linking life history stage and habitat usage at a site scale with design elements and hydrology – not all fish and life stages are created equal; and confounding issues with baseline data collection and monitoring.

NEARSHORE RESTORATION: NOT JUST ANOTHER DAY AT THE BEACH

ROOM
Heritage E

MODERATOR
Jay Krienitz

Thatcher Bay Nearshore Restoration

PRESENTER: Joseph George and Alison Studley, Skagit Fisheries Enhancement Group

The Thatcher Bay Nearshore Restoration Project is on the southwest shoreline of Blakely Island, a sparsely populated island in the San Juan Archipelago of Washington. The primary goal of this project is to improve natural processes and habitat function of the nearshore habitat in Thatcher Bay by removing wood waste covering nearly 2 acres of valuable nearshore habitat and restoring the habitat. Thatcher Bay was the site of a wood milling operation from 1879 to 1942. Mill waste, in the form of sawdust and wood chips, was dumped in the intertidal area surrounding the mill. Wood chips in the upper intertidal area have completely buried substrates suitable for forage fish spawning. Lower in the intertidal area, where soft sediments exist, the wood waste is releasing sulfide, a natural byproduct of wood decomposition. The sulfide contamination has been documented at levels that are toxic to benthic flora and fauna. The restoration of the area included removing the wood waste and contaminated sediments and refilling the excavated area with sediments common to the surrounding areas. The project will restore suitable forage fish spawning habitat on the beach and suitable habitat for invertebrate production and aquatic flora in the lower nearshore area.

Conservation of Native Eelgrass Habitats in British Columbia

PRESENTER: Nikki Wright, SeaChange Marine Conservation Society

The Conservation of Native Eelgrass Habitats in British Columbia is a multi-year, regional conservation initiative. Begun in 2012 and funded primarily by the Pacific Salmon Foundation, the project's objective is the protection and restoration of native eelgrass habitats within 21 coastal communities surrounding the southern Georgia Basin. It includes eelgrass mapping, restoration, monitoring, and stewardship activities as part of a strategic approach for a net gain of salmon habitat. The work is carried out by an active, engaged network of community members and a professional SCUBA dive team using a science-based restoration and monitoring methodology. Stewardship activities have included inter-generational community participation in eelgrass inventories and restoration, educational outreach, and the physical removal of intertidal and subtidal debris. The project is the result of many consultations with the Pacific Salmon Commission, Pacific Salmon Foundation, Ministry of Environment, Department of Fisheries & Oceans, and the Seagrass Conservation Working Group Community Coordinators. During several years, we have found that success for habitat restoration is the result of good science, results based adaptive management strategies, and positive partnerships with all levels of government and tribes. This presentation will illustrate the long-term benefits of these partnerships by showing how eelgrass inventory maps have been used, the extent of restoration in the Salish Sea thus far, and the sustained engagement of coastal communities.

Maynard Nearshore Restoration Project: Meeting the Needs of Diverse Stakeholders on a Large Estuary Project

PRESENTER: Kevin Long, North Olympic Salmon Coalition

The North Olympic Salmon Coalition implemented the Maynard Nearshore Restoration Project on Discovery Bay in Jefferson County in 2014 after a 10-year planning and stakeholder process. The earth moving required to take out an abandoned railroad grade, bulkheads, and creosote timber railroad trestles was relatively straightforward; however, the stakeholder process was not. At times, serious problems arose that threatened to stop this important restoration project. Stakeholders in the railroad grade trestles and fills included: Washington Department of Fish and Wildlife and Department of Natural Resources, which owned them; the State Historic Preservation Office, which considered them to be historic structures; trails groups, which hoped to use them as a regional trail corridor; a private waterline owner, who had infrastructure in them; and Washington Department of Transportation. Problems did not cease upon finally breaking ground. Early in the construction phase, contaminated soils were discovered leading to project redesign and cost overruns. These adversities were overcome (usually with a win-win solution) allowing the project to remove 1,900 tons of shoreline armoring along a half-mile of shoreline, 4 creosote railroad trestles, and 18,000 cubic yards of fill. Project actions improved the shoreline for migrating juvenile salmonids, improved potential forage fish spawning habitat, and protected and enhanced shellfish beds (including Olympia oyster beds). Kevin Long, the project manager, will share his experiences managing the multi-faceted stakeholder, design, permitting, and construction process.

Seahurst Park Ecosystem Restoration: A Comprehensive Nearshore Restoration Approach

PRESENTER: Steve Roemer, City of Burien, and Peter Hummel, Anchor QEA

The Seahurst Park Ecosystem Restoration Project in Burien is the largest bulkhead and armor removal and beach restoration project on Puget Sound. The project was initiated in 2001 by the City of Burien in partnership the U.S. Army Corps of Engineers and many other funding partners, and construction of the final phase was completed in 2014. The project focused on ecosystem processes and benefits for juvenile out-migrating salmon and took a comprehensive approach to planning, community involvement, restoration and park design, monitoring, and implementation. A key location for sediment supply to 10 miles of nearshore habitat, the nearly 1-mile-long project used a habitat-forming, process-based restoration approach. As a local government, the City of Burien used numerous and creative approaches to fund this multi-year, $11 million project. The presentation will provide an overview of this significant nearshore project, covering its goals, objectives, unique challenges, and opportunities. The presentation also will cover the context of the project in terms of the supporting studies, site conditions, community and stakeholder involvement, and funding partners. An overview of the project's ecological

underpinnings that drove the restoration will be provided, including the upland and coastal geology, as well as the nearshore and terrestrial biology. Lessons learned from Phase 1 and 2 physical and biological pre- and post-project monitoring also will be covered. In addition, the delicate balance between meeting ecological restoration objectives and allowing for continued educational and recreational use of this regionally significant park will be explored.

HOW'S THAT WORKING? EFFECTIVENESS MONITORING OF RESTORATION PROJECTS

ROOM
Cedar

MODERATOR
Jen Bayer

Salmon Recovery Funding Board Monitoring Panel: Providing Technical Evaluation and Guidance to Monitoring Programs Supported by the Salmon Recovery Funding Board

PRESENTER: Jody Lando, Stillwater Sciences

The six-member Salmon Recovery Funding Board Monitoring Panel provides technical expertise and support of statewide monitoring programs and projects that receive board funding. Formed on the basis of recommendations stemming from a 2013 evaluation of the board's monitoring programs, the technical advisory panel is tasked with developing clear expectations and evaluation of four Intensively Monitored Watersheds, Project-scale Effectiveness Monitoring, and a subset of statewide Fish In/Fish Out studies. The objective of evaluating the monitoring programs is to provide constructive, technical feedback to both practitioners and the board. The panel will conduct evaluations this year and will require close collaboration with monitoring practitioners. The intent of such efforts is to improve the overall quality and expectations of monitoring in support of salmon recovery. In addition, the panel advises the board on monitoring-related concerns, will make recommendations for revising the board's monitoring strategy, and will develop an adaptive management program to connect restoration and monitoring to salmon recovery.

Fish Use of In-stream and Floodplain Enhancement Projects: A Summary from Project Effectiveness Monitoring in Washington

PRESENTER: Jennifer O'Neal, Tetra Tech

The Washington Salmon Recovery Funding Board's Project-Scale Effectiveness Monitoring Program was started in 2004 to evaluate the effectiveness of salmon habitat restoration projects in the following categories: Fish passage, in-stream habitat, riparian planting, livestock exclusion, floodplain enhancement, spawning gravel placement, diversion screening, and habitat protection. The program was intended to evaluate effectiveness of projects at improving habitat and increasing fish use and to determine the cost-effectiveness of projects by category. Over time, the program has evolved to also provide information that can help adaptively manage the design process to build more effective projects. This includes fish use by structure or habitat type, species-specific habitat preference data, and qualitative observations of fish behavior. Results from the comparison of fish use, large woody materials, measures of habitat complexity, or specific observations of selected depths and velocities by species allow us to determine if these elements drive selection of habitats by salmonids. Examples of predictive models will be provided that can be used to develop better design criteria to target the particular needs of species and life stages.

Statistical Analysis of Project Effectiveness: Learning at the Regional Scale

PRESENTER: Leska Fore, Puget Sound Partnership

Project effectiveness in Puget Sound is measured and reported by numerous regional monitoring programs. How do we roll up project-scale studies to inform regional restoration efforts? Statistical meta-analysis provides a method to determine which restoration actions are the most effective. Meta-analysis is widely used in other fields to evaluate the effectiveness of medical treatments and educational programs. We evaluated several examples of effectiveness monitoring studies in Puget Sound such as projects to reduce toxics, improve water quality, and

restore habitat in lakes, rivers, and nearshore areas. We used meta-analysis as a framework to compare studies that use different response variables to measure change over time. We compared a diverse set of projects to evaluate which are most successful in terms of measurable change over time.

Long-term Coho Salmon Response to In-stream Restoration Treatments

PRESENTER: Brian Jenkins, Oregon Department of Fish and Wildlife

The Lifecycle Monitoring Project in western Oregon has been estimating salmonid abundance in eight study basins since 1998. The West Fork Smith River, a 69-square-kilometer basin in southwestern Oregon, is a system impacted by past land-use practices and has been the focus of stream restoration projects since 1981. To evaluate aquatic response to in-stream restoration, this study used long-term data sets estimating returning adult and out-migrating juvenile coho salmon in one test basin, seven control basins, and coast-wide estimates. Coho smolt production increased dramatically within the test basin over the study period and adult returns for the test basin show an upward trend relative to estimates for the Oregon Coast Coho Evolutionarily Significant Unit and two sub-strata population areas. Peak spawner abundance increased following treatments and continues to show an improving trend. Discussion of the results from the $1.6 million in recent basin-scale, in-stream work will be discussed.

Rudio Creek Ranch Restoration Project: A Case Study in Effectiveness Monitoring

PRESENTER: Monique Leslie, The Freshwater Trust

The Rudio Creek Ranch Restoration Project in the North Fork John Day River sub-basin has a primary goal of restoring about 2 miles of Rudio Creek and its floodplain to benefit federally listed summer steelhead and spring Chinook. Modifications during the past century resulted in decreased flows and a straightening and channelizing of Rudio Creek. Before implementation of the restoration project, flow restoration started with a conservation easement, which ensures that naturally cold water is used to satisfy downstream irrigation needs instead of warm reservoir water, and a point of diversion transfer that ensures natural flow to the mouth of Rudio Creek during late summer. In-stream habitat restoration began in 2012 with the objectives of increasing stream length and channel complexity; restoring floodplain and riparian vegetation; improving channel-floodplain connectivity; improving altered thermal regime; and maintaining fish passage. The effectiveness monitoring plan for the Rudio Creek project was designed to measure progress toward achieving project objectives, inform maintenance needs, and provide input into whether the project is trending towards or away from achieving project goals and compliance with NOAA Restoration Center's programmatic biological opinion. This plan is unique in that it specifies target thresholds and decision pathways that trigger an evaluation of the project by a review team consisting of regulating entities, project engineers, and project managers. This presentation will demonstrate how monitoring results have informed maintenance decisions and provide lessons learned around metric selection and sampling design.

INTEGRATED MANAGEMENT: THERE'S MORE TO SALMON RECOVERY THAN SALMON

ROOM
Heritage F

MODERATOR
Raquel Crosier

It's Not Just the 4 Hs…Need to Include "I" for Invasives

PRESENTER: Joe Maroney, Kalispel Tribe of Indians

Non-native species introductions (illegal and intentional) were a factor in 68 percent of fish extinctions in North America. The rates of these types of introductions have increased dramatically in the past 50 years impacting nearly every major watershed in the United States. The transformation of the Columbia River and its tributaries from a free flowing system to a system dominated by reservoirs has contributed to the establishment and spread of non-native invasive fish. That transformation also has impacted native fish in terms of habitat loss and degradation. The predatory effects of non-native invasive fish species on native fish are well documented in the Columbia Basin. These issues necessitate the discussion of the ecological and biological impacts of non-native invasive fish. There

is a serious need for concentrated focus and education throughout the Columbia Basin for the control and management of non-native, invasive fish. Several examples of northern pike, brook trout, and walleye suppression or eradication efforts undertaken in Washington will be highlighted.

Integrating Lamprey into Salmonid-based Habitat Restoration

PRESENTER: John Crandall, Methow Salmon Recovery Foundation

The Integrating Lamprey into Salmonid-Based Habitat Restoration Project is designed to provide information for salmonid-based habitat restoration projects so that they can benefit lamprey by considering the habitat needs of lamprey in project development, design, and implementation. Salmon and steelhead populations in the Pacific Northwest have declined precipitously and a significant effort to restore habitat for these fish is underway. At the same time, Pacific lamprey populations throughout the Columbia River basin also have declined. Yet, habitat restoration specifically designed to enhance habitat conditions for Pacific lamprey has been largely overlooked. While the cause of this lag is likely complex, a lack of an accessible source for technical information related to enhancement of lamprey habitat has contributed. The Pacific Lamprey Instream and Riparian Habitat Restoration Guide is an outreach tool developed to provide details for the enhancement of lamprey habitat in order to restore this imperiled fish species. The biology and ecology of lamprey differ significantly from salmonids and it is important to consider how these differences influence overall project effectiveness. The guide is intended to provide habitat restoration practitioners in the region with the background and technical information necessary to incorporate lamprey-specific project design elements into stream and riparian habitat restoration projects. These design elements will assist with improvements in habitat conditions and limiting factors for all life stages of lamprey. During the past few years, several projects in the Columbia River basin have developed innovative techniques that address factors limiting lamprey populations and these efforts will be highlighted.

Effectiveness Monitoring Strategy for Clean Water Act Watershed-Based Pollution Control Plans in Washington

PRESENTER: Scott Collyard, Washington Department of Ecology

The Washington Department of Ecology is required, under the federal Clean Water Act and U.S. Environmental Protection Agency regulations, to develop and implement water cleanup plans for impaired waters, and evaluate the effectiveness of the water cleanup plan. To meet this requirement, the Environmental Assessment Program has developed an effectiveness monitoring strategy that is intended for easy integration into pollution control plans. The program employs a “weight of evidence” approach using several types of monitoring activities to determine the cumulative effectiveness of best management practices at a watershed scale. In addition, the program continues to develop and use watershed health indicators and data analysis tools to help foster improvements in study designs and in plan implementation. Ultimately, the goal of effectiveness monitoring is to increase efficiency in making management decisions that will result in water quality improvements when implementing restoration efforts at a watershed scale.

Is it POSSIBLE? Protecting Watersheds from Invasive Species with Early Detection and Rapid Response Management Protocols

PRESENTER: Jill Silver, 10,000 Years Institute

Decades of protection and active restoration work in the Hoh River validates the inclusion of invasive species prevention in watershed recovery planning and activities. Invasive plants from Europe and Asia appear innocuous until - suddenly - they’re densely established, replacing the valuable ecosystem services provided by native plant communities, and requiring funding, time, and herbicide for restoration. Knotweeds, Scotch broom, and reed canarygrass thrive in disturbed environments – exactly those provided by migrating rivers in forested ecosystems where exposed gravel substrates and eroded banks offer ideal conditions for invasion; reversing riparian protection and salmon recovery investments. Arriving via wind and water, and through restoration, recreation, and construction activities, invasive plants not only move within watersheds, but from outside as well, and thus, expensive, ecologically-harmful invasions take hold. Fourteen years of invasive species prevention and control work on the wild Hoh River on Washington’s Olympic Peninsula provides key insights into the ecological and

economic benefits of early detection and rapid response protocols, eliminating invasive species before they become established. The key is to act early to stop the introduction and movement of seeds and other plant propagules. Recreational fishing guides are astonished at the low level of knotweed and reed canarygrass in the Hoh River! This presentation shares rationale, methods, and analysis of the costs and effectiveness, along with beautiful photographs of a wild river with intact native riparian and wetland plant communities.

FISH PASSAGE: GETTING AROUND IT

ROOM
Spruce

MODERATOR
Jeannie Abbott

Fish Passage: An Update on the Fish Barrier Removal Board

PRESENTER: David Price, Washington Department of Fish and Wildlife

In recent decades, state agencies, local governments, non-profit groups, tribes, and others have worked to remove culverts that present barriers to steelhead and salmon in streams throughout the state. Since 1999, the timber industry also has restored thousands of miles of spawning and rearing habitat under the terms of Washington's Forest and Fish Law. There has been substantial progress made with approaches that remove fish barriers based on road ownership, but in many cases, full and partial barriers elsewhere in the system have continued to block fish passage. Coordinating fish barrier correction on a watershed basis can help build on the investment that has been made already to improve access to high quality fish habitat. In 2014, the Washington State Legislature created the Fish Passage Barrier Removal Board to identify and expedite the removal of fish barriers and create a coordinated statewide approach for fish barrier removal to maximize investments. That strategy is especially important as barriers are removed associated with the 2013 culvert court decision requiring the state to correct up to 900 additional fish barriers on state lands. This presentation will introduce and provide an update on the Fish Passage Barrier Removal Board as well as connect this program with other barrier removal efforts.

Upper Columbia United Tribes: Fish Reintroduction into the Upper Columbia Basin

PRESENTER: Keith Kutchins, Upper Columbia United Tribes

The Fish Passage and Reintroduction into the Upper Columbia River Project will inform decision-makers about how to achieve fish passage and reintroduction into the Columbia River basin above Chief Joseph and Grand Coulee dams. Native peoples' culture, nutrition, and spiritual existence have lacked salmon in areas upriver from Chief Joseph and Grand Coulee dams for more than 70 years. Reintroduction of salmon is an important component of ecosystem-based function and adaptation to climate change. Technical, legal, social, economic, and political mechanisms now exist to achieve reintroduction into previously blocked habitats in these areas of the upper Columbia River. The U.S. tribes and Canadian First Nations have developed a scientifically-rigorous, sequentially phased plan to investigate and implement fish passage and reintroduction into the upper Columbia River basin. The Upper Columbia United Tribes will describe a structured coordination framework and work plan that implements the first phase of that plan.

A New Concept in Moving Fish: The Whooshh Fish Transport System

PRESENTER: Eric Kinne, Washington Department of Fish and Wildlife

The Whooshh Fish Transport System in southwest Washington provides a new technology in transporting fish. The system propels adult fish from one location to another through a long, flexible tube. At one end, crewmembers load adult salmon into the tube. Fish transport through the tube by pressure differential and exit into a pond or awaiting transport truck. This system is 120-feet long and the fish move at a rate of about 22 miles per hour. Small salmon may get stuck in the tube, which is designed to operate with fish from 15 to 30 pounds. Another larger salmon or a water-soaked sponge can be loaded into the tube to move smaller fish through the system. Fish are less stressed with the salmon cannon. The Washington Department of Fish and Wildlife has compared fish transported with the cannon to fish transported by hand or tote. Fish were held for 6 weeks and no differences in mortality or condition of fish were observed. This technology has the potential to move fish over long distances and heights.

REGIONAL MONITORING AND ADAPTIVE MANAGEMENT PANEL

ROOM
Pine

MODERATOR
Laura Blackmore

Puget Sound Chinook Monitoring and Adaptive Management Program

PRESENTER: Jeanette Dorner, Puget Sound Partnership

The Chinook Monitoring and Adaptive Management program in Puget Sound is working with Chinook salmon watersheds to develop watershed-scale monitoring and adaptive management plans for Chinook salmon recovery. The first phase focused on translating local watershed thinking into a common regional framework. The second phase (underway) will further develop full monitoring and adaptive management plans at the watershed and regional level. This presentation will cover the approach, results, current work underway, and opportunities for funding. Using the Open Standards for the Practice of Conservation approach and the *Puget Sound Chinook Salmon Recovery: A Framework for the Development of Monitoring and Adaptive Management Plans*, the Puget Sound Partnership worked with the 16 watersheds to complete translation of existing watershed plans into a common language. Watershed teams described strengths and gaps in existing plans, assessed status and trends of Chinook populations and key habitat components, identified monitoring priorities, and created adaptive management processes to support use of new information to guide management decisions. The second phase of the project establishes priorities for regional monitoring, identifies monitoring protocols, and operationalizes adaptive management processes. While additional funding is needed, the Puget Sound region already has substantially improved the ability to report on salmon recovery progress and efforts at the regional and watershed level. Authors will describe how this effort will establish a comprehensive, methodical, effective, and transparent monitoring and adaptive management program that is incorporated into, and leveraged by, the broader efforts around Puget Sound recovery.

Are We There Yet? Evaluating Progress towards Recovery Goals in the Yakima Basin

PRESENTER: Alex Conley, Yakima Basin Fish and Wildlife Recovery Board

What kind of data will we need to evaluate if a delisting is warranted? In the Yakima basin, we completed a recovery plan for steelhead in 2009, and a strong partnership of tribal, state, local and federal governments, conservation districts, non-profit organizations, and others is aggressively implementing recovery actions. Steelhead are responding positively, and are approaching recovery targets in some areas. We're increasingly being asked how we'll know when we are there. Partners in the basin are monitoring whether fish populations are meeting the biological goals set in the steelhead recovery plan. However just knowing when we have enough fish in the right places won't be enough to justify a delisting. We also will need to be able to determine whether the threats that were identified by NOAA when the species was listed have been adequately addressed. We are pulling together the best data available on whether we are adequately addressing the more qualitative threats criteria, so that this information can be considered as part of the next 5-year status review. One of our primary goals is to identify critical data gaps and develop programs that will fill these data gaps before the 2020 Stock Status Review. We will present this work and how it will help us answer the question of whether we are there yet.

Tradeoff Considerations in Adaptively Managing Salmon Recovery

PRESENTER: Steve Martin, Snake River Salmon Recovery Board

Implementation is a natural and desired outcome when stakeholders engage with scientists in developing the goals, objectives, strategies, and most specifically, the projects. Since its inception in 2002, the Snake River Salmon Recovery Board has guided more than $30 million in federal, state, and private funding based on the priority areas and actions established in the recovery plan. Are the actions the best type and in the correct locations for the most effective outcome? Monitoring the outcomes and adaptively managing future decisions requires a

deliberate decision that has tradeoffs. The challenge in using the adaptive management approach lies in finding the correct balance (funding tradeoff, time and patience, and support) between gaining robust knowledge vs. attempting the best short-term outcome based on current knowledge. Salmon recovery is in its infancy and we need to consider the tradeoffs between short-term outcomes and long-term success. Patience, commitment, collaboration, and follow through are essential.

Integrating Habitat Status and Trends and Storm Water Monitoring in the Lower Columbia

PRESENTERS: Karen Adams and Jeff Breckel, both from the Lower Columbia Fish Recovery Board

The Integrated Habitat Status and Trends Monitoring project in the lower Columbia will provide the means to assess changes over time in watershed processes and habitat conditions critical to salmon and steelhead recovery. While local, state, and federal agencies monitor watershed and habitat attributes, there are no means to comprehensively and consistently monitor these attributes across the many watersheds of the lower Columbia in Washington and Oregon. The Lower Columbia Fish Recovery Board is working with federal, state, and local agencies to integrate and supplement existing monitoring activities to more effectively and efficiently support regional salmon recovery, watershed enhancement, and storm water management efforts. During the past 3 years, project partners have developed and refined a monitoring design that lays out management questions and objectives addressed, stratification schemes, site allocation scenarios, the temporal scale of monitoring and reporting, and metrics and measurements. The monitoring design will be complete in 2015.

Upper Columbia Adaptive Management: Fifteen Years of Evolution and Lessons Learned

PRESENTER: Derek Van Marter, Upper Columbia Fish Recovery Board

The classic concept of adaptive management is simple: Learn by doing and monitoring. Academically, we know that there are many pitfalls to adaptively implementing a plan successfully. This presentation will explore how the Upper Columbia Fish Recovery Board organized its science and public review processes to continue to inform implementation, and what we have learned from that approach in the past 15 years. In short, science and collaboration remain the foundation of how we, as a backbone organization, continue to successfully implement a salmon and steelhead recovery plan through a voluntary, non-regulatory framework, while also being asked to expand our influence within the region's uplands. The presentation will explore the following lessons: 1) The end game isn't data collection or management; it's information generation and distribution; 2) Successful management requires responsible entities; 3) Effective collaboration demands constant feeding and care.

Habitat Restoration in the Columbia River Basin: A Federal Funding Agency Perspective

PRESENTER: Rosemary Mazaika, Bonneville Power Administration

Bonneville Power Administration, U.S. Army Corps of Engineers, and Bureau of Reclamation spend tens of millions of dollars to improve salmon habitat in the Columbia River estuary and tributaries. This program, one of the largest and most complex in the nation, provides "off-site mitigation" for impacts of the hydropower system. But what has been learned about improved conditions for fish? What information sheds light on conclusions about success? Is it enough to simply protect habitat? Will passive restoration result in benefits necessary to improve salmon survival? What elements of restoration are necessary to ensure long-term benefits to fish? These are just some of the questions that are raised concerning the benefit of the region's investment. An extensive research, monitoring, and evaluation program is delivering answers to some of these questions. However, many remain unconvinced that efforts to improve conditions for salmon and steelhead are succeeding. I will discuss the Bonneville Power Administration's tributary habitat program, the implementation process, and how our accomplishments are recorded. I will reflect on data that are being developed and their utility to practitioners and policymakers. I conclude that while data collection is important, program success will require synthesis and a captive audience truly intent on understanding the many facets of what we are doing and how it can sustain economies and build empires.

WEDNESDAY
10:30 A.M. – 12:30 P.M.

PROJECT MANAGEMENT AND PLANNING: MEASURE TWICE, CUT ONCE

ROOM
Ash

MODERATOR
Tom Slocum

Effective Goals and Objectives for Successful Salmon Recovery Funding Board Projects

PRESENTER: Tom Slocum, Skagit Conservation District and Salmon Recovery Funding Board Review Panel

From the earliest years of the Salmon Recovery Funding Board grant program, the board's standard proposal form has required project sponsors to identify the goals and objectives of their projects. This basic question is intended to help sponsors develop focused and coherent project designs that will accomplish meaningful actions and will tangibly contribute to the implementation of their regional salmon recovery plans. While the benefit of having clear and coherent goals and objectives is obvious, 15 years into the grant program, some of the proposals submitted to the board still come up short. This presentation will present guidance for sponsors on developing goals and objectives for their proposed projects, so that each project ultimately makes an effective contribution to our state's salmon recovery program. Widely-used project development guidance such as the "Logic Framework Approach" and "SMART" criteria will be presented and applied to the context of developing Salmon Recovery Funding Board planning, restoration, and acquisition projects. Relevant project development information from the Washington Department of Fish and Wildlife's habitat restoration guidance documents also will be discussed. The presentation will draw on actual examples of effective and less-than-effective goals and objectives, gleaned from the presenter's 11 years of experience reviewing grant proposals for the board's review panel. Through a group discussion, we will try to share a sense of "best practices" for this crucial component of project planning.

Consultants are People Too

PRESENTER: Eli Asher, Cowlitz Indian Tribe

As in-stream habitat restoration has matured as a field, design consultants have become increasingly important members of the project team. Unfortunately, the partnership between project sponsors and consultants often is fraught with tension. Blown budgets, missed deadlines, and wasteful re-designs are common outcomes of relationships and expectations that are poorly developed and rarely discussed. This presentation will cover four practices that will improve relationships, project outcomes, budgets, and timelines. The core principle in this presentation is that consultants are people, too: They are human members of your team, not design machines. The presentation will cover easy, productive ways to build relationships, keep budgets and timelines in check, and avoid costly re-designs by approaching the process with an eye toward collaboration.

Veterans and the Environment: Engaging with and Fully Understanding Marginalized Populations

PRESENTER: Jason Alves and Jeremy Grisham, Washington State Department of Veterans Affairs

This presentation examines the role barriers play in a veteran's transition from military service and respective cultural and sub-cultural factors that lead to the marginalization of the veteran community as a whole. In addition, the work also identifies the unique opportunities the Veterans Conservation Corps provides in connecting with and succeeding with marginalized veterans as well as methods and approaches that can be used with other non-traditional populations under the ecotherapy and ecopsychology approaches. Healing the mind, the soul, and the planet.

Cultural Resources Panel

PRESENTERS: Maurice Major, Washington Department of Natural Resources and Katherine Kelly, Washington Department of Fish and Wildlife

One of the most confusing and mysterious hoops that restoration projects must jump through can be the cultural resource review. A re-contoured shoreline or newly excavated channel may be great for the fish, but such projects might involve removal of a beloved historic structure or impacts to an ancient archaeological site. These types of

cultural resources are non-renewable, and once they are gone, it is forever. Additionally, tribes identify other types of cultural resources, such as traditional cultural properties and an array of plant and animal species that continue to be important today. State, tribal, and federal agencies may be proponents of a restoration project on the one hand, while the same agency's other hand is holding up the project due to cultural resource concerns. This panel will discuss some of the issues that arise when cultural resource protection and environmental restoration projects are in conflict, and how to plan projects that will avoid such problems. Initiating archaeological investigations and tribal consultations early in the planning phase can yield benefits not only in avoiding delays that can arise from finding a site in the path of a proposed new channel, but can help the project achieve a design that makes use of archaeological and traditional knowledge about reference sites, ancient species composition, hydrology buried under fill, and characterization of the disturbance being remedied.

INNOVATIVE PARTNERSHIPS: FARMERS, FISH, AND THE FUTURE

ROOM
Birch

MODERATOR
Ron Shultz

The Rationale for Landowner Engagement: Why Farmers and Environmentalists Need Each Other

PRESENTER: Don Stuart, Stuart Consulting

This presentation will show why farmer and environmental cooperation is essential for BOTH a healthy, sustainable environment AND for strong, successful farms. With agriculture using 80 percent of the nation's water and occupying half the land base – frequently in salmon-sensitive areas – successful salmon recovery often requires active, willing, and preferably enthusiastic participation by working farmers. Engaging farmers can be challenging where farmers (and the farm community) have come to believe that environmental restoration and protection are contrary to their best interests. This presentation will include examples of the many ways in which salmon restoration and working farms both benefit from cooperation and will show how both suffer when that cooperation is lacking. It will discuss the core sources of farm-environmental conflict and explain the "farmer-environmental paradox," which often prevents collaboration. And it will offer proven approaches for dealing with this conflict, both individually and at a community level.

Bridging the Divide Between Big Ag and Conservation on the Willamette River in Oregon

PRESENTER: Matt Blakely-Smith, Greenbelt Land Trust

The divide between Big Ag and the conservation community on the Willamette River in Oregon illustrates the challenges and opportunities for region-wide habitat restoration and recovery goals. Many farmers feel vilified by the conservation community because we openly blame the industry for diminished water quality and habitat conversion. Farmers in turn portray the conservation community as being poor land stewards with a vast portfolio of failed projects and wasted public money. Our experience shows that both groups can benefit from working together. Greenbelt Land Trust is modifying precision agricultural techniques to restore a 400-acre floodplain and a 2.5-mile-long side channel that supports juvenile spring Chinook salmon. A permanent conservation easement compensated the farmers and allowed them to retain ownership of the family property while enabling them to purchase more productive farmland outside of the flood zone. The easement allowed us to retire all of the agricultural fields and reconnect the Willamette River to its historical floodplain. This presentation will discuss how we can break down social barriers to achieve our region-wide restoration and recovery goals. We also will explain the nitty-gritty details of how farming techniques can vastly improve efficiencies and the success rate on large-scale restoration projects.

Hedgerow Buffers: A Viable Option for Smaller Streams in Agricultural Areas

PRESENTER: Frank Corey, Whatcom Conservation District, and Jessica Shaw, Washington State University

The riparian re-vegetation project in Whatcom County has successfully planted more than 40 miles of "hedgerow" along fish bearing waterways in agricultural areas in the past 10 years. Riparian restoration is a component of nearly every salmon recovery strategy. This program has documented a cost-effective means to restore a significant level of riparian function to a challenging component of the landscape where the needs for farming and fish must be balanced. Relatively narrow, 15-foot-wide buffers are a more palatable option for landowners and an effective means to improve water quality and fish habitat. Using an innovative planting strategy that mimics natural succession following land disturbance, canopy cover has been achieved over long reaches of stream with minimal long-term maintenance. The hedgerows function as a physical barrier to pollutants and as an important source of food and cover for aquatic organisms. Preliminary results from research conducted during the past two summers indicates that narrow buffers provide similar amounts of shade as wider buffers. Subsequent research investigates whether fish abundance in buffered streams is influenced by buffer width or more closely by shade and habitat conditions. Hedgerow buffers are an effective strategy that should be considered throughout the northwest.

Voluntary Incentive Programs: Are They Effective Tools for Salmon Recovery?

PRESENTER: Erika Britney, ICF International, and Ron Shultz, Washington State Conservation Commission

The Effectiveness of Voluntary Incentive Programs project in Puget Sound focused on moving forward the debate about whether voluntary incentive programs are useful tools for achieving resource objectives by identifying the strengths and weaknesses of these programs, identifying solutions to address key criticisms of them, and building on recognized successes. There has been a lengthy debate about the effectiveness of voluntary incentive programs for supporting salmon recovery on agricultural lands. Proponents of these programs point to notable examples of successful programs. Critics point to the lack of consistent reporting of projects or Best Management Practices and the lack of data about results achieved. Many critics also advocate for more regulatory-driven, prescriptive approaches to ensure agricultural land management is fish friendly. In this presentation, we will discuss the differing perspectives on voluntary incentive programs to define what it means for a voluntary incentive program to be effective, characteristics of successful and effective programs, and issues that hamper effectiveness, consistent monitoring, and reporting of results achieved. We will wrap-up our discussion by presenting a prioritized set of recommendations for addressing these issues and replicating successful programs.

WEDNESDAY AFTERNOON SESSIONS

RECONNECTING FLOODPLAINS: GET BACK TO WHERE YOU ONCE BELONGED

ROOM
Hemlock-Oak

MODERATOR
Kelley Jorgensen

Alluvial Fan Restoration on Lower Boise Creek

PRESENTER: Mason Bowles, King County

The Lower Boise Creek Channel Restoration Project near Enumclaw was designed to restore and to expand spawning and rearing habitat for salmonids. The historic alluvial fan was abandoned a century ago when the railroad relocated the creek into an over-steepened ditch. Construction of a new alluvial fan was halted when polyaromatic hydrocarbons and heavy metals were discovered along the alignment of an historic railroad trestle. Pump-and-treat technologies combined with dig-and-haul methods removed 559 tons of contaminated soil and 286 tons of creosote pilings. Following site cleanup 9,000 cubic yards of soil were excavated to create 600 linear feet of new channel containing 150 pieces of large wood. Four acres of riparian and upland area were planted with native trees and shrubs. Snorkel surveys indicate that the project consistently is supporting far more trout and coho than before construction, and are greatly exceeding the upstream control. Steelhead, which did not spawn in the vicinity of the project, have spawned at the site in each of the past 3 years; in one year, 28 percent of all steelhead redds in the watershed were found within the project site. Along with these successes, there also have been challenges with redd dewatering and stream overheating. Diverting and concentrating low flows beneath shade cloth successfully reduced temperatures and protected redds. Take-away lessons are to use scenario-based planning and pre-mortem analysis to identify and manage risks. Permits should include provisions for rapidly responding to undesirable conditions with post-construction adjustments.

The Eschbach Park Levee Setback and Side Channel Reconnection Project: Successes and Lessons Learned

PRESENTER: Karen Hodges, Yakima County Public Services and Water Resources Division

The Eschbach Park Levee Setback and Side Channel Restoration Project is on the Naches River in Yakima County on the downstream right bank from the City of Yakima Water Treatment Facility on Highway 12. The County removed the Eschbach Park levee and built a new levee nearly 1,100-foot landward from the original location. The project provides fish access to more than 37 acres of high quality, mature riparian habitat to the Naches River and reconnects two side channels cut off by original levee construction in 1974. Over time, levee removal will allow the river to reconnect a larger reach (2.1 miles) of the Naches River to its historic floodplain. In the 1996-1997 floods, the Eschbach Park levee contributed to an avulsion of the river channel that resulted in degradation of the reach and the loss of more than 150 acres by downstream landowners. This area is used by Endangered Species Act-listed (threatened) mid-Columbia steelhead and bull trout, as well as coho and spring Chinook. As these habitats become reconnected to the river and expand in extent, habitat quality and quantity will increase dramatically in the lower Naches River. All of the floodplain areas affected are already in conservation status, thus the habitat will be protected in perpetuity. Other benefits include reductions in property losses and reduced modeled flood elevations at the City of Yakima Water Treatment Plant and U.S. Highway 12, both on the opposite bank from the levee removal.

Meacham Creek Floodplain Restoration and In-stream Enhancement Project

PRESENTER: Michael Lambert, the Confederated Tribes of the Umatilla Indian Reservation

Floodplain and channel processes in Meacham Creek, a tributary to the Umatilla River, have been damaged land management actions, primarily associated with the adjacent Union Pacific Railroad railway built in the early 1900s near Meacham Creek. As a result, the channel was disconnected from the floodplain and shallow groundwater table, stream banks are exposed and unstable, roughness features to dissipate flood flow energy are lacking, in-stream aquatic habitat has been removed or simplified, and water quality in terms of stream temperature and sediment routing is degraded. Meacham Creek supports two federally listed threatened species, middle Columbia River steelhead and Columbia River bull trout, and key species spring Chinook salmon and Pacific lamprey. A multiple phase restoration approach was implemented to restore, enhance, and protect 22 hectares of floodplain habitat and restore channel morphology while enhancing fish habitat. The project resulted in moving the stream into historic channel alignment and excavating historic meanders in the floodplain, resulting in 1,805 meters of new, reconfigured stream channel and 2,509 meters of off-channel and side-channel habitat. Habitat complexity was increased significantly by incorporating in-stream habitat features. Four large spur dikes in the floodplain were modified or removed, and the 853-meter levee along the existing channel was removed. The project created or enhanced 1.33 hectares of wetland features. We present our design development process and show results of our project actions and learned experiences.

Meacham Creek Hyporheic Restoration Monitoring Project

PRESENTER: Byron Amerson, Montana State University

The Meacham Creek Hyporheic Restoration Monitoring Project in the Umatilla River basin, Umatilla County, Oregon was designed to evaluate the efficacy of a 2011 channel restoration on hyporheic and surface water hydrology and temperature. In 2011, a 2.6 kilometers each of Meacham Creek was reconfigured from a straight, steep wall-based channel to more a sinuous, low-gradient channel in an effort to restore its degraded hydrology. Key objectives of the project were to raise the water table, create new and more diverse subsurface flow paths, increase the rate and magnitude of groundwater-surface water exchange, and initiate increased buffering and lagging of water temperature in the subsurface to mitigate warm surface water temperatures. The primary goal of the project was to address aquatic habitat needs for spring Chinook and summer steelhead, which use Meacham Creek for spawning and rearing. Our work combined hydraulic modeling of the floodplain aquifer with a very rich floodplain groundwater temperature data collection campaign to develop a comprehensive understanding of how hydrology and water temperature were affected by the channel plan form change due to the restoration project. Here, we present preliminary results of our monitoring and modeling effort showcasing how water temperature, an important water quality parameter, also can be used as a tracer to track hyporheic water movement and confirm model predictions.

ESTUARY RECONNECTION: WORTH ITS SALT

ROOM
Heritage E

MODERATOR
Cindy Dittbrenner

Predicting the Number, Orientation, and Spacing of Dike Breaches for Tidal Marsh Restoration

PRESENTER: Gregory Hood, Skagit River System Cooperative

Tidal channels are structurally and functionally prominent features in tidal marshes, so their restoration is central to tidal marsh restoration. How many tidal channels can a restoration site support? How many dike breaches should be made to restore tidal inundation and tidal channels, if the dike is not to be removed entirely? Analysis of tidal marshes in Puget Sound river deltas and the lower Columbia River estuary showed that channel outlet count scales with marsh area. Further analysis indicated tidal marsh restoration projects lacked enough tidal channels up to five-fold. This deficiency likely impacts fish access to the restoration sites by a similar factor. After addressing the question of tidal channel outlet count, the next design questions are how should dike breaches be oriented in tidal marsh islands and how should they be spaced. Analysis indicated that outlets of the two largest tidal channels draining a marsh island are typically oriented

downstream, in parallel with the nearest river channel. However, the outlets of smaller tidal channels are oriented randomly. Tidal channel outlet spacing is generally independent of site size and constant within a river delta. These results provide general guidance to improve tidal marsh restoration design.

Agriculture and Habitat Restoration: Groundwater Management Case Studies

PRESENTER: Mike Ramsey, Recreation and Conservation Office

This session will discuss how subsidence results in increasingly low farm field elevations compared to groundwater over time. This issue is essential to estuary restoration, but has not been rigorously observed. Subsidence rate and change over time has been haphazardly documented. The risks have not been quantified. The session will discuss some case studies and consider how to move forward for restoration objectives. Restoration planning is underway for Leque Island, a historical delta island in the Stillaguamish Delta. It is bisected by a causeway constructed to connect Camano Island and the mainland. The Port Susan Restoration Project restored a farm field where the costs of pumping made farming uneconomical. The project design includes a flood gate that reduces flood impacts to adjacent farmland. The Fisher Slough Restoration Project team learned that spring water levels are critical to farm operations because they can delay the time of spring tillage. The project incorporated drainage system enhancements into restoration and made estimates of how the project would reduce flooding on Carpenter Creek. The Wiley Slough Restoration Project team is working to resolve claims from adjacent landowners that restoration modified farm field drainage, and increased spring flooding. Downstream shoaling on the delta flats have been affecting conveyance, due to the very low slope of channels, suggesting that the function of farm drainage systems fluctuates. The Fir Island Farms Restoration Project team is evaluating the effect of restored tidal inundation and changes to drainage infrastructure on agricultural lands. The monitoring strategy includes multiple parameters related to drainage and water levels. Subsidence and sea level rise are likely to compel abandonment of some delta farmlands, unless river sediments can be brought in to raise subsided lands.

The Qwuloolt Estuary Restoration Project as Levee Breach Approaches: Progress and Preliminary Lessons

PRESENTER: Josh Meidav, The Tulalip Tribes

The Qwuloolt Estuary Restoration Project located in the Snohomish River basin, the second largest watershed in Puget Sound, will be completed this year through a significant levee breach that will reconnect a previously cutoff floodplain with tidal inundation and provide multiple salmon species access to 375 acres of estuarine wetlands and improved access to 16 miles of upstream rearing and spawning habitat. Completion of the project will achieve close to one-third of the 10-year target for estuary restoration of the Snohomish. The tribe will build a 3,957-foot setback levee, lower and breach a 1,500-foot existing levee, restore the stream and channel, build a wave attenuation berm, plant native plants, rebuild the topography, seal the tidegate, and built a storm water treatment pond. This project, 20 years in the making, would not be possible without the support of multiple partners across agencies and communities. At the same time, this project has (and continues to) overcome multiple challenges, with contexts and solutions that can provide practical observations to all concerned with salmon recovery in the Pacific Northwest, as well as offer a springboard for productive discussion around adaptive management in the salmon habitat recovery process. This talk will discuss the technical design and the progress in implementation, monitoring, and initial lessons learned in one of Puget Sound's largest restoration projects underway.

Restoration of Cold Water Refugia in the Columbia River Estuary: Lessons Learned

PRESENTER: Chris Collins, Lower Columbia Estuary Partnership

During the past century, a combination of factors has degraded Columbia River water quality, including its thermal regime. Adult and juvenile salmonids migrate through the main stem Columbia River (including the Columbia River estuary) during periods when temperatures average 18-22˚C and reach as high as 24˚C. The effects of these temperatures include physiological stress and higher susceptibility to predation. Data are

available detailing the characteristics and use of thermal refugia by adult salmon and steelhead above Bonneville Dam; however, very limited data exist regarding use of thermal refugia in the Columbia River below Bonneville Dam. Despite this data gap, available evidence suggests that thermal refugia may provide important benefits to out-migrating juvenile salmon. This is particularly true for sub-yearling Chinook, whose migration timing coincides with the period of warmest main stem Columbia River temperatures. This reliance has important implications for salmon recovery, particularly in the face of climate change (warmer air temperatures and changes in precipitation patterns), which is anticipated to increase main stem temperatures above already stressful levels. The anticipated benefits (and potential future reliance) of thermal refugia to sub-yearling Chinook also presents a new habitat enhancement strategy for salmon recovery projects in the Columbia River estuary. We present a summary of the potential benefits of thermal refugia, an initial assessment of current and potential thermal refugia in two reaches, a summary of remaining uncertainties associated with the ability of individual sites to provide thermal refugia, and examples of habitat enhancement techniques anticipated to protect and restore thermal refugia.

INTENSIVELY MONITORED WATERSHEDS: WHAT WE'RE LEARNING

ROOM
Cedar

MODERATOR
Dan Rawding

Progress and Challenges of Testing the Effectiveness of Stream Restoration in the Pacific Northwest Using Intensively Monitored Watersheds

PRESENTER: Stephen Bennett, Utah State University

Across the Pacific Northwest, at least 17 Intensively Monitored Watershed (IMW) experiments have been implemented to test the effectiveness of a broad range of stream restoration actions for increasing the freshwater production of salmon and steelhead and to better understand fish-habitat relationships. We present results from a recent review of the IMWs including the key elements necessary to implement an IMW, scope and status, challenges, and ways to improve current and future IMWs. Not all IMWs implement the key elements consistently, reflecting the difficulty of such watershed-scale experiments. Improving coordination between funders, restoration groups, and researchers is the most significant challenge reported by IMW teams. However, there is broad support across the Columbia River basin for acquiring a greater understanding of the effectiveness of stream and estuary restoration and we conclude that despite the challenges we documented, the IMW approach is likely the most reliable way we have of meeting this goal. Implementing the IMW approach will require a commitment to long-term funding, treatment of restoration as a management action, and a commitment to adhere to adaptive/experimental management procedures.

Strait of Juan de Fuca Intensively Monitored Watershed Project Overview

PRESENTER: Michael McHenry, Lower Elwha Klallam Tribe

The Strait of Juan de Fuca Intensively Monitored Watershed was initiated in 2004 to test the watershed-scale response of steelhead and coho salmon to watershed restoration. The straits Intensively Monitored Watershed includes two treatment watersheds and one control watershed. Restoration work included placement of large woody materials, road and culvert removal, off-channel habitat creation, and riparian planting. Monitoring of physical habitat, coho and steelhead parr densities, and smolts and adults suggest some improvements in pool habitat and small increases in steelhead and coho.

Density-dependent and Density-independent Processes Interact to Govern Coho Salmon Productivity

PRESENTER: Joseph Anderson, Washington Department of Fish and Wildlife

A quantitative assessment of the processes constraining vital rates such as productivity and survival is an essential component of understanding how, why, when, and if habitat restoration increases salmon productivity. Here we present results of 10 years of coho salmon and habitat monitoring from the Hood Canal Intensively Monitored Watershed encompassing Big Beef, Little Anderson, Seabeck and Stavis Creeks in western Washington. Using a life-cycle monitoring approach, we measured the abundance of spawning adults in the fall, stream-rearing parr in the summer, and seaward migrating smolts in the spring. A series of Ricker stock-recruit models examined the extent to which density dependent processes and environmental predictors influenced survival. Interestingly, at both sites where density-dependence was detected, effects were observed at younger (egg to parr) but not older (parr to smolt) life stages. Parr to smolt survival showed a strong year effect, as trends within each of the four sites tended to track each other through time, suggesting a regional climate signal that was shared among the study populations. A small number of habitat treatments have been implemented on two of the watersheds but the limited spatial and temporal distribution of these treatments has made responses in fish productivity difficult to detect. As restoration projects accumulate in future years, we plan to test hypotheses of mechanisms by which specific project types might benefit salmon populations.

System Responses of Juvenile Chinook Salmon to Estuary Restoration in the Skagit River Estuary

PRESENTER: Correigh Green, National Marine Fisheries Service

The Skagit Intensively Monitored Watershed project examines the responses of Chinook salmon to restoration in the Skagit River estuary. The effort comprises monitoring juvenile Chinook salmon population characteristics in three distinct areas: Lower Skagit River, the Skagit estuary and shoreline areas of Skagit Bay, and neritic habitat of Skagit Bay. More than 900 acres of restoration have occurred in the Skagit estuary during 20 years. We are testing hypotheses of the following system-level responses of salmon cohorts to estuary restoration: 1) reduced local density, 2) longer residency within the estuary, 3) greater body size of estuary rearing fish at emigration to Skagit Bay, and 4) reduced proportion of small fry migrating directly into Skagit Bay shoreline habitats. In turn, we are testing whether these hypothesized changes influence marine survival and returns of adult salmon. In this talk, we present the rationale for these hypotheses and results to date. We found strong evidence for estuary habitat limitations in the data collected before restoration, and detected a negative relationship between marine survival and the frequency of fry migrants into Skagit Bay.

Factors Contributing to Overwinter Survival of Coho Salmon in Tributaries in Southwest Washington

PRESENTER: Mara Zimmerman, Washington Department of Fish and Wildlife

In this presentation, we examine factors contributing to apparent overwinter survival of coho salmon in Mill, Abernathy, and Germany Creeks, near Cathlamet, Washington. Overwinter survival of coho salmon differs between watersheds and among years but was negatively correlated with summer parr abundance suggesting that availability of overwinter rearing habitat has limited the number of coho salmon smolts each spring. During the summer rearing period, coho salmon were implanted with Passive Integrated Transponder (PIT) tags. An antenna array operated in Abernathy Creek recorded a consistent and substantial fall movement of juvenile coho salmon downstream suggesting that some of the coho salmon may overwinter outside the natal watershed. The probability of being detected as a fall migrant was higher for coho salmon tagged in the lower main stem whereas the probability of being detected as a spring smolt was higher for coho salmon tagged in tributaries and main stem headwaters. Our results demonstrate that growth during the summer rearing period and tributary and headwater areas are important factors contributing to the production of spring smolts in these watersheds.

EVOLUTION OF HATCHERY AND HARVEST PRACTICES IN ADVANCING RECOVERY 1

ROOM
Heritage F

MODERATOR
Jim Scott

H-Integration: Perspectives from a Habitat Restoration Practitioner

PRESENTER: Jamie Glasgow, The Wild Fish Conservancy

For more than a century, hatchery production has been used as a primary tool for fishery enhancement and habitat mitigation in the Pacific Northwest. Recently, leading fishery scientists have called for meaningful hatchery and harvest management reform to address unintended genetic, ecological, and fishery related impacts associated with some hatchery practices. Contemporary science points to the preservation of wild fish populations' genetic integrity as a necessary approach to enable the rapid adaptation and evolution required to maintain or recover Endangered Species Act-listed salmonid populations for future generations. This is especially true in the face of continuing habitat loss and the accelerating effects of global climate change. With significant and timely hatchery and harvest reform we improve our ability to regain the health and resilience of wild salmonid populations and the long-term economic, social, and cultural benefits that they provide.

On the Science of Hatcheries: An Updated Perspective on the Role of Hatcheries in the Pacific Northwest

PRESENTER: Andy Appleby, Hatchery Scientific Review Group

Hatcheries have long played a necessary role in meeting harvest and conservation goals for Pacific Northwest salmon and steelhead. However, scientists and policymakers have identified a need to reform the hatchery system because of growing concerns about the potential effects of artificial propagation on the viability of salmon and steelhead in their natural habitats. Congress established the Hatchery Reform Project as part of a comprehensive effort to conserve indigenous salmonid populations, assist with the recovery of naturally spawning populations, provide sustainable fisheries, and improve the quality and cost-effectiveness of hatchery programs. The Hatchery Scientific Review Group was charged with reviewing all state, tribal, and federal hatchery programs in Puget Sound and coastal Washington. Comprehensive reviews of more than 200 propagation programs at more than 100 hatcheries across western Washington were completed. The reviews used an ecosystem-based approach founded on two central premises: That harvest goals are sustainable only if they are compatible with conservation goals, and that artificially propagated fish affect the fitness and productivity of natural populations with which they interact. The review group understood that the scientific framework it propose, along with its specific recommendations for hatchery reform, would require constant review and revision. Since the last review group publication in 2009, research and monitoring of hatchery programs has brought forward new information and insights on hatchery science. These advancements are the focus of the review group's 2014 report.

A Tribal Selective Chinook Gillnet Fishery on a Critical Puget Sound Population Group

PRESENTER: Randy Kinley and Alan Chapman, Lummi Nation

The South Fork Nooksack Chinook Population Recovery Project on the South Fork Nooksack River in Whatcom County is a key early action in the WRIA 1 Salmonid Recovery Plan. Failure to collect natural brood stock for supplementation led to a captive bloodstock program. A DNA baseline was constructed to identify populations of Chinook salmon in the basin. Juvenile Chinook salmon were collected, screened against the baseline and South Fork population, and transferred to a state hatchery for rearing until ready for transfer to seawater or to another freshwater facility. Each fish is identified by a PIT tag and genetic profile to allow mating crosses that maximize genetic diversity in the sub-yearling releases. Freshwater survival ranged from 58 percent to 98 percent and sea water survival ranged from 35 percent to 79 percent. Growth in sea water was greater than expected, reaching an unusually large size for Chinook in captive culture (10-20 lbs.). The captive brood release grew from 1,954 sub-yearlings smolts in 2011 to 677,540 sub-yearling smolts in 2014.

Density Dependence Impacts on Fish Management and Restoration Programs in the Columbia Basin

PRESENTER: Robert Naiman, University of Washington School, and Greg Ruggerone, Independent Scientific Advisory Board

This presentation highlights key findings and recommendations from the Independent Scientific Advisory Board's 2015 report on density dependence in the Columbia River basin: (1) Historical estimates of average all-species abundance in the Columbia basin likely were over-estimated. (2) Even if historical adult salmon abundance was less than previously estimated, it was still much greater than today. Yet, density-dependent responses are common throughout the Columbia basin. Of the Endangered Species Act-listed populations examined, recovery is constrained by density dependence. (3) Evidence of strong density dependence suggests that carrying capacity has been diminished; identifying particular mechanisms causing density dependence – such as predator-prey interactions or limited food supply, rearing habitat, or spawning habitat – helps guide habitat restoration and population recovery actions. (4) Hatchery releases may have unintended density-dependent effects on natural populations; supplementation may not produce the intended boost of natural origin returns even when total spawning abundance has increased. And (5) density-dependent relationships are central to evaluating salmon population responses to recovery actions and for setting spawning escapement goals that sustain fisheries as well as a resilient ecosystem. The board serves the Northwest Power and Conservation Council, NOAA Fisheries, and Columbia River Indian tribes.

Stillaguamish Tribe's Smolt Outmigration Estimation Project: A Tool to Manage H-integration Efforts

PRESENTER: Kip Killebrew, Stillaguamish Tribe

The Stillaguamish Tribe has operated an out-migrant screw-trap on the main stem Stillaguamish River for 14 years. This project highlights the ways in which co-managers can monitor the interactions among the H's within the Stillaguamish watershed. Measuring and understanding the inter-annual variation in production of wild Chinook, listed as threatened under the Endangered Species Act, is critical for monitoring the totality of freshwater habitat experienced by juvenile Chinook salmon. Quantifying the number of smolts leaving the watershed provides a direct measure of the year-to-year changes in freshwater survival and growth, free from the confounding influences of marine conditions. The project also is used to evaluate the effectiveness of the tribe's conservation hatchery program in meeting its goals. One of the goals of the hatchery is to produce juvenile Chinook that are indistinguishable from their wild spawned cousins in both timing and size at migration, as well as measuring post-release survival. Data collected at the smolt trap can be used by the Environmental Model Predicting Adult Returns (used to generate preseason adult forecasts) to help determine hatchery release targets, carrying capacity and density dependent effects, all of which are needed to assess population viability and manage H-integration efforts.

FISH PASSAGE: WATER UNDER THE BRIDGE

ROOM
Spruce

MODERATOR
Pat Powers

Washington Department of Fish and Wildlife and Natural Resource Conservation Service Working Together to Improve Fish Passage

PRESENTER: Melissa Erkel, Washington Department of Fish and Wildlife

The Washington Department of Fish and Wildlife has partnered with Natural Resources Conservation Services to find eligible landowners for their Environmental Quality Incentives Program to address and fix fish passage barriers. Find out who is eligible to apply for the program and more about our working relationship together. The two agencies have a long history of applying restoration and conservation techniques that are compatible to land uses. For more than 75 years, the Natural Resources Conservation Services has worked in close partnership with farmers, ranchers, and local and state governments to maintain healthy and productive working landscapes. The Department of Fish and Wildlife has been a leader of fish passage in Washington

State since the early 1990s. By initiating culvert inventories, developing training programs, producing guideline manuals, developing prioritization methods, and maintaining a statewide database. This information is being used to target outreach to landowners with fish passage barriers for the Environmental Quality Incentives Program. The voluntary conservation program provides assistance to landowners and agricultural producers in a manner that promotes agricultural production and environmental quality as compatible goals. Farmers, ranchers, and foresters receive financial and technical assistance to implement structural and management conservation practices that optimize environmental benefits on working agricultural and forest lands.

Family Forest Fish Passage Program

PRESENTER: Laurie Cox, Washington Department of Natural Resources

Considered the best fish passage grant program in Washington, the Family Forest Fish Passage Program pays for barrier culvert replacement projects on small, private forestland. Session 1: We estimate there are more than 7,000 barrier culverts on small private forestland but only a 1,000 landowners have signed up for the program. We need your help to find more, and to find sponsors to manage the projects. The program is for small forest landowners with more than 2 acres of land, harvesting less than 2 million board feet of timber a year. Learn what is eligible, how to sign up landowners for a barrier culvert evaluation, and the benefits to a landowner. Session 2: Learn how to conduct a culvert evaluation using the Washington Department of Fish and Wildlife's Level A analysis. This will be a hands-on training with a simulated culvert using rotary laser level and stadia rod to measure slope, length, outfall drop, etc. We also have an online tool to find known barriers, which may be eligible in your area, and lots of outreach materials – all your fish enhancement group needs to start taking advantage of this great grant program.

Lewis River Fish Passage and Reintroduction Program

PRESENTER: Frank Shrier, PacifiCorp Energy

The Lewis River Fish Passage and Reintroduction Program is a phased approach intended to restore salmon and steelhead populations to the upper watershed of the North Fork Lewis River and upstream of the PacifiCorp Energy dams. In this presentation, we will discuss the installation, commissioning, and operation of the Merwin Upstream Fish Capture and Transport facility and the Swifoot Downstream Floating Surface Collector. Included will be a discussion of the amount of habitat that has been made available for access by anadromous salmon and steelhead. Details of fish capture numbers and transportation of fish upstream and downstream of the projects will be provided. In addition, part of the Lewis River fish passage program includes habitat improvement projects in the upper and lower basin, and details of these restoration efforts will be discussed.

Chico Creek Estuary Restoration

PRESENTER: Tom Ostrom, Suquamish Tribe

The Chico Creek estuary in Dyes Inlet in Kitsap County, like many estuarine deltas, has been damaged by roads. State Route 3 and a frontage road (Kitty Hawk Drive Northwest) were built in the early 1960s with seemingly little regard for sensitive estuarine habitats and stream processes. Fill for the roads displaced estuarine marsh, distributary channels, floodplain, and stream channel habitats. Chico Creek was rerouted into two culverts at its mouth in the estuary. In addition to the direct loss of habitat from the road construction, the culverts have degraded downstream habitat, created fish passage problems, and have been a continuing maintenance burden. Natural processes, including sediment transport and tidal exchange, also have been impacted. For more than 10 years, the Suquamish Tribe, Kitsap County, Washington State, and others have been working collaboratively on planning and implementing a phased restoration of the Chico Creek estuary. The first phase of this plan, the removal of Kitty Hawk Drive and culvert from the estuary, was completed in 2014. This presentation explores the challenges of planning, designing, and implementing the early phases of a large-scale estuary restoration project.

The Suquamish Tribal and Community Partnership's Integrated 4-H Recovery Strategy in Cowling Creek

PRESENTER: Paul Dorn, Suquamish Tribal Fisheries Department

The Suquamish Tribe's Cowling Creek Center, which is in north Kitsap County directly west of Seattle, is dedicated to returning naturally spawning salmon to the watershed using a community partnership. Two culverts were installed intertidally when Miller Bay Road Northeast was built, completely blocking steelhead, coho, cutthroat, and chum salmon that had returned to this reservation watershed, extirpating fish that helped sustain tribal members from time immemorial. The tribe had operated a hatchery on the creek until 2004 using native brood stock from nearby Chico Creek. The tribal-community partnership incubates 100,000 eyed chum eggs received from the tribe's Grovers Creek Hatchery and rears the fish for several months. Trout Unlimited constructed three fish ladders allowing the 2,113 returning adult salmon to migrate unimpeded upstream. The Tribe and community partners are buying Cowling Creek watershed habitat for permanent protection, removing barriers identified by the Wild Fish Conservancy, engaging citizens and students, and working with the County to remove the remaining barriers.

RECOVERY PLANNING IN DIFFERENT SETTINGS

ROOM
Pine

MODERATOR
Laura Blackmore

Recovering Steelhead on the Edge: South-Central and Southern California

PRESENTER: Mark Capelli, National Marine Fisheries Service

The recovery of south-central and southern California steelhead began in 1997 with the National Marine Fisheries Service's listing two distinct sub-populations of steelhead in the southern half of coastal California at the southern extent of their range in North America. The Services' Technical Recovery Team for southern steelhead has divided the south-central and southern California steelhead distinct sub-populations into nine biogeographic regions, characterized by a distinguishing suite of physical, climatic, and hydrologic features. Recovery of the two southern steelhead distinct sub-populations will require the restoration of a minimum number of populations within each of the nine biogeographic regions. The core watersheds identified in this biological strategy are geographically dispersed across the recovery planning area (extending from Monterey Bay to the U.S.-Mexico border) to preserve the existing diversity of life-history forms (ranging from anadromous to resident) and their evolutionary trajectories. Additionally this biological strategy is intended to minimize the likelihood of extirpation of individual populations within each biogeographic region by natural perturbations (including periodic droughts, wildfires, and longer range climatic changes), and preserve the potential natural dispersal of fishes between watersheds. The steelhead recovery plans identify a series of recovery actions intended to address the threats facing the species, as well as future threats posed by climate change and related habitat transformations. Additionally, a long-term research and monitoring program is proposed to address a number of key issues (such as the relationship between anadromous and resident forms) and refine the population and distinct sub-populations-wide viability criteria developed by the Technical Recovery Team. Recovery will require re-integrating the listed steelhead populations back into habitats in a manner that allows the co-occupancy of watersheds populated with about 27 million people.

Hood Canal Summer Chum Salmon Recovery: A Success Story in the Making

PRESENTER: Thom Johnson, Point No Point Treaty Council

Recovery of Endangered Species Act-listed summer chum salmon in the Hood Canal and eastern Strait of Juan de Fuca region of Washington is a success story in the making. Recovery planning and implementation were underway before the 1999 listing, with harvest reductions and hatchery supplementation programs enacted in the early 1990s. The Summer Chum Salmon Conservation Initiative, distributed by state and tribal co-managers in 2000, described a comprehensive plan for implementation of summer chum salmon recovery.

A 2005 *Summer Chum Recovery Plan*, incorporated the Summer Chum Salmon Conservation Initiative's harvest and hatchery management provisions and addressed habitat protection and restoration. In 2007, National Marine Fisheries Service prepared a supplement plan that established viability criteria for summer chum populations and serve as recovery goals. A comprehensive management, monitoring, and assessment program has been implemented. This presentation reports on progress towards achievement of recovery goals for summer chum. Abundance of summer chum has increased from a range of 1,000 to 5,000 fish just before listing to a range of 13,000 to 40,000 fish during 2010 through 2014. Spatial distribution and diversity of summer chum throughout the Evolutionarily Significant Unit have improved. Extinction risk has been reduced. A 2014 report provides guidance to policymakers about updating of recovery goals that takes into account climate change and regime shifts in ocean conditions. Summer chum are on a trajectory toward recovery and the outlook for summer chum is much brighter than it was just 15 years ago.

The Cowlitz Experience: Recovering Listed Populations While Maintaining Hatchery Production

PRESENTER: Mark LaRiviere, Tacoma Power

The Cowlitz River in Washington has four dams mid-basin that separate the lower and upper river basins. Natural-origin salmonids interact with abundant hatchery-origin fish throughout the Cowlitz River system. Salmonid population recovery efforts in the Cowlitz River are focused on the upper basin, primarily for lower Columbia River spring Chinook. The Cowlitz *Fisheries and Hatchery Management Pla*n, a Federal Energy Regulatory Commission license requirement, is the instrument used by Tacoma Power and the resource agencies to implement the Cowlitz Hydro Project Settlement Agreement priority of recovering salmonid populations listed under the Endangered Species Act. The existing plan maintains upper basin adult presence, and attempts to re-establish self-sustaining, natural-origin populations in both the lower and upper basins while still providing harvest opportunities for hatchery-origin fish. The plan is guided by an adaptive management process and incorporates the most recent science from the recommendations of the Hatchery Scientific and Review Group to meet the settlement agreement priorities. The plan is guided by the Cowlitz Fisheries Technical Committee and incorporates feedback from affected agencies, tribes, and the public. Notable recent actions from implementing the Cowlitz plan, and a recent update, include: Integrating steelhead and fall Chinook hatchery populations, studying the natural-origin populations in the lower river to determine abundance to set appropriate mix of natural and hatchery fish on the spawning grounds, ending a non-indigenous hatchery steelhead program, and transporting the returns from all natural origin populations above the dams.

Lake Ozette Recovery Plan: Keeping Stakeholders Engaged from Planning to Implementation

PRESENTER: Claire Turpel Chase, Triangle Associates, Inc.

The *Lake Ozette Sockeye Recovery Plan* on the Olympic Peninsula is a result of exemplary collaboration among diverse groups. This session will cover how to maintain the involvement of stakeholders and adjust when turnover occurs. This recovery plan addresses sockeye habitat restoration and hatchery management. It also includes voluntary actions to return the sockeye population in Lake Ozette to a healthy, naturally self-sustaining condition. Stakeholders, ranging from the National Park Service, NOAA's National Marine Fisheries Service, the Washington Department of Natural Resources, tribal governments (the Makah and the Quileute Tribes), community members, businesses, landowners, and local governments, all came together to develop the sockeye recovery plan in 2006. These groups began implementing this plan in 2011 and implementation is still in progress today. For the past 9 years, Triangle Associates, Inc. has served as the neutral facilitator for the *Lake Ozette Sockeye Recovery Plan* and implementation. During this session, Megan Johnston and Claire Turpel Chase from Triangle Associates, Inc., will share lessons learned on stakeholder engagement from plan to progress. Very few of the stakeholders involved in the initial planning effort still are involved in the project today. As such, Megan and Claire will discuss creative ways of handling inevitable turnover during long-term projects without losing time, budget, direction, or momentum. Specifically, they will address ways to maintain institutional memory to ensure robust salmon recovery plans and implementation.

PROJECT MANAGEMENT AND PLANNING: ORGANIZE, DON'T AGONIZE

ROOM
Ash

MODERATOR
Meg O'Leary

The Duwamish Blueprint: A Strategy for Recovering Salmon in Washington's Most Impacted Estuary

PRESENTER: Elissa Ostergaard, Water Resource Inventory Area (WRIA) 9

The Duwamish River estuary, which encompasses the lower 11 miles of the Green-Duwamish River and discharges to Elliott Bay near downtown Seattle, has been ravaged by flow diversions, dams, levees, revetments, contaminants, dredging, and straightening in the past 150 years. Studies indicate that its intertidal mudflats and marshes are also the lynchpin for salmon recovery in the watershed, and that increasing the area of these shallow water habitats will boost Chinook productivity and make investments in the upper watershed worthwhile. A group WRIA 9 stakeholders who are also experts on Duwamish habitat restoration developed the *Duwamish Blueprint*, a detailed plan for salmon habitat creation along the Duwamish during the next 10 years. Key elements of the strategy include streamlining permits, pursue new funding sources that allow timely purchase when land becomes available, prioritizing funds for the largest potential sites, researching details of juvenile salmonid use of different Duwamish habitat types and configurations, stewardship and monitoring of sites and adjusting based on findings, and hiring a part-time Duwamish basin steward to implement and track the recommendations in the blueprint.

The Chelan-Douglas Land Trust's Role in Large-Scale Salmon Habitat Protection and River Restoration

PRESENTER: David Morgan, Chelan-Douglas Land Trust

The Entiat River restoration projects involve multiple partners including the Chelan-Douglas Land Trust, which owns large tracts of permanently undeveloped floodplain in the middle reaches of the Entiat River valley. Although it is considered some of "the best of what's left," scientific assessments by our salmon recovery partners have determined that significant opportunities exist to improve fish habitat on or near our properties. Many of the typical project constraints related to scale and nearby development are lessened because of years of successful land protection efforts in a concentrated area by the land trust. If that work had not taken place, it is unlikely these ambitious restoration efforts would be proposed. The Chelan-Douglas Land Trust is collaborating with our partners to develop the most effective fish habitat restoration while also considering values the land trust considers essential such as esthetics, safety, and protecting existing high quality habitat. The presentation will provide examples of how land trust staff and board of directors have engaged in project planning, and how we are working with the restoration team to find the right balance.

Elements of Success: Lessons from a Decade of Restoration Project Identification, Cultivation, and Implementation

PRESENTER: Tina Whitman, Friends of the San Juans

Friends of the San Juans will share lessons learned from a decade of nearshore marine restoration project identification, cultivation, and implementation in San Juan County with public, private, and tribal landowners, drawing from numerous shoreline projects in the design and implemented stages. Coastal geologic processes create and maintain the nearshore habitats upon which forage fish and many other Puget Sound species of concern rely. Shoreline modifications, such as bulkheads, disrupt and damage sediment supply and transport processes that form beaches and provide appropriate spawning substrate for surf smelt and Pacific sand lance. Shoreline modifications have been identified as one of the greatest threats to regional nearshore ecosystems and are ranked as top threats to salmon recovery and the marine ecosystem in San Juan County. Successful restoration requires an understanding of the strategic actions to target, as well as long-term focused communication and technical support at all project stages including identification, cultivation, funding,

design, construction, and monitoring. Investment of resources in the early phases of project development, including prioritization, landowner engagement, feasibility studies, and conceptual designs, helps ensure that technically sound, ecologically important projects, with willing landowners, advance to implementation. There will be an emphasis placed on the key landowner engagement, technical, project management, and human elements required to foster efficient and effective coastal wetland and beach projects.

A Watershed Approach to Developing Habitat Projects in a Puget Sound River System

PRESENTER: Brian Combs, South Puget Sound Salmon Enhancement Group

The Watershed Approach to Developing Habitat Projects in a Puget Sound River System Project in Goldsborough Creek in Mason County, provides an example of how watershed assessments can identify and prioritize habitat restoration projects, and highlights one of the completed projects. The 80-square-mile Goldsborough Creek system is a tributary to Oakland Bay and is host to significant salmon and steelhead populations. In the early 1900s, a railroad grade was constructed through the middle of the floodplain, cutting off fish access to small streams and off-channel habitat. The channel response was to down cut and further create fish passage problems. In 2001, a 30-foot-high dam was removed, representing a restoration milestone allowing wild salmon stocks to re-build for the first time in decades. With the dam gone, the restoration focus shifted to the multitude of fish passage and habitat problems resulting from the railroad grade and other degradation that had occurred in the past century. The South Puget Sound Salmon Enhancement Group and regional partners completed a watershed-based assessment and design report identifying fish passage and habitat problems and yielded conceptual-level design plans to be used for prioritization and funding efforts. This presentation will highlight dozens of restoration projects identified, present the current status of fish populations, present a completed project, and summarize lessons learned and strategies used.

Fish Now or Function Later?

PRESENTER: John Crandall, Methow Salmon Recovery Foundation

In the realm of salmon recovery, there are social and political desires to develop both immediate returns of fish to our watersheds and to ensure that habitat improvements designed to increase fish productivity are naturally sustained. The appropriate actions developed to meet these goals are not always compatible. Habitat restoration projects implemented to produce fish quickly may foreclose options to promote natural process. These efforts must include some evaluation of the long-term maintenance needed to maintain the immediate gains. Process-based restoration efforts seek to develop habitat conditions that promote the formation, destruction, and sustainability of complex fish habitat over the long-term. Supporters of process-based restoration emphasize the valuable opportunity to develop habitats capable of sustaining fish populations with minimal additional expenditures. The critical element needed to help implementers and funders evaluate the performance of each approach is a change in the current project funding model from short implementation windows with limited monitoring support to a longer horizon with strong adaptive management support. To ensure continued public support, and therefore access to the areas where restoration actions are needed, it will be increasingly necessary for implementers to develop clear and compelling evidence of stewardship commitment and that restoration actions are achieving sustainable payback on the significant public investment communities are being asked to make.

INNOVATIVE PARTNERSHIPS: WHOSE WATER?

ROOM
Birch

MODERATOR
Lisa Pelly

Modernizing Large Irrigation Systems and Increasing In-stream Flow

PRESENTER: Aaron Penvose, Trout Unlimited

Modernizing large irrigation systems and increasing in-stream flow in the Methow and Wenatchee River watersheds has made huge strides in the past 5 years. Trout Unlimited has focused on building relationships with large irrigation districts and implementing multi-million dollar irrigation efficiency upgrades, in exchange for increasing in-stream flow and enhancing fish habitat for endangered fish. These projects are touted by the irrigation districts as extraordinary advances in the efficiencies of their systems, reduced staff needs, and assurances of water delivery to their shareholders for the next century. The Pioneer Water User Association construction project on the Wenatchee River was funded in part by the Upper Columbia Salmon Recovery Board and an example of Trout Unlimited's work with irrigation districts. This project permanently moved the water association's diversion from the Wenatchee River while protecting more than 35 cubic feet per second in the lower river, which represents as much as 10 percent of the late season flow. Trout Unlimited secured more than $3 million in grants for the proposal. As part of this project, Trout Unlimited and partners removed the channel spanning diversion dam associated with the historic diversion. This project serves as a model for collaboration in good water management and flow restoration for fish.

Dungeness River In-stream Flow Improvements

PRESENTER: Joe Holtrop, Clallam Conservation District

The Dungeness River in-stream flow improvements effort on the north Olympic Peninsula has been a resounding success and has set a benchmark for collaboration among organizations with conflicting objectives. Pioneers first diverted water from the Dungeness River in 1896 to irrigate the parched Sequim Prairie, which lies in the rain shadow of the Olympic Mountains. By 1924, the water rights for five irrigation companies and four districts withdrawing water from the Dungeness River were adjudicated, totaling nearly three times the average late summer stream flows. As recently as the 1980s, irrigators were diverting more than 80 percent of September river flows, seriously impacting salmon habitat. Rather than litigate, the Jamestown S'Klallam Tribe and Department of Ecology negotiated a breakthrough trust water rights agreement with the irrigators, agreeing to work together to reduce irrigation water withdrawals from the river. Conservation efforts began in earnest following the 1999 listing of Puget Sound Chinook as threatened under the federal Endangered Species Act. Resulting grant funding has enabled the Dungeness Valley irrigation districts and companies to pipe more than 50 miles of leaky irrigation ditches and cut their irrigation water withdrawals from the Dungeness River in half. In 2013, irrigators and the Department of Ecology negotiated superseding water right certificates that more accurately reflect their current needs, and they have agreed to never take more than half the flow of the Dungeness River. Water conservation work continues, including shallow aquifer recharge projects designed to capture and infiltrate early summer snowmelt to augment late summer stream flows.

Wheeling Water from Tieton River to Cowiche Creek Water Users to Improve Spawning and Rearing Habitat

PRESENTER: Rick Dieker, Yakima-Tieton Irrigation District

In 2014, the Yakima-Tieton Irrigation District began to deliver up to 7.9 cubic feet per second of water to the Cowiche Creek Water Users Association through the irrigation district's delivery system by wheeling this water from the Tieton River to the Cowiche Creek basin. The existing creek rights of the water association then were left in-stream to improve habitat for Endangered Species Act-listed steelhead, coho salmon, and other species. This session will discuss how the irrigation district worked with the North Yakima Conservation District, the U.S. Bureau of Reclamation, the water association, Trout Unlimited, federal and state agencies, conservation groups, and the Confederated Tribes and Bands of the Yakama Nation to implement the project.

Hood River Basin Water Planning: Identifying Opportunities for Effective Restoration, Adaptive Management, and Prudent Investment

PRESENTER: Les Perkins, Farmers Conservation Alliance

The Hood River basin water planning process in Hood River County, Oregon resulted in a comprehensive plan, which residents and policymakers can use to make informed decisions about restoration activities, resource management, and long-term investments relating to water quality and quantity. The Hood River basin historically has enjoyed a collaborative environment where a large number of restoration projects have been completed. Impacts from climate change on the largely glacially-fed system prompted stakeholders to engage in a planning process that produced a tool to evaluate and plan for potential future water resource scenarios. Assessments of historical and existing water use and supply, existing and future climate modeling, glacier modeling, water conservation potential, water storage potential, and groundwater modeling were all used to create a water resource model to evaluate potential impacts of restoration and infrastructure projects on river and stream flows. Habitat modeling paired with the water resources model allows evaluation of the potential impact to habitat for specific species at specific life stages within specific reaches. Information derived from these models and studies are allowing water resource managers, policymakers, and funders to make decisions based on a cost-benefit analysis both in terms of environmental benefit and benefit to the water resource users (primarily irrigators). This comprehensive plan also has created a platform of information upon which to write grants with a high level of success. The Hood River Watershed Group now is creating a water conservation strategy to plan restoration and conservation projects.

Can Longer Forest Harvest Intervals Increase Summer Stream Flow for Salmon Recovery?

PRESENTER: Robert McKane, Environmental Protection Agency

The Mashel Stream Flow Modeling Project in the Mashel River basin in Washington, is using a watershed-scale, eco-hydrological model to assess whether extended forest harvest intervals can remediate summer low-flow conditions that have contributed to sharply reduced runs of spawning Chinook salmon and steelhead within the Mashel basin. The Mashel is the principal salmonid-producing tributary to the Nisqually River, which flows westward from Mount Rainier to Puget Sound. The mature forests that once dominated the Mashel basin have been replaced mostly with young forests that are managed using short harvest intervals, usually 40 years or less. Field research in the Pacific Northwest indicates that young, vigorously growing forests can use more than three times more water than old forests. The processes underlying these findings have been incorporated in an eco-hydrological model, which has been used previously to quantify the effects of forest management on stream flow, water quality, and forest productivity in the Pacific Northwest. We applied the model to the Mashel basin using 200-year forest management scenarios with harvest intervals of 40, 80, or 120 years. These harvest scenarios also were run with “low,” “medium,” and “high” climate change scenarios to examine the combined effects of climate and forest age on snow pack and summer stream flow. Results will be discussed in the context of potential impacts on connectivity of salmon habitats within the Mashel basin.

THURSDAY MORNING SESSIONS

LARGE-SCALE FLOODPLAIN PROJECTS: REACHES AND BASINS

ROOM
Hemlock-Oak

MODERATOR
Jennifer O'Neal

Yakima Basin Integrated Water Resource Management Plan – Habitat Enhancement 10-Year Plan

PRESENTER: Richard Visser and Scott Nicolai, Fish Habitat Subcommittee of the Yakima Basin Integrated Water Resource Management Plan

The fish habitat enhancement initial 10-year development plan in the Yakima River basin identifies 16 "game-changing" habitat projects that are scientifically defensible, biologically sound, and support water supply projects in the integrated plan. Projects are scoped at a scale that may be a challenge to implement with existing programs. Several projects focus on enhancing bull trout habitat in major ways, and also aim to strengthen the partnership with the U.S. Forest Service for watershed protections and enhancements to provide fish habitat and water supply benefits resilient to potential climate change effects. The projects also support other elements of the *Yakima Basin Integrated Plan*, such as leveraging and further enhancing the recent investment Washington State made in the recent Teanaway basin acquisition, and water conservation projects that provide reach-level benefits in flow-impaired streams. The projects implement priority actions identified in previous strategic planning efforts.

Restoring Channel Migration and Floodplain Connectivity Improves Habitat for Chinook Salmon at Rainbow Bend

PRESENTER: Joshua Latterell, King County

The Rainbow Bend Levee Removal and Floodplain Reconnection Project in the Cedar River has improved habitat for juvenile and adult Chinook salmon in its first year. The project innovatively blends a process-based approach – restoration of a dynamic channel – with deformable built features. This hybrid approach has the potential to produce both near-term and long-term benefits for Chinook salmon. In 2013, an armored levee was removed from an outside bend to allow for channel migration and adjustment. Logjams were placed in the floodplain to add complexity and roughness when intercepted by the migrating channel. Two deformable channels and a backwater were excavated to reconnect and enhance the floodplain. Live stakes were installed in multiple phases to increase floodplain roughness. Within one year, habitat for juvenile and adult Chinook salmon began to improve. Floodwaters widened new and existing channels, aggraded the main stem, and engaged floodplain logjams. As a result of these changes, edge habitat area – an important form of juvenile rearing habitat – has nearly doubled. The greatest increases were in backwaters and side channels. Fish surveys show that, in the Cedar River, these backwaters and side channels support the highest densities of juvenile Chinook salmon. Spawning Chinook salmon showed a striking affinity for the floodplain side channel, which, in 2014, contained 9 percent of the Chinook redds in the Cedar River. This project illustrates how deformable side channels can be used, in combination with levee removal, to trigger geomorphic changes that benefit juvenile and adult Chinook salmon.

Basin Scale Floodplain Reconnection and Restoration in the Tucannon River: Analysis, Prioritization, and Implementation

PRESENTER: Tracy Drury, Anchor QEA

The Tucannon River near Dayton, Washington has been targeted for salmonid habitat restoration in the Snake River dam biological opinion with a habitat improvement target of 17 percent in spatial area. The initial step in restoring salmonid habitat is to understand ongoing geomorphic processes and to what extent these processes are natural or forced based on human derived stressors to the system. We conducted a geomorphic and

hydrodynamic analysis for more than 50 miles of the Tucannon River basin to evaluate hydrologic input locations and magnitudes, sediment supply and input sources, bedload size clasts and transport capacity, floodplain connectivity and confinement, and human derived stressor to the natural processes throughout the basin. The findings of these analyses were used to delineate ten discreet reaches based primarily on physical process and infrastructure constraints. We also collected available fish use data and coordinated with local practitioners to clarify existing areas of high use by targeted species during all life stages. Through this collaboration, we determined critical life history stages for target species and hydrologic conditions where restoration benefits should be targeted. This allowed us to develop biological criteria to assist in the delineation and prioritization of restoration actions. To date, more than 8 miles of river restoration has been implemented based on this planned and prioritization process. Restoration actions include reconnecting side channels and off-channel habitats, levee removal and setbacks, large wood placement, riprap removal, and riparian restoration. In addition, protect reaches where natural processes are vibrant were identified as no touch zones.

Reach-Scale Large Wood Restoration in the North Fork Nooksack River

PRESENTER: Mike Maudlin, Nooksack Indian Tribe

Habitat restoration projects in the North Fork Nooksack River, near Glacier in Whatcom County, are designed to reconnect side channels and restore large forested islands and mature floodplain vegetation. In the past 150 years, the North Fork has transitioned from a complex island-braided system to a simpler braided system with a wider active channel, reduced floodplain forest, and frequent channel shifting. Natural-origin North Fork and Middle Fork Nooksack Chinook recruits-per-spawner ratios for brood years 1994 through 2005 averaged 0.25 (i.e. less than replacement ratio of 1), and substantial near-term improvements in abundance and productivity are needed to sustain and recover the population. Since 2008, the Nooksack Indian Tribe has been designing and implementing complex, reach-scale, large wood restoration projects in the North Fork; a total of 124 engineered logjams have been constructed in three reaches of the river, including 83 structures in the 1.5-mile Wildcat Reach. Building on the Wildcat project, the tribe is beginning implementation of the farmhouse project, which includes 184 logjams designed in six phases through a 3-mile reach of the river. In this presentation, we discuss the restoration strategy for the North Fork Nooksack River, project design, and implementation of complex logjam projects. We also present preliminary effectiveness monitoring results that provide early indications of success.

ESTUARY RESTORATION: THE TIDE WAITS FOR NO ONE

ROOM
Heritage

MODERATOR
Mike Ramsey

Lessons Learned from Monitoring Estuary Restoration Projects in the Skagit and Stillaguamish Deltas

PRESENTERS: Joelene Boyd, The Nature Conservancy, and Brenda Clifton, Skagit River System Cooperative

Several large estuary restoration projects – Deepwater Slough, Fisher Slough, Port Susan Bay, and Wiley Slough – completed in the Skagit and Stillaguamish River deltas have been monitored and observed for several years post-construction. With at least 2 years of post-restoration results, the lessons learned from these case study sites provide insight to how certain restoration actions performed – insight that is now informing the restoration design at Fir Island Farm and could be used to inform other project designs. These restoration projects have extensive post project monitoring that includes channel development, habitat and vegetation, and overall site condition analysis. For example, channels created during the construction provide immediate critical habitat for salmon and other species while observed development of channels post project has been minimal. Conversely existing drainage system and haul routes used by heavy construction equipment during the construction phase are still visible and in some instances are affecting water movement across the project site. Vegetation results for Fisher Slough show that the dominant vegetation and habitat establishment is not what was predicted or expected given seeding and re-vegetation efforts. Deepwater and Wiley Slough projects relied on the native recruitment of vegetation with different initial results than expected.

Lessons learned from these restoration case studies can be used to inform future estuary restoration design and save resources for future restoration projects.

Managing the Multi-Agency Columbia Estuary Ecosystem Restoration Program and Assisting in Recovery of Threatened and Endangered Species

PRESENTERS: Blaine Ebberts, U.S. Army Corps of Engineers, Jason Karnezis, Bonneville Power Administration, and Lynne Kransow, NOAA

The Columbia Estuary Ecosystem Restoration Program was created to meet the estuary ecosystem restoration requirements of the Biological Opinion for the operation of the federal Columbia River Power System. The restoration program has developed into a functional, adaptively-managed restoration program that provides substantial benefit to Endangered Species Act recovery in the Pacific Northwest. A joint effort between the Bonneville Power Administration and the U.S. Army Corps of Engineers, Portland District, the restoration program engages state, federal, tribal, and local entities in ecosystem restoration throughout the lower Columbia River and estuary. Although benefiting endangered salmon is a primary driver, the objectives of the program reflect an ecosystem-based approach: 1) Increase the opportunity for access by aquatic organisms to and for export of materials from shallow water habitats; 2) Increase the capacity and quality of estuarine and tidal-fluvial ecosystems; 3) Improve ecosystem realized functions. The primary approaches to restoration are to restore hydrologic connections between main stem and floodplain, create and enhance shallow water habitat, and reestablish native vegetation. A major component of the program is the analysis and rating of individual restoration projects by a panel of scientists known as the Expert Regional Technical Group. The application of science through an adaptive management framework is essential to the technical group's process. The technical group evaluates projects using a combination of professional judgment and best available science. This blended approach ensures that science is central in decision-making while preventing imperfect knowledge from becoming an excuse for inaction.

Restoration Monitoring in the Snohomish River Estuary: Project and Landscape Contexts

PRESENTER: Casimir Rice, NOAA

The comprehensive restoration monitoring in the Snohomish River estuary has been underway since 2009. It consists of intensive, project-level monitoring embedded in an estuary-wide program that provides invaluable context for individual projects and also allows assessment of the cumulative effects of multiple projects. The Snohomish River is the second largest watershed in Puget Sound and home to a rich community of wildlife, including wild Chinook salmon and bull trout, both listed as threatened under the Endangered Species Act. Despite major historical habitat loss (about 85 percent of 4,000 hectares), the Snohomish estuary has unusually high potential for restoration. Restoration of up to 45 percent of historical estuarine wetlands in the next decade is realistic. We have intensively monitored fish use across the Snohomish estuary for more than a decade, and in 2009 began comprehensive, pre-project monitoring of elevation, hydrology, and biota (vegetation, invertebrates, birds, mammals, and fish) at Qwuloolt, a 150-hectare site scheduled to have tidal influence returned in late 2015. We've documented pre-breach conditions at Qwuloolt and estuary-wide, seasonal, and inter-annual patterns of juvenile salmon abundance and size, fish assemblage composition, and temperature and salinity variation. Major environmental gradients such as hydrologic connectivity, and biological attributes such as species composition and hatchery releases, influence wild fish use of estuaries and must be understood in estuary restoration planning, design, and monitoring.

Union River Estuary Restoration

PRESENTER: Mendy Harlow, Hood Canal Salmon Enhancement Group

The Union River estuary restoration in the lower Hood Canal watershed was designed to support habitat objectives and community values. Habitat objectives included the restoration of tidal influence to the former salt marsh and re-establishment of high salt marsh and tidal channels. Community values supported the preservation of the dike-top trail, which is part of the Theler Wetlands trail system that hosts as many as

30,000 visitors a year. The full dike removal alternative was abandoned and the final design included two pedestrian bridges over 100- and 300-foot dike breaches. Restoration included excavation of more than 35,000 cubic yards for 10,000 feet of tidal channels and associated marsh. The construction of a nearly half-mile long setback dike with new trail, forming a trail loop around the restoration site allows an opportunity for the public to view the transformation of the newly developed salt marsh habitat.

SALISH SEA MARINE SURVIVAL PROJECT 1

ROOM
Cedar

MODERATOR
Michael Schmidt

The Salish Sea Marine Survival Project

PRESENTER: Michael Schmidt, Long Live the Kings

Twenty years after the crash of Chinook, coho, and steelhead in the Strait of Georgia and Puget Sound, Long Live the Kings (U.S.) and the Pacific Salmon Foundation (Canada) have developed a comprehensive approach to determine the primary factors affecting juvenile Chinook, coho, and steelhead survival in the Salish Sea. The Salish Sea Marine Survival Project brings together multidisciplinary expertise from more than 40 federal and state agencies, tribes, academia, and nonprofit organizations on both sides of the U.S.-Canada border. Through the development of a comprehensive, ecosystem-based research framework, coordinated data collection, and improved information sharing, the project will help managers better understand the critical relationship between salmon and the Salish Sea. The project's 5-year research phase began in 2014. This presentation will provide an overview of the Salish Sea Marine Survival Project and the status of its research. It is intended to be a session opener, for the Salish Sea Marine Survival Project session Thursday afternoon.

Spatial and Temporal Patterns of Smolt-to-Adult Survival of Hatchery-Reared Chinook Salmon

PRESENTER: Casey Ruff, Skagit River System Cooperative

Conservation of threatened Chinook salmon populations relies on an understanding of factors affecting survival at specific life stages, which in turn can be used to adapt management strategies including harvest actions. This study examined spatial and temporal patterns of smolt-to-adult survival of hatchery-reared Chinook salmon in the Salish Sea and coastal areas throughout Oregon, Washington, and British Columbia using existing time series of smolt release sizes and cohort abundances (harvest impacts and escapement) for 59 individual populations spanning the time period between 1971-2008. Furthermore, we developed a suite of models to assess the importance of specific factors in explaining annual variability in smolt-to-adult survival including region of release, year of release, life history type, and timing of adult return. Preliminary results suggest that there is indeed regional asynchrony in temporal patterns of smolt survival between Chinook populations within the Salish Sea and between Salish Sea and coastal populations. These results indicate that environmental drivers operating at more localized spatial scales are affecting variability in smolt survival of Chinook salmon populations in the Salish Sea. Results can be used to improve stock assessment models.

Puget Sound Steelhead Marine Survival Trends: What's Happening to our Fish Out There?

PRESENTER: Neala Kendall, Washington Department of Fish and Wildlife

The Puget Sound steelhead early marine survival project in Washington seeks to understand why Puget Sound steelhead numbers are low and not recovering. Steelhead trout numbers have fallen dramatically in the Salish Sea and especially in Puget Sound. To better understand the patterns, we have compared the declining steelhead abundance and survival trends in Puget Sound with those in neighboring regions. We found that many coastal populations shared a pattern of declining abundance from the mid-1980s through the mid-90s, and that while many of the populations rebounded in the 2000s, Puget Sound smolt-to-adult returns continued to decline and generally have remained below those of other regions. Second, we present an analyses on these smolt-to-adult returns with factors potentially affecting survival including smolt abundance, individual and population life-history characteristics, environmental data, and buffer prey data. We are evaluating hypotheses about spatial variation in mortality, size-selective mortality, match-mismatch, and life history variation.

Watershed Location Outweighs Effects of Freshwater Rearing on Early Marine Survival of Puget Sound Steelhead Smolts

PRESENTER: Megan Moore, NOAA

Steelhead smolts migrating through Puget Sound experience very low survival rates each year, likely limiting the recovery of depressed populations in the basin. It is unclear whether poor survival to the ocean is a function of direct effects within the marine environment, or caused by watershed-specific characteristics like habitat conditions or hatchery introgression. We transplanted steelhead smolts from a highly urbanized, hatchery-influenced watershed feeding into central Puget Sound (Green River) to a relatively undisturbed south Puget Sound watershed free of hatchery influence (Nisqually River), while an identical number of smolts were transferred from the Nisqually River to the Green River. Survival from freshwater release through Puget Sound was monitored using acoustic telemetry. Smolts from both populations released in the Green River survived at similar rates, as did smolts from both populations released in the Nisqually River, and smolts from both release sites survived at similar rates through congruent migration segments. However, smolts from both populations released in the Nisqually River experienced early marine (all segments combined) survival rates than smolts with a 65 kilometer shorter migration from the Green River, indicating an effect of release location over any population effects. Release date also had an effect on smolt survival rate, with a higher probability of survival estimated for smolts released at the end of April than those released in early and mid-May. These results are most likely associated with marine conditions common to both watersheds.

Predation by Harbor Seals on Steelhead Smolts in Puget Sound

PRESENTER: Megan Moore, NOAA

Increases in harbor seals and decreases in steelhead trout are among the numerous indicators of an ecosystem shift in Puget Sound that has happened during the past several decades. Instrument packs, including satellite tracking devices and acoustic telemetry hydrophones, were put on 12 harbor seals in Admiralty Inlet and central Puget Sound. Steelhead smolts from the Nisqually and Green Rivers systems were implanted with transmitters that could be detected by the seal-mounted hydrophones. Harbor seal receivers detected about 20 percent of the steelhead smolts that entered Puget Sound and 25 percent of those detected tags were later detected on further along the steelhead migration route, indicating survival to those locations. About 20 percent of the detected tags were detected repeatedly, often near the seal resting locations, suggesting the fish were eaten by the seals and the tags defecated. We also tested whether the sound of the acoustic transmitter affected survival of steelhead and found that it did not. Future studies using a similar approach will be designed to estimate the percentage of wild steelhead smolts consumed by harbor seals in the main basin of Puget Sound.

EVOLUTION OF HATCHERY AND HARVEST PRACTICES IN ADVANCING RECOVERY 2

Room
Heritage F

Moderator
Guy Norman

Lower Columbia Conservation and Sustainable Fishery Plan

PRESENTERS: Patrick Frazier and Jeff Breckel, Lower Columbia Fish Recovery Board, and Eric Kinne, Washington Department of Fish and Wildlife

Nearly all of the lower Columbia salmon and steelhead populations are listed as threatened under the federal Endangered Species Act, due in part to historic hatchery and harvest practices. Recovery of salmon and steelhead populations, therefore, will require a reduction in hatchery and harvest impacts. The Lower Columbia Fish Recovery Board and Washington Department of Fish and Wildlife collaboratively completed a plan that works to both support fishing and to recover or enhance salmon and steelhead populations. The plan describes how hatchery and harvest programs will be changed to reduce their negative impacts. Actions will be implemented on a population-by-population basis and can include changes in production levels, refuge

streams with no hatchery production, use of natural origin fish in hatchery programs, control hatchery fish in natural spawning areas, and an increase harvest of hatchery fish. The plan includes a monitoring and adaptive management program to ensure that recovery goals are achieved. The plan will sustain productive fisheries and assist in achieving recovery goals and objectives.

Cedar River Sockeye Hatchery Program 2014 Strategic Plan

PRESENTERS: Brent Lackey, Seattle Public Utilities, and Betsy Daniels, Triangle Associates

The *Cedar River Sockeye Hatchery Program 2014 Strategic Plan* completed in King County is a timely case-study in supporting salmon recovery while using science to guide supplementation of naturally-produced salmon through hatchery adaptive management and strategic planning. To protect drinking water quality, sockeye are not allowed to pass the Landsburg Dam. As mitigation, the hatchery produces fry to replace those that could have been produced above the dam and supplements production from sockeye spawning in the Cedar River below the dam. The Cedar River Sockeye Hatchery is jointly operated by Seattle Public Utilities and the Washington Department of Fish Wildlife through a cooperative agreement under a hatchery Adaptive Management Plan. Research and monitoring under the management plan is overseen by agency representatives and stakeholders through an Adaptive Management Workgroup. To establish a common understanding among the different interests on the workgroup, Seattle Public Utilities initiated a strategic planning process for the hatchery program. Facilitators conducted meetings in which widely differing interests, including local, state, and federal agencies, a tribe, and private fisheries advocates met to agree on measurable goals for implementing the adaptive management plan, as well as milestones and actions for operation of the hatchery through 2025. In this presentation, the process used to develop the strategic plan will be highlighted and the role of the neutral party, agencies, and stakeholders will be explored. This case study is presented for others interested in stakeholder involvement in hatchery program implementation who had to consider all "H's."

An Approach to All-H Integration: Tracking and Reporting Progress Across the Hs in the Upper Columbia

PRESENTER: Greer Maier, Upper Columbia Salmon Recovery Board

The Upper Columbia Integrated Recovery Reporting Program is a new approach to tracking recovery actions and integrating decisions across management sectors affecting salmon and steelhead recovery. In this presentation, you will learn how one regional recovery board is tackling the issue of genuine integration. Two of the key uncertainties in implementing the regional recovery plan are the effect of various management actions on life-stage specific survival rates and their population level responses, as well as how strategies within each of the Hs (harvest, hatcheries, hydropower, and habitat) interact and contribute to recovery. Partners in the upper Columbia have invested nearly $94 million on habitat protection and enhancement since 1996, and millions more on conservation hatchery programs and improvements to survival at dams. This newest integrated reporting effort is an attempt to capture investments in time and money, and the corresponding contribution to recovery to better understand where to focus future investments. In its habitat report, the Upper Columbia Salmon Recovery Board explored questions related to habitat implementation, the projected benefit of such efforts to fish and habitat, and the expected contribution of such efforts to recovery. The region has implemented more than 350 projects in the past 20 years and translated reported metrics into benefits for fish and progress toward recovery. For the hatchery report, the board evaluated the 22 different regional hatchery programs that release more than 16 million juveniles annually, with a focus on the nearly 2 million that are listed species. The board will use these reports to facilitate more effective recovery.

Chum Salmon Enhancement in the Lower Columbia River: An Integrated Strategy of Habitat Restoration, Supplementation, and Monitoring

PRESENTER: Bryce Glaser, Washington Department of Fish and Wildlife

The Washington Department of Fish and Wildlife Chum Salmon Enhancement Project in the lower Columbia River is using an integrated strategy of habitat restoration, supplementation, and monitoring to promote

recovery of Columbia River chum salmon. Funded in 2008 by the Bonneville Power Administration, this project has focused on implementing annual monitoring of viable salmonid population parameters for lower Columbia River chum salmon populations, developing tributary-focused habitat restoration projects to provide high quality chum spawning habitat, and maintaining existing safety net and reintroduction chum salmon hatchery supplementation programs. Future project goals are to continue annual monitoring, to finalize design, and to build several chum spawning habitat restoration projects in key watersheds where chum populations are severely depressed or extirpated, and to finalize and implement a supplementation strategy designed to jump start recovery in these areas.

Addressing Limiting Factors and Critical Uncertainties in the Reintroduction of Chum Salmon to Oregon Tributaries of the Columbia River

PRESENTER: Kristen Homel, Oregon Department of Fish and Wildlife

Historically, chum salmon represented a significant portion of the annual returns of salmon and steelhead to the lower Columbia River, with peak returns estimated at over 1 million chum salmon in 1928. Beginning in the 1800s, changes to land use significantly degraded the lower river habitats with which chum salmon are associated. Coupled with harvest rates of more than 80 percent, by the 1940s, more than 90 percent of chum salmon populations were extirpated. In Oregon, chum salmon recovery efforts began in earnest in 2012 with the initiation of the Chum Reintroduction Project. This project has focused on identifying and addressing factors that limit survival and reproduction of chum salmon, along with investigating critical uncertainties in the techniques required to re-establish viable chum salmon populations in Oregon tributaries to the Columbia River. In this presentation, I describe (1) the adaptive management approach that will be used to achieve population recovery goals, (2) limiting factors and critical uncertainties, and (3) experimental reintroductions that were completed in 2013 and 2014. Preliminary results from experimental reintroductions indicate both adult out-planting and onsite incubation of eyed-eggs are viable techniques, although the efficacy of each depends on characteristics of the reintroduction site. As such, the Oregon approach to chum salmon recovery includes employing a suite of reintroduction techniques in habitats spatially arranged throughout the lower Columbia River in an effort to spread risk and encourage adaptation to diverse environments.

South Fork Nooksack Chinook Population Recovery Project

PRESENTER: Alan Chapman, Lummi Nation

The South Fork Nooksack Chinook Population Recovery Project on the South Fork Nooksack River in Whatcom County is a key early action in the WRIA 1 Salmonid Recovery Plan. Failure to collect natural brood stock for supplementation led to a captive bloodstock program. A DNA baseline was constructed to identify populations of Chinook salmon in the basin. Juvenile Chinook salmon were collected, screened against the baseline and South Fork population, and transferred to a state hatchery for rearing until ready for transfer to seawater or to another freshwater facility. Each fish is identified by a PIT tag and genetic profile to allow mating crosses that maximize genetic diversity in the sub-yearling releases. Freshwater survival ranged from 58 percent to 98 percent and sea water survival ranged from 35 percent to 79 percent. Growth in sea water was greater than expected, reaching an unusually large size for Chinook in captive culture (10-20 lbs.). The captive brood release grew from 1,954 sub-yearlings smolts in 2011 to 677,540 sub-yearling smolts in 2014.

FISH PASSAGE: CAN'T CROSS THE SAME RIVER TWICE

Room
Spruce

Moderator
Larry Dominguez

10 Years and 60 Culverts Later

PRESENTER: Darrell Gray, Nooksack Salmon Enhancement Association

The WRIA 1 Fish Passage Barrier Inventory Project in Whatcom County was coordinated by Whatcom County with assistance from the Nooksack Indian Tribe and the Nooksack Salmon Enhancement Association. During

the 3-year project, 1,674 structures were assessed and 837 were barriers to fish passage. When barriers were identified, upstream habitat assessments were conducted and Priority Index numbers were calculated. A database and GIS layer was created containing all stream crossing data for state, county, city, and private roads in the county. This became a valuable tool for prioritizing, strategizing, and funding the removal of fish passage barriers in Whatcom County. The Nooksack Salmon Enhancement Association also completed design surveys of the top 30 private fish passage barriers and developed crossing specifications and cost estimates. The association and Nooksack Tribe use the information to apply for grants to remove these barriers. Since 2004, the association has worked with private landowners to remove more than 60 fish passage barriers, often in conjunction with the removal of state, county, and city road fish passage barriers. The WRIA 1 Fish Passage Barrier Inventory will continue to be a valuable tool for prioritizing future fish passage projects.

Design and Physical Model Testing of a Bottomless Sedimentation Invert Culvert

PRESENTER: Matthew Houser, Contech Engineered Solutions LLC

Testing at Colorado State University suggests that the forces experienced by sediment in streams are similar to those experienced by fish. Thus, a culvert in which bed transport continuity is achieved is analogous to a culvert in which fish passage continuity is achieved. With this objective in mind, a model study was conducted in a 2-foot-wide flume at Colorado State University to develop new culvert technology. Thirty test runs were completed with unique combinations of roughness elements and slat arrangement, slope, sediment input, and discharge to arrive at the best design. The best design was then tested on 20 sediment, slope, and flow conditions. The study found that sediment deposition and streambed continuity could be achieved by modifying a four-sided culvert to have sedimentation members and slats with and an open bottom resulting in an ecological invert culvert. This new culvert technology is presented as an alternative to stream simulation culverts in settings where they are either unnecessary or cost prohibitive. Of the ten expected outcomes of a well-designed stream simulation culvert, the nine most important are achieved by the ecological invert culvert. These are flood conveyance, fish passage, stream profile continuity, hydraulic diversity, sediment transport continuity, low flow continuity, margin habitat, debris transport, and connectivity to hyporheic zone. The ecological invert culvert also achieves material efficiencies over a traditional concrete box culvert and requires less design expertise than a stream simulation culvert.

Davis Creek Fish Barrier Correction

PRESENTER: Doug Meyers, Big R Bridge

The Davis Creek Fish Barrier in Grays Harbor County opened 14 miles of prime spawning and rearing habitat for five species of salmon. This project is under South Bank Road in Grays Harbor County near the City of Oakville and getting the road opened up to the public on time was a priority. Everyone has to keep under budget while doing more with less, and often with little time to do it. Structural plate buried bridges are the newest alternative to traditional bridges that have been around for more than 80 years. Many owners and engineers in the construction industry are not familiar with buried structures, but the reality is that buried bridges have been around for a long time and have a proven history in North America. We have come a long way since empirical design methods were developed in the 1930s. Advancements in materials, corrugation profiles, and evolution of design methods have resulted in structures that no one could have envisioned back then. This presentation will focus on industry advances, accelerated construction techniques, and cost benefits using buried bridges. We will look briefly at other successful buried bridge structures in Washington and see how they were economical alternatives to comparable rigid structures.

Icicle Creek Fish Passage Assessment and Design

PRESENTER: Patrick Powers, Trout Unlimited

The Icicle Creek Fish Passage Assessment and Design Project is a review and design of historical fish passage through a reach locally known as “the boulder field.” Icicle Creek is the largest tributary of the Wenatchee River and contributes 20 percent of the late season flow. This boulder field drops 30 feet in less than 100 feet creating a medium to high flow velocity barrier. More than 23 miles of potential habitat are

upstream. At a very narrow range of lower flows some bull trout and steelhead may be able to pass through drops of 7 to 8 feet spread out over the boulder field length. Trout Unlimited secured funding for the fish passage assessment and geomorphic analysis of the boulder field and diversion dam upstream. The current design effort is developing preliminary designs for passage improvements at these two locations. For the boulder field, options being reviewed range from a major widening and re-grade of the entire boulder field to provide passage over a wide range of flows, to smaller passage improvements, to potential existing passage routes at low flow. The project also includes a geomorphic assessment of a road built in the 1930s and five other waterfalls upstream. An overall watershed perspective of competing fish resources perspectives will be discussed.

DATA ANALYSIS AND PRIORITIZATION TOOLS: SOMETHING OLD, SOMETHING NEW

Room
Pine

Moderator
Chip McConnaha

The 2006-2011 Puget Sound Change Map: Status and Future

PRESENTER: Ken Pierce, Washington Department of Fish and Wildlife

The Puget Sound Change Map is an ongoing Washington Department of Fish and Wildlife project to map land cover changes throughout Puget Sound with an emphasis on canopy loss and impervious surface increase. Using aerial imagery, the project has mapped more than 90,000 change locations for the times periods 2006-2009 and 2009-2011 including 43,000 acres of non-forestry related canopy loss and more than 9,000 acres of new impervious surface. This comprehensive map of Puget Sound change is designed to help understand dynamic watershed conditions and provide a means for monitoring land cover and land management effectiveness. During 2014, the department partnered with seven local entities working on a variety of uses, underscoring the data's versatility and applicability in the Puget Sound region. For example, Whatcom County employed the data to examine canopy loss in the ecologically important Lake Whatcom watershed. The Northwest Indian Fisheries Commission is using the data in its update of the *State of Our Watersheds* report in quantifying impervious surface increase and riparian canopy loss. Pierce County is using the information to assist in targeting riparian areas for future restoration projects. This presentation will summarize some of the major trends and provide information on data distribution and future plans.

Fisher Protocol©: A New Rapid Assessment Tool for Quantifying In-stream Salmon Habitat

PRESENTER: Jim Fisher, Fisher & Associates, LLC

The new Fisher Protocol© was deployed in the Abernathy Creek watershed in Cowlitz County as a rapid assessment tool to locate and quantify all salmonid spawning and rearing habitat in the main stem from the headwaters to the mouth in 2014. A two-person stream team was able to assess more than 10 stream miles in less than 8 days using the Protocol, and identified all spawning and rearing habitat areas by GPS and photographs, and quantified each by stream surface area in foot2. The copyrighted method is based on simultaneous measurement of three or four parameters within optimum metric ranges that define habitat. Results of this demonstration project identified 191 rearing habitat units and 38 spawning habitat locations. The quantity of spawning habitat could support up to 215 redds (Chinook, coho, steelhead), or 430 returning adults. The recovery plan interim target is 900 adults for this watershed, suggesting available spawning habitat is a significant limiting factor for recovery. Survey results showed only 0.45 percent of the in-stream area of the watershed contains suitable rearing habitat, and only 0.29 percent contains spawning habitat. These results suggest there is substantial need for more restoration projects focused on creating functional spawning and rearing habitat. This study demonstrated that the new Fisher Protocol is a very useful, rapid assessment method for identifying and quantifying actual spawning and rearing habitat, and generating cost-effective data useful for entities involved in managing restoration of in-stream habitat in salmonid-bearing watersheds.

A Revised Ecosystem Diagnosis and Treatment Model to Support Monitoring and Adaptive Management Programs

PRESENTER: Greg Blair, ICF International

The Ecosystem Diagnosis and Treatment system was developed in the Pacific Northwest more than 20 years ago as an application of the medical model of diagnosis and treatment to watershed management issues. The system is used to build working hypotheses to direct habitat restoration and protection activities in many Pacific Northwest salmon watersheds. The original purpose of the system was to provide a scientific basis for moving forward with restoration and protection activities. It continues to be used for that purpose, but also is used to evaluate recovery progress and refine restoration strategies as new information becomes available through monitoring programs and to incorporate climate change into recovery planning. Habitat-based life cycle models like the Ecosystem Diagnosis and Treatment system also are an important component of a watershed adaptive management program. They provide a platform to organize and synthesize new information and they are a means to improve on existing or develop new species-habitat recovery hypotheses. We present an entirely updated the system model architecture developed to provide greater flexibility, improved integration with watershed information, and enhanced transparency to better communicate recovery hypotheses. The system includes a more flexible data management and reporting structure that allows for alternative species-habitat-relationships and improved assessment and reporting of habitat status and trends.

A Rapid Habitat Assessment for Modeling Limiting Factors to Salmonid Restoration in Abernathy Creek

PRESENTER: Peter Stevens, Cramer Fish Sciences

This presentation describes surveying, modeling, and quantification of habitat carrying capacity for spawning and rearing salmon and steelhead. Abernathy Creek was surveyed for key habitat characteristics directly linked to predicting suitable stream habitat for salmonid rearing and spawning. The habitat data then were modeled to predict the stream's carrying capacity at two life stages, spawning and rearing, for Chinook, coho, and chum salmon and steelhead trout. Hydraulic geometry was incorporated into the model to predict the differences in area and depth between different primary spawning and rearing seasons. The key limitation to spawning capacity was high levels of fines. Key limitations to rearing capacity were the paucity of large woody materials and low abundance of alcoves and back channels. Paradoxically, modeling showed that engineered channels actually may reduce coho rearing capacity by about 43 percent, leading to an about 16 percent reduction in adult equivalent recruits. Rearing habitat was found to be more limiting than spawning habitat. Therefore, expansion of rearing habitat in specific reaches should be prioritized to alleviate the rearing capacity bottleneck. The assessment revealed specific locations and habitat features that limit production, and quantified the gains in potential fish production that have been realized or could be realized from habitat restoration projects. This demonstrates the utility of the modeling approach in generating estimates of carrying capacity and evaluating different strategies for habitat restoration to achieve recovery goals set in recovery plans.

MANAGING SALMON IN A CHANGING CLIMATE

ROOM
Ash

MODERATOR
John Stein

Salmon Grow on Trees: Ridge-top to River Restoration

PRESENTER: Melody Kreimes, Upper Columbia Salmon Recovery Board

The Upper Columbia Salmon Recovery Board's forest health program is building consensus among the timber industry, conservation groups, and local, state, federal, and tribal governments to improve the health of the national forest lands, which are 70 percent of the land base in Chelan and Okanogan Counties. The 5,000+ miles of roads on these public lands have long been identified as a threat to Endangered Species Act-listed salmonids. The forest also is susceptible to uncharacteristically severe fires, insect infestations, disease epidemics, habitat loss, and hydrologic events that cause massive erosion. Climate change will only

exacerbate these threats. Restoring healthy forests is critical to recovery of listed salmon and steelhead in the region. The Upper Columbia Salmon Recovery Board's Forest Health program integrates aquatic and terrestrial restoration, in balance with social and economic interests, through a locally-led, collaborative process. Innovative approaches include: Leveraging resources for aquatic assessments and integrating aquatic data into Forest Service landscape analyses; modeling forest management activities that can increase snowpack and in-stream flows; increasing economic viability of forest treatments to help pay for ecological restoration; and Forest Service partners supporting accelerated project planning and implementation to address critical issues in priority watersheds. This presentation will explore the challenges and opportunities of facilitating landscape-scale restoration among diverse stakeholders and across 3 million acres of federal lands.

Recovering Salmon in a Changing Climate: South Fork Nooksack River Climate Change Pilot Project

PRESENTER: Treva Coe, Nooksack Indian Tribe

The South Fork Nooksack River Climate Change Project in the South Fork Nooksack River, Whatcom County, Washington, was developed as a pilot project to consider how projected climate change impacts could be incorporated into the South Fork Temperature Total Maximum Daily Load Program and inform adaptation of the *WRIA 1 (Nooksack) Salmon Recovery Plan*. Past and ongoing land uses have severely degraded habitat conditions in the South Fork Nooksack River, which lacks large wood and deep pools and is 303(d)-listed for low in-stream flows and temperature. Effective salmon recovery into the future must consider the cumulative impacts of both land use and climate change. Two components comprised the climate change pilot project: A quantitative assessment that modeled stream temperatures under various future climate and restoration scenarios and a qualitative assessment that evaluated potential impacts of climate change in the south fork to Chinook, steelhead, bull trout, and other salmonid populations and identified and prioritized restoration actions to address those impacts. Temperature modeling indicates that maximum daily temperatures in the south fork during critical conditions could increase by 3.4-6°C by 2080, depending on future emissions scenarios, but that restoration of natural channel and riparian conditions could mitigate that increase. We present results of our scenario modeling and recommendations for salmon recovery adaptation.

Climate Change and Steelhead Recovery in the Skagit River

PRESENTER: Ed Connor, Seattle City Light

A modeling project was completed to assess the impacts of climate change on steelhead in the Skagit River. A statistical model was first developed to identify key hydrological and ocean condition variables correlated to changes in wild steelhead returns. This multiple-regression model includes three variables: the Pacific Decadal Oscillation index of surface sea temperatures in the north Pacific, annual peak flows in the Skagit River, and annual low flows. The model explains almost 80 percent of the variability in wild steelhead returns during the past 30 years. This model indicates that steelhead returns are positively affected by warmer surface water temperatures in the north Pacific, but negatively impacted by the increasing magnitude and frequency of peak flow and low flow events. Global climate models applied to the north Pacific predict an increase in ocean surface temperatures during the next 80 years, while downscaled modeling of hydrological conditions in the Skagit predict substantial increases in annual peak flows and reductions annual low flows during this same period. The results of modeling suggests that while Skagit steelhead populations will be favorable affected by increasing temperatures in the north Pacific, this benefit will be largely outweighed by the strongly negative impacts of increasing peak flows and declining base flows on the freshwater survival. The long-term recovery of steelhead in the Skagit likely will require adaptations in flow regimes from reservoirs, the protection of cold water refuge habitats and in-stream flows, and restoration projects that improve the freshwater survival of juvenile steelhead.

Restoring the Lower Columbia River Ecosystem: Status and Future Directions

PRESENTER: Catherine Corbett, Lower Columbia Estuary Partnership

The lower Columbia River and estuary is designated an "estuary of national significance," or one of 28 National Estuary Programs. All National Estuary Programs work with regional stakeholders to identify issues facing the ecosystem and develop quantifiable objectives and actions to address them. Regional stakeholders identified restoring biological integrity of the lower Columbia ecosystem as the ultimate goal and historic habitat diversity as a key attribute to indicate whether we are meeting that goal. Historic habitat diversity is a key attribute because native flora and fauna evolved under ecological conditions and habitats that persisted for thousands of years previous to large-scale human development. Recovering aspects of native habitat diversity should benefit native species, and as a result, is a common end point for many ecosystem restoration programs. In the lower Columbia, the science community is developing voluntary quantifiable conservation targets, including priority geographic areas for protection and restoration to recover historic habitat diversity. We completed a habitat change analysis comparing 1870s with 2009 land cover, and identified priority habitats for restoration and protection, based on the severity of loss (the more severe the habitat loss, the higher the priority). Those locations where the priority habitats still exist are important for protection, whereas areas in low impact land use (called "recoverable" areas) are locations that can be restored to a suitable priority habitat if respective landowners are willing. Maps of habitat change, intact priority habitats and recoverable areas are available on our Web site. This presentation will provide an overview of the status of habitat protection and restoration in the lower Columbia – where and how much land has been restored and protected, and priority areas for future restoration efforts. We also provide initial recommendations for shifting the focus of efforts to begin integrating anticipated changes in precipitation, temperature, and sea level from climate change.

INNOVATIVE PARTNERSHIPS: INFRASTRUCTURE INSIGHTS

ROOM
Birch

MODERATOR
Paul Cereghino

Workin' on the Railroad – Case Study: How to Build a Bridge with Burlington Northern Santa Fe Railways

PRESENTER: Mike Kaputa, Chelan County

This project in the Wenatchee watershed (Nason Creek) showcases a variety of complex legal and policy approaches to building a salmon recovery project within critical infrastructure of national importance. Nason Creek is the highest priority tributary for restoration in the Wenatchee watershed and contains critical infrastructure, including State Highway 2, Burlington Northern Santa Fe's main line from Seattle to Chicago, Bonneville Power Administration's transmission line, and Chelan County Public Utility District's transmission line. There is excellent floodplain and off-channel habitat that is constrained by this critical infrastructure but tremendous opportunity for improvement of habitat conditions if the infrastructure owners can modify their facilities. The case study project overcame many legal and policy hurdles to provide high priority habitat in a high priority reach. Construction of the railroad in the 1890s disconnected Nason Creek from 152 acres of floodplain wetland. In addition, the railroad prism blocked access to four perennial tributaries, Coulter, Roaring, Gill, and Knutson Creek basins, which account for 15 percent of the flows in the Nason Creek basin. Project construction included a bridge within the railroad track prism to reconnect surface waters of Nason Creek and 152 acres of floodplain wetland. The case study includes a description of the legal agreements, insurance packages, and funding arrangements necessary to build the project in the railroad prism and under train traffic.

Puget Sound Nearshore Ecosystem Restoration Project: Where We've Been and Where We're Going

PRESENTER: Theresa Mitchell, Washington Department of Fish and Wildlife

The Puget Sound Nearshore Ecosystem Restoration Project (PSNERP) has been an ongoing General Investigation study in partnership with the U.S. Army Corps of Engineers during the past decade. Early

excitement and participation of partners has waned as the project has transitioned from study and data collection to work primarily done within the confines of the Corps to ready the project for advancement through the Corps' stringent planning process. This session will provide a refresher on PSNERP and its process-based ecosystem restoration philosophies, relate PSNERP goals and objectives to salmon recovery objectives, and provide an update on status of the project. Project ideas evaluated by PSNERP were provided by local restoration organizations, including salmon recovery groups and practitioners and maybe even from you! Conceptual level design work was done by PSNERP on 36 project ideas that were identified as being a solid fit with PSNERP goals and objectives. If successful in navigating the Corps' planning process, the PSNERP General Investigation would result in a new construction authority granted by Congress to the Corps for the purpose of Puget Sound nearshore restoration. With this new authority, Puget Sound and its inhabitants – including salmon – will benefit from the Corps' unique ability to mobilize and implement large-scale ecosystem restoration projects.

Powel Shoreline Restoration Design and Implementation Projects: The Complexities of Performing Shore Land Restoration on Private Property

PRESENTER: Brenda Padgham, Bainbridge Island Land Trust

The Powel shoreline restoration projects on Bainbridge Island took place over 5 years and are one of the largest shore land restoration projects on private property in Puget Sound. Through the removal of 1,500 lineal feet of armor and fill, and improvement in the condition of the marine riparian area, this project offers an opportunity to showcase options for restoring important habitats on residential shoreline property. We hope that providing an example of such a rare restoration opportunity, and its success, will serve as a demonstration of how such restoration may be achieved, and how policies and regulations may be changed to improve restoration opportunities and coastal management. The project included project development, planning and design, stakeholder engagement, permitting, implementation, and volunteer monitoring. We will provide a review of the process, players, diverse challenges – from agreeing on a design with 11 stakeholders to working through cultural resource issues – and techniques used to achieve success. Restoration of intertidal and riparian areas on private, residential shore land is an important step to species recovery, shoreline landowner awareness of the value of the nearshore and riparian habitat, and options available to them for a more resilient shoreline. We also describe the complexities of a regulatory framework, diverse stakeholder interests and perceptions, budgets, and the need for incorporation of multiple disciplines for reaching restoration goals.

Willow Creek Daylight: Balancing Constraints and Opportunities

PRESENTERS: David Cline, Shannon & Wilson Inc. and Keeley O'Connell, EarthCorps

Located in Edmonds, the Willow Creek daylight and Edmonds Marsh estuary restoration project represents a rare, nearshore habitat restoration opportunity, considering the limited number of pocket estuaries with tributary streams along the central Puget Sound basin. Willow Creek is a tributary to Edmonds Marsh, historically a pocket estuary marsh and sand-spit barrier formed from coastal sediment shoaling patterns from south to north at Point Edmonds. During the 20th century, establishment of the railway, port, industrial and commercial properties, and urbanization of the city have contributed to significant loss of habitat connectivity and isolated the marsh from the shoreline and Puget Sound. Habitat losses of the central Puget Sound basin shoreline include hydrologic modification of streams and tidal marsh systems, restricted fish passage, filling and fragmentation causing significant losses of pocket estuary marshes. These pocket estuary habitats provide juvenile Chinook with rearing, feeding, shelter, and osmoregulation functions. Recent studies also have highlighted the importance of juvenile Chinook rearing along the Puget Sound shoreline coastal creeks and streams. This presentation will provide an overview of the Willow Creek daylight project, and the contrasting Burlington Northern Santa Fe railway, State Route 104, and the former Chevron-Unocal tank farm property constraints, with the opportunities for marsh restoration, reduced flood impacts, shoreline restoration, and park enhancements along Marina Beach Park. We will share information on our stakeholder engagement strategies, technical design hurdles, and solutions to benefit fish, the park, adjacent landowners, and the community of Edmonds.

THURSDAY AFTERNOON SESSIONS

FLOODPLAINS: IN-STREAM PROJECTS

Room
Hemlock-Oak

Moderator
Stephanie Suter

Lessons Learned from Fish Exclusion for River-scale Logjam Projects

PRESENTER: Ned Currence, Nooksack Indian Tribe

The South Fork Nooksack River Downstream of Hutchinson Phase 1 and North Fork Nooksack River Farmhouse Phase 1 Restoration Projects in Whatcom County entailed construction of 12 and 27 logjams, respectively. Both projects required isolation via bulk bags and/or bladder dams, followed by fish exclusion of isolated areas. A total of 2,190 fish were handled for the downstream project and 1.4 percent died. A total of 184 fish were handled for the farmhouse project and 6.5 percent died. We shall present lessons learned from these projects, including causes of mortality and recommendations to minimize them. Fish died because of: (1) fish exclusion (seining, electrofishing); (2) installation or decommissioning of isolation materials; and (3) rapid changes in water depths that caused stranding. Recommendations include: (1) carefully plan isolation; (2) minimize fish handling to the extent possible by herding fish out before and during installation of isolation measures; (3) select appropriate mesh size for seining and remove large cobbles to avoid crushing; (4) minimize electrofishing, especially when visibility is limited; and (5) plan isolation to allow for gradual dewatering to minimize stranding, and be prepared for rapid rescue should stranding occur.

West Fork Smith River In-stream Restoration: A True Collaborative Effort

PRESENTER: Matt Ruwaldt, Partnership for the Umpqua Rivers

The West Fork Smith River, a nearly 27-square-mile basin in southwestern Oregon, has been heavily impacted by past land use practices. Restoration efforts began in the mid-1980s, culminating with $1.6 million of in-stream activities during 4 years. The recent work resulted in the restoration of nearly all stream reaches accessible to salmonids. Restoration was accomplished through excavator, helicopter, and line-pulling machine-based placement of boulders and large woody materials. Populations of Endangered Species Act-listed Oregon Coast coho salmon, Chinook salmon, cutthroat trout, steelhead trout, and Pacific lamprey are expected to benefit. These efforts were led by the Partnership for the Umpqua Rivers, in conjunction with the Coos Bay Bureau of Land Management. A true collaborative effort, the project also relied on the Oregon Department of Fish and Wildlife, U.S. Forest Service, Oregon Watershed Enhancement Board, Umpqua Soil & Water Conservation District, Roseburg Resources Company, Whole Watershed Restoration Initiative, and U.S. Fish and Wildlife Service. Stream reaches were identified through recent intrinsic potential and overwinter survival studies done within the basin. Fish population trends will be measured through the Life Cycle Monitoring program that Oregon Department of Fish and Wildlife has been undertaking since 1998.

Restoring Thermal Refuge Habitat For Juvenile Salmonids in the (Quite Warm) Sammamish River

PRESENTER: Paul Devries, R2 Resource Consultants

The City of Bothell has a unique opportunity to reconnect and restore about 1,100-feet of an old remnant channel and floodplain of the Sammamish River in an urbanized environment. The river has been disconnected from its floodplain for about 100 years after construction of the Ballard Locks and lowering of Lake Washington, and has been significantly channelized. This talk will give an overview of the historical conditions, the changes that occurred, and the data collection and analyses performed to evaluate feasibility and develop a biologically meaningful design to restore this site. A key goal is to create accessible, off-channel rearing and summer thermal refuge habitat for juvenile salmon and trout. The site is located where there is evidence of cold water springs discharging to the river bottom. Groundwater piezometer and deep well data

were collected and analyzed with modeled river levels. The results indicated a feasible restoration project could be designed to provide critical cooler water refuge during summer months. Water levels in the river controlling connectivity are influenced in a unique way by managed levels in Lake Washington and seasonal flow patterns, which strongly influenced design of inlet and outlet connections to passively provide connectivity during outmigration months and moderate to higher flows, and reduce connectivity for predatory fish species and elevated river temperatures during summer months. The design also considered floodplain fill rates, sedimentation, beaver influences, and public safety. Re-vegetation goals include creating an insulating riparian zone over the off-channel habitat and restoring floodplain plant community diversity and structure.

White River Large Wood Atonement Project: Using Geomimetic Design Principles to Partially Restore Watershed Processes

PRESENTER: Robes Parrish, U.S. Fish and Wildlife Service

The White River Large Wood Atonement Project (Wenatchee River basin) aims to increase the persistence time of mobile large wood. The channel is considerably incised due to repeated logging, which causes higher flows to rapidly export its ample but small-diameter in-stream wood supply. In 2014, we installed 128 untreated pilings using a barge-mounted system to access this remote reach while producing no adverse construction-related impacts. Whole trees and racking material also were added by helicopter to 14 of the 28 structures across 1.6 miles. The organizing design concepts were derived from a 2012 study that analyzed the stability and persistence of natural logjams. This study presents geomimetic design as a method of applying the observed morphology and characteristics of natural analogs to engineered logjams for achieving dynamic stability. Several other upper Columbia logjam projects also have been built using geomimetic design and ongoing monitoring will test their long-term effectiveness. A 5-year flood was experienced shortly after construction and the White River project is showing early signs of success.

PLANNING, CONSTRUCTION, AND MONITORING OUTCOMES: REVIEWING THE FULL ARC OF ESTUARY RESTORATION

ROOM
Heritage E

MODERATOR
Richard Brocksmith

Smuggler's Slough Restoration: Status and Lessons Learned

PRESENTER: Jill Komoto, Lummi Nation

The overall goal of the Smuggler's Slough Restoration Project, in the Nooksack estuary on the Lummi Reservation in Bellingham, is to reconnect a former tributary of the old Nooksack River, between Bellingham and Lummi Bays to allow for juvenile fish passage and restoration of both saline and freshwater estuarine habitats. Implementation of restoration actions began in 2008 with acquisition of key parcels. In 2010, upper Smuggler's Slough was enhanced with additional side channels, created through a process known as deleveling. More than 60 acres were planted the following two winters, using tribal technicians and community volunteers. The second phase, the Marine Drive tide gate project was completed in 2011. This project replaced failed culverts to reduce flooding in upstream agricultural areas and allow for juvenile salmonid passage. Other actions are underway, including replacement and removal of other culverts considered barriers, installation of beaver deceivers, and acquisition of parcels on the downstream portion of the project. Breaching the seawall, replacing old tide gates, and placing berms to protect homes and productive agriculture lands are options to restore historic saltwater marshes on the Lummi Bay side. To complicate matters, this restoration project is being implemented in coordination with the new Lummi Nation wetland mitigation bank, the first tribal mitigation bank in the nation. Restoration actions that benefit the mitigation bank cannot be funded with public funds. Along the way, many lessons have been learned, with good examples for others to follow and an understanding of what we could have done better.

Turning Back the Clock: Trending Towards Historical Function at a Major Estuary Restoration Site in Puget Sound

PRESENTER: Gavin Glore, Mason Conservation District

The Skokomish estuary restoration is at the mouth of the Skokomish River on the Great Bend of Hood Canal and is one of the largest estuary restoration sites in Puget Sound. The Skokomish Tribe initiated restoration of the site in 2007 and Mason Conservation District has been privileged to assist the tribe in planning and implementing the three phases of restoration. Gavin Glore, from the Mason Conservation District, will discuss how the use of historic aerial photographs was critical to planning the restoration and show examples of how the engineered designs were implemented successfully. Alex Gouley, Skokomish Tribe, will discuss some the positive effects the restoration has had on the quantity and quality of salmon habitat, wetland function, and reductions in frequency and severity of local flooding.

A Comparison of Techniques for Restoring Tidal Delta Habitats for Juvenile Chinook Salmon Recovery

PRESENTER: Eric Beamer, Skagit River System Cooperative

Monitoring restoration actions of the *Skagit Chinook Recovery Plan* provides an opportunity to determine the effectiveness of different restoration techniques implemented in the Skagit River estuary. Estuaries of large rivers have undergone extensive modifications from their historical footprints. Efforts to remove risks of flooding and tidal inundation and to improve drainage capabilities have resulted in extensive habitat loss for fish species that depend upon tidal marshes, sloughs, and distributaries for rearing during juvenile life stages. Recent efforts to restore disconnected habitats for threatened and endangered fish stocks has used a variety of techniques without good knowledge of which techniques are best for fish. These techniques primarily range in the degree to which natural processes are restored to previously disconnected systems. Using pre- and post-project monitoring data, we compared four restoration techniques designed to restore rearing habitat in tidal marshes and sloughs for juvenile Chinook salmon in the Skagit River estuary: 1) self-regulating tide gate, 2) dike breach, 3) fill removal, and 4) dike setback. We evaluate how these techniques vary in restoration cost, amount of habitat restored, local habitat conditions, and density of juvenile Chinook salmon. Using these metrics as well as considerations for maintenance, we determine which types of estuary restoration are most cost-effective, sustainable, and likely to achieve recovery goals for Skagit Chinook salmon.

Ecosystem Monitoring Results: Off-Channel Habitat Use by Juvenile Salmonids in the Tidal Freshwater Section of the Columbia River Estuary

PRESENTER: Amanda Hanson, Lower Columbia Estuary Partnership

The Columbia River historically supported one of the most productive populations of salmonids in the world. High quality, off-channel habitats provide rearing and refugia opportunities for juvenile salmonids and are particularly important in the lower river and estuary. Habitat loss due to large-scale land conversion, diking, and hydro-system development have reduced the amount and quality of rearing habitat available to juvenile salmon. Extensive habitat restoration efforts are ongoing in the lower river to improve rearing opportunity for juvenile salmon. However, several uncertainties remain about the benefits of lower river habitats, including how tidal freshwater habitats benefit upriver stocks. The Lower Columbia Estuary Partnership and NOAA have conducted ecological monitoring in the lower river over multiple years, representing the most consistent fish collection record in the tidal freshwater reaches of the lower river to-date. We present data indicating usage of tidal freshwater floodplain and tributary habitats by salmonids belonging to stocks originating from the interior reaches of the Columbia River and discuss the benefits of these habitats for out-migrating salmonids. Our results support the need for continued protection and restoration of lower river habitats.

SALISH SEA MARINE SURVIVAL PROJECT 2

Room
Cedar

Moderator
Michael Schmidt

Genome-wide Association Study of Survival in Acoustically Tagged Steelhead Smolts in Puget Sound

PRESENTER: Kenneth Warheit, Washington Department of Fish and Wildlife

The genome-wide association studies use genome scans to document a relationship between a phenotype (e.g., survival) and a genotype (e.g., blocks of linked SNPs or genes), based on population samples. Genome-wide association studies are used in a wide variety of studies ranging from understanding diseases in humans, to improving the agricultural production of domestic animals and plants, to documenting specific behaviors or morphology in wild animals. In salmonids, the studies have been used, for example, to gain a better understanding of developmental rates and migratory behavior in steelhead and rainbow trout, and disease resistance in Atlantic salmon. In this study, we investigated if there is an association between genomic signatures in steelhead smolt and their survival while out-migrating through Puget Sound. Steelhead smolts were implanted with acoustic transmitters, and we defined survival as a fish's detection at either the Admiralty Inlet or Strait of Juan de Fuca acoustic detection array. We genotyped fish classified as survivor or non-survivor. To date, we have classified 285 smolts from Hood Canal and Puget Sound as 149 non-survivors, 49 survivors to the Admiralty array only, and 87 survivors to the Strait of Juan de Fuca array. This presentation will discuss the results from the association analyses.

Salmon Poisoning Fluke in Out-migrating Puget Sound Steelhead

PRESENTER: Martin Chen, Northwest Indian Fisheries Commission

Nanophyetus salmincola, also known as the salmon poisoning fluke, in out-migrating Puget Sound steelhead is a potential contributor to low early marine survival. The parasite is known to be present in south Sound watersheds with poor steelhead returns. We sampled 385 steelhead smolts in five Puget Sound river systems at hatcheries, from in-river traps and estuaries, and from offshore areas, and counted the number of tailless late larval cysts in kidney tissue. No cysts were found in hatchery and wild steelhead at any point in the outmigration journey in the Skagit and Snohomish River systems. No cysts were found in wild steelhead smolts trapped in the Tahuya River flowing into Hood Canal. The Green River is highly infective below Soos Creek. Wild and hatchery steelhead sampled in the Green River estuary had cyst counts increased significantly above trap levels, showing that fish enter saltwater with newly acquired infections. Newly acquired infections damage the fish as parasites penetrate the skin and migrate through host tissues. Nisqually River wild steelhead were heavily infected when trapped near Yelm. Cyst counts increased but not significantly over trap levels when fish were sampled in the Nisqually estuary. There is a correlation between the prevalence of infections in Puget Sound rivers and low steelhead returns. Field sampling and experimental approaches were used to determine if the infection causes early marine mortality. Data showing how to manage infections in hatchery steelhead will be presented.

Contaminant Exposure in Out-migrant Steelhead Trout and Chinook Salmon from Puget Sound

PRESENTER: Sandra O'Neil, Washington Department of Fish and Wildlife

Juvenile salmon migrating from freshwater into Puget Sound on their way to the Pacific Ocean encounter a wide range of water quality conditions, from relatively clean to highly contaminated, depending on their migration route and duration of time spent in contaminated habitats. We conducted field assessments of contaminant exposure to chemicals of concern in juvenile steelhead trout and Chinook salmon at four major rivers, marine nearshore embayments, and offshore bases of Puget Sound to determine if they are exposed to chemical contaminants that may impair their early marine survival. The steelhead assessment results indicated that toxic contaminants are probably not a primary factor affecting survival. Levels of human-made toxic contaminants measured in wild steelhead from Skagit, Green-Duwamish, and Nisqually systems were generally below thresholds for adverse effects to fish health. However, levels of flame retardants were elevated

in Nisqually steelhead trout, with 25-33 percent of the samples above levels associated with increased disease susceptibility (all sampling locations) and altered thyroid levels (offshore site only). In contrast, the results of the Chinook salmon fish health assessment indicated that human-made toxic contaminants likely are a significant factor affecting early marine survival, particularly in more developed systems. Chinook salmon out-migrating through developed habitats had levels of toxic chemicals at concentrations known to affect multiple measures of fish health. Results from this work will be used to provide a measure of the effectiveness of current toxic reduction strategies and actions, inform future pollution reduction efforts, and enhance recovery of steelhead trout and Chinook salmon.

Qualitative Zooplankton Community Patterns in Puget Sound

PRESENTER: Iris Kemp, Long Live The Kings

Zooplankton community data are necessary to understand how changing prey fields in the Salish Sea affect overall salmon marine survival. But zooplankton data are rare in Puget Sound. Here, we use a 20-year dataset to qualitatively describe zooplankton community patterns in Puget Sound. Zooplankton were collected by the Washington Department of Fish and Wildlife across Puget Sound, from 1974 to1994. Sites were located offshore of known herring spawning areas and typically sampled between January-June. Numerical abundance of each taxonomic category within the sample was qualitatively assessed. Hierarchical cluster analysis, nonmetric multidimensional scaling, and logistic regression were used to identify broad-scale patterns of taxa presence. Results indicate seasonal and inter-annual variation and evidence of community change over time. A subset of taxa show significant trends over time; these taxa appear to drive overall community patterns. Although there are many caveats associated with qualitative datasets, these analyses summarize a unique long-term zooplankton collection effort in Puget Sound and, when assessed in comparison with current Puget Sound zooplankton sampling program data collected through the Salish Sea Marine Survival Project, may provide information on ecosystem shifts within the Salish Sea during the past several decades.

EMERGING SCIENCE FROM THE DEPARTMENT OF FISH AND WILDLIFE

ROOM
Heritage F

MODERATOR
Erik Neatherlin

Getting to Salmon Recovery: How New Science Helps

PRESENTER: Erik Neatherlin, Washington Department of Fish and Wildlife

What is working to restore salmon populations in Washington? The Washington Department of Fish and Wildlife has emerging science and new approaches to get at this question from across the state: Columbia basin, west side, and the Columbia estuary. This session will highlight three approaches that leverage population-based information to directly inform restoration and recovery priorities. We will provide an overview of how fish in-fish out data can get at basic life stage limitations. Salmon life cycle models developed in the upper Columbia and being developed in Puget Sound reveal the bottlenecks to recovery. These models also help us understand which of the 4-H dials we need to modify to improve survival for the most critical life stages and locations. Finally, otolith microchemistry is emerging as a very useful tool in evaluating habitat use, residency, and growth in juveniles and relating this to abundance and survival of returning adults. Together, these approaches provide a foundation for linking population survival, growth, and productivity to restoration priorities.

How Life Cycle Models Provide a Tool for Recovery

PRESENTER: Jeremy Cram, Washington Department of Fish and Wildlife

Life cycle models provide a framework for accounting for population dynamics that can inform management actions. These may include life-stage- or tributary-specific habitat actions, hatchery reform, hydropower scenarios, or other changes. They also provide a population-scale tool for evaluating completed actions. Life cycle models can help target restoration to the right life stage to improve restoration outcomes.

Using Life Cycle Models to Identify Steelhead Recovery Goals and Actions in Puget Sound

PRESENTER: Philip Sandstrom, Washington Department of Fish and Wildlife

In Puget Sound, steelhead were listed as threatened under the U.S. Endangered Species Act in 2007. To establish recovery goals and evaluate potential recovery actions, we are developing a life cycle model for the three major population groups and 32 demographically independent populations in Puget Sound. The goal of the project is to predict plausible abundance trajectories under a range of biological and management scenarios based on observed patterns of adult abundance, juvenile abundance, and life history diversity. The model uses stage-specific survival rates to simulate successive, linked generations of spawning and recruitment over long time frames. In its simplest form, the model will be composed of two stages, freshwater production (smolts per spawner) and marine survival. Freshwater production will be based on stock-recruit dynamics in which capacity is modeled as a function of habitat availability and productivity responds to environmental predictors such as summer low flow and winter peak flow. Marine survival will vary across Puget Sound in accordance to recent work showing depressed marine survival for southern Puget Sound populations. A series of scenarios will examine the impacts of changes in life-stage specific survival rates on demographically independent populations or major population groups status across a range of management scenarios. For example, the model will help determine the levels of freshwater productivity and marine survival that would permit sustainable harvest in future generations. Overall, the model will use existing empirical population data to provide realistic bounds for population abundance, productivity, and diversity goals.

Life History Strategies of Coweeman Fall Chinook, with Emphasis on Residency and Growth in the Columbia River Estuary

PRESENTER: Lance Campbell, Washington Department of Fish and Wildlife

Growing evidence in the Columbia River estuary suggests juvenile Chinook salmon use portions of both the freshwater and saltwater components of the estuary before out migration. However a clear link between these estuarine-using juvenile life history strategies and returning adult populations has not been made. To test the hypothesis that estuary rearing juveniles contribute to adult populations, we chemically marked out-migrating wild juvenile Chinook salmon at the Coweeman River smolt trap and collected retuning adult otoliths from the spawning grounds on subsequent return years. We analyzed the chemical patterns in otoliths and estimated the size and timing of juvenile outmigration. Furthermore residency within the freshwater portion of the estuary was estimated based on recoveries of chemically-marked adult otoliths from the Coweeman River.

FISH PASSAGE PROJECTS: AND THE SALMON SING

ROOM
Spruce

MODERATOR
David Price

Morey Creek Dam Bypass Channel and Lessons Learned

PRESENTER: Valarie Elliott, Formerly of the U.S. Air Force

Since 1949, barriers in the Clover Creek system hindered salmon migration upstream of Steilacoom Lake, and by 1975, use of Clover Creek by migrating salmon was no longer documented. A dam had been built at the outlet of Steilacoom Lake and provided only intermittent passage into the lake. In the late 1980s, an improved fish ladder was put in place at the dam to allow fish past the dam and upstream of the lake. The next upstream obstacle was Morey Dam built in 1979 to create Morey Pond (about 2.5 acres in size) for recreational fishing. The 12-foot high dam is a vertical barrier that prevents migratory fish passage. The dam was ranked by Pierce County as a high priority to remove. The about 590-foot bypass channel project, built in 2009 through a partnership between the U.S. Air Force and Pierce County at McChord Air Force Base in Pierce County, now allows anadromous salmonids to migrate from Clover Creek through Morey Pond into Morey Creek and eventually into Spanaway Lake. Project development and success, along with lessons learned, will be discussed.

Pole Creek Bridge and Building Streams Through Road Crossings

PRESENTER: Tom Smayda, Smayda Environmental Associates, Inc.

The Pole Creek Bridge along Upper Hoh Road in Jefferson County has been constructed with a functioning stream within the bridge prism. The goal was to construct a stream that is stable and safe at the bridge to support public transportation, while also providing habitats for salmon spawning and rearing plus water quality benefits. This goal aims at a higher standard than just fish passage. The environmental upgrades were accomplished by constructing the streambed with whole trees and spawning-size gravel. The woody material was installed upstream, downstream, and within the bridge crossing. This wood serves to keep peak flow velocity low, so that spawning gravels and pools exist in the bridge vicinity. Creek incision is prevented and floodplain size is increased. The installed wood is configured to avoid excessive accumulation of wood and gravel. This approach is protective of the bridge and beneficial to the environment. During low flow, pools remain in the project area as rearing habitat. Gravel beds and pool-riffle sequences serve to increase hyporheic flow at the bridge, so that water quality is improved. By working through a regional enhancement group, the project area was extended both up- and downstream of the road right-of-way, providing room for enhancement, without extensive armoring or weirs. Native plants were transplanted into the riparian zone from surrounding donor sites. These same design principles have been applied at a dozen other Olympic Peninsula bridge sites. A conclusion is that functioning streams with large woody materials can be constructed safely at road crossings.

Steelhead Return to Taneum Creek After Habitat Restoration

PRESENTER: Patrick Monk, U.S. Fish and Wildlife Service

Taneum Creek, a tributary to the Yakima River in Kittitas County, supported runs of salmon and steelhead trout until the early 1900s when fish access to the stream was blocked, resulting in the loss of the fishery. In the 1980s, the creek was identified as a high priority stream for restoration of fish runs. Restoration actions included screening irrigation diversions, constructing fish ways, removing dams, and restoring in-stream flow and habitat conditions. PIT-tag interrogation sites were constructed and installed at key locations on the creek in 2010 and 2011 with the objective of monitoring fish returns to the creek. Adult steelhead have naturally recolonized Taneum Creek, with counts of PIT-tagged adults ranging from 29 to 66 during the 2010-2014 monitoring period. PIT-tag arrays also detected movements of rainbow trout, cutthroat trout, coho, and Chinook salmon in the creek year-round. Data collected from PIT-tag sites demonstrated that the newly constructed fish passage structures allowed fish to migrate freely up and down the creek. Continued monitoring is recommended to evaluate fishery restoration activities for long-term viability and contribution to recovery of Endangered Species Act-listed steelhead.

McDonald Creek Restoration Project: Success in the Making

PRESENTER: Jarred Figlar-Barnes, Grays Harbor Stream Team

The McDonald Creek Restoration Project in Elma is a continuing, 6-year, watershed-wide restoration project. The project has and continues to focus on habitat restoration, barrier correction, community outreach, and the overall goal of restoring coho salmon runs to the McDonald Creek watershed. The project was started by Jarred Figlar-Barnes in 2009 and through many partnerships has become a continuing success story. This presentation will provide a brief overview of the project and its history, before focusing on the recent return of coho salmon to McDonald Creek, how multiple restoration projects contributed to this outcome, and what future plans exist for the creek.

Frazer Creek Emergency Bridge Construction and Carlton Fire Impacts to the Local Landowners and Watershed

PRESENTER: Jay Kidder, Chinook Engineering

The Carlton Fire burnt through multiple watersheds and one of the hardest hit was Frazer Creek and tributary to Beaver Creek. Our discussion presents a snapshot into the lost stream habitat, infrastructure, and homes, and our attempt to help the impacted landowners in a winter emergency. Five bridges were designed and constructed during the fall and winter of 2014. Emergency work was ongoing to Washington State Highway 20 while our bridge design work was fast-tracked to prepare designs for five local landowner sites where undersized culverts were washed out, inundated, or plugged. With designs completed and steel bridges undergoing fabrication and delivery, construction was started to install the bridges as quickly as they were delivered. Working conditions ranged from below zero temperatures with associated complications for construction and operations. We had clear, cold days and 12 inches of snow then rain and flooding on the frozen ground. Come look at the photographs and hear the discussions to learn about these and future challenges in the burnt Frazer Creek and Beaver Creek watershed.

DATA ANALYSIS AND PRIORITIZATION TOOLS: SOMETHING BORROWED, SOMETHING BLUE

ROOM
Pine

MODERATOR
Chip McConnaha

Using GIS Metrics to Compare Conceptual Restoration Alternatives: Lessons Learned from Goodell Creek

PRESENTERS: Christina Avolio and Jennifer Schmidt, Herrera Environmental Consultants

Even after watershed and recovery planning efforts identify specific geographic areas to focus habitat restoration efforts, evaluating where and how to begin a restoration project and focus restoration spending still presents hurtles. Washington State salmon recovery project designs must increasingly anticipate the potential effects of a changing climate but, even with this uncertain future, provide quantitative, defensible evidence of tax dollars being well spent. Tools are needed to effectively and efficiently anticipate potential as well as measure actual ecological lift associated with salmon recovery investments. To support this and other flood management and restoration efforts, multiple tools have been developed, and some models have been used in the state with various levels of success. This presentation focuses on a simple GIS-based approach for using available spatial datasets and targeted field validation to enable quantitative development and evaluation of metrics for aquatic habitat and habitat accessibility. Using two-dimensional hydraulic model output, this approach can be used to relatively compare potential restoration alternatives at the early stages of project development. This presentation will discuss the methods, results, and lessons learned from one case-study of this approach at the Goodell Creek Alluvial Fan Project area. There, the utility of the GIS analysis and the applicability of the results were found to be related closely to both the precision of the model inputs and the particular habitat evaluation criteria. Nonetheless, the overall approach could potentially provide a robust tool for sites lacking sufficient quantitative field data.

Habitat Optimization Model for Ecosystems HOME:® Make Better Decisions about Restoration Design and Monitoring

PRESENTER: Wayne Wright, GeoEngineers, Inc.

Habitat restoration efforts on streams and rivers in Oregon and Washington including McKay Creek, and the Nooksack, lower South Fork Grays, and Walla Walla Rivers have employed a new ecohydraulic tool called HOME® during the past year to assess habitat conditions and assist with design decisions. The tool was developed specifically to develop habitat maps under multiple flow scenarios for any fish species or life stage based on hydraulic output files such as HEC-RAS or River Flow 2D. HOME® effectively meshes species habitat preference criteria with the hydraulic output commonly used for in-stream restoration design projects.

The tool allows designers, resource managers, and interested stakeholders to view the current habitat conditions, define opportunities while preserving functional habitat, and sets up a robust platform for long term effectiveness monitoring based on actual habitat area calculations. The data derived are displayed numerically and in color graphics to promote system understanding and easy adjustment of conceptual designs to gain the maximum use of limited restoration funds. Substrate, depth, velocity, and cover are common input variables for calculating habitat conditions. Each variable are individually displayed for design considerations then summed to offer a combined weighted useable area calculation for any particular species and life stage of interest. This presentation will introduce the HOME® ecohydraulic tool and demonstrate its use in multiple habitat restoration applications during the past year.

SCORE! Data Reporting Systems Help Guide and Document Salmon Recovery

PRESENTER: Anne Marshall, Washington Department of Fish and Wildlife

The Washington Department of Fish and Wildlife's Salmon Conservation Reporting Engine (SCoRE; https://fortress.wa.gov/dfw/score/) provides access to statewide data and information on salmonid abundance, hatcheries, and recovery organizations. We are updating SCoRE in 2015 to streamline accessibility of these vital salmon recovery data. For habitat restoration practitioners, we will demonstrate the utility of SCoRE for project planning, monitoring, and reporting. For example, SCoRE provides project planners a knowledge source about status and trends of local populations to help support proposed work. For salmonid abundance, one of the most important recovery metrics, continually updated data from the Salmonid Stock Inventory database are provided via SCoRE. Salmonid Stock Inventory is the department's system for identification and status monitoring of Washington salmonid populations. We have updated the inventory recently to revise population delineations and descriptions to match Endangered Species Act-listed recovery populations, remove outdated non-federal status ratings, provide greater detail for population abundance, and overall improve quality and accessibility of data and information. For example, due to improvements in hatchery fish marking programs, we now can provide abundance data for hatchery- and wild-origin fish on spawning grounds for many populations. Also, data now may be reported at the sub-population (tributary) level, which works to inform habitat restoration at smaller scales. Linking the inventory data to GIS mapping is planned. We will demonstrate how users can access data to create syntheses at multiple levels (entire basin, major population group, Evolutionarily Significant Unit or Distinct Population Segment) through the inventory data available on https://data.wa.gov. We expect valuable feedback from conference participants on how to further improve our delivery of recovery-related data.

Long-term Habitat Status and Trends Monitoring in the Okanogan Subbasin

PRESENTER: John Arterburn, Confederated Tribes of the Colville Reservation

Understanding the status and trends of habitat conditions is a core component of salmon and steelhead conservation efforts throughout the Pacific Northwest. A key limitation of many existing monitoring efforts is that habitat conditions are commonly reported using metrics that do not translate directly to population recovery goals, are difficult to apply, and their meaning is difficult to communicate to decision makers. The Confederated Tribes of the Colville Reservation's Okanogan Basin Monitoring and Evaluation Program collects data on 40 habitat metrics at 300 fixed and rotating sites distributed throughout the subbasin on a 4-year monitoring cycle. These data are modeled to produce habitat status and trend reports relevant to critical decisions such as the prioritization of habitat protection and restoration actions. We created customized reporting tools to compare habitat scenario performance, allowing for characterization of observed trends in habitat conditions in terms of change in habitat potential for Endangered Species Act-listed Chinook and steelhead by expressing habitat conditions in terms of fish population performance using Viable Salmonid Population parameters. The two systems' integration translates habitat data into useful information for decision making, and provides a consistent platform for tracking improvements in data quality and identifying additional monitoring needs. Our reporting approach has broad application to other habitat status and trend monitoring efforts in the Columbia basin and our reporting tools can be easily rolled up without losing the context from the watershed or population from which they have been derived.

Columbia River In-stream Atlas: A Stream Flow Restoration Prioritization Tool for Salmon, Steelhead, and Bull Trout

PRESENTER: Marie Winkowski, Washington Department of Fish and Wildlife

The Columbia River Instream Atlas in the interior Columbia basin is a tool to prioritize stream flow restoration, an established requirement for salmonid recovery. The atlas compiles reach-specific information on salmon, steelhead, and bull trout use, habitat quality, and flow within eight Water Resource Inventory Areas including the Okanogan, Methow, Wenatchee, upper Yakima, Naches, lower Yakima, Walla Walla, and middle Snake Rivers to identify areas for restoration that can have the most effective outcomes. The atlas is being updated to reflect changes in fish use and distribution, habitat quality, and stream discharge. Here we will focus on the fish component of atlas and describe how it is compiled and gives an overall score for each stream reach. It includes information on fish status, fish use based on life histories, and fish distribution. Spawning, rearing, and migration information for each stream reach is collected for each population present. Using these data, each population within a Water Resource Inventory Area is assigned risk rankings. To replace the now-defunct "Salmonid Stock Inventory status scores," we are using a combination of criteria including longer-term adult escapement trends, more recent changes in adult abundance trends, proportion of years escapement or recovery goals are met, Population Viability Analysis probabilities of extinction. With this information, we can quantify the abundance risk of fish populations and use the atlas as a tool to better manage fish populations, restore their habitat, and plan for humans' water use needs.

STORYTELLING FOR SALMON RECOVERY

ROOM
Ash

MODERATOR
Amy Windrope

Salmon Stories: Expanding Our Views on Salmon Recovery in Washington

PRESENTER: Scott Boettcher, SBGH Partners

The "Salmon Stories: Expanding our views on Salmon Recovery in Washington" project (http://bit.ly/1zhu62l) intends by its title to expand our views on salmon recovery in Washington. A lot is happening, all around the state, on any given day and in any given community (city, county, tribal communities alike). Salmon Stories enhance communication and collaboration across the spectrum of salmon recovery professionals and salmon recovery advocates by exposing the successes and challenges of salmon recovery in the 21st century. While the output of Salmon Stories is in and of itself a Web-based medium, it's the method and ease of Web-publishing that's really the backstory. Publishing to the Web is not new. What is new is the availability of tools to enable non-programmers and non-information technologists to publish directly to the Web. Salmon Stories demonstrate how today's communication tools have advanced to the point where we all have the capability to publish directly to the Web, real-time. This accrues the salmon recovery community immeasurable benefit.

Creating a Salmon Recovery Message that Sticks

PRESENTER: Michelle Alvarado, Wahoo Films

As kids, we often nagged our parents with the question, "Why?" We wanted to connect with our parents and learn about the world around us. The salmon recovery and restoration accomplishments throughout Washington are still unfamiliar to many. We have so many opportunities to reach our communities and further our efforts by improving the stories we tell. Little did we know that, as adults, asking "why" would become central to creating a powerful message in furthering salmon recovery. When telling our story, we focus on delivering value to our audiences beyond the work we provide. It should ultimately answer the questions – why is this important to us, and why is it important to our audience. In this presentation, we will explore "why we do what we do" and how to articulate that to an audience. We will dive into examples of organizations' marketing strategies, including the Governor's Salmon Recovery Office, Trout Unlimited, and more. Just like kids, developing the "why" helps the inquisitive mind and helps solving problems in a creative way. Most importantly, it encourages the idea of possibility.

Rebranding the Salmon Story Using Multi-Media: Methods, Tools, and Practices that a Small Organization is Using to Tell a Big Story

PRESENTER: Joy Juelson, Upper Columbia Salmon Recovery Board

Recently, the Upper Columbia Salmon Recovery Board completed a strategic communications plan to develop innovative ways to reach diverse audiences. We have made significant progress using innovative approaches through the use of science conferences, workshops, reporting, social media, Web sites, blogging, presentations, graphic design, newsletters, and videos. The board will share examples of our products and methods intended to gain an audience's attention and commitment. Good communication is important because as recovery actions become more complex, organizations and agencies must become more agile. They must be able to innovate and deliver information in a way that will garner new audiences and funding. A successful communication strategy can enable an organization to implement, monitor, and communicate the science more effectively. Everyone has a compelling story to tell about salmon recovery and we will share what we have learned with you.

Using Video Storytelling to Engage Your Community: The Rainbow Bend Project

PRESENTER: Annette Frahm, FrahmComm

The Rainbow Bend project in the Lake Washington/Cedar/Sammamish Watershed (WRIA 8) moved people out of harm's way in the flood zone and reclaimed the floodplain to restore salmon habitat. Annette Frahm of FrahmComm worked with King County to produce a video telling the compelling story of this project. Storytelling is an important tool for today's communicators to use when talking about urgent problems or the outcomes of programs and projects. Stories have great power to engage people, make our work real, and build community. Annette Frahm will describe why storytelling is important and what makes a good story. She will explain the elements of plot, story structure, and characters, using the example of the Rainbow Bend video.

WHAT WE TALK ABOUT WHEN WE TALK ABOUT PARTNERSHIPS

ROOM
Birch

MODERATOR
Doris Small

Union and Tahuya Summer Chum Restoration Program: Engaging Volunteers in Salmon Recovery

PRESENTER: Clayton David and Seth Elsen, Hood Canal Salmon Enhancement Group

The Union and Tahuya Summer Chum Supplementation Project in Belfair involves a partnership between the Hood Canal Salmon Enhancement Group, Washington Department of Fish and Wildlife, and the community to employ a conservation hatchery strategy toward salmon recovery. Since 2000, this project has provided the unique opportunity to mesh salmon restoration efforts with environmental education and public involvement. The project remains consistent with recovery goals stipulated in the Hood Canal Summer chum recovery plan and compliments the newly completed Union River estuary restoration by allowing the opportunity to quantify the effects of improving rearing habitat. Each August, an adult weir trap has been placed in the Union River to collect data on adult summer chum abundance. Eggs and milt were collected from a small brood stock of summer chum in the Union River, and have been used to supplement the wild summer chum population in the Tahuya River. Spawning occurred at a Department of Fish and Wildlife facility and eyed eggs are reared at a remote incubation site along the Tahuya River. Each year, in early March, these fry were released into the Tahuya River to supplement the wild run. This project could not be possible without intensive volunteer involvement. Volunteers assist with every phase of the project, from monitoring and spawning to rearing and releasing. With volunteers present at the weir site, opportunities exist for community outreach and education about problems facing our salmon populations and our efforts to reverse declines. We feel this project can serve as a model for future salmon recovery efforts and community involvement.

Lower Skykomish: Reach-Scale Salmon Restoration through Multi-Benefit Partnerships

PRESENTER: Brett Gaddis, Snohomish County

The Lower Skykomish River Restoration Project is a 2.8-mile, phased, multi-site, multi-benefit project between the cities of Sultan and Monroe. Moving this project from plan to implementation depended on multiple partnerships and serves as a model for the reach scale, multiple benefit approach. The vast majority of prospective riparian habitat restoration project areas are in private agricultural land ownership. The County has vested years in outreach and relationship-building among this influential community through the Sustainable Lands Strategy. Agricultural landowners are becoming increasingly interested and engaged in habitat restoration, enhancement and floodplain protection activities, as evidenced with this project. In addition, more diverse funding opportunities are emerging, as the multi-benefit approach to floodplain management gains interest among policymakers. With this project, a combination of strategies were applied that work with natural channel processes to promote habitat and water quality improvement, and to help safeguard the productivity of adjoining floodplain areas. This successful project partnership accomplished the installation of 14 in-stream structures, 1,800 feet of individual wood placement, established a riparian buffer over 1 mile of stream bank, and conserved 29 acres with more than 3,000 feet of natural river bank edge habitat.

Stumbling Toward Strategy: Implementing Subbasin-level Restoration, One Crisis at a Time

PRESENTER: Eli Asher, Cowlitz Indian Tribe

Researchers are intensively monitoring Mill, Abernathy, and Germany Creeks near Longview to determine if habitat restoration actions result in measurable increases in salmon populations. Unfortunately, implementing the subbasin-level habitat restoration effort required to test the hypothesis is off to a slow start. In-water habitat restoration projects in Abernathy Creek have faced funding uncertainty, bureaucratic tangles, permitting delays, and coordination missteps. By 2014, things began to look up. The Pacific Coastal Salmon Recovery Fund had provided money for two implementation projects, the Salmon Recovery Funding Board provided additional state funding for Intensively Monitored Watershed implementation, restoration designs were rolling off the presses and onto the ground, and parties transitioned to partners. The Cowlitz Indian Tribe implemented projects identified in the treatment plan in 2012 and 2014, have three projects slated for 2015, and are designing three likely 2016 projects. Once a cautious and reluctant landowner, the Washington State Department of Natural Resources has become a proponent and collaborator. This presentation highlights the value of persistence in building partnerships, seeking funding, and keeping an eye on the prize, with a few photographs of logs, streams, and a youth riparian planting event for balance.

A Partnership and Planning Approach to Habitat Restoration in the Tucannon Watershed

PRESENTER: Kris Buelow, Snake River Salmon Recovery Board

The Tucannon River is a 503-square-mile watershed in southeast Washington supporting four Endangered Species Act-listed stocks of Chinook, steelhead, and bull trout. Tucannon populations are threatened by passage, diversion screens, loss of riparian habitat, low stream channel complexity, high channel confinement, low floodplain connectivity, high summer temperature, and high fine sediments. Through perseverance and broad partner support, many of the threats to the Tucannon are behind us. However, some of the hardest and most expensive challenges identified in the watershed assessment are just now being addressed. In 2010, a change in the way projects were identified, structured, and funded in the Tucannon began with the completion of the Tucannon geomorphic assessment and a conceptual restoration plan. With new information and a better understanding of the restoration needs, the Snake River Salmon Recovery Board worked with local restoration partners and the Bonneville Power Administration to develop the Tucannon River Habitat Programmatic. The programmatic is a basin-scale habitat project that has led to restoration as a direct result of effective planning and solid partnerships. The programmatic is a model of how funding certainty and planning can leverage funding opportunities and lead to larger, highly beneficial river function restoration.

FRIDAY MORNING SESSIONS

HABITAT COMPLEXITY: IT'S COMPLICATED

ROOM
Hemlock-Oak

MODERATOR
Laura Blackmore

Upper Columbia Nutrient Supplementation Project

PRESENTER: Lucius Caldwell, Confederated Tribes and Bands of the Yakama Nation

The Upper Columbia Nutrient Supplementation Project in Twisp is tasked with assessing the potential for restoration activities associated with nutrient augmentation in lower-order streams tributary to the Methow River. In the U.S., billions of dollars have been spent on stream habitat restoration, much of which focuses on increasing channel complexity. In spite of these expenditures, ecological mechanisms underlying the impacts of such projects on targeted fish species remain largely unstudied, and monitoring efforts continue to be an afterthought in the design of restoration projects. In light of these knowledge gaps, the overall goal of this project is to quantify aquatic food-web changes due to habitat restoration efforts focused on increasing channel complexity in a small spring-creek tributary to the Methow River. Ultimately, we hypothesize that underlying food-web differences represent one mechanism by which stream restoration benefits fishes, including native populations of upper Columbia summer steelhead and spring Chinook, bull char, and sculpin. We report here that more complex reaches consistently support greater densities of all species, and recaptured fish exhibit similar instantaneous growth rates in complex and simplified reaches. This suggests that streams with restored complexity have the potential to host a broadened fundamental niche available to fishes, such that fish growth in restored reaches is not density-limited under the current population sizes observed in lower-order upper Columbia tributaries. Results are interpreted in a food-web context.

LIDAR Applications in the Goodman Creek Assessment: Improving Off-Channel Habitat and Riparian Wetland Delineation under the Forest Canopy

PRESENTER: Chris Vondrasek, Pacific Coast Salmon Coalition and University of Washington School of Environmental and Forest Sciences

The Goodman Creek Assessment in Water Resource Inventory Area 20, in Jefferson County, used newly acquired lidar data and developed new watershed scale habitat assessment methods. Critical riverine habitats for juvenile salmon include riparian wetlands, intermittently flooded side channels, small tributaries, and reaches reshaped by large wood. These hydrological features are frequently unmapped or inaccurately delineated, especially in and near smaller rivers obscured by dense riparian forests. As part of the Goodman Creek assessment, we used recently acquired lidar data to develop two new models, a hydraulic model and a topographic model, that improved our ability to capture these habitat features in the riparian floodplain. To model ecologically meaningful flows with the hydraulic model, we created 2-year over-bankfull flows and a 50-year flood event that could potentially cause significant lateral channel movement. We also developed a relative-elevation-above-water-surface model with the goal of creating an informed but simpler GIS tool that produces similar results to the more complex, hydraulic model. Lastly, we created a canopy height model in the riparian corridor of the entire watershed and used it to create a map of the potential areas of large woody materials recruitment. Using these improved models, the Goodman Creek assessment will be able to more accurately inform potential habitat restoration opportunities in the watershed. These models and wider availability of new lidar data also suggest a new potential to improve salmon habitat conservation and restoration planning in forested watersheds.

Salmon and Steelhead Response to In-stream Habitat Restoration

PRESENTER: Karl Polivka, U.S. Forest Service

Habitat restoration in the Entiat River sub-basin in central Washington is intended to increase the likelihood that salmonid populations persist. A common restoration technique is the addition of in-stream structures. However, few of the studies that evaluate the effectiveness of this technique have been completed in upper Columbia River sub-basins, such as the Entiat. My research has shown that the abundance of both steelhead and Chinook salmon is greater at structures within some segments treated with restoration structure, but this pattern varied within the rearing season. Extensive sampling in untreated habitat revealed that increased fish numbers at structures represent an increase in stream capacity for fish and not just movement of individuals. Before and after studies were possible in some reaches and these indicated that caution should be taken in making conclusions about the numerical response of fish to restoration. Mark and recapture assays showed that individuals of both species show higher affinity for restored habitat, occupying pools with structures longer into the rearing season than those without structures. From these assays, we also determined that growth of individual fish was, on average higher at structures in some years, implying that fish production and, likely, survival, also are possibly enhanced by structures.

Weaving the Food Web: Relationships, Implications, and Considerations for Aquatic and Riparian Macroinvertebrates in Salmon Habitat Restoration Projects

PRESENTER: Celeste Mazzacanno, Xerces Society for Invertebrate Conservation

Macroinvertebrates are at the heart of the food web and their abundance and diversity have important implications for the success of fish and other predators that rely on them as food. Fish production can be constrained by not only the availability of macroinvertebrate prey within the aquatic habitat, but also by macroinvertebrates that enter the stream from distant or terrestrial sources, such as fishless tributaries and riparian buffers. Macroinvertebrate community responses to reach-level restoration differ in their extent, timing, and rate of change, and they are not always linear, immediate, or predictable. In addition, the effects of stressors related to catchment-level land uses and global climate change may have a greater impact on local macroinvertebrate populations than reach-level restoration can remediate. The effects of various stream restoration activities are discussed in the context of their potential impacts on associated macroinvertebrate communities that serve as terrestrial and aquatic food subsidies.

FRIDAY
9:30 – 11:30 A.M.

FLOODPLAINS BY DESIGN

ROOM
Heritage E

MODERATOR
Julie Morse

The Floodplains by Design partnership – led by The Nature Conservancy, Puget Sound Partnership, and Washington Department of Ecology – is working to change the face of floodplain management and accelerate the pace of salmon recovery through fostering new collaborations and an approach that better integrates a broader variety of the functions, values, and risks associated with floodplains. This session will provide a broad overview of the Floodplains by Design statewide initiative and efforts to accelerate salmon recovery through institutionalizing a multiple benefits approach. The session will start with a broad overview of the regional initiative, focusing on salmon recovery, flood risk reduction, and other outcomes from Floodplains by Design projects. Many have been working to integrate multiple benefits at the local level, and this session will highlight in-depth case studies of Floodplains by Design projects in the Yakima and Cedar Rivers watersheds. This session will end with a panel discussion with Floodplains by Design policy leaders, local practitioners, and science advisors focused on how Floodplains by Design can improve its efforts to advance salmon recovery.

Floodplains by Design: A Multiple Benefits Approach to Salmon Recovery

PRESENTER: Jenny Baker, The Nature Conservancy

Floodplains are critical for salmon recovery throughout Washington as the complex mosaic of habitats that form in a connected floodplain have been lost or disconnected by dikes and levees. Floodplains can support a tremendous wealth of goods and services, including fisheries, water filtration, flood storage, rich agricultural soils, flat ground for building, wildlife, and recreation. As multiple interests touch the landscape in floodplains, competing interests may result in resistance from those who are not supportive of salmon habitat restoration. Floodplains by Design is a new partnership looking at ways to overcome these obstacles and accelerate the pace of salmon recovery. Floodplain management to date has been done by numerous entities, each with a narrow focus and sometime at odds with the focus of others. Rather than maximizing the goods and services derived from floodplains, this silo approach to floodplain management leads to unintended consequences, inefficiency, and conflict. Meanwhile salmon runs remain on the brink, flood risks continue to rise, and conflicts between competing goals persist. Floodplains by Design seeks to advance integrated floodplain management plans and projects that consider a broader variety of functions, values, and risks. Projects can have a larger extent and scope when they both improve ecological function and meet other community needs because they are more likely to garner political support and public funding. Floodplains by Design seeks to accelerate local on-the-ground efforts by aligning programs, resources, and politics with a multiple benefits ideal. This presentation will describe the Floodplains by Design partnership's approach, share measures of success and lessons learned to date, and discuss future plans.

Integrating Salmon Recovery Funding Board and Floodplains by Design Projects on the Lower Naches River

PRESENTER: Joel Freudenthal, Yakima County

This presentation is a timeline for restoration of the lower 9 miles of floodplain on the Naches River. The timeline begins in 2005 with recommendations in the *Lower Naches Comprehensive Flood Hazard Management Plan* and ends in 2018 with completion of the rebuilding of Nelson Dam. Along the way will be multiple successful and failed grant applications, use of mitigation funds, land donations from the Washington Department of Transportation, Federal Emergency Management Agency's Floodplain mapping and what it told us, levee failure and positive response from the County and U.S. Army Corps of Engineers, the Floodplains by Design partnership grant projects, sediment transport studies, and true multi-jurisdictional and multi-authority design processes. The intent of the talk is to discuss the long time frames, multiple benefit and funding approaches, and stick-to-it-iveness required for this type of main stem, multiple reach-scale restoration project.

Restoration Strategies for the Corridor: Two Case Studies on the Cedar River

PRESENTER: Jean White, King County

The Cedar River lies in the heart of King County, running from a scenic and remote public utility reservoir in the central Cascade Mountains to a bustling industrial and residential urban core in Renton. Planning for multi-benefit floodplain management in this system requires integration of flood, habitat, and recreational issues, all with substantial public interest. The newly created Washington Department of Ecology Floodplains by Design Program, along with a river corridor-scale planning process sponsored by the King County Flood Control District are working in concert to strategically integrate property acquisitions and project designs to best meet the needs of the citizens in the Cedar River valley. This effort continues the legacy of partnership among entities such as the WRIA 8 Salmon Recovery Council, King County, and the Cities of Seattle and Renton, towards long-range, strategic planning for salmon recovery on the Cedar River. King County will describe three project and programmatic actions to illustrate this vision. The Rainbow Bend project site includes new off channel habitat that was heavily used in its first year after construction by both out-migrating juveniles Chinook and incoming adult Chinook and sockeye. The Riverbend Mobile Home Park property is a recent flood-risk acquisition made possible through collaborative state and local funding. Design for the future use of the site was started recently with primary goals for salmon recovery. Further acquisitions in the mouth of Taylor and Royal Arch Reaches will lay the groundwork for the next stages of salmon recovery on the Cedar River.

MODERATOR
Julie Morse

PANELISTS
Joel Freudenthal
Yakima County

Randy Johnson
Jamestown S'Klallam Tribe

David St. John
Puget Sound Partnership

Gordon White
Washington Department of Ecology

Jean White
King County

ORCA AND SALMON RECOVERY WORKSHOP

ROOM
Cedar

MODERATOR
Stephanie Solien

The workshop, organized as a panel discussion, will focus on the challenge of recovering an endangered population of southern resident killer whales, whose primary diet consists of Chinook salmon, of which many stocks are endangered. The whales were listed as endangered in 2005, continue to decline, and could be at risk of extinction. This workshop will focus on identifying how agencies and non-governmental organizations might best address the needs of salmon AND the whales: The science and processes needed to best prioritize recovery projects, and the outreach needed to educate the public and decision-makers of these critical interdependencies.

Overview of Resident Orcas Status and Perspectives on Salmon Connection

PRESENTER: Ken Balcomb, Center for Whale Research

All of the evidence gathered to date indicates the so-called southern resident killer whales are obligate predators upon fish, with their fate inextricably linked to that of relatively large adult Chinook salmon year-round availability in the marine ecosystem of the Pacific Northwest. The core area of the whales' distribution in the recent four decades has been Puget Sound, Juan de Fuca and Georgia Straits, and the near-coastal waters of British Columbia and Washington State, but their foraging range extends episodically as far south as central California and as far north as southeast Alaska. The core area includes the terminus of several major salmon spawning rivers that historically had 10 million or more adult Chinook salmon returning to the region during all seasons each year, plus feeder Chinook salmon schools migrating throughout Pacific Northwest coastal waters. The phenomenal biomass of large nutritious Chinook salmon in the region was no doubt a factor in the co-evolution of this obligate predator-prey relationship, and it also was attractive to human fisheries of the recent century and a half that harvested it excessively. Many stocks of Chinook salmon in this region are now at serious risk of extinction, some already are extinct, and exceptionally major runs of these fish such as those to the Columbia and Snake river systems have been decimated due to a variety of causes. The whales' population cannot significantly increase until the carrying capacity of the prey population increases, no matter how much we wish it would. If we want future generations of humans to have the chance to see these magnificent resident whales, we must get fully behind salmon restoration efforts in all of the eastern north Pacific watersheds, and particularly those with once-abundant Chinook salmon.

Size Matters: Using Photogrammetry to Monitor Length, Growth and Body Condition for Conservation of Resident Killer Whales

PRESENTER: John Durban, NOAA Southwest Fisheries Science Center

Dr. Durban will give an overview of his research and collaborations using photogrammetry to fill key data gaps that currently constrain conservation of northern and southern resident killer whales in the U.S. and Canada; specifically measuring length, growth, and body condition to assess whether the abundance of their Chinook salmon prey is low enough to cause nutritional stress. During the past 10 years, this has involved the use of laser-metrics from small boats to assess growth trends, aerial photogrammetry from a helicopter to measure full body length and size-at-age relationships, and novel work using a small unmanned hexacopter to infer body condition from whale shape. This work addresses key elements of conservation and recovery plans in both the U.S. and Canada aimed at maintaining an adequate food supply for these protected populations.

Importance of Salmon to Southern Resident Killer Whales: Diet and Distribution of Resident Orca In and Out of Puget Sound

PRESENTERS: Mike Ford and Brad Hanson, NOAA

Salmon and killer whales are two iconic species of the Pacific Northwest. The southern resident population of killer whales is listed as endangered under the Endangered Species Act, and many West Coast salmon populations are listed as endangered or threatened. Recovery of both is interlinked, because salmon are the dominant component of the whales' diet. In this talk, we review research on the diet and movements of the killer whales, focusing on which species and stocks they consume in different seasons and locations, and how this intersects with what we know about stock-specific salmon abundance and distribution.

The Connection Between Southern Resident Killer Whale Recovery and Salmon Recovery

PRESENTERS: Lynne Barre and Scott Rumsey, NOAA

This presentation highlights the connection between salmon recovery and orca recovery. Lynne will provide a brief introduction to the recovery program for endangered southern resident killer whales. Since southern residents primarily eat Chinook salmon, addressing threats and recovering salmon populations are an essential part of restoring the ecosystem that supports recovery of the whales. Scott will overview federal, state, and local efforts to recover threatened and endangered salmon, available funding and initiatives to advance salmon recovery, progress and challenges in implementing recovery, as well as opportunities for public engagement.

WORKING WITH BEAVERS TO RESTORE HABITAT FOR SALMONIDS

PANELISTS
Ken Balcomb, Center for Whale Research

Lynne Barre, NOAA

Jeanette Dorner, Puget Sound Partnership

Rich Osborne, North Pacific Coast Lead Entity

Scott Rumsey, NOAA

David Troutt
Nisqually Indian Tribe

ROOM
Heritage F

MODERATOR
Michael Pollack

Comparing and Contrasting Beaver Policy and Regulations in Washington and Oregon

PRESENTER: Michael Pollock, NOAA

There are four basic actions related to beaver that are regulated: Removing beaver, removing beaver dams, releasing beaver, and constructing or reinforcing beaver dams. Related actions include providing beaver with food and building materials, constructing temporary lodges, and planting beaver food for the long-term, but

there are minimal regulatory complexities associated with these actions. Rules regarding the removal of beaver and beaver dams are fairly straightforward and the process reasonably streamlined, even though such actions can result in substantial habitat damage, inclusive of damage to habitat used by Endangered Species Act-listed species. In contrast, the regulations governing the release of so-called "nuisance" beaver into new habitat and the construction or reinforcement of beaver dams for the purposes of habitat restoration are often complex, sometimes conflicting, and can vary by landowner, status of permit holder, funding source for the proposed action, geographical location, and other factors. While the current regulatory framework favors beaver and beaver dam removal, regulations are slowly changing and regulatory recognition of the essential role that beavers will have in salmon recovery and stream restoration in general is growing.

Holistic Approach to Watershed Restoration: One Beaver at a Time

PRESENTER: Melissa Babik, Mid-Columbia Fisheries Enhancement Group, and Kent Woodruff, U.S. Forest Service

The Methow Valley Beaver Project in Okanogan County, along with the Yakima Basin Beaver Reintroduction Project in Kittitas County, strive to enhance watershed function, one beaver complex at a time. This presentation will depict lessons learned and share results from biological monitoring in the 12 years of combined experience using “nuisance beavers” as a restoration tool for salmon recovery. By re-establishing self-sustaining beaver populations in these upper watersheds, these projects are restoring habitat, increasing stream complexity, attenuating flows, recharging underground aquifers, and adapting to climate change impacts. We also will address challenges in beaver reintroduction, importance of community involvement, and synergy with other restoration projects.

Using Beavers as a Climate Change Adaptation Tool

PRESENTER: Ben Ditbrenner, Beavers Northwest

The Sky Beaver Project in the Snohomish River watershed is a unique collaborative beaver enhancement and research project on the west slope of the Cascade Mountains. While the ‘wet side’ of the Cascades often is assumed to be less prone to climate change impacts, current climate models suggest otherwise. Higher elevation, west-facing alpine areas are expected to continue to experience warmer winter temperatures and decreasing snowpack, resulting in lower spring and summer stream volumes. These changes likely will threaten sensitive riparian habitats and species as well as ecosystem resilience. Endangered Species Act-listed wildlife, such as salmon and steelhead, will undoubtedly suffer additional declines in their already limited habitat if these projections are realized. The types of impoundments that beavers create may be able to offset some of the anticipated impacts resulting from hydrologic and temperature changes. Beaver impoundments have been shown to attenuate peak flows, recharge groundwater and hyporheic flows, and regulate stream temperature and base flow. The Sky Beaver Project is restoring headwater habitat and hydrology through the relocation of nuisance beavers from suburban lowland areas. This presentation will address some of the initial results of beaver relocation in the Skykomish watershed and what role beavers might play as a climate change adaptation tool in the watershed.

Modeling the Role Beaver Play in Generating Steelhead Habitat – Learning from an Intensively Monitored Watershed

PRESENTER: Nicholas Weber, Eco Logical Research

The Bridge Creek Intensively Monitored Watershed in the John Day River basin uses beaver dam analogs to restore an incised stream. During the past several centuries, the population of North American beaver has been dramatically reduced through fur trapping. As a result, the geomorphic impacts long-term beaver occupancy and activity can have on fluvial systems have been lost. Concomitant with the decline in beaver populations was an increasing pressure on streams and floodplains through human activity, placing numerous species of stream-rearing fish in peril, most notably the Endangered Species Act-listing of trout and salmon populations across the entirety of the western United States. The rehabilitation of stream systems is seen as one of the primary means by which population and ecosystem recovery can be achieved, and given the role

beavers play in structuring stream habitat, managing the population dynamics of beavers can be a powerful tool to manage stream habitat rehabilitation. We have constructed an individual-based model of trout and beaver populations that allows the exploration of fish population dynamics as a function of stream habitat quality and quantity. We based the simulation tool on the Bridge Creek (John Day River basin, Oregon) Intensively Monitored Watershed where we have implemented a large-scale restoration experiment using wooden posts to provide beavers with stable platforms for dam building and to simulate the dams themselves. Extensive monitoring captured geomorphic and riparian changes, as well as fish and beaver population responses. In the simulation, stream habitat quality and quantity can be manipulated directly through rehabilitation actions and indirectly through the dynamics of the co-occurring beaver population.

The Beaver Restoration Guidebook: Working with Beavers to Restore Streams, Wetlands, and Floodplains

PRESENTER: Gregory Lewallen, Portland State University

The Beaver Restoration Guidebook has been developed through collaboration from NOAA, U.S. Fish and Wildlife Service, U.S. Forest Service, and Portland State University. The use of beavers in stream, wetland, and floodplain restoration is rapidly expanding in North America because of the positive effects of beaver on the dominant physical and biological processes in fluvial ecosystems. The guidebook is intended to act as a practitioner's guide that will provide a practical synthesis of the best available science for using beavers to improve ecosystem functions. Divided into two broad sections – Beaver Ecology, and Beaver Restoration and Management – the guidebook has a wide intended audience and focuses on the many ways in which beavers improve habitat primarily through the construction of dams that impound water and retain sediment. The Beaver Ecology section first discusses the general effects that beaver dams have on physical and biological processes within fluvial ecosystems, followed by "Frequently Asked Questions" about beaver, and then finally a "Mythbusters" section that discusses and dispels common myths or misperceptions about beavers. The Restoration and Management Section discusses the common emerging techniques for using beavers and beaver dams to improve ecosystems, methods for mitigating the unwanted effects of beaver activity, and real-life examples or case studies of pioneering practitioners who have used beaver restoration tools in the field, and the lessons they have learned that will help guide future restoration efforts. Also included is a comprehensive beaver ecology library of more than 1,400 references from scientific journals, "grey" literature, Web sites, legislation, regulations, and presentations. The guidebook is intended to facilitate beaver restoration approaches underpinned by sound scientific principles, such that a more comprehensive, evidence-based understanding of beaver ecology, restoration, and management emerges.

SHOW ME THE MONEY: FINANCING PROJECTS

ROOM
Spruce

MODERATOR
Leslie Connelly

OWEB and Watershed Councils: A Funding Approach that Builds Resiliency, Sustainability, and Achieves Ecological Outcomes

PRESENTER: Courtney Shaff, Oregon Watershed Enhancement Board

The Oregon Watershed Enhancement Board has provided operating grants to watershed councils for more than 15 years. These grants help support the operations of watershed councils to engage people and communities in collaborative, voluntary restoration and protection of native wildlife habitat and natural watershed functions to improve water quality or stream flows. Council capacity grants are a core element of the board's long-term investment strategy for conservation. The board envisions a statewide watershed restoration system that is resilient, sustainable, and achieves ecological outcomes. To support this vision, the board recently has changed the grants it offers to watershed councils by adopting new rules and guidance for funding watershed council capacity grants and offering Building Capacity grants to provide resources for increased resource sharing and strategic collaboration. Changes are responsive to fiscal and operational realities that were not anticipated when the board first offered council support grants. Lessons include: Complex restoration

work requires diverse skill sets, ongoing need to engage new council leadership and members, councils need more funding and resources than the board alone can provide, diverse funding sources build council resiliency, and the board's capacity grants have funded duplicative administrative infrastructure with their own fiscal management, human resources, organizational management, information technology and other administrative functions. This presentation will share the board's approach and lessons learned from both its Council Capacity and Building Capacity grants to watershed councils.

Development of a Public-Private Partnership in an Era of Declining Federal and State Budgets

PRESENTER: Rudy Salakory, Cowlitz Indian Tribe

Of the Four Hs of salmon population decline, habitat loss remains the least mitigated factor. Habitat loss continues at a faster pace than habitat can be restored or conserved. This co-occurs with a trend of declining budgets at both the state and federal level. It is reasonable to assume that this trend will continue for the foreseeable future. At the same time, market solutions to offset environmental impacts, such as mitigation banks, are becoming more available. Are market-based solutions the future of habitat restoration and protection? This talk focuses on a case study of a large-scale habitat restoration and conservation project on the lower Columbia River using a market-based solution for a public need and could help to serve as a model to offset large impacts on Endangered Species Act-listed species and their habitat.

Salmon Recovery through Mitigation Opportunity

PRESENTERS: Sky Miller, Cardo and Jennifer Aylor, Eldred Associates

The Salmon Recovery through Mitigation Opportunity Project in Washington will optimize salmon recovery projects while providing compensatory mitigation by matching transportation and development projects with habitat restoration and protection projects. Mitigation matching is dependent on the availability of: 1) Proposed, prioritized conservation projects that define anticipated environmental benefits; 2) Proposed development projects that define the anticipated environmental impacts; and 3) Map-based, Web-enabled technologies that allow developers to search for restoration or protection projects that are potential matches for the purpose of compensatory mitigation. The objective of this project is to develop an online mitigation matching portal. This will provide permitting agencies and permit applicants with easy access to habitat project lists and mapped locations to find what they need to implement projects and mitigation more efficiently. A map-based, GIS platform and interactive Web application can allow permitting agencies and permit applicants to work from the same system and use the same tools to develop mitigation plans and alternatives.

Willingness to Pay for Willamette Basin Spring Chinook and Winter Steelhead Recovery

PRESENTER: Michael Papenfus, U.S. Environmental Protection Agency

Estimating public preferences for salmon recovery in the Willamette basin will allow decision-makers and communities to make better decisions about salmon recovery. One of the primary goals of conducting economic valuation studies should be to improve the way in which communities frame choices about the allocation of scarce resources and to clarify the trade-offs between alternative outcomes. The challenge of quantifying public preferences is particularly relevant to salmon conservation efforts in the Pacific Northwest. Despite the deep cultural importance of salmon to the citizens of the Pacific Northwest, there is a remarkable lack of valid, empirical, economic studies quantifying this importance to the general public in the region. This is conspicuously true for the Willamette basin, home to more than half of Oregon's human population and to the few remaining spring-run Chinook salmon populations in the state. There are many competing uses for Oregon's waters and decision-makers are often faced with trade-offs on how to allocate resources to accommodate these uses. Many of these uses conflict with salmon conservation and there is not adequate information to quantify societal values for salmon preservation. We conduct a study to estimate the general Oregon population's preferences to restore Chinook salmon and winter steelhead in the Willamette basin. Valid estimates of the public value for salmon will support government agencies and community organizations to factor the value of salmon preservation benefits into their strategic policy and financial decisions.

SETTING LONG-TERM GOALS FOR COLUMBIA BASIN SALMON AND STEELHEAD

ROOM
Pine

MODERATOR
Barry Thom

DISCUSSION LED BY: Barry Thom, NOAA, and Phi Rockefeller, Northwest Power and Conservation Council

During the next 5 years, NOAA's National Marine Fisheries Service will be making a number of significant management decisions for Columbia River basin salmon and steelhead because of our Endangered Species Act, Magnuson Stevens Fishery Conservation and Management Act, tribal treaty and trust responsibilities, and other federal obligations for Columbia River basin salmon and steelhead. It is important that these decisions reflect regional views. To capture a broad range of regional perspectives, NOAA-Fisheries commissioned the *Columbia Basin Situation Assessment*. The many voices reflected in the assessment report expressed considerable support for addressing the complexities of salmon recovery in a more coherent, integrated, and efficient way. Participants also noted that the most effective recovery processes should include a shared regional definition of success. Since then, several other regional entities, including the Northwest Power and Conservation Council, have called for establishing common, long-term salmon and steelhead goals in the Columbia basin. This workshop is designed to provide an overview of current thinking about the collaborative effort and an opportunity for audience members to offer input into designing a regional collaboration process to address long-term goals for listed and non-listed salmon and steelhead recovery regarding Endangered Species Act, tribal trust, and harvest responsibilities.

SOCIAL MARKETING: BAIT A HOOK

ROOM
Ash

MODERATOR
Gretchen Glaub

Why the Puget Sound Partnership is Promoting Social Marketing: A Case Study from Snow Creek

PRESENTER: Emily Sanford, Puget Sound Partnership

The Snow Creek Social Marketing Project in Jefferson County provides a great small-scale example of how social marketing can be applied successfully to have significant positive impacts on a restoration project's outcomes. For instance, advertising "free weeding" instead of "restoration work," resulted in the percentage of landowners signing on for restoration increasing by a factor of four. This presentation will first outline the Puget Sound Partnership's Stewardship Program's approach to encourage the application of social marketing by practitioners around the Puget Sound. Efforts made to understand the target audience's specific barriers and motivators will be summarized and the products designed to incentivize the use of social marketing will be described. We then will highlight the Snow Creek case study, which both exceeded project goals and has influenced the approach used in surrounding watersheds. Snow Creek provides spawning grounds for endangered Hood Canal summer chum and Puget Sound steelhead. With riparian degradation identified as a significant limiting factor, and a series of larger scale restoration projects completed on surrounding public land, the challenge remained to work with private landowners, some who had expressed concern about salmon restoration, to remove invasive weeds and restore native vegetation along the stream bank to improve habitat. The North Olympic Salmon Coalition, with funding from the Puget Sound Partnership's ECO Net Social Marketing grant program, undertook this project, and sub-contracted with Washington State University's Jefferson County Extension and the Washington Conservation Corp. Participants in this session will receive a brief introduction to social marketing and benefit from seeing an example of its practical application.

Building Landowner Support for Salmon Recovery in Rural Residential and Working Landscapes

PRESENTER: Dan Calvert, Oregon Sea Grant

In many watersheds, private landowners play a critical role in salmon recovery efforts. However, successfully involving watershed residents, particularly those from rural residential and working landscapes is challenging. This presentation offers strategies to increase voluntary cooperation and support for watershed restoration and salmon recovery by private landowners. Discussed will be lessons learned from research examining

interactions between private landowners and watershed councils participating in the Willamette River Model Watershed Program in Oregon. The research was performed through semi-structured interviews with 40 private landowners from seven river basins. There is no "right way" to engage watershed residents; outreach efforts must be tailored for different types of landowners with an awareness of watershed social-ecological conditions. Technical and financial support for restoration projects on private property is important. Perhaps most vital is building relationships and trust between watershed council staff and private landowners. Every restoration project on private property is the result of one-on-one interactions between watershed council staff and the landowner. While landowner outreach is expensive and hard to quantify and measure, it is an integral component of watershed-scale restoration and salmon recovery efforts.

Long-Term Shoreline Habitat Protection Incentives: A Pilot Neighborhood Conservation Easement Program

PRESENTER: Debra Clausen, San Juan Preservation Trust

Long-Term Shoreline Habitat Protection Incentives: A Pilot Neighborhood Conservation Easement Program in San Juan County is designed to enhance community efforts to meet shoreline habitat protection goals. Coastal geomorphic processes create and maintain the nearshore habitats upon which many Puget Sound species of concern rely, including forage fish spawning areas and juvenile salmonid rearing and migratory habitats. Shoreline modifications that disrupt and damage these processes are viewed as one of the greatest threats to the ecological functioning of coastal systems. Protection of remaining high quality nearshore habitat important to juvenile salmon and salmon prey is the top salmon recovery strategy for San Juan County. Unfortunately, regulatory protections are not holding the line against the incremental degradation of marine shorelines. This leaves voluntary protection through conservation easements and acquisition as one of the best options for achieving habitat protection goals. Traditional land conservation programs are typically designed for individual large parcels located predominantly in upland habitats. Protection programs are needed that address multiple adjacent shoreline property owners at the process-unit scale. The San Juan Preservation Trust and Friends of the San Juans have partnered to develop and implement an innovative Neighborhood Salmon Conservation Easement Program that targets multiple adjacent properties within top salmon recovery shore forms and regions of San Juan County. Presenters will discuss preliminary project results and lessons learned on the topics of landowner and neighborhood engagement; improved shoreline habitat, coastal process and shore form-specific conservation prescriptions; and economic valuation of shoreline habitat protection.

Social Marketing in Action: Developing and Implementing a Behavior Change Strategy in Puget Sound

PRESENTERS: Carey Evenson, Colehour+Cohen, and Patricia Jatczak, Washington Department of Fish and Wildlife

Hard shore armor – such as bulkheads, seawalls, and revetments – has been shown to adversely impact nearshore ecosystems in a number of ways, including depriving shorelines of critical habitat for forage fish and juvenile salmon. The Puget Sound Marine and Nearshore Grant Program, a partnership between the Washington Departments of Fish and Wildlife and Natural Resources, funded a project to create a social marketing strategy designed to influence residential shoreline landowners to make behavior changes related to shore armor. Phases of this project included strategic thinking about barriers and opportunities that led the grant program to identify the need for this work, the creation of social marketing strategy to reduce shoreline armor in Puget Sound, and the on-the-ground application of this strategy in the form of pilot incentives projects across Puget Sound. This approach focuses on realistic approaches and research-based incentives to overcome the specific barriers to reducing shore armor.

FRIDAY
9:30 – 11:30 A.M.

DATA SELFIES: THE HOW AND WHY OF DATA

In this session, you'll get a chance to compare how several recovery programs use data to direct actions. Speakers from Bonneville Power Administration, Governor's Salmon Recovery Office, National Oceanic and Atmospheric Administration, Puget Sound Partnership, Washington Department of Fish and Wildlife, and Willamette Partnership will each present a snapshot of the role data plays in their program. Speakers will use a similar template describing their work in 5-minute lightning talks. We'll then convene the group of speakers in a roundtable discussion where the audience will be asked to challenge them to clarify the analysis most helpful in driving their work and how they could be even better served through better alignment.

ROOM
Birch

MODERATOR
Damon Hess

PANELISTS

Brodie Cox, Washington Department of Fish and Wildlife

Kiri Kreamer, Governor's Salmon Recovery Office

Nicole Maness, The Willamette Partnership

Stacy Vynne, Puget Sound Partnership

Rob Walton, NOAA

Ben Zelinsky, Bonneville Power Administration

SPEAKER BIOGRAPHIES

David Troutt, Salmon Recovery Funding Board
David Troutt is chairman of the Salmon Recovery Funding Board and is the board's longest serving member. David has served as Natural Resources director for the Nisqually Indian Tribe since 1987. He heads a diverse department comprised of salmon harvest management, two large salmon hatcheries, shellfish management, data operations, environmental management, wildlife management, legal, administration, and budget development and monitoring. He also serves as chair of the Nisqually River Council and president of the Nisqually River Foundation. David has served on the Washington Biodiversity Council, the Executive Committee of the Tri-County Response to ESA, the Development Committee of the Shared Strategy for Puget Sound, the Steering Committee for the Hatchery Reform Project, and as a voting member of the Resource Advisory Committee for the Mount Baker-Snoqualmie National Forest. David received his bachelor of science from the University of Washington School of Fisheries

Kaleen Cottingham, Recreation and Conservation Office
Governor Chris Gregoire appointed Kaleen Cottingham director of the Washington Recreation and Conservation Office in 2007, building on Kaleen's distinguished career that has blended law and environmental policy. Kaleen has worked for three governors, serving as natural resources policy advisor, legal counsel, and a member the Pollution Control and Shorelines Hearing Board. She also served the elected Commissioner of Public Lands as both deputy commissioner and supervisor, leading the Washington Department of Natural Resource's strategic direction and policy initiatives on a wide variety of natural resources issues and managing the daily operations of the department. She has a bachelor of science degree in forest resources from the University of Washington and a law degree from the University of Puget Sound law school.

Jim Unsworth, Washington Department of Fish and Wildlife
Jim Unsworth is the newly-appointed director of the Washington Department of Fish and Wildlife. He spent more than 30 years in wildlife management with the Idaho Department of Fish and Game and served as deputy director for that agency from 2008-15. He previously held several management positions for that department, including wildlife bureau chief and state big game manager. Jim holds a bachelor's degree in wildlife management from the University of Idaho, a master's degree in fish and wildlife management from Montana State University, and a doctorate in forestry, wildlife, and range sciences from the University of Idaho. Jim is an avid hunter and fisher.

Steve Tharinger, Washington House of Representatives
Steve Tharinger was elected to the Legislature in 2010 to represent the 24th Legislative District, which includes all of Clallam and Jefferson Counties and a portion of Grays Harbor County. He has a long record of community service, volunteerism, and small business experience. Steve has a history of addressing natural resource issues. His past experience includes serving on the following: the Washington Biodiversity Council, the Washington Wildlife and Recreation Coalition Board, the Dungeness River Management Team, the Salmon Recovery Council and Ecosystem Coordination Board for the Puget Sound Partnership, and the Salmon Recovery Funding Board.

Jeff Breckel, Lower Columbia Fish Recovery Board
Jeff Breckel has been the executive director of the Lower Columbia Fish Recovery Board since the board's inception in 1998. The board is the regional recovery organization responsible for developing and implementing watershed recovery efforts over all or part of a six-county area in southwest Washington.

Bill Iyall, Cowlitz Indian Tribe
First elected to the Cowlitz Tribal Council in 1993, Bill became vice chairman in 2006, and has served as chairman since 2008. He was appointed by Governor Gary Locke to the Lewis and Clark 200 Year Commemoration Commission, representing western Washington tribes at the White House Celebration in 2002. Bill helped achieve federal recognition of the Cowlitz Tribe and served as the Economic Development Committee chairman, providing leadership in the tribe's economic development project on its initial reservation. Among his many duties, he is responsible to the general council for the tribal operations in natural resources. Bill has worked at the national and local level on many Cowlitz Tribal issues. He has a bachelor's degree in civil engineering from Saint Martin's University, and has worked as a professional engineer on structural design, project management, personnel management and operations management of public utilities and public works facilities such as roads, bridges, sewers, buildings, parks, and other municipal facilities.

Norm Dicks, Former U.S. Representative
Former Congressman Norm Dicks serves as senior policy counsel, for Van Ness Feldman, LLP, advising clients on a wide range of public policy, strategic, and regulatory issues, particularly those in the environmental sector. Before joining the firm, Norm represented Washington State's 6th Congressional District from 1977-2013, where he received a rare, first-term appointment to the House Appropriations Committee, a committee he

served on for his entire tenure in Congress. In addition, he served on and chaired the Interior Appropriations Subcommittee where he made environmental issues a priority, and worked tirelessly on issues affecting national parks, national forests, and Native Americans. Congressman Dicks also became the chair of the Defense Appropriations Committee, and concluded his tenure in Congress as a top-ranking Democrat on the Defense Appropriations Committee and top-ranking Democrat on the House Appropriations Committee. From 1990 to 1998, Congressman Dicks served on the House Intelligence Committee and was awarded the Central Intelligence Agency's Directors Medal. Upon his retirement, Norm received the Department of Defense's Distinguished Public Service Medal, the highest honor bestowed upon a civilian for his work on behalf of military members and their families. He also has received numerous awards for his commitment to salmon recovery in the Pacific Northwest.

Phil Rockefeller, Northwest Power and Conservation Council
In 2011, Governor Chris Gregoire appointed Phil Rockefeller to the Northwest Power and Conservation Council. Before his appointment to the council, Phil served 13 years in the Washington State Legislature, where he chaired the Senate Environment, Water and Energy Committee. His previous work includes service in the U.S. Air Force, employment with the U.S. House of Representatives and various federal agencies in the Pacific Northwest, as well as 4 years as assistant to former Governor John Spellman. Among Phil's legislative accomplishments are the 2007 bill creating the Puget Sound Partnership and legislation enacted in 2011 that transitions Washington State away from coal-based power production. He is a strong advocate of renewable energy investment, fish and wildlife protection, and development of state and local strategies to address impacts of climate change. Phil received his undergraduate degree from Yale University and his law degree from Harvard.

Ron Judd, Seattle Times
Ron C. Judd, a longtime popular columnist for the Seattle Times, is the author of a broad range of nonfiction books, from works of humor to outdoor guides to a comprehensive guide to the Winter Olympics. He has worked as a journalist for 25 years, along the way becoming one of the world's foremost authorities on the uses (and abuses) of big blue tarps. His latest work, "The Winter Olympics" gives readers a rare and refreshing look inside the Olympic Games, one of the world's great events.

John McMillan, Trout Unlimited
John McMillan has worked as a research fishery scientist for the past 18 years from the John Day River in the interior Columbia River to the Hoh River of the Olympic Peninsula rainforest. He has worked for the U.S. Forest Service, the Hoh Indian Tribe, the Wild Salmon Center, and for NOAA on the Elwha River dam removal project. John currently works as the science director for Trout Unlimited's Wild Steelhead Initiative. Much of his professional scientific study has focused on the biology, behavior, and ecology of steelhead and rainbow trout, with a particular interest in the mechanisms influencing why individual fish adopt particular life history strategies, such as anadromy and residency. In his pursuit of understanding steelhead, John has snorkeled more than 1,500 river miles, spent thousands of hours observing steelhead, and as a result is considered a regional expert on the plight of steelhead. In addition to publishing scientific manuscripts on this topic and others, his writing and underwater photography and videography has been broadly published in scientific journals, books, popular magazines, newspapers, movies, and television. His latest publication is the book *May the Rivers Never Sleep*, which was a collaboration with his father Bill McMillan; the book pays homage to the strong conservation influence of Roderick Haig-Brown.

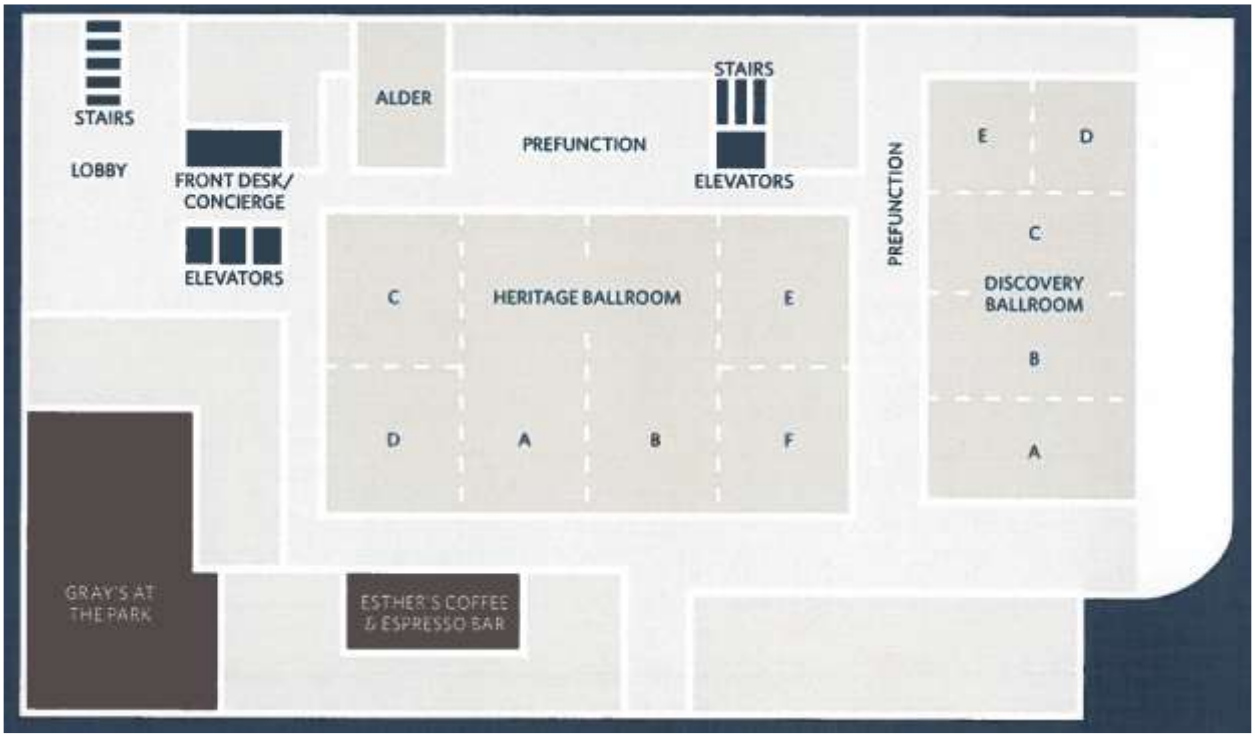
Jacques White, Long Live the Kings
Before becoming Long Live the Kings's executive director in 2010, Jacques served as director of marine conservation at The Nature Conservancy of Washington and director of science and habitat programs at People for Puget Sound. He has served as a member of the Ecosystem Coordination Board of the Puget Sound Partnership and on the steering committee for the U.S. Army Corps of Engineer's Puget Sound Nearshore Ecosystem Restoration Project. Jacques has received several awards for his scientific research, authored more than 20 scientific and policy articles and publications, and frequently speaks at regional and national environmental conferences. He holds a doctorate in marine, estuarine, and environmental sciences from the University of Maryland, a master of science degree in marine science from Louisiana State University, and a bachelor of science degree in oceanography and a bachelor of arts degree in zoology from the University of Washington.

Bill Bradbury, Northwest Power and Conservation Council and former Oregon Secretary of State
Bill Bradbury grew up in Chicago and Pennsylvania before moving to the West Coast, where he worked in broadcast journalism before running for public office. Bill served in the Oregon Legislature from 1981 to 1995, and was chief sponsor in his first term of The Salmon and Trout Enhancement Program (STEP). Since being enacted in 1980, an estimated 2 million volunteer hours have been donated to improve salmon habitat and watersheds all over Oregon. Bill served as Oregon Secretary of State from 1999 to 2009. In 2010, he was appointed to the Northwest Power and Conservation Council by Oregon Governor Ted Kulongoski.

William W. Stelle, Jr., NOAA Fisheries
Will Stelle was appointed the regional administrator for the Northwest Region of NOAA's National Marine Fisheries Service in 2010. The Northwest Region administers fisheries, endangered species, and marine mammal programs off the coasts of Oregon and Washington, and in the vast inland watershed habitats of Pacific salmon and steelhead in Washington, Oregon, and Idaho. Will is also the West Coast salmon coordinator. Before

joining the Obama Administration, Will was a partner at the law firm of K&L Gates. His practice concentrated on projects involving complex federal and state environmental regulatory challenges, specializing in freshwater and marine issues habitats and endangered species. He served as NOAA Fisheries' Northwest regional administrator from 1994 until 2000, where he managed the listings of salmon and steelhead populations under the Endangered Species Act in Washington, Oregon, Idaho, and California. Before settling in the Northwest, Will held a variety of policy positions dealing with a range of environmental and natural resource programs in Washington, D.C. He served as the associate director for natural resources with the White House Office on Environmental Policy overseeing federal forestry and natural resource policies. Before that, he was special assistant to the secretary of the Department of Interior, where he helped develop and implement major changes to western federal land management under the Northwest Forest Plan. Will has a bachelor of arts degree from Boston University and law degrees from the University of Washington School of Law and the University of Maine Law School.

HOTEL MAPS



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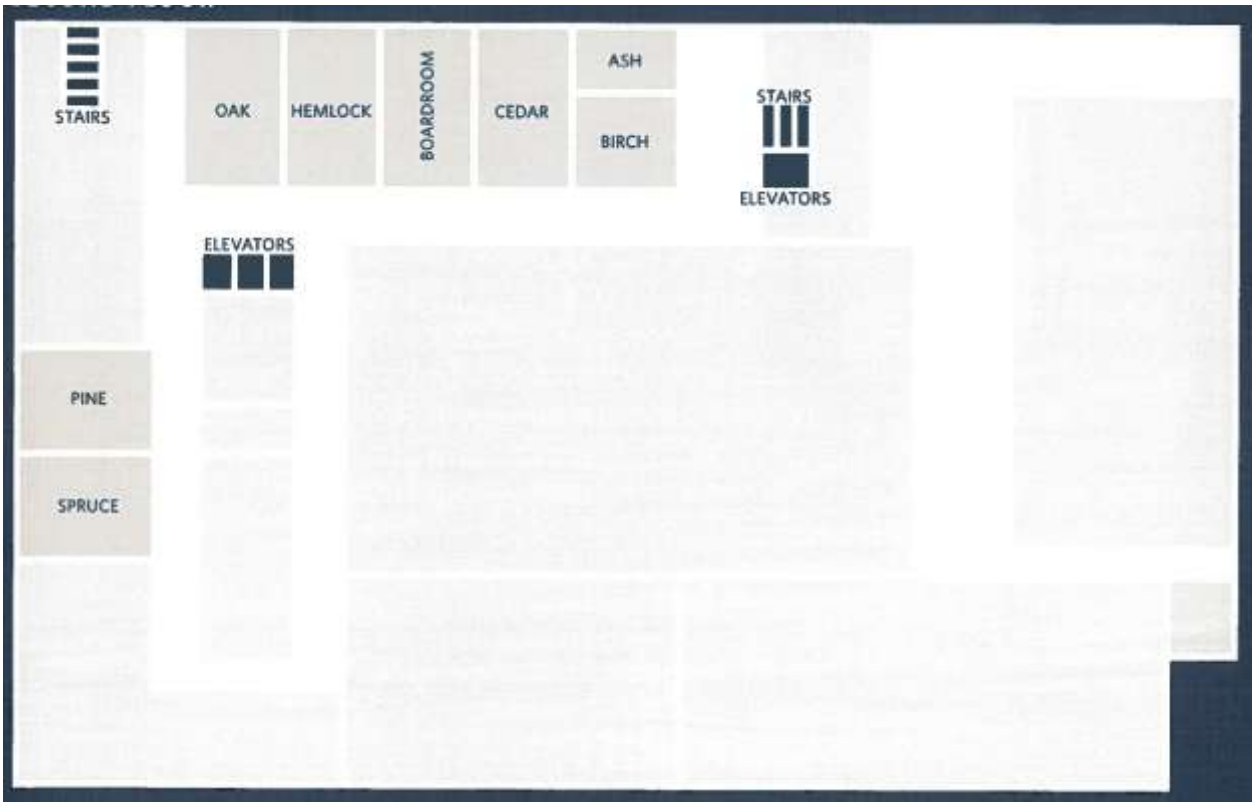

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