ADVANCES IN TIDAL HABITAT RESTORATION PLANNING


Restoration in tidal environments requires different tools to inform the design compared to freshwater environments. The hydraulic processes acting on the habitats are different, the size and behaviors of juvenile salmonids using these habitats are different, and even the major stressors affecting habitat quality are different. This session will describe emerging science and new tools focused on improving the efficiency and effectiveness of restoration in tidal environments. Several projects are being conducted to provide information to refine tidal restoration site selection and improve the design process. In this session, presentations will represent a broad range of disciplines working together to restore salmon habitat through scientific studies and science-based design. Presentation topics will include:

- New information on fish behavior in tidal environments and a comparison of natural and modified tidal channel openings through the lens of fish passage conditions.
- Information will be presented on tidal channel geometry from reference pocket estuaries and the application of these data to restoration design and design guidance.
- A cost-effective approach to scaling site restoration design approaches using commonly available dataset.
- A case study on tidal channel evolution from the Leque Island restoration project with recommendations for design.
- Long-term tidal wetland restoration monitoring in Lower Columbia River and implications for restoration site selection and design.
- New information on identifying restoration priority sites for restoring coastal stream mouths along Puget Sound shores with a railroad will also be presented.

An assessment of juvenile Hood Canal summer chum use of nearshore habitat at multiple scales.
   Presenter: Micah M Wait, *Wild Fish Conservancy, Duvall, WA*
   Co-Presenter: Adrian M Tuohy, *Wild Fish Conservancy, Duvall, WA*

Applying tidal landform scaling to habitat restoration planning, design, and monitoring: Leque Island & zis a ba Case Studies
   Presenter: Greg Hood, *Skagit River Systems Cooperative, LaConner, WA*

Data is not enough: The importance of community engagement in Public Land restoration on the lower Columbia River.
   Presenter: Alex H Uber, *WDFW, Ridgefield, WA*

Failure or Success? Implications of Long-term Tidal Wetland Restoration Monitoring in Lower Columbia River
   Presenter: Sarah Kidd, *Lower Columbia River Estuary Partnership, Portland, OR*
   Co-Presenter: Matt Schwartz, *Lower Columbia River Estuary Partnership, Portland, OR*

Juvenile salmon movement related to the tide cycle: a pilot study to inform tidal fish passage in Puget Sound - Part 1
   Presenter: Doris Small, *Washington Dept Fish and Wildlife, Olympia, WA*
   Co-Presenter: Pad Smith, *Washington Dept Fish and Wildlife, Olympia, WA*

Juvenile salmon movement related to the tide cycle: a pilot study to inform tidal fish passage in Puget Sound - Part 2
   Presenter: Pad Smith, *Washington Dept Fish and Wildlife, Olympia, WA*
   Co-Presenter: Doris Small, *Washington Dept Fish and Wildlife, Olympia, WA*
Prioritization of Coastal Streams and Embayments Along Puget Sound Shores with a Railroad  
Poster: Paul Schlenger, Environmental Science Associates, Seattle, WA

The influence of Tidal Channel Geometry on Pocket Estuary Restoration Design  
Poster: Jessica Côté, Blue Coast Engineering, Lake Forest Park, WA

ALLUVIAL WATER STORAGE: LOSSES FROM CHANNEL INCISION AND POTENTIAL FOR RESTORATION

CHAIR: Michael Kaputa, Chelan County Natural Resource Department, Wenatchee, WA

In the context of growing water shortages from climate warming and an urgent need for innovative approaches to accommodate water supply for growing populations, the purpose of this session is to explore the connection between channel incision, alluvial water storage, and salmon habitat restoration. Session presentations will include recent advances in science and policy related to restoring the natural water storage functions of streams. The valley bottoms that historically served as a reservoir for both sediment and water supported vibrant riparian forests, floodplain wetlands, corridors for fish and wildlife, and stream temperatures and flow regimes supportive of native salmonids. As we have learned over the past 20 years of river restoration and salmonid habitat recovery efforts, the legacy of in-channel wood removal, timber harvest, splash damming, road building, and channel straightening is the down-cutting of stream channels and the transport of large quantities of sediment out of the valley network, resulting in channel incision. The cumulative effect of channel incision is reduced in situ water storage, drier valley bottoms, and lowered streamflows during the summer. Several scientific studies in California have demonstrated that stream restoration can lead to increases in groundwater storage, increases in baseflow of up to 50%, and decreases in stream temperature of up to 3 °C. Thus, stream and floodplain restoration may offer a multi-benefit approach to increase water storage at a fraction of the cost and impact of traditional water storage projects. This session will explore this connection between channel incision and increased water storage and consider the role of floodplain restoration to the future direction of salmon recovery in the Pacific Northwest, including recommendations for integrative actions.

Channel incision and the loss of water storage in drainage networks  
Poster: Tim Abbe, Natural Systems Design, Seattle, WA

Could beaver dams buffer water storage losses from declining snowpacks?  
Poster: Konrad Hafen, University of Idaho, Moscow, ID

Going Big With Large Wood: An Example of Landscape Scale Restoration in the Teanaway Community Forest  
Poster: Ryan DeKnikker, Yakama Nation, Ellensburg, WA

Identifying and quantifying restorable water storage in the Wenatchee  
Poster: Susan Dickerson-Lange, Natural Systems Design, Seattle, WA

Low-tech restoration to treat structurally starved streams – what is it and why do we need to do a lot more of it?  
Poster: Stephen Bennett, Utah State University, Logan, UT
Restoration of urban ravines to increase in-situ storage of sediment and water
Presenter: Maggie Stepp, Natural Systems Design, Seattle, WA

Stream restoration as a strategy to address water scarcity
Presenter: Michael Kaputa, Chelan County Natural Resource Department, Wenatchee, WA

Presenter: Mike McHenry, Lower Elwha Klallam Tribe, Port Angeles, WA
Co-Presenter: Tim Abbe, Natural Systems Design, Seattle, WA

ASSESSING AND ADDRESSING THREATS TO ESA-LISTED SALMONIDS AT ECOSYSTEM-SCALES

CHAIR: Steve Manlow, Lower Columbia Fish Recovery Board, Longview, WA
Pacific salmon evolved and adapted to diverse ecosystems, relying on habitat from headwater streams to large rivers, estuaries and oceans to complete their life histories. The ecosystems that salmon and steelhead rely on are often highly altered today, as roads, development, hydropower, timber harvest and agriculture continually reshape habitat conditions. Population abundance, productivity and diversity are also altered through harvest and hatchery impacts, as well as ocean conditions and changing predator/prey relationships. These threats led to the decline and subsequent Endangered Species Act listing of many salmon twenty years ago. Today, managing these “all-H” threats is the key focus of Washington’s locally developed and state and federally adopted recovery plans. As some species near ESA delisting and others struggle to progress, it is essential to re-assess threats across the H’s, learn from successes and challenges, and adaptively manage recovery efforts.

Presentations today cover integrative approaches to recovering and sustaining salmon by reducing or eliminating threats, and provide pathways to improve the integration and strategic application of recovery and management plan programs. Topics include: all-H reporting in the Upper Columbia region; integrating bull trout and salmon recovery in the Mid Columbia; an assessment of regulatory and restoration programs as well as hatchery and harvest reform in the Lower Columbia; a perspective from the Washington coast; and, ESA delisting considerations from the Hood Canal and NOAA.

A Decision Pathway for the Recovery/Delisting of Hood Canal and Eastern Strait of Juan de Fuca Summer Chum Salmon
Presenter: Scott Brewer, Hood Canal Coordinating Council, Poulsbo, WA

An assessment of recovery partner implementation of Lower Columbia recovery plan programs: an EF Lewis River pilot study
Presenter: Katie Blauvelt, PC Trask and Associates, Portland, OR

Coast Salmon Partnership: Integrating People, Plans, and Knowledge into New Salmon Habitat
Presenter: Mara Zimmerman, Coast Salmon Partnership, Aberdeen, WA

Hydropower in Salmon Recovery- the Forgotten "H"
Presenter: Florian Leischner, Tacoma Power, Tacoma, WA
Co-Presenter: Phil Sandstrom, Tacoma Power, Tacoma, WA

Integrating bull trout and salmon recovery in the Mid Columbia
Is the key to success a 5th "H" (Humans)? Seeking "win-win" opportunities with our All-H partners
Presenter: Greer Maier, Upper Columbia Salmon Recovery Board, Wenatchee, WA

Recovery and Delisting Species Under the Endangered Species Act
Presenter: Gary Rule, NOAA Fisheries, Portland, OR

Tracking hatchery and harvest reform to support recovery in the Lower Columbia region
Presenter: Amelia Johnson, Lower Columbia Fish Recovery Board, Vancouver, WA
Co-Presenter: Steve Manlow, Lower Columbia Fish Recovery Board, Vancouver, WA

CHEHALIS BASIN AQUATIC SPECIES RESTORATION PLAN – INSIGHTS ON BASIN WIDE INTEGRATED RESTORATION PLANNING & IMPLEMENTATION

CHAIR: Emelie McKain, Washington Department of Fish & Wildlife, Olympia, WA
The Chehalis Basin is the second largest river basin in Washington State. It is a uniquely abundant river basin, but it has suffered from reduced salmon runs and devastating flooding for decades. The State of Washington, Quinault Indian Nation, the Confederated Tribes of the Chehalis and other partners are developing an Aquatic Species Restoration Plan (ASRP) as part of a comprehensive strategy to restore the ecological health of the Chehalis River Basin. This unprecedented effort is integrating stakeholder perspectives in the creation of a process that will restore hundreds of miles of riparian habitat throughout the basin on private lands. This session will outline our approach to basin scale restoration, lessons learned from previous state and tribal efforts, and a path forward to improve the Chehalis for aquatic and semi-aquatic species, as well as the people that call this basin home.

Funding Success: Lessons Learned Thus Far
Presenter: Steven Malloch, Chehalis Basin Board, Lacey, WA

Informing the Plan through Implementation - Taking Early Reach Scale Action and Securing Landowner Willingness
Presenter: Tom Kollasch, Grays Harbor Conservation District, Montesano, WA

Large Scale Integration of Landowners and Stakeholders
Presenter: Kirsten J Harma, Chehalis Basin Lead Entity, Oakville, WA

Science & Restoration Planning
Presenter: Mara Zimmerman, Coast Salmon Partnership, Aberdeen, WA

Stakeholder Perspectives and Panel Discussion
Presenter: Emelie McKain, Washington Department of Fish & Wildlife, Olympia, WA

Why the Chehalis, and Why Now?
COMMUNICATING SALMON RECOVERY

CHAIR: Tricia Snyder, Yakima Basin Fish and Wildlife Recovery Board, Yakima, WA
We've made incredible progress in salmon recovery over the past twenty years. One of the challenges we face now is communicating that progress. Effective communication is critical to ensure legislative support, build public buy-in, and attract additional sources of funding. However, many of us in the salmon recovery world find communication and outreach challenging. Some don't feel they have the capacity to conduct outreach and some aren't sure where to even start.
This session proposes to address some of those concerns, share lessons we've learned, and determine where we need to go next. Potential topics within this session that have been discussed are: communicating on a budget: how to effectively leverage low capacity, communicating complex projects: a Yakima Basin Integrated Plan presentation, communicating salmon recovery to the next generation, and communication planning 101. The following presenters have been contacted and are interested in giving a presentation within this session:

- Melissa Speeg, Outreach Coordinator, Kittitas Conservation Trust,
- Kelsey Green, Conservation Outreach Associate, American Rivers
- Landon Shaffer, Stewardship Coordinator, and Emily Smith, Education Coordinator Mid-Columbia Fisheries Enhancement Group
- Brady Kent, Agricultural Coordinator, Yakama Nation
- Tricia Snyder (proposed session chair), Lead Entity Coordinator, Yakima Basin Fish and Wildlife Recovery Board

Achieving Zero Watershed Impacts through Salmon-Safe
Presenter: Ellen K Southard, Salmon Safe, Seattle, WA

Big Communications on a Little Budget
Presenter: Melissa Speeg, Kittitas Conservation Trust, Roslyn, WA

Communicating with Tribes: Where do you start?
Presenter: Brady Kent, Yakama Nation, Toppenish, WA

Communication Planning 101
Presenter: Tricia Snyder, Yakima Basin Fish and Wildlife Recovery Board, Yakima, WA

Diverse Stakeholders and Communicating Salmon Recovery
Presenter: Kelsey Green, American Rivers, Ellensburg, WA

Engaging the Community in Salmon Restoration
Presenter: Landon Shaffer, Mid-Columbia Fisheries Enhancement Group, Ellensburg, WA
Co-Presenter: Emily Smith, Mid-Columbia Fisheries Enhancement Group, Ellensburg, WA

From Restoration to Education: Closing the Loop on Salmon Recovery
Presenter: Claire Williamson, South Puget Sound Salmon Enhancement Group, Olympia, WA
DIFFERENT MONITORING APPROACHES FOR ADAPTIVE MANAGEMENT AND SALMON RECOVERY.

CHAIR: Stacy Polkowske, WA Department of Ecology, Lacey, WA

This session will explore different monitoring approaches that are designed to answer various questions about watershed conditions, project effectiveness and adaptive management. Aspects to be covered include technical topics like habitat status and trends, project effectiveness, and intensively monitored watersheds as well as some higher-level policy presentations from the SRFB Monitoring Panel and the Oregon Watershed Enhancement Board (OWEB).

This session will provide a brief overview and lessons learned from SRFB’s project effectiveness monitoring program. We will learn more about Ecology’s statewide habitat status & trends efforts and how collaborators can utilize the data management system and protocols to set up their own studies. Specific examples of recent and ongoing monitoring efforts will be highlighted including: a watershed-scale effectiveness monitoring study in the Newaukum River Watershed, how large wood placement effecting a stream ecosystem and coho production on the Oregon coast, and what we are learning from the Intensively Monitored Watershed in Lower Columbia. We will also explore the untapped potential of using benthic macroinvertebrates to learn about the environmental stressors in the stream systems we work in.

The session will then look to the future of monitoring and adaptive management by providing an overview of SRFB’s recent monitoring retrospective workshop what the next steps are in moving forward. We will also hear from OWEB on how they are measuring progress in salmon recovery with their Focused Investment Partnerships approach.

Throughout the session, presenters will demonstrate different ways to display and visualize monitoring results for different audiences as well as provide useful monitoring tools for the salmon recovery community. Together this session will consider the past, present and future ways of evaluating our success, solving problems and adapting from lessons learned.

Building a foundation for measuring progress – Oregon Watershed Enhancement Board’s Focused Investment Partnerships

Presenter: Ken Fetcho, Oregon Watershed Enhancement Board, Salem, OR

Fish and in-stream habitat responses to habitat restoration treatments in the Lower Columbia IMW complex

Presenter: Jamie Lamperth, Washington Department of Fish and Wildlife, Kelso, WA

Regional restoration evaluation: lessons from the Salmon Recovery Funding Board’s Project Effectiveness Monitoring Program

Presenter: Phil Roni, Watershed Sciences Lab, Cramer Fish Sciences, Issaquah, WA

SRFB Monitoring Retrospective Workshop and "Next Steps"

Presenter: Keith Dublanica, Governor’s Salmon Recovery Office - RCO, Olympia, WA

The first statewide stream macroinvertebrate bioassessment in Washington State with analysis for multiple stressors

Presenter: Chad Larson, Washington Dept of Ecology, Lacey, WA
The Mill Creek (OR) Study: Assessing the effects of large wood placement on a stream ecosystem
Presenter: Evan Hayduk, Midcoast Watersheds Council, Newport, OR

Watershed Health Monitoring: Standardized Monitoring Methods and Support for Cooperators
Presenter: Glenn Merritt, Department of Ecology, Environmental Assessment Program, Lacey, WA

Watershed scale effectiveness monitoring to support Clean Water Act and salmon recovery objectives.
Presenter: Scott Collyard, Washington Dept of Ecology, Lacey, WA

FISH PASSAGE (WORKING TITLE)

TBD

Removing Powerdale and Middle Fork Nooksack River dams: Designing Riverbeds for Fish Passage in High Energy Environments
Presenter: Paul DeVries, R2 Resource Consultants, Redmond, WA

Winning the upstream battle - A novel GIS tool for prioritizing fish passage barriers from the Upper Columbia
Presenter: Greer Maier, Upper Columbia Salmon Recovery Board, Wenatchee, WA

HATCHERIES AND HYDROPOWER (WORKING TITLE)

ORGANIZER: Sarah Gage, Governor’s Salmon Recovery Office, Olympia, WA
still needs abstract

Coho salmon and habitat response to restoration in a small stream
Presenter: Joe Anderson, Washington Department of Fish and Wildlife, Olympia, WA

Monitoring Puget Sound Early Winter Steelhead Hatchery Releases
Presenter: Bethany E Craig, Washington Department of Fish and Wildlife, Mill Creek, WA

HOW MUCH SPACE DOES A RIVER NEED? ESTABLISHING ECOLOGICAL CORRIDORS FOR LARGE SCALE RESTORATION AND MONITORING

CHAIR: Ian Sinks, Columbia Land Trust, Vancouver, WA
The aquatic habitats sustained by streams and rivers extend outside of a bank-full channel. Thus, this session focuses on defining the spatial requirements for rivers to create and sustain a diverse range of habitat types as the foundation to achieving long-term restoration goals. The physical space available to a river influences fluvial processes and the diversity and quantity of habitat that can form. Constraining the space available to a river eliminates the processes needed to form and sustain the unique habitats upon which salmonids and many other species depend, including side channels, oxbow lakes, and emergent wetlands.
This session will explore how restoration practitioners have approached project scale and how decisions of appropriate project scale can influence the effectiveness of restoration actions. What is the minimum space needed to restore “properly functioning conditions” that can truly sustain the ecosystems upon which salmon depend? We define an “ecological corridor” as the minimum space a historically unconfined stream or river needs to sustain the suite of habitats it once had prior to human disturbance. The concept of a minimum footprint for restoration is based on understanding the key formative processes for aquatic habitat in a given reach, and is useful for estimating spatial scales and structural requirements of these habitat-forming processes. Once the space and structural components that enable natural river processes to create and maintain diverse habitat types are understood, that knowledge can be used to plan and implement effective protection and restoration actions to achieve salmon recovery.

This session includes presentations about the concept of an ecological corridor, methods for delineation, and approaches for monitoring to evaluate the formation and diversity of habitats. The session will also include insights into land acquisition, working with land owners and stakeholders, and experiences related to establishing large scale restoration corridors in fluvial networks.

**Advances in Monitoring of Large-Scale Restoration Efforts and Implications to River Corridor Planning for Salmon Recovery**

Presenter: Jennifer O'Neal, *Natural Systems Design, Bellingham, WA*

**Combining landowner outreach and geomorphic data to identify floodplain-scale restoration potential in Chimacum Creek**

Presenter: Sarah Doyle, *North Olympic Salmon Coalition, Port Hadlock, WA*

**Defining ecological corridors in fluvial networks for salmon recovery assessment, planning, and process-based restoration**

Presenter: Tim Abbe, *Natural Systems Design, Seattle, WA*

**Establishing a fluvial ecological corridor for the Lower White River in the city of Sumner, WA**

Presenter: Doug Beagle, *City of Sumner, Sumner, WA*

**MAGA: Making Abernathy (Creek) Great Again**

Presenter: Eli Asher, *Cowlitz Indian Tribe, Longview, WA*

**Quantitative tools to assess current and historic floodplain connectivity in the Skookumchuck watershed**

Presenter: Susan Dickerson-Lange, *Natural Systems Design, Seattle, WA*

**Restoring Channel Processes and Habitat on the Alluvial Fan of Illabot Creek**

Presenter: Devin Smith, *Skagit River System Cooperative, La Conner, WA*

**INTEGRATING CLIMATE CHANGE ADAPTATION MEASURES INTO RESTORATION DESIGN AND RESERVE PLANNING IN THE LOWER COLUMBIA RIVER.**

**CHAIR: Catherine Corbett, Lower Columbia Estuary Partnership, Portland, OR**

Since the late 1800’s, the lower Columbia River ecosystem lost approximately 50% of its native historic habitat largely to development and agriculture. Over 23,758 acres have been restored or protected by regional partners in the past 20 years, a significant effort to reverse the trajectory of degradation. Areas that have been acquired and restored for
conservation purposes function as a *de facto* reserve network. To ensure our reserve network is protective of native species, we established native habitat coverage targets, using established conservation biology approaches, that describe the quantity, types, and priority locations for recovery of habitat to meet our goal of *historic* habitat diversity. Nonetheless, ample recent conservation biology research concludes that the historic habitat mosaic no longer serves as an appropriate guide for maintaining biodiversity with transitioning climate and ecosystem conditions. Protecting biodiversity and native species will require a shift from place-based strategies that maintain integrity of local reserves within fixed boundaries to dynamic approaches that promote landscape permeability and species’ ability to move through landscapes so they can persist. Climate change adaptation needs to be an intentional process, rather than trusting our usual conservation practices and restoration project design methods will be effective and sufficient in the face of rapid climate change.

This session will provide an overview of conservation biology approaches for integrating shifting climate conditions into conservation reserve network planning, including our ability to meet our conservation habitat coverage targets with sea level rise. Additionally, we will present how we’ve started integrating climate adaptation measures into individual restoration project designs in the lower Columbia River. Presentations will include projects designed to restore cold water refuges through enhancing confluence areas and alluvial fans and integrate living shorelines in flood control measures. Additional presentations will discuss specific design criteria needs for infrastructure and hydrologic reconnection/fish access projects.

**Assessing the Resiliency of Lower Columbia River Wetlands to Climate Induced Sea Level Rise**  
Presenter: Keith Marcoe, *Lower Columbia Estuary Partnership, Portland, OR*

**Columbia-Pacific Passage Habitat Restoration**  
Presenter: Jason R Smith, *Columbia River Estuary Study Taskforce, Astoria, OR*

**Designing habitat for a changing climate: a quantitative approach**  
Presenter: Joseph M Parzych, *Inter-Fluve, Hood River, OR*

**Enhancing cold water refuges at small tributaries in the lower Columbia River**  
Presenter: Chris Collins, *Lower Columbia Estuary Partnership, Portland, OR*

**Incorporating future climate predictions into today's ecosystem restoration design**  
Presenter: Caitlin Alcott, *Inter-Fluve, Hood River, OR*  
Co-Presenter: Matt Cox, *Inter-Fluve, Hood River, OR*

**Integrating climate change projections into culvert design and research**  
Presenter: Jane B Atha, *Washington Department of Fish and Wildlife, Olympia, WA*

**Integrating Climate-Smart Conservation into our Ecosystem Restoration Program for the Lower Columbia River.**  
Presenter: Catherine Corbett, *Lower Columbia Estuary Partnership, Portland, OR*

**Restoration using multiple climate adaptation measures for a 1,000-acre floodplain section of the Lower Columbia River**  
Presenter: Curtis Loeb, *Wolf Water Resources, Portland, OR*
INVASIVE SPECIES IMPACTS TO SPECIES RECOVERY, THE ENVIRONMENT, AND ECONOMY: WASHINGTON STATE'S COMPREHENSIVE APPROACH TO PREVENTION, CONTAINMENT AND MANAGEMENT

CHAIR: Justin D Bush, State of Washington Recreation & Conservation Office, Olympia, WA

Since 2006, the Washington Invasive Species Council has been tasked with providing direction, planning, leadership, and coordination for combatting harmful invasive species throughout the state and preventing the introduction of others that may be potentially harmful. This session will address the known and potential impacts of invasive species to Washington state’s economy and environment through the lens of species recovery. We will provide background information and summaries on invasive species issues that have been stopped and others that may be on the horizon. Success of the council and success of species recovery are intrinsically connected. Presenters representing organizations and agencies that are the first line of defense in Washington will discuss direct and indirect impacts from new and spreading invasive species with a focus on teaching salmon recovery professionals how to recognize and report new threats.

Effective methods to revegetate Reed Canarygrass dominated wetlands and riparian areas without the use of herbicides

Presenter: Peter Bahls, Northwest Watershed Institute, Port Townsend, WA

Flowering Rush: Impacts to Salmon Recovery, the Environment and Economy

Presenter: Jenifer Parsons, Washington Department of Ecology, Union Gap, WA
Co-Presenter: Jennifer Andreas, Washington State University, Pullman, WA

Northern Pike are coming and you should be afraid

Presenter: Joe Maroney, Kalispel Tribe of Indians, Usk, WA

Watershed Recovery, Reed Canarygrass and Scotch Broom — Rationale and Strategies for Investment and Action

Presenter: Jill Silver, 10,000 Years Institute, Forks, WA

JUVENILE SALMON AND ESTUARY ECOSYSTEM FUNCTION ACROSS DELTAS AND RESTORATION PROJECTS IN PUGET SOUND: WHAT HAVE WE LEARNED, WHERE ARE WE GOING?

CHAIR: Tish L Conway-Cranos, Washington Department of Fish and Wildlife, Olympia, WA

Puget Sound has lost over half of its historic tidal wetlands, and restoring this habitat is an integral component of Chinook salmon recovery and resilience. Over the past twenty years, dozens of restoration projects have restored over 3,000 acres of tidal wetland habitat in Puget Sound. In this session we will explore how juvenile salmon are using estuary habitats in Puget Sound, how estuary ecosystems are responding to restoration, and how we might use this information to envision the next generation of estuary restoration projects. Individual speakers, many of whom have received funding from the Estuary and Salmon Restoration Program (ESRP) Learning Program, will present on estuary use by juvenile salmon, and ecosystem responses to restoration at multiple Puget Sound sites, including the Skagit, Snohomish, Skokomish, and Nisqually estuaries. Specific ecosystem responses presented will include sediment transport and deposition, vegetation development, and invertebrate community changes, as well as juvenile salmonid abundance, distribution, growth, and diets. Together these insights will paint a holistic picture of fish and habitat responses to estuary restoration, as well as provide direction for how best to plan future estuary restoration projects and identify the most pressing remaining questions.
Note: We list 8 talks here, but could easily envision an entire additional session dedicated to this topic.

15 Years of Estuary Restoration in the Dosewallips Delta
Presenter: Micah M Wait, Wild Fish Conservancy, Duvall, WA

A decade of post-restoration monitoring in the Nisqually River Delta: structure, function, and benefits for juvenile salmon
Presenter: Melanie Davis, US Geological Survey, Olympia, WA

Habitat structure and function following estuary restoration in the Skokomish
Presenter: Lisa Belleveau, Skokomish Indian Tribe, Shelton, WA

Juvenile Chinook habitat restoration on the delta of the Fraser River Estuary
Presenter: Misty MacDuffee, Raincoast Conservation Foundation, Sidney, BC, Canada

Landscape features and density dependence in tidal delta habitats: juvenile Chinook in four Puget Sound estuaries
Presenter: Correigh Greene, NOAA/Northwest Fisheries Science Center, Seattle, WA
Co-Presenter: Eric Beamer, Skagit River System Cooperative, La Conner, WA

Restoration benefits below the surface: Developing an empirical basis for connecting shoreline restoration to salmon recovery
Presenter: Genoa Sullaway, NOAA NWFSC and University of Washington, Seattle, WA

Successful juvenile life history strategies in returning adult Chinook from five Puget Sound populations
Presenter: Lance Campbell, Washington Department of Fish and Wildlife, Olympia, WA

The Union River Estuary Restoration: 5 years later
Presenter: Mendy A Harlow, Hood Canal Salmon Enhancement Group, Belfair, WA
Co-Presenter: Clayton David, HCSEG, Belfair, WA

Tidal Channel Erosion Rates Depend on Marsh Restoration Site Size.
Presenter: Greg Hood, Skagit River System Cooperative, La Conner, WA

MARINE FOOD WEB AND HABITAT INTERACTIONS IN THE SALISH SEA

CHAIR: Iris Kemp, Long Live the Kings, Seattle, WA

Note to conference organizers:
We propose to host a session describing recent findings of Salish Sea Marine Survival Project studies. It is possible that researchers unaffiliated with the Salish Sea Marine Survival Project will also submit proposals related to Salish Sea marine food webs and habitat interactions. If so, we recommend conference coordinators consider a broader inclusive session spanning a full day or more. We have titled our session proposal such that it can capture a wide breadth of presenters interested in participating.

Description:
Salmon are an integral part of complex food webs spanning multiple habitats. This session predominantly focuses on the marine environment: investigating salmon and steelhead growth, distribution, and survival patterns, and the physical and biological factors that drive them. Studies in this session have assessed relationships between salmon, steelhead, their prey, and their predators, explored top-down versus bottom-up controls on juvenile salmon growth and survival, and modeled trophic relationships in an ecosystem context. Much of the work presented in this session results from the Salish Sea Marine Survival Project (SSMSP) – an interdisciplinary US-Canada research effort that began in 2014 and is now in its final year. The SSMSP has leveraged human and financial resources from the United States and Canada to determine the most significant factors affecting the survival of juvenile Chinook, coho and steelhead in Puget Sound and the Strait of Georgia. This comprehensive, collaborative effort addresses key uncertainties impeding salmon recovery and sustainable fisheries in our shared waters of British Columbia and Washington State and will lead to Chinook, coho, and steelhead recovery management actions and improved adult salmon forecasting, addressing Tribal Treaty Rights and Endangered Species Act obligations. Presenters in this session will discuss results of scientific research and monitoring, and outline recommendations emerging from these results that relate to management actions and ecosystem recovery.

**Ecosystem Indicators Development for Steelhead Trout and Coho and Chinook Salmon**  
Presenter: Kathryn Sobocinski, NOAA/LLTK, Seattle, WA

**Bottom-up Processes Affecting Marine Survival of Salmon in the Salish Sea**  
Presenter: Dave Beauchamp, US Geological Survey, Seattle, WA

**Characterizing impacts of the Hood Canal Bridge on migrating steelhead smolts using acoustic telemetry**  
Presenter: Megan Moore, NOAA, Port Orchard, WA  
Co-Presenter: Barry Berejikian, NOAA Fisheries, Port Orchard, WA

**Ecological factors affecting the early marine survival of Puget Sound steelhead smolts**  
Presenter: Barry Berejikian, NOAA Fisheries, Port Orchard, WA

**Effect of multiple pressures on early marine survival of juvenile salmon in Puget Sound**  
Presenter: Hem Nalini Morzaria-Luna, Long Live the Kings, Seattle, WA

**Population specific consumption of Pacific Herring in juvenile and sub-adult Chinook Salmon in the Salish Sea**  
Presenter: Eleni Petrou, University of Washington, Schol of Aquatic and Fishery Sciences, Seattle, WA  
Co-Presenter: Josh Chamberlin, NOAA/Northwest Fisheries Science Center, Seattle, WA

**Underwater video illustrates that the Hood Canal Bridge impedes migration of salmonids**  
Presenter: Hans Daubenberger, Port Gamble S’Klallam Tribe, Kingston, WA  
Co-Presenter: Emily Bishop, Westward Ecology, Port Townsend, WA

**ONE SIZE DOES NOT FIT ALL: PLANTING RIPARIAN BUFFERS IN WORKING AGRICULTURAL LANDSCAPES**

**CHAIR: Beth leDoux, King County, Seattle, WA**

Salmon recovery has been a Puget Sound priority for over a decade and the 14 Chinook Recovery Plans developed by Puget Sound Watersheds signify a strong commitment to that effort. A primary recommendation of these salmon plans is to restore and enhance streams and rivers with substantial riparian buffers to improve water quality and restore natural habitat processes for salmon. A rapidly growing regional population coupled with a burgeoning interest in local
food and food security have amplified the need to resolve longstanding conflicts. The conflict is particularly acute in floodplain areas that are critical for salmon and also feature some of the best agricultural soils in Washington. In the last several years, intensive efforts have been initiated to integrate these mandates in ways that result in net gains for both salmon and farms. Intensive work has been occurring in Snohomish and King County, along with other Puget Sound watersheds, to think through how to create a locally derived strategy to implement buffer restoration that is not only science based, but also explicitly incorporates consideration of the opportunities and constraints inherent in an active agricultural landscape. This session will share the work happening on the ground to try and support both fish and farms and how riparian buffers can do both.

Changing Rules in Restoration: How new policies and permits have impacted RFEG riparian restoration strategies
   Presenter: Kelsey Taylor, Skagit Fisheries Enhancement Group, Mount Vernon, WA

Habitat loss, restoration, and treaty rights - Applying Treaty Rights at Risk in the context of variable width buffers.
   Presenter: Colin M Wahl, Tulalip Tribes, Tulalip, WA

Integrated Riparian Restoration in the Stillaguamish and Snohomish Watersheds
   Presenter: Kristin Marshall, Snohomish Conservation District, Lake Stevens, WA

Reecer Creek Floodplain Restoration – Reviewing Restored Channel and Riparian Development
   Presenter: Katrina Strathmann, Mid-Columbia Fisheries Enhancement Group, Yakima, WA
   Co-Presenter: Rebecca Wassell, Mid-Columbia Fisheries Enhancement Group, Ellensburg, WA

Riparian buffer flexibility allows for restoration success in Woods Creek
   Presenter: Cindy Dittbrenner, Snohomish Conservation District, Lake Stevens, WA

Riparian Buffers: Perspectives from the Land
   Presenter: Melissa Borsting, King County, Seattle, WA

The Voluntary Stewardship Program - Protecting Critical Areas & maintaining Agricultural Viability
   Presenter: Bill Eller, Washington State Conservation Commission, Olympia, WA

Using Riparian Science to Establish Recommendations for Variable Width Buffers in the Snoqualmie River Valley
   Presenter: Beth leDoux, King County, Seattle, WA

TIME CAPSULES AND TAROT CARDS -THE INCREASING COMPLEXITY OF RESTORATION PROJECTS OVER THE LAST TWENTY YEARS AND WHAT THE FUTURE HOLDS FOR RESTORATION.

CHAIR: Sherrie Duncan, Sky Environmental, Tacoma, WA
ORGANIZER: Lisa Spurrier, Puyallup and Chambers Salmon Recovery Lead Entity, Tacoma, WA
As we mark twenty years of salmon habitat restoration in the Northwest, it is important to reflect on what we have accomplished to date as well as what lies ahead. It is notable that the type and complexity of salmon habitat restoration projects have changed dramatically in scale and cost over time. Early salmon habitat restoration projects following the first Salmon Recovery Funding Board grant round were typically smaller in scale and focused on discrete factors limiting habitat structure and correcting, fish barriers. Today restoration practitioners have changed their focus to take a processed-based view of what restoration projects should look like and many projects are aimed at addressing miles of river and floodplain at the reach scale and it is not uncommon for watersheds to be somewhere in the process of removing a dam. In this session, take a trip through time with project sponsors from 1999 to 2019 and beyond. We will first explore how project types have evolved over time by looking at examples of projects that have been done over the last twenty years, beginning with simple projects and then transition into more complex, multi-benefit, multi-stakeholder projects and the challenges and opportunities that they present. With twenty years of work under our belt, what can we say, with confidence, about restoration projects looking forward to the next twenty years? Based on our experience with this work, what questions do we need to ask to make sure we are getting the most important work done and using the limited funding to get the best results for salmon? What are important considerations when striving to provide salmon the greatest possible resilience to climate change?

20 years of Restoration in the NF Stilly: Changing strategies and lessons learned are shaping the future of salmon recovery.
   Presenter: Tracy Drury, Anchor QEA, Bellingham, WA
   Co-Presenter: Andy Brew, Anchor QEA, Bellingham, WA

Breaking down barriers: how science, policy, and community resolve has shaped salmon recovery in the Puyallup River Watershed
   Presenter: Kristin Williamson, South Puget Sound Salmon Enhancement Group, Olympia, WA

Climate Change and Sea Level Rise – Tips and Tools for Evaluating Future Conditions with Hydraulic Models
   Presenter: David Cline, Shannon & Wilson, Seattle, WA

Countyline Levee Setback Project: A Flood Protection Project Along the Lower White River, Washington Yields Multiple Benefits
   Presenter: Stephanie Shelton, King County Department of Natural Resources and Parks, Seattle, WA

It’s more complicated than we thought...
   Presenter: Mike Rustay, Snohomish County, Everett, WA
   Co-Presenter: Gretchen Glaub, Snohomish County, Everett, WA

Nez Perce Tribe Watershed Restoration - 1997-2019
   Presenter: Heidi McRoberts, Nez Perce Tribe, Lapwai, ID

Restoring Water Quality Through Rebuilding Hyporheic Function
   Presenter: Mike (Rocky) Hrachovec, Natural Systems Design, Seattle, WA

What it takes to move the needle: sweat, diesel, and jet fuel.
   Presenter: Eli Asher, Cowlitz Indian Tribe, Longview, WA
URBAN STORMWATER THREATS AND CLEAN WATER STRATEGIES TO CONSERVE AND RECOVER COHO SALMON

CHAIR: Nathaniel L Scholz, NOAA Fisheries, Northwest Fisheries Science Center, Seattle, WA

In the Pacific Northwest, as in other coastal areas of the United States, non-point source pollution is the foremost water quality threat to aquatic species, populations, communities, and ecosystems. Human population growth continues to drive development and land conversion within salmon-supporting watersheds, increasing both imperviousness and corresponding toxic stormwater runoff. The Puget Sound region, for example, is expected to add more than a million people by 2030. This session will showcase recent research demonstrating that untreated urban runoff is highly toxic to the freshwater life stages of salmon, as well as their prey. The focus will be primarily on coho (Oncorhynchus kisutch) as a sentinel species for the impacts of stormwater, as well as the effectiveness of green infrastructure and other clean water strategies designed to remove (filter) contaminants and protect salmon health. The presentations will center on a well-described urban mortality syndrome (also known as coho pre-spawn mortality), whereby adult coho returning to restoration sites in urban streams die before spawning. This line of research began nearly 20 years ago, and has since provided a significant lesson about the potential for toxic runoff to undermine physical habitat restoration efforts (i.e., create ecological traps). Looking to the future, the session will also explore recent solutions-oriented studies on the effectiveness, affordability, durability, replicability, and scalability of green infrastructure. As a basis for action, spatially-explicit vulnerability maps for the coho urban mortality syndrome are now available for the entirety of the Puget Sound basin (https://esajournals.onlinelibrary.wiley.com/doi/10.1002/eap.1615). These maps are intended to catalyze local engagement and guide pollution reduction strategies throughout the region. Lastly, the best available science is increasingly pointing to motor vehicles as the primary source of toxics in urban runoff. The session will feature state-of-the-art analysis (high resolution mass spectrometry) to resolve the literally thousands of distinct chemicals in urban stormwater.

Elevated Contaminants in Resident Chinook Salmon Pose a Threat to Salmon Reproduction and to People and Whales that Eat Them

Presenter: Sandra O’Neill, WA Dept. Fish and Wildlife, Olympia, WA
Co-Presenter: Andrea Carey, WA Dept. Fish and Wildlife, Olympia, WA

Aligning land use and water quality across a gradient of coho mortality in Puget Sound

Presenter: Jessica I Lundin, NOAA Fisheries, Northwest Fisheries Science Center, Seattle, WA

Current and future vulnerability mapping for the coho urban mortality syndrome in Puget Sound

Presenter: Blake E Feist, NOAA Fisheries, Northwest Fisheries Science Center, Seattle, WA

Green stormwater infrastructure to improve water quality in salmon habitats

Presenter: Jenifer K McIntyre, Washington State University, Puyallup, WA

New science informing endangered species management

Presenter: Doug Osterman, WRIA 9, Seattle, WA

Suspect and non-target screening for contaminants of emerging concern in Puget Sound

Presenter: Zhenyu Tian, UWT Center for Urban Waters, Tacoma, WA

The urban mortality syndrome: juvenile coho salmon as surrogates for adult spawners

Presenter: Jay W Davis, U.S. Fish and Wildlife Service, Lacey, WA
Using High-Resolution Mass Spectrometry to Identify Organic Contaminants Linked to Urban Stormwater Mortality Syndrome

Presenter: Edward P Kolodziej, Center for Urban Waters, Tacoma, WA