Abstracts for Poster Presentations

Characterizing Recreational Anglers in the Summer Flounder Fishery: Varying angler identity and reporting familiarity along the U.S. East Coast

Student

Adebote, Mary; *Virginia Tech, maryadebote@vt.edu*

Understanding the diversity of recreational anglers and their engagement with fisheries reporting programs is critical for designing responsive and equitable fisheries management strategies. This study applies a person-centered segmentation approach to identify and characterize distinct angler typologies within the summer flounder (*Paralichthys dentatus*) fishery along the U.S. East Coast. Using a structured online survey and multivariate cluster analysis, we identified four unique angler groups differentiated by socio-demographic traits, fishing effort, access mode, and recreational identity: Affluent Northern Boat Loyalists (AFNB), Diverse Casual Shore Anglers (DCSA), Experienced Mid-Atlantic Anglers (EMA), and Moderate-Engagement Generalists (MEG). Beyond demographic and fishing access differences, clusters also varied in their familiarity with the Marine Recreational Information Program (MRIP) and perceptions of reporting ease, revealing differences in their engagement with established fisheries data collection programs. These patterns highlight important variation often masked in aggregate statistics, including disparities in shoreline access, racial representation, centrality of fishing to personal identity and reporting familiarity. Collectively, the findings highlight persistent patterns of social stratification within marine recreational fisheries and demonstrate that behavioral and access-based heterogeneity shapes both participation and data reliability. Incorporating angler typologies into stakeholder engagement and monitoring frameworks can enhance legitimacy, improve reporting compliance, and strengthen the resilience of participatory fisheries governance.

New fish guidance technology for Western ecosystems: review of field studies

Professional

Bajer, Przemek; *Carp Solutions LLC, contact@carpsolutionsmn.com*

A novel fish guidance technology—the low-voltage “electric fish fence”—has been used successfully in the eastern United States and Europe for more than a decade but has not yet been widely adopted in the western United States. Here, we review results from field studies conducted in North America and Europe and identify potential applications in western regions. In Midwestern U.S. rivers, low-voltage systems have been used to block and remove invasive common carp during spawning migrations. Migrating carp were guided into traps and automatically removed using an active electric field and conveyor systems. Over two consecutive years, more than 90% of migrating carp were blocked and over 70% were removed. In high-gradient streams of northern Michigan, similar systems have been used to block spawning runs of invasive sea lamprey with comparable effectiveness (>90% blocked, ~75% removed). In Central Europe, low-voltage systems have successfully guided migrating eels toward fish ladders, while in power-plant applications, they have reduced fish entrainment in intake canals by more than 60%. Overall, the high efficiency, portability, and relatively low cost of these systems make them well-suited to a wide range of fish conservation and management applications in the western United States. Potential uses include screening agricultural water diversions, guiding migrating fish toward passage facilities, and reducing entrainment at power-plant intakes. Because these systems require minimal power, they are

particularly well-suited for remote or off-grid installations common throughout the western U.S., where flexible and cost-effective fish guidance solutions are often needed.

Quantifying Chinook Salmon habitat across flow regimes: High-resolution modeling in Oregon's Willamette River Basin

Professional

Bartelt, Karen; *US Geological Survey, kbartelt@usgs.gov*

The Santiam and McKenzie River Basins of western Oregon provide critical habitat for federally listed Upper Willamette River spring Chinook salmon (*Oncorhynchus tshawytscha*). Streamflows in each basin are regulated in part by high-head multi-purpose dams, however, quantitative linkages between reservoir-regulated streamflows and downstream patterns of juvenile rearing and adult spawning habitats remain limited. This study integrates high-resolution topo-bathymetric lidar, two-dimensional hydraulic models, and novel sediment distribution models to evaluate habitat availability across a range of streamflows for over 400 km of river. Results reveal that the quantity of fry habitat is relatively insensitive to streamflow, while the quantity of parr habitat generally increases with streamflow, especially for the range of streamflows typical of spring and summer months. In contrast, spawning habitat is generally inversely related to streamflow and is primarily limited by suitable substrate availability, likely reflecting coarse sediment retention effects of upstream dams. Additionally, we identified specific streamflow thresholds where redd dewatering risk increases substantially with declining streamflow. These findings provide reservoir managers with spatially explicit tools to evaluate tradeoffs that may result from various streamflow management scenarios for rearing and spawning periods and insights into habitat dynamics in large, regulated rivers while also demonstrating how high-resolution modeling can support landscape-level habitat assessments.

Aerial monitoring reveals estuarine use and first photographic confirmation of white sturgeon (Acipenser transmontanus) in the Eel River, California

Student

Boeberitz, Olivia; *Cal Poly Humboldt, osboeberitz16@gmail.com*

White sturgeon (*Acipenser transmontanus*), the largest freshwater fish in North America, are a long-lived, amphidromous species distributed from Ensenada, Mexico to Alaska. Although primarily associated with large river systems like the Sacramento–San Joaquin, Columbia, Snake, and Fraser rivers, they make infrequent marine migrations along the West Coast and are occasionally found in the ocean. In California, white sturgeon are designated a Species of Special Concern and were recently advanced as a candidate species under the California Endangered Species Act. While core spawning populations in major river basins are well documented, their distribution outside of these areas remains poorly understood. Historical accounts suggest they have occurred in systems such as the Eel, Klamath, Smith, and Russian rivers, but evidence of presence outside the Sacramento–San Joaquin system is limited or unconfirmed. In Humboldt County, California, documentation of white sturgeon presence is sparse, consisting largely of anecdotal reports and incidental observations, and no targeted monitoring currently exists. Standardized unmanned aircraft system (i.e., drone) surveys were conducted weekly at Cock Robin Island in the lower Eel River estuary from May to December 2025. Across 27 surveys, white sturgeon were observed on 7 occasions, with up to 14 unique

individuals confirmed. This represents the first known photographic confirmation of white sturgeon presence in the Eel River estuary. Observations were concentrated from July through October, suggesting seasonal estuarine use that may correspond with foraging or transitional habitat use. These findings highlight the need for expanded monitoring to evaluate residency, seasonal patterns, and connectivity with larger West Coast populations.

Investigating the Role of EGLN3 in Hypoxia Response and Cardiac Physiology in Rainbow Trout (*Oncorhynchus mykiss*)

Student

Bordas, Adel; *Oregon State University, adelbordas@gmail.com*

Hypoxia is a prevalent and intensifying stressor in aquatic systems due to climate change, eutrophication, and habitat alteration. While rainbow trout typically require cold, well-oxygenated water, they show population-level variation in hypoxia tolerance. This study investigates the role of the gene EGLN3, a regulator of the hypoxia-inducible factor (HIF) pathway, in mediating physiological and cardiac responses to hypoxia in rainbow trout (*Oncorhynchus mykiss*). We hypothesized that knocking out EGLN3 would lead to increased hypoxia tolerance. To test this, we used CRISPR to generate EGLN3 knockout (KO) fish and compared them to albino controls. We conducted progressive hypoxia trials with continuous ECG monitoring to measure cardiac performance until dysfunction occurred. Hearts were collected for histological assessment of ventricular compaction and vacuolization. Preliminary results reveal no significant difference in average heart rate across oxygen saturation or in time to cardiac dysfunction at 10% oxygen. However, the type of dysfunction varied: KO fish displayed gradual declines in heart rate and greater amplitude loss, while controls exhibited sharper rate drops with smaller amplitude changes. These findings suggest that EGLN3 does not significantly alter overall cardiac performance or time to dysfunction under hypoxia but may influence how dysfunction manifests. Ongoing histological analyses will help clarify whether structural differences in cardiac tissue contribute to these patterns.

Residence Time as a Metric for Connectivity in Lotic Ecosystems: Developing Protocols with Applications in Process-Based River Restoration

Student

Brice, Julia; *Oregon State University, briceju@oregonstate.edu*

Natural riverine ecosystem processes occur under hydrogeomorphic conditions that allow multidirectional movement between stream channel, floodplain, hyporheic, and groundwater. Streams and rivers with impaired processes often lack interconnectivity. These systems exhibit homogenous, incised channel characteristics resulting in rapid, direct flow paths. Process-based approaches to river restoration reestablish connectivity by rehabilitating physical channel structure, aiming to push systems into lower-energy, higher-complexity states. Quantifying functional shifts at the scale of process-based projects is challenging, and therefore benchmark assessments of “success” are limited. We propose that water residence time can serve as a proxy for system connectivity, as it has well-established links to several hydrologic and ecological functions including nutrient cycling, chemical and sediment retention, flow attenuation, groundwater recharge, and support of biodiverse habitats. We conducted slug tracer releases and monitored breakthrough concentration curves in two McKenzie River tributaries at base flow and high flow conditions to evaluate residence time as a proxy for flow complexity and system connectivity. In Cook Creek, we compared solute transport through an old growth forest reach containing several log jams to transport in an adjacent reach through a simplified second-growth forest. In Quartz Creek we assessed transport in an upstream

unmodified reach versus transport in a modified reach within a floodplain restoration project. We generated cumulative distribution mass recovery curves and calculated values for time to 50% mass recovery. In both systems and flow conditions, the reaches with greater connectivity had much greater residence times than confined reaches. The cumulative distribution curves showed clear differences in flow path efficiency between high and low connectivity reaches, and thus, promise as a tool to assess restorations.

Weir'd Rivers: an application of the weighted proportion of hatchery origin spawners method in a supplemented system

Professional

Buch, Gerrit; *Oregon Department of Fish and Wildlife, gerrit.buch@odfw.oregon.gov*

Snake River spring Chinook Salmon are federally listed and managed by the Lower Snake River Compensation Plan. In the Imnaha river basin in Oregon there is a federally funded supplementation program to aid in conservation and provide fisheries for recreational and cultural value. Since the plan was enacted, ODFW and comanagers have been reporting on the estimated proportion of hatchery origin spawners (pHOS) at a river specific level.In the Imnaha river, the weir traps fish to supply the hatchery program with broodstock and controls the proportion of hatchery fish passed above the weir to spawn naturally with the natural origin fish that return. This ratio is determined by a hatchery genetic management plan (HGMP). These plans are designed to help protect the natural origin genetic lineages from the possible negative impacts of hatchery origin Chinook Salmon, while providing a population boost for these threatened stocks. This project aims to apply the newer method of weighted pHOS (pHOSw) to account for the spatial variation in hatchery and natural origin spawners which the generalized pHOS metric does not account for. A comparison will be made using various pHOSw estimates against the standard pHOS estimate using trapping data from the Imnaha River Weir and carcass recoveries in the above and below weir survey sections. We expect to see a lower pHOSw statistic above and below the weir when compared to standard pHOS. We hope to show how the spatial distribution of hatchery origin spawners influences the pHOS statistic and by using pHOSw managers can make more informed decisions about passing hatchery origin fish above the weir to spawn in nature.

Behavioral Software for the Analysis of Fall Chinook Response to Odors

Student

Burke, Cristian; *Oregon State University, burkecr@oregonstate.edu*

Hatcheries are a tool for salmon management and conservation, but hatchery-origin fish have been shown to have reduced fitness and pose potential genetic and ecological risks to their wild counterparts. These risks are of particular concern if hatchery-origin fish do not return to the hatchery but rather stray and spawn with natural-origin fish. Homing to the natal hatchery as adults is governed by discrimination of hatchery-specific olfactory cues learned as juveniles prior to seaward migration. If hatchery water does not provide a unique olfactory signature as an imprinting/homing cue, returning hatchery-origin salmon may demonstrate increased staying rates. To improve the homing of hatchery-origin fish and reduce the risks to natural-origin fish, odor additions to hatchery water to improve imprinting are being investigated. The purpose of this study was to identify odors that may be used by hatcheries to improve imprinting and increase return rates to the hatchery. Odors that are detectable to fish but are not naturally attractive or repulsive may provide potential cues that could be added to the rearing environment and increase homing. Our study tested 15 unique odors to determine possible

odors for hatchery use. Each odor was tested in a Y-maze (a maze with two branches) with the odor dripped into a single branch of the maze. A single Fall Chinook salmon fry was released into the maze, and footage was recorded for 10 minutes. To assess innate responses to test odors, experiment footage will be processed and analyzed using the behavior tracking software Noldus Ethovision XT. With this study, the usefulness of Ethovision XT in hatcheries and related research will be further showcased. The Y-maze footage is currently being processed, and analysis is expected to be completed by April 2026.

UPRfish Cloud: A crew support platform for standardized surveys of upper fish distribution limits

Student

Cárdenas, A. Brent; *Oregon State University, brent.cardenas@oregonstate.edu*

Accurately delineating the upstream extent of fish distribution is fundamental to species conservation, riparian protection, and forest management in the Pacific Northwest. The UPstream Regional LiDAR Model for Extent of Trout (UPRLIMET) predicts fish-bearing streams using LiDAR-derived terrain metrics, including elevation, channel gradient, drainage area, and upstream network length. UPRLIMET+ expands this framework through broader geographic coverage, higher-resolution (1 m) terrain data, and additional environmental predictors. Continued advancement requires standardized field data for model calibration and validation. UPRfish Surveys provide the empirical foundation for identifying fish presence. Protocols employ systematic electrofishing that extends 400 m beyond the last detected fish to establish defensible upper distribution limits. Observations are georeferenced and structured for integration with hydrography and LiDAR-derived variables, generating model-ready datasets. This poster presents UPRfish Cloud, an ArcGIS Online survey support platform that organizes survey data, standardized protocols, and project resources within a structured framework. The platform includes web maps displaying near real-time data submission, supporting field coordination and quality control. The system supports collaborative data collection across public and private partners and prepares inputs for UPRLIMET+ applications. During the 2026 field season, this framework will be applied to streams supporting Westslope Cutthroat Trout (*Oncorhynchus clarkii lewisi*) in northeastern Oregon. Resulting datasets will inform future adaptation of UPRLIMET+ to evaluate species-specific upper distribution thresholds and regional transferability. By linking standardized surveys with high-resolution geomatics and predictive modeling, this framework improves the accuracy and consistency of fish-distribution mapping.

HOT-TO-GRO, tag, move, and let ‘em go: Using the perspective of time to determine efficacy of transplanting White Sturgeon in the Columbia River to mitigate for poor recruitment

Professional

Carpenter, Andrea; *Oregon Department of Fish and Wildlife, andrea.l.carpenter@odfw.oregon.gov*

White Sturgeon (*Acipenser transmontanus*) populations are largely separated from one another in the lower Columbia River due to the series of dams, known as the Federal Columbia River Power System. From 1994 to 1995, a total of 8,449 White Sturgeon were captured from the free-flowing reach of the Columbia River below Bonneville Dam, tagged with passive integrated transponder tags, and released upriver to the impounded reach of The Dalles Reservoir (between The Dalles and John Day dams). The long-term goals of the project were to

determine the feasibility of using transported sturgeon to 1) mitigate for lost recruitment in impounded areas, 2) provide Tribal harvest opportunities, and 3) improve the status of the impounded population by adding outside genetics. Over thirty years of stock assessments in The Dalles Reservoir allowed CRITFC, WDFW, and ODFW to track the long-term performance of the transplanted sturgeon in terms of survival and growth, compared to resident sturgeon. The ability of transplanted sturgeon to survive, grow, contribute to fisheries, and recruit to the broodstock population suggest that transplant supplementation is a viable option to mitigate for reduced White Sturgeon recruitment in areas of the Columba River.

Large Wood Post-Fire in Two Western Oregon Streams

Student

Carpenter, Cassidy; *Oregon State University, carpenc2@oregonstate.edu*

Large wood (LW) is instrumental in providing habitat for fish and other aquatic biota in streams. Therefore, processes that influence stream wood loads can have a fundamental influence on the quality and quantity of aquatic habitats. Wildfire is an increasingly common forest disturbance in the western US with the potential to change stream wood inputs. However, the influence of fire-associated wood additions may vary depending upon the characteristics of wood entering streams. We expect that in areas with a legacy of forest management, wood recruitment from wildfires will differ from wood recruited via individual mortality. While potential for shifts in wood characteristics is logical, direct empirical assessments to test this are uncommon. It is especially rare to have extensive pre-fire datasets that allow for meaningful comparisons. In this study, we leverage pre- and post-fire wood surveys to assess the effects of a large-scale severe wildfire on LW standing stocks in two headwater streams in western Oregon. The North Fork and South Fork of Hinkle Creek are within the Archie Creek fire footprint from 2020. Both streams are on private timber land with ~50-year-old second-growth forests at the time of the fire. Pre-fire LW standing stock data were collected in summer 2007. Post-fire stream wood surveys were conducted in summers 2023 and 2025 (3–5 years post-fire). These surveys revealed a 3 to 4-fold increase in LW frequency after-fire. However, overall LW volume increased less than 20%,due to inputs of smaller wood (in diameter and length) relative to pre-fire stream wood. A cumulative distribution analysis indicated significantly different patterns of wood accumulation before and after fire due to a large number of log jams in the post-fire streams. This research suggests that wildfires indeed increase stream wood loads, but that overall influence on wood volume will vary depending on stand age and large wood distribution within the stream channel.

Changing Frequency and Drivers of Consecutive Droughts in the Pacific Northwest

Professional

Chandel, Vikram Singh; *Washington State University, vikramsingh.chandel@wsu.edu*

Droughts stress agricultural systems, aquatic ecosystems, and regional water management. While recovery is possible in the following year, consecutive droughts can critically strain reservoir storage, instream flows, and habitat conditions—particularly in highly managed basins such as the Willamette Valley. Using the Standardized Precipitation Evapotranspiration Index (SPEI) derived from the gridMET dataset (1979–2025), we identify two prominent back-to-back drought periods in the Willamette River Basin: 2014–2015 and 2020–2021. These events coincided with significant hydrologic stress, affecting reservoir operations and flow management with implications for salmonid habitat and competing water demands. We will quantify historical

trends and assess projected changes in the frequency and persistence of consecutive drought events across the basin, with particular focus on the Willamette Valley. Additionally, we investigate the influence of large-scale climate drivers, including ENSO and the Pacific Decadal Oscillation, on drought clustering and multi-year hydrologic deficits. Understanding the changing risk of consecutive droughts can inform adaptive water management strategies, including Forecast-Informed Reservoir Operations (FIRO), by improving anticipation of prolonged low-flow conditions. This work aims to support more resilient reservoir operations and long-term planning to sustain flood protection, water supply reliability, and ecological function under increasing hydroclimatic variability.

State of the Salmonids III

Professional

Chen, Emily; *California Trout, echen@caltrout.org*

This poster announces the forthcoming State of the Salmonids (SOS) report, the third edition of a comprehensive statewide assessment of threats and status of California's 32 types of trout, salmon, and steelhead. Working together with researchers from UC Davis and UC Berkeley, California Trout staff will gather published research, data, reports, expert judgment, and other information from federal, state, and local partners to analyze populations trends in California's salmonids. Species accounts will summarize the best available scientific information on each species and compile references for each. Each species will then be assigned a threat level based on the methodology of the 2015 CDFW Species of Special Concern report and peer reviewed by species experts, and then compared to results from 2017 and 2008, respectively. Conservation and management actions implemented for each species since 2017 will be highlighted, and actionable recommendations for recovery will be summarized. This poster is a call for assistance from salmonid species experts and those involved in their monitoring and restoration to share information and data that can help in this effort.

Attraction, then Production?: A glimpse at how large wood addition influences salmonid population demography at the riverscape scale

Student

Clark, Noel; *Colorado State University, noelmclark@gmail.com*

Stream habitat enhancement is a growing focus in fisheries conservation; however, key challenges remain in assessing the efficacy of habitat enhancement efforts, particularly in wild aquatic populations. One large question underpinning these challenges is whether physical habitat structures – a common implementation of stream habitat enhancement – increase production of aquatic species or merely attract and concentrate individuals around these structures (known as the production vs. attraction debate). To address this question, we are conducting a manipulative before-after-control-impact (BACI) field experiment in a well-studied stream in Hokkaido, Japan to assess the demographic responses of a multi-species salmonid community to habitat enhancement via large wood addition. We added 80 large wood structures to eight longitudinally distributed 200m treatment sections paired with control sections within the 5.3 km study reach of the Horonai River in June 2024. Approximately 10,000 masu salmon (*Oncorhynchus masou*) were PIT tagged and genetically sampled in the Horonai River across 11 sampling occasions between 2018-2024 as part of an ongoing mark-recapture study, and these occasions represent “before” data. Here we discuss the experimental design process we used to approach this long-standing debate, and we present preliminary results leveraging 11 “before” and three “after” sampling occasions completed since June 2024 to assess the population-level response to wood addition. We see evidence of increased total fish abundance

in treatment compared to control sections following wood addition; however, there is no riverscape scale difference in total fish abundance which may suggest that treatment sections are “attracting” fish from nearby control sections. Future work will assess changes in community composition, biomass, survival, and growth across spatio-temporal scales to understand the mechanisms driving salmonid population responses to stream habitat enhancement.

Eco-evolution between predator and prey: do trout evolve adaptations to predate on threepsine stickleback fish more effectively?

Student

Combrink, Lucia; *University of British Columbia, lucia.combrink@icloud.com*

This project seeks to examine the eco-evolutionary arms race between coastal cutthroat trout (*Oncorhynchus clarkii clarkii*) and one of their natural prey items, the threespine stickleback (*Gasterosteus aculeatus*), in small freshwater lakes on the coast of British Columbia. It is well-established that stickleback evolve rapidly in response to predation by trout, often developing distinct defensive morphology (i.e., longer spines) in lakes where they co-occur with trout. In this project we examine whether the evolution of defensive traits in stickleback also drives an evolutionary response in the predator. We ask: do trout also evolve morphological traits that can increase their predation efficiency on stickleback, even as stickleback evolve to escape predation? We address this question by examining defensive morphology of stickleback in a lake both with and without naturally occurring (i.e., unstocked) cutthroat trout from the Sunshine Coast of British Columbia. This project investigates previously unexplored perspective of the predator at the end of an evolutionary feedback loop, highlighting how evolution could be perceived as a cascade of feedbacks. This project was financially supported by the WDAFS Small Project Grants program.

Tracking Invasive Crayfish Populations and Their Impacts in Southwest Oregon

Professional

Dammann, Denise; *Denise Dammann Consulting, ddammann@jeffnet.org*

The only native crayfish in Western Oregon is *Pacifastacus leniusculus* (signal crayfish). Non-native *Faxonius neglectus* (ringed crayfish) and *Procambarus clarkii* (red swamp crayfish) have been introduced into the Umpqua and Willamette Basins in SW Oregon. Observations found that within a decade after *F. neglectus* were discovered at sites historically abundant with native crayfish, *F. neglectus* were well-established and native crayfish were not detected. These observations, combined with the lack of data on invasive crayfish and the concern for impacts to the North Umpqua Subbasin’s aquatic ecosystems, prompted presence/absence crayfish surveys from 2022-2025. Objectives were to find the leading edge of invasive crayfish populations or isolated populations in the North Umpqua subbasin and survey adjacent drainages connected by roadways. Site selection was based on historically-known locations, and survey results informed future site selection. At each site, a combination of both baited trapping and baiting, observing, and netting was used. Survey results found both *F. neglectus* and *P. clarkii* expanded their range from historically-known locations. Also, at some sites where previously there had been both native crayfish and *F. neglectus*, the invasive crayfish outcompeted the natives and only *F. neglectus* were present. Finding the leading edge of ringed crayfish population in Sharps Creek a tributary to the Row River, creates an opportunity to test methodologies of control to slow the spread of the population upstream. Early detection is the first step to understanding the impact of invasive crayfish on stream ecosystems. Studies of other crayfish introductions have consistently found that non-native crayfish have negative effects on the ecosystem. They prey on native aquatic organisms and

their eggs, spread diseases, compete for food, can modify their habitat, and are better adapted to avoid predation. More research will be conducted in the future.

Baseline Matters: Building the Foundation for Fish Response to Habitat Restoration

Professional

Drascic, Frederick; *Oregon Department of Fish and Wildlife, frederick.j.drascic@odfw.oregon.gov*

Innovation in floodplain restoration is the landmark of practice in the Pacific Northwest. In recent years, valley reset and stage 0/8 (S0) restoration approaches have gained attention as evidence of ecological uplift has been documented. These restoration approaches propose to reset valley-scale processes (hydrologic, geologic geomorphic and biological) to improve the resiliency and sustainability of ecosystem services. But how effective are they? These restoration approaches have not been investigated thoroughly, particularly in regard to fish response. In the Grande Ronde Basin, the Wallowa-Whitman National Forest, and local Federal, State, Tribal, and NGO partners, have embarked on implementation and monitoring of watershed-scale valley reset/S0 restoration on 20+ miles of fish bearing streams throughout the Meadow Creek watershed. Watershed-scale restoration that incorporates valley reset restoration tools offers an opportunity to learn more about the biological and geophysical effects of process-based restoration. As part of the restoration planning, scientists and practitioners are co-developing the timeline for work to facilitate pre- and post-restoration data collection. In particular, this long-term monitoring project seeks to understand and interpret the effects of these restoration efforts on several fish response metrics at the watershed level, with a particular emphasis on *Oncorhynchus mykiss* (resident rainbow trout and anadromous steelhead). Seasonal sampling occurs for one month every June and September across 72 sites. Over the first two years of monitoring, a total of 2,734 *O. mykiss* have been pit-tagged, 496 recaptured, and 464 tallied.

A Tale of Two Facilities: 45 years of the ODFW Salmon and Trout Enhancement Program (STEP) told through two early programs

Student

Duckwall, Cole; *Oregon State University, duckwalc@oregonstate.edu*

The ODFW Oregon Salmon Trout Enhancement Program (STEP) provides regional capacity for recreational, economic, and educational opportunities for local communities. The State of Oregon is divided into 10 different STEP regions that host volunteer opportunities for involvement in fish habitat surveys, habitat restoration, fish culture, storm drain marking, and other projects. We start with an overall description of regional production of salmonids for economic, recreational, and restoration purposes. In 2023, 4.72 million salmonids were reared or released statewide, and the program collected 7,761 fish for broodstock. In that same year, 618 miles of waterways provided opportunities for 453 participants conducting stream restoration, improved fish passage, and planted adult carcasses for increasing nutrients. In addition to describing the overall STEP program, we provide a more in-depth comparison of two STEP facilities to illustrate some of the diversity in activities and outcomes. In 1983 the city of Depoe Bay formed the Salmon Enhancement Commission that used hatchboxes to boost Coho fisheries to comparable populations of the 1940's-50's. In that same year, establishment of the Morgan Creek hatchery was initiated in the Tenmile, Coos, and Coquille STEP district with the goal of rehabilitating and improving natural habitat and native fish stocks, among other goals including citizen involvement. Both the Depoe Bay and Morgan Creek STEP facilities continue

to be volunteer operated and produce annual releases of salmonids for harvest and other opportunities. In this poster, we focus on how STEP provides enhancement to salmon and trout in those specific regions and local communities economically, educationally, and recreationally.

Hydraulic Benefits of Baffled, Parallel, Flowthrough Raceways for Chinook Salmon Culture

Professional

Farnworth, Christopher; *USFWS, christopher_farnworth@fws.gov*

Baffled raceways provide a practical and hydraulically efficient method for improving solids transport and rearing conditions in salmonid culture systems. At the Little White Salmon national Fish Hatchery, we evaluated the hydraulic effects of baffle inserts in Chinook salmon raceways located on station, focusing on how flow redistribution influences waste transport and overall raceway cleanliness. Previous studies have shown that baffles increase flow uniformity, reduce dead zones, and improve fish health. Our observations conditionally align with these findings. Although total inflow remains constant in our raceways, baffles modify the effective flow area, increasing local velocity according to the continuity relationship Q (Flow Rate) = V (Velocity) * A (Area). This increase in bottom velocity enhances bed shear stress, a key driver of solids mobilization, which can be approximated by the “Bed Shear Stress Equation”. By increasing shear stress and guiding turbulent flow, baffles maintain a self-cleaning bottom where feces and uneaten feed are continuously transported toward the tail end of the raceway for removal. Similar improvements in solids transport efficiency have been documented in engineered raceway systems. These hydraulic benefits translate into more predictable rearing conditions, improved waste removal, and reduced labor associated with manual cleaning. Our findings, which account for the lack of serious risk to adult survival support the broader conclusion that baffled raceways offer a scalable, hydraulically optimized approach for improving Chinook salmon culture in conservation hatcheries with similar systems.

Trends in Entrainment of Threatened sDPS Green Sturgeon in the Central Valley Project and California State Water Project Pumping Facilities

Professional

Fitz, Kyra S.; *National Marine Fisheries Service, kyra.fitz@noaa.gov*

To be submitted by early March upon travel approval

The Incredible Journey: Using Coded Wire Tags to understand hatchery migrations and returns

Professional

Foster, Sarah; *Oregon Department of Fish and Wildlife, sarah.l.foster@odfw.oregon.gov*

Coded wire tags are now a standard in measuring and predicting return and catch rates of hatchery salmon. Improved technology through the use of AutoFish trailers now allows coded wire tags to be more efficiently implanted in hatchery fish in mass quantities. When coded wire tags are retrieved through sampling, either at the hatchery or via creel or spawning ground surveys, information can be retrieved about migration length, age at spawning or harvest, rates of returns, and incidences of stray or precocious returns. This information can be vital in making future predictions about salmon runs, tracking hatchery success by year, and noticing trends in specific rivers or hatchery locations. This data is not only important in establishing regulations, but in providing a deliverable progress report to the public, as well as other stakeholders who

invest in hatcheries. This poster will display the migration length and pertinent life cycle of groups of coded wire tagged salmon from several hatcheries, and will demonstrate any changes in trends over time. It will also demonstrate the cooperative partnerships between the ODFW Fish Identification program and federal, state, and tribal agencies; further illustrating how these partnerships facilitate refined management and stewardship of hatchery fish.

Using Dragonfly Nymphs to Estimate Mercury Risk to Fish Consumers in the Santiam River Basin, Oregon

Student

Fretwell, Luca; *Oregon State University, fretwell@oregonstate.edu*

The Willamette River basin provides essential access to fish for cultural, traditional, subsistence, and nutritional consumption. Yet the Willamette River and many of its tributaries fail to meet water quality standards for some environmental contaminants, including mercury, a dangerous neurotoxicant that poses significant risks to human health. Humans are primarily exposed to mercury by eating fish and rice, and fish consumption advisories have been in place throughout the Willamette River basin since 2006 to warn consumers of mercury exposure. The Santiam River, a major tributary of the Willamette, offers extensive recreational fishing opportunities, could benefit from additional mercury risk assessments. Dragonfly larvae are a useful biosentinel for estimating mercury risk because they are present in a wide variety of freshwater habitats, including the Santiam River, have high site fidelity, and their mercury concentrations are correlated with co-located fish mercury concentrations. We collected dragonfly larvae from 15 sites throughout the Santiam River system and quantified mercury concentrations in >10 specimens/site. Using published regression equations, we used our dragonfly data to estimate mercury concentrations via bioaccumulation in 4 fish guilds to evaluate potential mercury exposure through fish consumption within the Santiam River basin. Preliminary data indicated that 7 sites were below existing benchmarks for protection of human health, and 3 sites had concentrations that indicated sport fish may exceed the EPA methylmercury criterion of 0.3 mg/kg ww. Results of this analysis may shed light on dietary health concerns at finer spatial scales such as smaller tributaries and commonly fished rivers. These data could be used to prioritize future monitoring and mitigation to make fish consumption safer for all.

Using hook and line sampling in Northern California's Sandy Beach Surfzone to evaluate surfperch populations, inside and outside of MPAs

Student

Gabay, Noah; *Cal Poly Humboldt, nsg27@humboldt.edu*

Marine Protected Areas are thought to increase fish size and abundance, however quantifying these effects is difficult. While many stretches of Northern California's coast are "protected", little research is being done to evaluate their performances. The sandy beach surf zone in this region is data poor, with limited prior research available on the fish present. The fish assemblage in this habitat is composed largely of Redtail (*Amphistichus rhodoterus*) and Silver surfperch (*Hyperprosopon ellipticum*), in the family Embiotocidae, which are targeted by recreational fishers across the region. In this study we used a standardized hook and line protocol to collect weight, length, and CPUE data on surfperch across three protected sites and three reference sites in Northern California from May - October, 2024 & 2025. In total we caught 937 Redtail and 759 Silver surfperch. Redtail and Silvers were 132 to 364 mm and 40 to 850 grams, and 90 to 260 mm and 30 to 290 grams, respectively. Preliminary catch data suggest potential differences in surfperch size and catch rates between protected and reference sites. This repeatable,

relatively low-cost sampling design is well suited for integration into long-term monitoring programs. Since hook-and-line gear is widely available and easily standardized, this research approach is transferable across a diverse array of aquatic systems.

Coho Salmon fry growth and survival fed three commercial starter feeds

Professional

Gannam, Ann; *USFWS, Abernathy Fish Technology Center, ann_gannam@fws.gov*

In Mountain-Prairie Region many of the National Fish Hatcheries (NFHs) have used Skretting starter feeds successfully with the fish showing acceptance and good growth. Recently Skretting has stopped producing feeds at their Tooele, UT facility. Some Skretting feeds will still be available from Canada. Questions have arisen from Mountain-Prairie Region hatchery managers and biologists as to which feeds are available and would perform well for fish cultured at their facilities. Several commercial feeds are available from across the U.S. for salmonid fry and other fish species and all NFHs use them. However, feed manufactures including Skretting/Bio-Oregon, Cargill/EWOS, Rangen, Ziegler, Otohime and Star Milling produce fry feeds starting with the mash to larger feed sizes. Not all these feeds have been tried across the country, and some may show better results and be more economical than the feeds currently used. The Abernathy Fish Technology Center (FTC) in the Pacific Region tested three starters feeding Coho Salmon. A trial at Bozeman Fish Technology Center (FTC) Mountain-Prairie Region tested Bio-Oregon, BioVita and BioPro, Otohime and initially Skretting fry feeds. During the trial Skretting feed became unavailable and a switch was made to Bio-Oregon BioClark's. In the latest test with Greenback Cutthroat, they added Rangen soft moist fry feed. Ziegler feeds would be an alternative to test. At the Northeast Fisheries Center in the Northeast Region feed trials were run with Shasta strain Rainbow Trout and Bloaters (a type of deepwater cisco). The project will identify which commercial fry starter feeds are best across salmonid species. This current poster presentation will detail the results seen at the Abernathy FTC using Coho Salmon.

Passage Guidelines for Select Native Fishes of the Pacific Northwest

Professional

Gray, Ann; *USFWS (retired), ann_e_gray@fws.gov*

To broaden perspectives on fish passage for multiple native fishes in the Pacific Northwest, U.S. Fish and Wildlife Service summarized the state-of-the-science and provided guidelines for implementation of nature-based and technical fish passage solutions. Passage needs for Bull Trout (*Salvelinus confluentus*), Pacific Lamprey (*Entosphenus tridentatus*), White Sturgeon (*Acipenser transmontanus*), Freshwater sculpins (Family Cottidae) and small-bodied fishes (e.g., sculpins, minnows, suckers, stickleback, sand rollers, non-anadromous lampreys, etc.) in the Pacific Northwest region of the United States are addressed. These Guidelines include links to useful resources, which should be consulted for more in-depth and detailed information (https://www.fws.gov/media/passage-guidelines-select-native-fishes-pacific-northwest)
To complete their life cycles, most fishes must migrate between habitat types, flow conditions, and thermal regimes, which has become more critical in the face of climate change. On a broader population-level scale, connectivity facilitates the recolonization, range expansion, and migration of native fish species. Preserving and restoring aquatic connectivity will help ensure the long-term viability of fish populations. Little attention has been given to passage needs for culturally and ecologically significant fishes relative to the focus for anadromous salmon and steelhead (*Oncorhynchus* spp.). This document begins to fill that gap, which is timely given the

growing interest in increased connectivity in freshwater aquatic systems. Sections on other native species will be added as that information becomes available. Primary objectives of these Guidelines are to: 1. raise awareness of the different passage needs for "other" native fishes; 2. discuss passage constraints (e.g., jump heights, flow depths, velocities); 3. provide general recommendations to improve passage for a variety of fish life histories; and 4. provide links to other resources.

Tribal-Led Integration of Traditional Ecological Knowledge and Genomic Tools for Salmon Conservation

Professional

Henrikson, Cody Nuk'ulaełen; *Chickaloon Village Traditional Council, cahenrikson@chickaloon-nsn.gov*

Chickaloon Village Traditional Council (CVTC), an Ahtna Dene Tribe in Southcentral Alaska. For the Ahtna people, Salmon People, salmon are both ecological indicators and cultural keystone species. As ecological, social, and climatic pressures intensify across western watersheds, incorporating multiple perspectives into fisheries science is increasingly essential. CVTC integrates Traditional Ecological Knowledge (TEK) with contemporary fisheries science to protect and restore culturally important salmon populations. CVTC's Tribal-led TEK study documents observations of salmon distribution, run timing, habitat conditions, and environmental change within the Chickaloon Village customary use area. Through community-based participatory research and semi-structured interviews, Tribal Citizens and other knowledge holders share long-term ecological knowledge that extends beyond available written records and agency data sets. These qualitative insights are systematically integrated with quantitative research efforts, including habitat assessments, fish passage restoration design, stable isotope analysis ($\delta^{15}N$), sedimentary environmental DNA (sedDNA) TEK has informed CVTC hypotheses regarding historical species presence, spawning reaches, and watershed connectivity, guiding site selection for molecular sampling and restoration prioritization and has influenced the implementation of several habitat restoration projects. In turn, genomic and isotopic data provide complementary lines of evidence that support or refine community knowledge. This integrative approach demonstrates how Indigenous knowledge systems and molecular tools can strengthen one another to build more complete ecological baselines. By centering Tribal perspectives in research design, CVTC advances a model of fisheries science that is collaborative, culturally grounded, and methodologically rigorous. As fisheries professionals consider how to harness "The Power of Perspective" this work offers a practical example of how Tribal-led science can enhance resilience, relevance, and respect in salmon conservation across the West.

A swimming success: Comparing the 2025 and 2024 fall Chinook run in the Upper Klamath Basin

Professional

Honda Scully, Kai; *Oregon Department of Fish and Wildlife, kai.h.scully@odfw.oregon.gov*

Once the third most productive river for salmon in the lower 48, the Klamath River had been drastically changed by the construction of four hydroelectric dams. These dams have blocked fish migration into upstream habitats since the construction of the first dam in 1912. To recover salmon populations in the Klamath River Basin, the four mainstem hydroelectric dams were removed in 2023-2024 opening hundreds of miles of historic habitat and returning the river to a

more natural flow and temperature regime. Since the removal of the final dam in 2024, salmon and other anadromous fish species can once again access the Upper Klamath Basin, with the first salmon spotted in the Spencer Creek tributary only 14 days after the dam removal. Throughout the fall of 2024, Oregon Department of Fish and Wildlife observed significant spawning throughout the Upper Klamath Basin with an estimated run size of 521 fall run Chinook. Now in 2025, the salmon have returned with significantly larger numbers, with an estimated run size of 3450. The salmon have begun to spawn in new locations throughout the mainstem Klamath River, as well as passing through the fish ladders on both the Keno and Link dam reaching the Upper Klamath Lake for the first time in over a century. In this poster I will be comparing the 2024 and 2025 Upper Klamath River fall Chinook salmon run, looking at the differences in redd counts, carcasses sampled, and live fish counts, as well as highlighting the new spawning ground used on the mainstem Klamath river.

Mind the Gap: Jacks, Gene Flow, and Temporal Genetic Structure in Reintroduced Coho

Professional

Horn, Rebekah; *CRITFC, rhorn@critfc.org*

In the mid- to late 1990s, the Yakama Nation Fisheries reintroduced Coho salmon (*Oncorhynchus kisutch*) into the Wenatchee and Methow rivers of the mid-Columbia Basin from a Lower Columbia River–derived stock. One objective of the Mid-Columbia Coho Reintroduction Program is to evaluate whether these populations are becoming locally adapted while minimizing unintended genetic divergence among broodlines. To address this objective, we assess temporal genetic divergence using parentage-based tagging (PBT) and population genomic analyses, with particular attention to broodstock age structure. We analyzed SNP data from broodstock sampled between 2012 and 2025, representing four to five generations per broodline. Parentage-based tagging was used to estimate reproductive success across parental and grandparental generations. Population genetic metrics (heterozygosity, F_{IS}, F_{ST}, and PCA) were used to evaluate genetic structure and divergence, and adult migration timing was compared among broodlines using returns at Priest Rapids Dam. Genetic structure was strongly associated with the three-year broodline cycle. Broodline significantly influenced reproductive success in both parental and grandparental analyses ($p < 0.0001$). Broodline B produced more offspring and grandoffspring than broodlines A and C, while broodline C consistently showed reduced reproductive success. Broodline B also exhibited significantly later adult migration timing relative to broodlines A and C. These results indicate that strong broodline structure and limited overlap among spawning years contribute to temporal genetic divergence. Incorporating two-year-old males (jacks) into the broodstock can increase gene flow among adjacent brood years, reducing genetic divergence while maintaining a locally derived broodstock and supporting long-term population stability.

Frequent Flyers: Higher Recapture Rates of Wild-Origin Kootenai River White Sturgeon (*Acipenser transmontanus*) Using Baited Capture Methods

Professional

Huffman, Samantha; *Oregon Department of Fish and Wildlife, sammielynne14@gmail.com*

Naturally recruited Kootenai River White Sturgeon (*Acipenser tranmontanus*) (KWSG) in the Kootenai River, Idaho, USA, are becoming fewer and fewer. Monitoring of KWSG includes both unbaited capture methods (gillnets) and baited capture methods (setlines and angling). Understanding how capture methods may influence which portion of the population we sample

can help us better monitor the population for long-term management. We analyzed 30 years of KWSG capture data from setlines, gillnets, and angling. This information was then used to demonstrate the relationships between size and recapture, by hatchery or wild origin, and to identify these relationships. We used univariate analyses to explore how sample methods influenced repeated captures of the same individual. Baited sets had right-skewed distributions with an individual fish being recaptured up to 60 times. Fish recaptured more than 10 times were predominantly of wild origin. This poster provides a descriptive overview of recapture histories of the KWSG and wild sturgeon, potentially exhibiting trap-happy behavior. These patterns may be a combination of sampling design, gear use, and individual size behavior. The findings show that larger, wild-origin KWSG are more likely to be caught numerous times on a baited set than hatchery fish. The results are intended to support the interpretation of monitoring data and guide future evaluation of factors influencing sampling efforts and wild population monitoring.

Characterizing Spatial Heterogeneity of Dissolved Oxygen Within and Among Beaver Ponds

Student

Kahle, Bayly; *Oregon State University, kahleb@oregonstate.edu*

Beavers (*Castor canadensis*) are ecosystem engineers that can transform stream ecosystems by constructing pond complexes that alter stream hydrology, trap sediment, and increase the range of conditions available to aquatic organisms. As beavers are increasingly incorporated into restoration, it is important to quantify how they alter the range and spatial distribution of water quality parameters. Although beaver effects on dissolved oxygen have been studied, the variation of dissolved oxygen within and among beaver ponds remains poorly understood. The goal of this study was to characterize this spatial heterogeneity in a complex of beaver ponds in Mulkey Creek, a third order tributary of the Mary's River in Corvallis, OR. During summer and fall, we placed dissolved oxygen loggers in nine ponds to characterize both within- and among pond variation. To quantify finer scale patterns of spatial heterogeneity in DO within a subset of ponds (and reveal the extent of hypoxia), we mapped dissolved oxygen at dawn using Global Navigation Satellite System (GNSS) positioning and handheld DO probes. We recorded extreme spatial and temporal variation in DO, with values ranging from anoxia (~0 mg/L) to supersaturation (>20 mg/L). Heterogeneity within ponds was associated with primary and secondary channel features that likely have different water residence times. Our work shows that beaver effects on dissolved oxygen are more complex than previously recognized and require intensive monitoring to accurately quantify.

Inferring Steelhead Abundance in the Hood River Using Genetic Monitoring Over Multiple Generations

Professional

Koch, Ilana; *Columbia River Inter-Tribal Fish Commission, koci@critfc.org*

Estimating population abundance is essential for monitoring species of conservation concern, such as anadromous salmonids. In systems where traditional fisheries methods are infeasible, genetic monitoring provides a powerful alternative. Close-kin mark-recapture (CKMR) uses kinship relationships among genotyped individuals within a population to estimate abundance. We applied CKMR-based genetic tools to estimate the abundance of anadromous Steelhead in Oregon's Hood River, where dam census counts ceased after Powerdale Dam was removed in 2010. Juvenile Steelhead were sampled annually via rotary screw traps during a base period spanning five broodyears (2003–2007), with corresponding adult samples collected during the

same years. Prior to dam removal, adult census counts and tissue samples were collected from all fish passed above the dam, providing a valuable reference of census size (N_c). Both juvenile and adult Steelhead samples were genotyped using a GT-seq panel of 220 neutral markers. Effective number of breeders (N_b) was estimated using COLONY and N_eEstimator, and compared to N_c estimates to establish N_b/N_c ratios from the base period. Preliminary results indicate that N_b/N_c ratios remained relatively stable across years, supporting the use of N_b as a proxy for estimating annual steelhead abundance. Ongoing analyses are underway to validate these findings by assessing the contribution of resident versus anadromous spawners to juvenile collections and evaluating interannual variation in N_b. This study highlights the utility of genetic tools for long-term monitoring of natural-origin Steelhead in the Hood River and their potential to inform conservation and management decisions in the absence of traditional census methods.

Spatial effects of climate warming trends and extreme events on salmonid thermal habitat in the Clackamas River Basin, OR

Student

Krochta, Michael; *Portland State University, mkrochta@pdx.edu*

Rising stream temperatures driven by climate change increasingly threaten coldwater aquatic species, yet the combined and interactive effects of long-term warming trends and short-duration extreme events remain understudied. In the Clackamas River Basin, Oregon, USA, we assessed long-term stream temperature patterns from 1991 to 2023 and projected mid- and late-century conditions using spatial stream network models and CMIP6 climate projections under SSP2-4.5 and SSP5-8.5 scenarios. Basin-wide warming was observed, with higher-elevation tributaries exhibiting greater thermal resilience and lower-elevation subwatersheds showing greater vulnerability. Projected increases in maximum seven-day average daily maximum temperatures of 1.42 to 2.04 °C by the 2060s and 1.84 to 3.24 °C by 2080s are expected to reduce thermally suitable salmonid habitat by 27% to 36% and 35% to 51%, respectively. We then evaluated summer stream temperature responses to the 2020 wildfire season and 2021 extreme heat event across eight tributaries using bootstrap analysis, predictive modeling, and thermal threshold exceedances. Severely burned tributaries experienced significant post-fire warming of 2.39 to 3.19 °C, and the number of days exceeding state thermal limits for anadromous fish doubled relative to pre-fire conditions. Elevated temperatures during the 2021 heat event persisted for multiple subsequent years in severely burned watersheds, exceeding near-term climate-based projections and indicating accelerated thermal degradation beyond expected trends. Together, these results demonstrate that event-scale disturbances amplify background warming, reshaping thermal regimes and reinforcing the importance of restoring salmonid habitat and protecting cold-water refuges.

Assessing the Ecological Impacts of Kellogg Dam Removal: eDNA Insights from the Kellogg Creek-Mt. Scott Watershed, a BACI Study

Professional

Lara, Andy; *Cramer Fish Sciences – Genidaqs, andylara16@gmail.com*

The Kellogg Creek Restoration and Community Enhancement Project in Milwaukie, Oregon, is a major effort to restore ecological function and expand community access to nature. A central component is the planned removal of Kellogg Dam, which would reopen approximately 15 miles of upstream habitat, improve flood resilience, modernize aging infrastructure, and enhance opportunities for recreation and environmental education.To support this effort, Cramer Fish Sciences and the North Clackamas Watersheds Council implemented a

before–after–control–impact (BACI) study using environmental DNA (eDNA). Surveys were conducted from 2022 through 2025 across the Kellogg Creek–Mt. Scott watershed, with Johnson Creek serving as a control. The study evaluates the presence and distribution of Coho Salmon, Chinook Salmon, Steelhead/Rainbow Trout, Pacific Lamprey, Coastal Cutthroat Trout, and other native species in relation to the existing dam and anticipated removal. Results reveal consistent seasonal and spatial patterns. Coho and Chinook were detected upstream of the dam during fall spawning periods, while Steelhead/Rainbow Trout were detected more consistently throughout the year, often peaking in winter. Coho and Chinook detections declined after spawning and were typically absent by spring, suggesting limited reproductive success or downstream juvenile movement. Coastal Cutthroat Trout, added in 2024, were detected at multiple upstream sites across seasons, indicating established presence in the watershed. Pacific Lamprey were not detected upstream of the dam in any year but were present at the Johnson Creek control site, suggesting the dam may limit passage for this species. Additional surveys confirmed the presence of two native mussel species, while turtle sampling yielded no detections, likely reflecting survey limitations. Together, these findings provide critical ecological baseline data and strengthen the foundation for evaluating conservation outcomes following dam removal.

Lessons Learned from Large-Scale NOAA Habitat Restoration Projects in Washington State

Professional

Lee, Larissa; *NOAA Restoration Center, larissa.lee@noaa.gov*

NOAA's Office of Habitat Conservation (OHC) has implemented an unprecedented amount of habitat restoration and resilience initiatives across Washington state within the last five years through its Community-based Restoration Program (CRP). This poster synthesizes the ecological outcomes and programmatic lessons gleaned from this intensive portfolio of implemented and ongoing projects. We will detail the geographic scope and types of restored habitats, the partnerships developed, and the documented results. The analysis will focus on evaluating the impacts on salmon and steelhead, the recovery of their habitats, and the enhancement of long-term habitat resilience against stressors. It will also describe the impacts of these projects to our partners' capacity to advance restoration. Furthermore, we offer reflections from the OHC Restoration Center's Washington Team, providing a robust analysis of practices, emerging challenges, and strategies for maximizing the efficacy of future large-scale habitat restoration efforts in the Western United States. This work provides a valuable evidence base for conservation practitioners, informing future strategies for accelerating the recovery of fish species.

Influence of Delta Channel Dendritic Structure on Juvenile Chinook Salmon and Fish Communities

Professional

LeMoine, Michael; *Skagit River System Cooperative, lemoine_mike@yahoo.com*

River deltas are coastal systems with complex networks of channels and bars shaped by fluvial and marine processes. Terminal channels within deltas often terminate inland, forming dendritic networks. While dendritic networks are well-studied in freshwater systems for their effects on hydrology, sediment transport, nutrient cycling, and biological exchange, the structure and function of dendritic terminal channels in tidal deltas remain less understood. Historically, many complex networks were lost or simplified due to diking, drainage, and channel modification,

prompting contemporary restoration efforts aimed at reconstructing terminal channels. We evaluated how the dendritic structure of terminal channels influences the distribution and abundance of juvenile Chinook Salmon (Oncorhynchus tshawytscha) and other fish species. Treating delta dendritic networks as analogous to stream systems, we quantified network topology, including branching, nodes, and connectivity; and related these attributes to fish occupancy and abundance. We hypothesized that larger terminal channels may limit juvenile Chinook Salmon accessibility over a tidal cycle, whereas greater network complexity would increase species richness and support higher salmon abundance by providing diverse habitats and foraging opportunities at channel confluences. We observed structured fish assemblages along blind tidal channel networks, indicating that tidal channel excavation restores spatially organized habitats that support juvenile Chinook Salmon and advance salmon recovery.

Utility of Parentage Based Tagging for Research, Monitoring, and Evaluation of Hatchery Programs within the Columbia River Basin

Professional

Lewis, Devayne; *Columbia River Inter-Tribal Fish Commission, dlewis@critfc.org*

Salmon and steelhead hatchery programs in the Columbia River Basin (CRB) are essential for sustaining population abundances and mitigating the impacts of hydrosystem development. Hatchery managers rely on robust research, monitoring, and evaluation (RME) tools. Parentage-based Tagging (PBT) is a modern genetic approach that offers several advantages over conventional tagging methods such as coded wire tags, physical marks, and Passive Integrated Transponders. These advantages include relatively low cost, nearly 100% tagging rates, elimination of tag shedding, and non-lethal tag recovery from any life stage. PBT baselines for Chinook Salmon and Steelhead were first established in 2008 in the Snake River Basin and expanded by 2012. Integrating PBT-based RME data from adult returns with other monitoring efforts provides hatchery managers a comprehensive means to track abundance, run timing, and harvest utilization across the CRB. The objective of this study was to evaluate the utility of PBT for comprehensive RME by comparing observed estimates of percent PBT-assigned, age and stock composition, and relative abundances of stocks passing Bonneville Dam to expected values derived from broodstock collections spawned in 2023. Expected percent PBT assignments varied widely among collections due to differences in integrated and segregated program designs. For 52 Chinook Salmon collections (N = 56,149), the average expected PBT assignment was 89.9% (range: 57.3–100%), while 15 Steelhead collections (N = 5,019) averaged 94.6% (range: 81.2–100%). Observed values generally aligned with expectations, with rare deviations explained by intentional inclusion of natural-origin fish in broodstocks. Similarly, discrepancies in age and stock composition and Bonneville Dam passage estimates were infrequent and interpretable. Routine monitoring of these metrics using PBT can enhance hatchery managers' ability to evaluate program performance and adaptively manage CRB hatchery stocks.

Tribal-academic monitoring efforts describe juvenile rockfish occurrence in Trinidad Harbor, 2024-2025

Professional

Marin Jarrin, Jose; *Cal Poly Humboldt, jose.marinjarrin@humboldt.edu*

Rockfish are an economically important resource with high cultural and ecological value for resident Tribes and local communities. Understanding juvenile rockfish rearing areas and abundance is an essential component for accurate management and stewardship. As part of a larger group effort to monitor Tribally important fisheries species and develop capacity to

improve fisheries resilience to climate change, we placed three SMURF (Standard Monitoring Units for the Recruitment of Fishes) traps on the seasonal extension of the Trinidad Harbor Pier from late May through late August in 2024 and 2025. The traps were monitored weekly; fish were counted, measured (thirty per species), and assigned to species or morphotype because some species of juvenile rockfish are so similar morphologically as to be indistinguishable. To have a better understanding of the species present, we took fin clips opportunistically from juvenile rockfish for DNA barcoding, using the resulting sequences to identify percent similarity via NCBI BLAST (GenBank). Non-rockfish species captured included cabezon, greenling, penpoint gunnel, northern clingfish, and sculpin. The number of juvenile rockfish caught was very different between years, with 1,023 caught in 2024 and 13,133 caught through August of 2025. At least eight species of rockfish were identified through barcoding, including black, quillback, and yellowtail rockfish. Average lengths increased over the course of each season, with size ranging from <30 to >80 mm total length. This study indicates Trinidad Harbor is particularly important for juvenile rockfish species.

Molecular Detection of a Cryptic Microsporidium: New Tools to Address Pre-spawn Mortality in Pacific Salmon

Student

Morgan, Bailey; *Oregon State University, morganba@oregonstate.edu*

Chinook salmon (*Oncorhynchus tshawytscha*) play a vital role in the economy, culture, and ecological health of the Pacific Northwest. Many populations are threatened by increasing rates of pre-spawn mortality (PSM), with rates reaching 65% on the Columbia River and up to 90% on the Willamette River. A large-scale histopathological surveillance effort identified a correlation between PSM and Adult Salmon Enteritis (ASE), a previously undescribed disease characterized by ulcerative enteritis and profound intestinal tract inflammation, and associated a novel microsporidium with a subset of ASE infections. *Enterocytozoon schreckii* was first described in 2022 and infects the enterocytes of Chinook salmon, and transmission experiments confirmed an infectious etiology for ASE, with *E. schreckii* among the associated pathogens detected in afflicted fish. However, its broader relationship to ASE remains poorly understood, in part because current surveillance techniques rely on labor-intensive histopathology that struggles to detect early infections and low-level parasite burdens. *E. schreckii* is closely related to *Enterocytozoon bieneusi*, a human pathogen later found to be far more prevalent than initially recognized following the development of molecular diagnostics — a precedent that motivates our approach here. We describe the development of a quantitative polymerase chain reaction (qPCR) assay targeting the small subunit ribosomal RNA gene of *E. schreckii*, validated on field samples and optimized for high sensitivity and specificity. Screening of archived and prospective samples reveals a higher prevalence and broader geographic distribution than described by histopathology alone, consistent with patterns observed for *E. bieneusi*. This tool anchors a multi-component study investigating the *E. schreckii*-ASE relationship, advancing our understanding of ASE epidemiology and PSM in a threatened salmon species.

Response of Adfluvial Native Salmonids to Northern Pike suppression on Coeur d'Alene Lake

Professional

Myers, Elizabeth; *Coeur d'Alene Tribe, elizabeth.myers@cdatribe-nsn.gov*

Historically, Westslope Cutthroat Trout (WCT) and Bull Trout (BT) were important food sources for the Coeur d'Alene Tribe, but current populations are severely depleted in the Coeur d'Alene Basin. The Coeur d'Alene Basin has faced many anthropogenic disturbances including pollution

from mining and agriculture runoff, logging, altered hydrology from construction of the Post Falls dam, and the introduction of nonnative fish species. There are greater than 20 species currently occupying Coeur d'Alene Lake, but only seven of those species are native. While both competition and predation from multiple nonnative species have likely played rolls in depleting WCT and BT populations, predation by Northern Pike (NP) has been identified as one of the predominant drivers of their decline. Research has shown that NP could consume up to 50% of WCT spawners destined for local watersheds annually. Active removal of NP has occurred in Windy Bay since 2015 and efforts across the southern end of the lake were added in 2019. Catch rates of NP in Windy Bay have remained at sustained low numbers since 2020 while catch rates in the southern end have been less consistent, but still show a downward trend. Juvenile-to-adult return rates of adfluvial WCT in Lake Creek, the primary tributary to Windy Bay, have shown a positive response to removal efforts, where mean return rates have increased from 1.6% to 4.2% since NP suppression efforts began. Greater juvenile survival results in increased numbers of first-time spawners, which tends to point to an increasing overall population. In 2025, 225 first-time spawners were recorded, which is the highest number since data collection began. Additionally, incidental bycatch rates of both WCT and BT have increased since suppression efforts began in the southern end.

Reproductive Biology and Proximate Composition of *Lethenteron* spp. in Alaskan River Drainages

Professional

Perk, Amber; *Confederated Tribes of Warm Springs, alperk@alaska.edu*

Anadromous Arctic Lamprey *Lethenteron camtschaticum* and freshwater-resident Alaskan Brook Lamprey *L. alaskense* are paired species with differing life history strategies. Alaskan populations of lampreys remain generally understudied. To increase our understanding of Alaskan lampreys, we characterized the reproductive condition and bioenergetic cost of the life-history strategies of Arctic and Alaskan Brook Lampreys in the Yukon and Susitna River drainages by examining size at maturity, fecundity, gonadosomatic index (GSI), hepatosomatic index (HSI), and proximate composition of lampreys at various stages during their spawning migration. A sample of 180 (74 female) lamprey from Emmonak (lower Yukon River) in September 2022, 103 (43 female) lamprey from Grayling (500 km upriver in Yukon River) in December 2022, and 52 (27 female) lamprey from Susitna River tributaries from June-August 2023 were collected for laboratory analyses. For Arctic Lamprey, moisture content declined in female gonads (62.0 to 57.7%) and increased in female muscle tissue (52.0 to 56.7%) and liver tissue (60.2 to 66.9%). For somatic indices of Arctic Lamprey, HSI declined in males (1.7 to 1.6%) and females (2.5 to 2.2%), while GSI increased in males (4.1 to 5.3%) and females (6.7 to 7.9%). For somatic indices of Alaskan Brook Lamprey, HSI declined in females (1.9 to 1.7%) and increased in males (1.6 to 1.7%), while GSI increased in males (2.8 to 3.4%). With these data, we examined the seasonal shifts in proximate composition following a juvenile stage of feeding versus non-feeding in migratory and resident lamprey, respectively. The current paucity of information on Alaskan lampreys obstructs our understanding of the species but the results of this study provide critical insights into the distinction between variants at the adult stage and reference values for parameters that could be useful for more effective fishery management and population monitoring.

Body condition comparisons of Washington bass (Micropterus spp.) to national and ecoregional standards

Professional

Pinkus, Griffin; *Washington Department of Fish & Wildlife, griffin.pinkus@dfw.wa.gov*

Standard weight (W_s) and relative weight (W_r) are critical fisheries management tools for assessing population conditions and comparing inter- and intra-population dynamics. When paired with standardized surveys, these metrics allow finer spatial comparisons and evaluation of environmental and biological influences on body condition. In Washington state, largemouth bass (*Micropterus salmoides*) and smallmouth bass (*Micropterus dolomieu*) are introduced species that support popular recreational fisheries. However, research on body condition of both species in Washington are limited and they remain underrepresented in developed W_s equations for estimates of W_r. Using statewide data collected from 1997–2025, we calculated W_r for both species using published W_s equations and developed region and season specific W_s equations using multiple regression to estimate relative condition (K_n). We also compared body condition indices among statewide, regional, and seasonal datasets using ANOVA. Results indicated that Washington has healthy bass populations relative to other North American populations. Statewide, largemouth bass exhibited high W_r (mean = 105.0; SD = 12.1), which were significantly greater than K_n derived from local W_s equations by an average of 10 ($P < 0.001$). Smallmouth bass had lower overall W_r values (mean = 93.1; SD = 12.1). However, both W_r and K_n from smallmouth spring samples were significantly higher than fall samples by approximately 5 ($P < 0.001$), consistent with seasonal spawning effects on body condition. The results provided here could be used to create regional and/or seasonal correction factors for W_r, increasing precision of estimates across seasons and informing more impactful management decisions. Future research focused on identifying other biological or environmental conditions that are influencing growth and condition in Washington's largemouth and smallmouth bass populations may be useful for informing management as well.

Effects of Ovaprim Dose, Saline Injection, and Handling on Sperm Production and Quality in Male Longfin Smelt

Professional

Rahman, Md Moshiur; *The University of California, momrahman@ucdavis.edu*

Male reproductive management is essential for conservation hatchery programs, yet hormone induction protocols may introduce unintended handling or injection effects. We conducted four sequential trials to evaluate the effects of Ovaprim dose, saline injection, handling, and male phenotype on sperm production and quality in wild longfin smelt (*Spirinchus thaleichthys*). Trial 1 identified black males and ventral injection were optimal conditions for sperm expression. Trial 2 compared Ovaprim doses (0.25, 0.5, and 0.75 μL g^{-1}) under optimized conditions. Dose did not significantly affect sperm expression or observed sperm amount, although 0.5 μL g^{-1} produced a comparatively higher volume of sperm among treated groups. Sperm motility traits (VSL, VCL, VAP, LIN, WOB, STR, ALH, BCF, MAD, FM, PM, and MOT) did not differ among dose treatments. Trial 3 compared Ovaprim (0.5 μL g^{-1}) with 0.9% NaCl saline (0.5 μL g^{-1}) injection using expressive black and light black males. Sperm expression, sperm amount, and motility parameters were comparable between hormone- and saline-injected males, indicating that injection alone may stimulate spermiation. Trial 4 incorporated a no-injection group to distinguish injection effects from handling. Treatment significantly influenced sperm expression and sperm amount, with markedly reduced expression in non-injected males. However, sperm

motility remained unaffected across treatments. Across trials, treatments influenced the likelihood and quantity of sperm production but did not affect sperm kinematic quality. These findings indicate that injection with Ovaprim or saline significantly and similarly increases spermiation in male longfin smelt relative to handling alone. Understanding these effects is critical for refining reproductive protocols in conservation hatchery programs for imperiled longfin smelt.

Spatio-temporal attention models for improved snow and streamflow forecasting

Professional

Rajagopalan, Kirti; *Washington State University, kirtir@wsu.edu*

Snow water equivalent (SWE)—the amount of water available if the snowpack is melted—is a key decision variable used by water management agencies to make operational decisions related to irrigation, flood control, power generation, and drought management. SWE values vary spatiotemporally, influenced by weather, topography, and other environmental factors. Although daily SWE can be measured at Snow Telemetry (SNOTEL) stations with the requisite instrumentation, these stations are spatially sparse, requiring interpolation techniques to create spatiotemporally complete datasets. While recent efforts have explored machine learning (ML) for SWE prediction, several recent ML advances have yet to be considered. We explore one such advance—attention mechanisms—for SWE prediction. Our hypothesis is that attention has a unique ability to capture and exploit correlations that may exist across locations, across time, or both. We present a generic attention-based modeling framework for SWE prediction and adapt it to capture spatial and temporal attention. Experimental results from 323 SNOTEL stations in the western U.S. demonstrate that our attention-based models outperform other ML approaches for forecasting. This work is being extended to incorporate snow cover and other information to enhance streamflow forecasting to inform water management operations.

Pixels to Protection: Using AI to Analyze Baited Remote Underwater Video Footage from the Sandy Beach Surf Zone of Northern California

Student

Rivera, Jazmyn; *Cal Poly Humboldt, jir33@humboldt.edu*

While the use of artificial intelligence (AI) in data collection is still in its infancy, many researchers have recognized the potential of this technology and are exploring various applications in marine and aquatic sciences. One area of study that is rapidly gaining attention is AI use in analysis of Baited Remote Underwater Video (BRUV) footage. Currently, BRUV footage must be manually analyzed. Enumerating and identifying organisms this way is time consuming and expensive. Costs and hours add up when experienced, trained technicians are required to complete this task, creating a bottleneck in the datastream. For every hour of footage analyzed manually, several hours of processing are spent conducting data collection. Despite this limitation, utilizing BRUVs in ecosystem monitoring remains beneficial as this sampling technique allows for non-invasive, non-destructive data collection, which is ideal when working with delicate or endangered species, or in sensitive habitats. By automating the BRUV footage analysis process, machine learning can reduce the burden of time while also lowering costs associated with manual BRUV video analysis. In our study, untrained AI fish detection software was tested on BRUV footage from a dynamic, low-visibility environment: the sandy beach surf zones in Northern California. The nMax software plug-in, developed for use with EventMeasure, was used to detect any organisms captured on screen when conducting the manual analysis. The AI software was only able to detect 45% of the fish that were observed by the technician, and 14% of the macroinvertebrates. Performance of AI was best when the

footage was in clearer water (>1m visibility). Our study was able to establish baseline data, which can serve as a stepping stone for future AI projects working to streamline this non-destructive, non-invasive sampling method in dynamic environments such as the sandy beach surf zone of the Pacific Northwest.

Detecting seasonal variation in fish assemblage and habitat use within Upper Snake River hydroelectric developments

Professional

Royce, Emma; *Kleinschmidt Associates, emma.royce@kleinschmidtgroup.com*

Hydropower operations create contrasting reservoir and tailrace macrohabitats that can alter flow, water temperature, and habitat complexity, ultimately shaping fish community structure. Along the Upper Snake River in southeastern Idaho, the Idaho Falls and Gem State Hydroelectric Projects form a series of reservoir and tailrace reaches with distinct environmental characteristics. As part of FERC relicensing, we conducted seasonal fish sampling to assess seasonal variation of fish assemblage, distribution, and habitat conditions. Multiple sampling techniques were used to ensure all habitat components within tailrace and reservoir segments were sampled (slow, fast, shallow, and deep). Seasonal fish sampling techniques included boat-mount and backpack electrofishing, fyke nets, gillnets, and setlines. All captured fish were identified, counted, and measured, with detailed biological data collected for key sport species including White Sturgeon, trout species, Smallmouth and Largemouth Bass, and Mountain Whitefish. Results reveal clear seasonal and habitat specific differences in fish community composition. Catch rates between sampling methods further emphasized differences in species behavior and habitat use across seasons. These findings establish an important ecological baseline by documenting how the fish assemblage and distribution changes seasonally within project influenced/developed macrohabitat types. Data collection will contribute to Idaho Fish and Game's understanding of habitat use, growth, and any natural production of introduced White Sturgeon, and support management of native and sport fish populations.

Improved precipitation phase partitioning in hydrologic models amplifies projected climate change impact on ecosystem services

Professional

Savalkar, Supriya; *Washington State University, supriya.savalkar@wsu.edu*

In the Columbia River Basin (CRB), climate-driven shifts from snow to rain are expected to alter the timing and magnitude of runoff, increasing stress on managed services that depend on reliable seasonal water storage. We use a basin-scale hydrologic modeling framework to evaluate how projected changes in snowmelt contribution translate into vulnerabilities for ecosystem services across different timeframes (mid-century - 2040s and end of the century – 2080s), emission pathways (RCP4.5 and RCP8.5), using an improved rain-snow partitioning method that uses both temperature and relative humidity. We found that the fraction of runoff attributed to snowmelt declines steadily from historical conditions going into the 2040s and 2080s, with the largest reductions under RCP8.5–signaling a transition towards a more rain-dominant hydrological response of the basin. These shifts are accompanied by earlier and more frequent flood-protection shortfalls. Historically, these events were concentrated in May-June, which could now be expected as early as February-March by the 2040s, with intensity increasing further by the 2080s. The winter-spring hydropower shortfalls at The Dalles remain comparable to historical levels, but summer-fall deficits increase substantially, exhibiting greater severity and variability by the 2080s under RCP8.5. The minimum environmental flow compliance deteriorates in warm seasons, with an increase in non-compliance from April

through August. During this time, the average period of non-compliance lasts about 2-3 weeks, exhibiting a flow deficit of about 25%, indicating increased ecological stress along the mainstem of the Columbia River. With the improved representation of the precipitation phase partitioning, we show increased projected vulnerabilities across key ecosystem services. This indicates that simpler approaches may understate climate impacts relevant to the CRB management decisions, including FIRO implementation and fish-flow objectives.

Trends in Predatory Fish and Their Potential Impact on White Sturgeon Recruitment in the Lower Columbia River

Professional

Schade, Shaffryn; *Washington Dept. of Fish & Wildlife, shaffryn.schade@dfw.wa.gov*

The Columbia River White Sturgeon population ranges throughout the Columbia River, upstream into Idaho and Canada. The most robust White Sturgeon populations are found in the lower Columbia River within the three impounded reaches between Bonneville and McNary dams, and the un-impounded reach downstream of Bonneville Dam. In recent years, the White Sturgeon population abundance in these areas has been declining due to persistent poor recruitment. Recruitment has historically been linked to specific water temperatures and flow regimes; however, continued shortfalls during years with improved hydrologic conditions suggest broader ecosystem dynamics may be contributing to recent declines. Multiple factors likely impact spawning success and early life-stage survival of White Sturgeon: river flow, temperatures, habitat modification and loss, prey availability, and predation by other fish species, birds, and marine mammals in the lower river below Bonneville Dam. Isolating the relative contribution of these factors remains a key challenge to understanding recruitment issues. During the annual Age-0 White Sturgeon gillnet index sampling, we encounter numerous predatory species as bycatch, the same species encountered during the Northern Pikeminnow Management Project. Together, these datasets provide a 29-year record of predator species composition and relative abundance throughout the lower Columbia River. Our study objective is to evaluate trends between White Sturgeon recruitment and predator species through time using Age-0 index data and Northern Pikeminnow Program data to determine whether increasing predator populations correspond with declining numbers of Age-0 and juvenile White Sturgeon. Identifying inverse or parallel trends among predators and juvenile sturgeon could provide valuable insights into whether predation is playing a larger role than previously understood in the ongoing recruitment challenges and help inform future management strategies.

Potential for Innovation at Alaskan Salmon Hatcheries

Professional

Sheridan, Tommy; *Alaska Blue Economy Center, tmsheridan@alaska.edu*

Alaska's salmon hatchery system, which was implemented in response to severely depressed salmon runs throughout the state during the 1960s and 1970s, resulted in the development of an innovative and scientifically based program that today involves 30 salmon hatcheries and over 100 release locations. Large hatchery programs currently take place in Cook Inlet, along the Kodiak Archipelago, across Prince William Sound, and throughout Southeast Alaska. Through a system of broad representation and taxation, Alaskan salmon hatchery operations directly benefit many thousands of Alaskans be they commercial, sport, personal use, or subsistence fishers. Were the State and Alaskan stakeholders to consider pursuing innovations in Alaska's salmon hatchery system, whether it is through the integration of mariculture into its

operations, or the exploration of renewable energy production options, we argue that the benefits would be equally diffuse.
Further, at a time when food security and community well-being are at the forefront of many community discussions throughout rural coastal Alaska, we believe that investments in Alaska's salmon hatchery system such as those described in this presentation (production diversification, energy infrastructure improvements) would result in a sustainable food system unlike any in the world. This presentation will highlight recent
efforts to explore the integration of mariculture (kelp and shellfish) production into Alaskan salmon hatcheries, and the exploration of renewable energy development at and near these facilities.

Using Environmental DNA (eDNA) to Detect Aquatic Invasive Species in Oregon Waterways

Professional

Shier, Isabel; *Oregon State University, shieri@oregonstate.edu*

Zebra (*Dreissena polymorpha*) and quagga (*D. rostriformis bugensis*) mussels are aquatic invasive species in North America known to cause significant ecological and economic strain on native species and waterways. Because of this, managers of uninvaded waterways in western North America, such as the Columbia River, are using environmental DNA (eDNA) to facilitate early detection of zebra and quagga mussels. To contribute to this effort, the State Fisheries Genomics Lab (SFGL) at Oregon State University has partnered with the Center for Lakes and Reservoirs at Portland State University (PSU) on a multi-year project that uses eDNA to monitor for the presence of dreissenid mussels in Oregon waterbodies. For the past three years, PSU has collected water samples from waterbodies throughout Oregon, with a particular focus on the Snake River, a major tributary of the Columbia River that has been a focus of concern following a detection of quagga mussels in 2023. Water samples were collected from April to October in three consecutive years (2023: n = 131, 2024: n = 201, 2025: n = 205). The SFGL then extracted DNA from these water samples, and conducted quantitative PCR (qPCR) using a dreissenid-specific assay that targets the 16S rRNA mitochondrial region. Results from the past three years showed no positive detections of dreissenid mussels within the surveyed areas. This project will continue into 2026, and through continued monitoring, aims to prevent the spread of zebra and quagga mussels in Oregon and other surrounding areas.

From Concept to Construction: Perspectives that Shape the River Restoration Process

Professional

Shier, Joel; *Mt. Hood Environmental, joel.shier@mthoodenvironmental.com*

Perspective shapes restoration decision-making at every scale, from species-level recovery planning to project-specific landowner priorities. Mount Hood Environmental is implementing a multi-phase habitat restoration project, in partnership with the U.S. Bureau of Reclamation, Rio Applied Science and Engineering, the Idaho Governor's Office of Species Conservation, and private landowners at River Valley Ranch, along 3 miles of the Pahsimeroi River in central Idaho. The project addresses degraded stream conditions and limited habitat complexity that constrain Chinoook salmon (*O. tshawytscha*) and steelhead (*O. mykiss*) juvenile rearing and adult holding habitat. Proposed actions were developed through collaborative efforts where diverse perspectives worked through an iterative process while using innovative approaches to clearly communicate project intentions—ultimately bridging the gap between differing viewpoints. These actions were designed to directly address limiting factors identified in

recovery planning documents, maintain infrastructure needs of state agencies, and meet the expectations of five landowners with different visions for project outcomes. This project demonstrates how coordinated partnerships across federal, state, and private entities can align ecological function, regulatory compliance, and working-land stewardship to advance salmonid recovery.

Incorporating relative humidity in precipitation phase partitioning can improve snow and streamflow predictions

Professional

Singh, Bhupinderjeet; *Oregon State University, bhupinderjeet.singh@wsu.edu*

Hydrology models are a key means to forecast streamflow to inform reservoir operations and other water management decisions. Models are typically calibrated for streamflow rather than critical intermediate drivers such as snow metrics. Because streamflow forecasts in snow-dominated basins depend strongly on how models represent precipitation phase and snow accumulation, rain–snow partitioning becomes particularly important. Although the importance of bivariate precipitation phase partitioning—incorporating surface air temperature and relative humidity—has been established for estimating rain versus snow, hydrology models often rely on a simpler temperature-only approach. We evaluate model bias changes for snow and streamflow metrics between temperature-based rain–snow partitioning (T-RSP) and temperature–relative-humidity-based partitioning (TRH-RSP). We used the VIC-CropSyst coupled crop–hydrology model across the Pacific Northwest US as a case study. Transition to TRH-RSP resulted in better agreement between modeled and observed (a) peak snow water equivalent (SWE) magnitude and timing (~50% reduction in mean absolute bias), (b) daily winter SWE (relative bias reduced from −30% to −4%), and (c) snow-start dates (mean bias reduced from 7 days to 0 days) for most observational snow telemetry stations. Most improvements occurred at mid elevations. We also find improvements in basin-level streamflow and the ratio of peak SWE to streamflow. Elevation, temperature exposure, and meteorological bias partly explain performance variability across stations. Overall, SWE biases due to precipitation phase partitioning account for a substantial portion of total SWE bias—at least as much as known precipitation biases. Transitioning from T-RSP to TRH-RSP can improve model accuracy and better support forecast-informed water management operations.

A Spatial Framework for Assessment of Aquatic Ecosystem Vulnerability to Wildfire Disturbance

Professional

Thaler, Evan; *Oregon State University, thaler.evan@gmail.com*

Wildfire has been a prominent component of the Pacific Northwest region of the United States for millennia, shaping watersheds and the aquatic ecosystems they harbor. However, decades of fire suppression, indigenous fire criminalization, ever-expanding human footprint, and longer periods of hot and dry weather attributed to modern changes in temperature and precipitation have led to an increase in the frequency, severity, and areal extent of wildfires. While the landscape and ecosystems in the region have evolved resilience to wildfire, changes to wildfire regimes can have complex cascading effects on aquatic biota through physical and chemical changes flowing through hydrographic networks. Although the impacts of individual post-fire disturbances on aquatic ecosystems have received increasing attention in empirical and modeling efforts over the past two decades, the compound effects of fire on watersheds and biological resilience remains difficult to encapsulate in numerical models, yet such integrative assessments are critical for informing pre- and post-fire watershed management.

Composite indices are useful spatial modeling tools to evaluate complex processes that interact to affect the vulnerability of landscapes to internal or external forcings. Indicators provide easy-to-interpret risk assessments that can be digested and utilized by land managers and policy makers. Building upon previous conceptualizations of wildfire risk to watersheds, we develop a new composite indicator that integrates wildfire hazard, watershed resilience, and biological vulnerability to provide spatial assessments of wildfire risks to aquatic species across the Pacific Northwest. As a case study, we apply our fish resiliency framework to bull trout (*Salvelinus confluentus*) within the Columbia River Basin.

Hatch timing of sculpin in regulated and unregulated rivers estimated by otolith microstructure analysis

Student

Veldhuizen, Sarah; *Colorado State University, sveld58@gmail.com*

Hypolimnial-release dams alter flow, temperature, and sediment regimes, impacting fish populations downstream. However, effects of dams on hatch timing and early life history of many fishes are not well understood. Freshwater sculpins (Cottus spp.) are widely distributed in cool and cold-water lotic systems throughout the northern hemisphere. Despite their ubiquity, little is known about their hatch timing—an event that has critical implications for recruitment success and therefore conservation and management. In this study, we investigated hatch-timing of young-of-year sculpin collected in August and October of 2024 and 2025 from three rivers in the southern Rocky Mountain region, CO, USA: a regulated reach of the Blue River (n=35) located 4.8-8 km downstream of the cold, hypolimnial-release Green Mountain Dam, a regulated reach of the Colorado River (n=32) located 61 km below Windy Gap Dam, and a reach on the unregulated Eagle River (n=27). We found that in both years, sculpin hatched earliest in the Colorado River (early to mid June), followed by the Eagle River (late June to early July), and latest in the Blue River (mid July). Our site on Colorado River resembles a more natural temperature regime than our site on the Blue River due to its greater distance from a dam. Therefore, our results suggest that sculpin hatch significantly earlier in less dam-influenced or unregulated reaches than sculpin in the reach highly influenced by hypolimnial-release dams. As dams become an increasingly abundant feature on the landscape, understanding how river regulation impacts early life history of native species is critically important. Future research should investigate how dam effects on hatch timing vary longitudinally, among discharge regimes, and across additional species and river systems.

Documenting patent infections of a non-native parasite on native and non-native fishes in the Willamette River Basin, Oregon

Student

Vityukov, Angelica; *Oregon State University, vityukoa@oregonstate.edu*

The parasite spillover hypothesis predicts that introduced parasites or hosts can facilitate infection of native species, reshaping host–parasite dynamics within invaded ecosystems. Fish parasite spillover, however, is often overlooked despite its potential to reduce host fitness and increase mortality. Anchorworms (*Lernaea* spp.) are parasitic copepods that infect a wide variety of freshwater fishes. They thrive in warm, low-flow environments and occur at high concentrations in areas of elevated fish density, including hatcheries. Adult females remain parasitic and embed the anterior portion of their bodies into host tissue, providing visible evidence of infection. Native to Asia, anchorworms have now been introduced globally. In the Willamette River Basin, previous work evaluated anchorworm prevalence on salmonids and introduced warmwater fishes, with infection highest in common carp and goldfish (species

sympatric with anchorworms in Asia). Here, we documented the prevalence of adult female anchorworm infection in native (non-salmonid) fishes within the basin. Across three studies, we examined over 7,000 fish specimens representing 45 species (12 families) from the Oregon State University Ichthyology Collection. We evaluated evidence for parasite spillover and identified physiological and ecological traits associated with host susceptibility. Infection prevalence varied among host species and was higher in fishes that use warmer-water habitats, occupy structured habitats, and tolerate environmental disturbance. On average, parasitism rates were highest in species native to Asia compared to species native to the Willamette River Basin or introduced from other regions. These results establish a regional baseline for anchorworm prevalence, improve understanding of invasion-mediated host–parasite dynamics, and provide empirical support for evaluating the parasite spillover hypothesis.

Long-term assessment of windthrow in riparian buffers in the Tongass National Forest

Professional

Warren, Dana; *Oregon State University, dana.richard.warren@gmail.com*

Periodic disturbances, such as wildfire, floods, and windstorms, are natural processes in forest and aquatic ecosystems, influencing their spatial heterogeneity and development, long-term persistence, and productivity. As a result of disturbances, there is variability in the spatial configurations and patterns of conditions across a landscape through time. While a certain level of disturbance is natural in many ecosystems, and may even be a desired process, the presence or impact of one disturbance may influence the susceptibility of a system to compounding disturbance events. Windthrow is a natural and ecologically important process in southeast Alaska that contributes to forest regeneration, nutrient cycling and, in riparian zones, the recruitment of large wood to streams, which can influence fish habitat. However, harvesting of landscapes can increase windthrow rates in adjacent forest stands, including riparian management areas (RMAs), beyond levels typically observed under natural conditions. To evaluate harvesting impacts on the occurrence and extent of windthrow, long-term data were collected across 261 RMAs in the Tongass National Forest in southeast Alaska. Annual observations of the RMAs adjacent to harvested areas were made between 2000 and 2022, totaling to 5,957 site-year observations across all buffer units. Wind events, forest management, and site factors were investigated alongside the blowdown data to explore how landscape features, local RMA characteristics, and broader harvest units could account for variation in blowdown frequency or severity. We found that management did increase blowdown rates, with 75% of the windthrow occurring within the first 5 years after harvest at the RMA level. Surprisingly few landscape or harvest factors were closely aligned with the proportion of windthrow in a harvest unit. The number of large wind events was an important metric, which may have overshadowed local factors in these systems.

Innovations in Forecast Skill to FIRO: Diagnosing Regional, Seasonal and AR-Driven Precipitation Predictability Across the CONUS

Professional

Weihs, Rachel; *UC San Diego, rweihs@ucsd.edu*

The Forecast-Informed Reservoir Operations (FIRO) Screening Process aims to identify barriers and potential of USACE reservoirs/dams nationwide to determine where a FIRO study could be most beneficial. Because FIRO relies on actionable predictions at operational lead times, the hydrometeorological forecast skill is a cornerstone of reservoir storage reliability. The FIRO Screening Process therefore leverages quantitative precipitation forecast skill alongside

operational water management factors to highlight ideal and non-ideal locations for potential FIRO applications. This study quantifies regional, seasonal, and process-based variations in precipitation forecast skill across the CONUS to inform the FIRO Screening Process. Across the CONUS, watersheds in the western United States tend to have some of the highest annual skill of extreme precipitation attributed to landfalling atmospheric rivers (ARs) and orographic forcing. Elsewhere across the U.S., annual precipitation forecast skill is lower; however, partitioning skill by season suggests that the cool season forecast skill is greater across the majority of watersheds. In contrast, warm season skill is reduced, particularly in convectively dominated regimes where mesoscale variability limits performance. The precipitation forecast skill is further stratified by AR versus non-AR events. The enhanced predictability of ARs translates into improved forecast skill. These finding may enable seasonally and storm-constrained FIRO applications where skill allows for greater confidence in operationally relevant water management decisions. Collectively, these results clarify where precipitation forecast skill by mechanism, season, and region adds more contextual benefit. This work advances the integration of forecast science into reservoir management strategies and strengthens the technical foundation for FIRO screening nationwide.

Reservoir Versus Stream Rearing in Mill Creek Coho Salmon: Growth, Habitat Use, and Implications for Survival Estimates

Student

Yevak, Samuel; *Oregon State University, yevaks@oregonstate.edu*

Understanding how juvenile habitat use influences growth is critical for management of ESA-listed Oregon Coast coho salmon. Mill Creek, an Oregon Department of Fish and Wildlife Life Cycle Monitoring site, is unique because Mill Creek Reservoir lies upstream of the smolt trap, and smolts from this system are consistently larger than those from nearby watersheds. Recent PIT-tag analyses suggest marine survival estimates at Mill Creek may be overestimated, but the role of within system habitat use remains unclear and may also reflect early exit from the reservoir and downstream estuarine rearing that are not fully accounted for in current monitoring approaches. We reconstruct early life habitat histories of returning adults using otolith $^{87}Sr/^{86}Sr$ transects and estimate daily growth from otolith increment widths. Preliminary results from 50 adults show clear isotopic separation among tributary habitats above the reservoir, reservoir, and downstream estuarine rearing environments, with most fish exhibiting reservoir or upstream tributary signatures but a subset indicating estuarine rearing. Ongoing analyses of >350 archived otoliths linked to PIT-tag data and brood year environmental conditions will evaluate habitat specific growth patterns and their influence on survival estimates. Results will inform reservoir management, Life Cycle Monitoring interpretation, and ecosystem-based recovery of Oregon Coast coho salmon.

The potential of improved forecasts to enhance the performance of USBR dams

Professional

Yourek, Matt; *Washington State University, matthew.yourek@wsu.edu*

Runoff forecasts are important for operating multi-objective reservoirs. Many dams operated by the U.S. Bureau of Reclamation (USBR) must maintain sufficient flood storage space but are also expected to refill each spring to meet water supply obligations. The ability of forecasts to inform reservoir releases during flood season has been limited due to poor model skill; however, a new generation of forecasts based on machine learning has the potential to improve forecast skill. One way to assess potential forecast value is to quantify the value of a perfect forecast, which represents an upper bound on the value of an imperfect but increasingly precise and

accurate forecast. In this study, we evaluate the performance of USBR reservoirs along several tributaries to the Snake River in Oregon and Idaho, whose primary purposes are for flood control and irrigation water supply. Performance is assessed on flood frequency and refill reliability. We compare the historical operation of these reservoirs to the performance that could have been achieved with perfect foreknowledge of inflows to represent the potential gains of more accurate runoff forecasting. Our results show that the Boise River System in Southern Idaho met its flood and refill targets in 16 of 41 years of data analyzed. In 12 years, the flood target was not met, but it could have been met with perfect foreknowledge. In only 3 years in which the refill target was not met, it could have been met using a perfect forecast. In the remaining 10 years, neither target could have been met, even if a perfect forecast had been used. These results indicate that the greatest gains from improved forecasts in the Boise system may come from reduced flooding.

Effectiveness of multiple translocation approaches in Bull Trout reintroduction efforts in the upper Willamette River basin

Professional

Zymonas, Nik; *Oregon Department of Fish and Wildlife, nik.zymonas@oregonstate.edu*

Bull Trout are native to Cascades drainages in the Willamette Basin but declined to just three small local spawning populations in the McKenzie River subbasin by the late 1980s. Collaborative interagency recovery efforts included translocation of juvenile Bull Trout to watersheds where populations were extirpated. Biologists collected Bull Trout fry from the strongest remnant population in the basin (Anderson Creek) and either directly transferred the fry to various recipient streams (1993–2005; 2017–2021) or brought them to Leaburg Fish Hatchery for headstart rearing prior to translocation (2007–2013). Multiple monitoring methods were used, including a long-term redd count program to assess spawning abundance. Direct transfer of more than 6,000 fry across 7 years to a stream (Sweetwater Creek) adjacent to Anderson Creek yielded redds beginning in the 8th year and peaking at 22 redds in the 15th year. Direct transfer of more than 10,000 fry across 9 years to small streams in the Middle Fork Willamette Basin also yielded redds beginning in the 8th year, with an initial peak in the 12th year and exceeding 30 redds by the 24th year. The headstart program obtained 62% survival to translocation. Release of 2,629 fish into Swift Creek across 7 years resulted in spawning adults beginning in the 8th year, expanding the distribution of spawning and early rearing in the basin. These efforts provide an interesting comparison to the Clackamas River reintroduction, which involved direct translocation of juvenile and adult Bull Trout from the Metolius Basin. Reintroduction approach involves consideration of several factors, including characteristics of the recipient site that influence productivity and survival. Headstart rearing may provide larger fish but substantially higher costs and risks associated with captivity. These results highlight the extended duration that may be required to attain high abundance of locally born adults in reintroduced populations.