

Primary author: Nick Ackerman  
Portland General Electric

Co-author(s): Brian Pyper

Presentation type: Paper

Title: Design and Performance of the River Mill Surface Collector

Abstract

PGE owns and operates the Clackamas River Hydroelectric Project on the Clackamas River in northwest Oregon. The Project is a 100+ year old three dam complex. River Mill Dam, built in 1911, is the most downstream dam in the Project. Prior to 2012, the only routes of passage for downstream migrating fish were through the powerhouse, or at high flows over the spillway. In December 2012, PGE put into operation a 500 cfs surface collection facility to safely pass downstream migrating fish. Paired releases of PIT tagged fish upstream of River Mill Dam in 2013 indicate that survival of salmon and steelhead smolts through the impoundment (Estacada Lake), and fish guidance efficiency are greater than 95% for all three species tested. Injury rates of PIT tagged smolts recovered at the surface collector were less than 2%. Numbers of fish captured in the collector have far exceeded expectations, with over 100,000 juvenile salmonids collected in the first year of operation. This presentation will provide a brief overview of the surface collector design and review biological performance in the first year of operation.

Primary author: Ivan Arismendi  
Department of Fisheries and Wildlife, Oregon State University

Co-author(s): Mohammad Safeeq  
Jason Dunham  
Sherri Johnson

Presentation type: Paper

Title: Can air temperature be used to project influences of climate change on stream temperature?

### Abstract

Worldwide, the lack of stream temperature records has motivated the use of predictive models based on large and available hydroclimatic datasets that act to surrogate actual measurements. Often, extreme stream temperatures are of greatest interest due to climate change and other human-related influences on fish. Here, we examine the long-term performance of two widely used linear and non-linear regression models between air and stream temperatures. We test the performance and temporal variability of the parameters that comprise these two models in regulated and unregulated streams using available long-term datasets from western North America. We found that estimates from the two models varied dramatically through time within and across streams. Indeed, model predictions based on parameters from previous time periods showed poor predictive performance of most recent observed stream temperatures. Although both models yielded the same qualitative result, predictions were less robust in regulated streams and poorest for extreme cold and warm temperatures. The magnitude of differences in these predictions falls within the range equal to or more than future projections reported for this region due to climate change (between 0.5 and 3.0°C by 2080). Even though these two models are simple, less data intensive, using this correlation approach should be taken with extreme caution. This study highlights the need to carefully evaluate the resolution and accuracy of these two models relative to the spatiotemporal scale of the question of interest and the implications of prediction uncertainty when using purely climatic variables.

Primary author: Stephen Atkinson  
Oregon State University

Co-author(s): Sascha Hallett  
Casey Dinsmore  
Craig Banner  
Jeri Bartholomew

Presentation type: Poster

Title: FishPathogens.net - a richly visual fish pathogen database

### Abstract

Fish are an integral part of many cultures, including those of the Pacific Northwest of North America. Widespread recreational fishing leads to the Oregon Department of Fish and Wildlife (ODFW) receiving many enquiries from the public regarding abnormal appearing fish, e.g. "What is that large white cyst in my salmon fillet?", "What are these worms in this bluegill?", "Can I still eat it?". ODFW supported us (OSU) to create a public database that is an easy-to-use, richly visual, web-based source of information for the pathogens of Oregon's fishes: [www.fishpathogens.net](http://www.fishpathogens.net).

Our database cross-references three primary categories of information: >500 host and pathogen images from OSU and ODFW collections; >120 pathogen information summaries from published sources; and >600 fish examination reports. Data sub-categories include lists of >200 fish host species, and a Google Maps-based locality recording and searching tool. We are digitizing pathogen records from OSU surveys and ODFW health records of wild and hatchery fish. We are incorporating significant but poorly-circulated data (reports, personal databases) from fisheries scientists.

Pathogens include viruses, bacteria, fungi, protozoans and metazoan parasites (acanthocephalans, myxozoans, crustaceans, platyhelminthes, nematodes). Non-specialists can identify common macroscopic pathogens and disease signs by stepping through a guided image search, browse through galleries of host and pathogen images, or search based on particular hosts, pathogen types or localities. Specific pathogen information can be printed out as "fact sheets". An advanced, filter-based search is available to pathologists to synthesise pathogen records and mine patterns from the original examination reports.

The database is hosted on a dedicated MySQL database server at OSU, using CentOS Linux, with Drupal 7 for webpage creation. We have designed both the output and input to be mobile-device-friendly, to promote accessibility by both the public and fish pathologists.

Primary author: Brian Bangs  
Oregon Dept. of Fish and Wildlife

Co-author(s): Paul Scheerer  
Shaun Clements  
Ann Gray  
Chris Allen  
Kim Garner

Presentation type: Paper

Title: Oregon chub recovery: an ESA success story and a strategy for post-delisting

#### Abstract

Oregon chub (*Oregonichthys crameri*), small minnows endemic to the Willamette Valley, were federally listed as endangered under the Endangered Species Act (ESA) in 1993. The species' status was downlisted to threatened under the ESA in 2010. In 2012, Oregon chub met the criteria for delisting. Recovery was achieved primarily through implementation of the Recovery Plan for Oregon Chub, which guided our efforts while the species was listed. In preparation for delisting, the U.S. Fish and Wildlife Service and the Oregon Department of Fish and Wildlife drafted a post-delisting monitoring plan (PDM) for Oregon chub. This plan outlines the monitoring needed to verify that the species remains secure from extinction after ESA protections no longer apply. The goals of the PDM are to: 1) outline the monitoring for species distribution, abundance, and threats; and 2) identify circumstances that will trigger increased monitoring or to identify when there are no longer concerns for Oregon chub and the PDM requirements have been fulfilled. We will discuss how the ESA was successful for the recovery of Oregon chub, summarize the goals of the PDM, and discuss our strategy to ensure chub remain secure.

Mike - I could do a half hour talk if it fits into the schedule. Thanks!

Primary author: Chris Bare  
ODFW

Co-author(s): Ian Tattam  
Jim Ruzycki  
Rich Carmichael

Presentation type: Paper

Title: Steelhead & Chinook escapement in the John Day River basin: redd surveys and a mark-recapture approach

#### Abstract

In 1959, the Oregon Department of Fish and Wildlife began conducting “index” redd surveys of John Day River Summer Steelhead *Oncorhynchus mykiss* and Spring Chinook Salmon *O. tshawytscha*. These populations represent some of the few remaining wild populations in the Columbia River basin. Despite providing important long-term trends, index redd surveys are unable to estimate abundance or distribution at the basin-wide scale because survey sites were not randomly selected. Beginning in 2004, we therefore applied a statistically based random sampling design to survey steelhead redds. Chinook spawning distribution is more limited in the basin, allowing us to census their redds beginning in 1998. Both steelhead and Chinook redd counts were expanded to spawner escapements using a fish-per-redd ratio borrowed from neighboring watersheds. Beginning in 2012, we also applied a mark-recapture technique using PIT-tagged adults to estimate Chinook escapement. Steelhead escapement increased over the past decade from approximately 4,500 in 2004 to 15,400 in 2012. However, low steelhead spawner escapements resulted in a large proportion of survey sites with no steelhead redds, which contributed to large variance estimates. Since 1998, John Day Chinook populations have shown trends in abundance similar to other northeast Oregon populations, suggesting that recent spawner escapement trends have largely been driven by out-of-basin influences. The Chinook redd count estimate in 2012 of 5,391 spawners was substantiated by our similar mark-recapture estimate of 5,267.

Primary author: Douglas Bateman  
Oregon State University

Co-author(s): David Hockman-Wert  
David Leer

Presentation type: Paper

Title: The Alsea Watershed Study: Logging and the Response of Habitat and Coastal Cutthroat Trout over 51 Years

### Abstract

There have been many studies to evaluate the effects of logging on salmonids in small and medium sized streams. In most cases, studies have been of short duration and concentrated on changes immediately following harvest. Because commercial forest stand rotations currently vary from 30-80 years, it is important to understand how habitat and fish populations behave over similar time scales. Abundance and biomass of cutthroat trout declined post-logging in Needle Branch and failed to recover during the initial study 1962-1974. Subsequent sampling (1988-1996) revealed similar abundance to pre-treatment periods but a reduced biomass suggesting that upper year-class cutthroat trout were still at reduced abundance levels. Preliminary results from a third sampling period 2006-09 found that abundance and biomass was similar to pretreatment years in Needle Branch suggesting recovery had finally occurred 45-50 years after initial logging. A substantial increase in large wood occurred in both Flynn Creek (the reference watershed) and Needle Branch. However, Flynn Creek, an unmanaged watershed, showed reduced biomass of cutthroat trout relative to the initial pre- and post-logging periods during both the 1988-96 and 2006-09 sampling periods. Although increasing large wood in Needle Branch could be expected to improve habitat and result in increased fish abundance, the opposite trend appears in Flynn Creek. The trends in cutthroat biomass observed in Flynn Creek and Needle Branch are both contrary to published projections of fish abundance through time as adjacent forest stands develop. These results emphasize the need to better understand processes that control fish abundance and how they are influenced by forest stand structure both temporally and spatially.

Primary author: Linda Beck  
USFWS - Malheur National Wildlife Refuge

Co-author(s): Daniel Craver  
Kristopher Crowley

Presentation type: Paper

Title: Malheur Lake: A Terminal Lake Dominated by Invasive Common Carp *Cyprinus carpio*

Abstract

Malheur Lake, located in southeastern Oregon's Malheur National Wildlife Refuge, on average is 34,000 acres and 1 meter in depth but fluctuates greatly in size on an annual basis. This Lake and surrounding basin is an important stop over for migrating and breeding birds in the Pacific flyway. Malheur Lake has been invaded by common carp *Cyprinus carpio* since the 1950's and has severely degraded habitat. Management of common carp has been tried in this terminal lake system primarily by broadscale rotenone treatments, but has failed. Currently, we are working on creating a sustainable basin management strategy to control this species to 100 lb/acre, a threshold discovered at which sub aquatic plant growth and other natural ecological processes regenerate. Many complicating factors such as inter-annual lake dynamics, lacking or aging infrastructure, and the need for multi-land owner participation make the solution of carp control difficult to achieve. This presentation will focus on the steps we have taken to acquire data to develop methodology and models to monitor and manage Malheur Lake and associated wetlands for the betterment of the avian populations of the Pacific Flyway.

Primary author: Brian Beckman  
NWFSC, NOAA Fisheries

Co-author(s): Larissa Rohrbach  
David Teel

Presentation type: Paper

Title: Marine Perspectives on Hatchery Chinook Salmon Production in the Columbia River Basin

Abstract

Note to organizers - this is really a salmon talk and should not go in the marine fish session. thanks - Brian

No matter what sub-basin, tributary or hatchery a smolt emigrates from, all successful smolts congregate in the coastal ocean off Oregon and Washington. There is increasingly clear evidence that variable ocean conditions are directly responsible for large-scale variation in the return of adult Chinook salmon to the Columbia River. There is also accumulating evidence that marine mortality occurs soon after smolts enter the ocean. However, not all smolts are equivalent. Different hatchery rearing regimes generate smolts of differing size, that are released at different times and from different locations in the Columbia River Basin. So, ocean conditions vary from year to year and smolt characters from different hatchery programs vary. In this talk we will examine the interactions among varying ocean conditions and varying smolt characters with two questions: 1). From a given hatchery program, how does size at release relate to smolt survival across varying ocean conditions? and 2). Are there differences in smolt performance in the ocean among different stocks of Chinook salmon and how do these differences relate to size at release and ocean entry timing? Together, the data provided will provide insights into potential ecological interactions between smolts from different stocks in the ocean and may lead to some insights on ocean carrying capacity.

Primary author: John Beeman  
USGS

Co-author(s): Hal Hansel  
Amy Hansen

Presentation type: Paper

Title: Behavior and dam passage of juvenile Chinook salmon and steelhead at Detroit Dam and Reservoir

### Abstract

Detroit Dam, a high-head flood-control reservoir on the North Santiam River, impedes migration of salmonids and is one of several Willamette Valley dams with mandates for improvement in downstream salmonid passage. We studied the in-reservoir movements and dam passage of acoustic and PIT-tagged juvenile Chinook salmon and juvenile steelhead during 2012 and 2013 to inform decisions about future downstream passage alternatives given the existing dam configuration. Juvenile Chinook salmon migrated from the release sites in two tributaries to the reservoir more quickly (median 2.4 d versus 41.3 d) and in a greater proportion than juvenile steelhead, but once in the reservoir juvenile steelhead migrated to the forebay faster (median 4.4 d versus 10.0 d) and had higher dam passage rates than Chinook salmon. The estimated probability of being present at the dam was 0.767 (spring) and 0.710 (fall) for juvenile Chinook salmon and 0.535 for juvenile steelhead (spring). Most dam passage was through the spillway during the spring study period, when the spillway and powerhouse were most available. Dam passage was primarily through the powerhouse during the fall study period when the regulating outlet and powerhouse were the most available routes. Dam passage rates were greatest at night, increased with dam discharge, and were greatest when the spillway was in operation. The results suggest that a properly-designed a surface-flow outlet could be a beneficial route of passage for juvenile Chinook salmon and steelhead at Detroit Dam. Fish passage rates with the existing dam configuration were greatest when the spillway was operated and lowest when the powerhouse was the only route operated.

Primary author: Karen Bennett  
USFS Regional Office

Co-author(s): Jay Stratton Noller

Presentation type: Paper

Title: Riparian Soils – indicators from the past to predict the future

Abstract

Soils harbor signatures of historic plant community structures, water, chemical and sediment movement on a landscape. Desired management objectives in terms of plant community structure, wood production and delivery, shading capacity and ultimately water temperature regulation vary by the type of soil adjacent to and surrounding stream systems. This is definitely not the area to employ one type of forest management prescription. A landscape mapping hierarchy of geoecological systems can aid in determining a landscapes capacity to produce healthy riparian vegetation and indicate expected sediment supply.

Riparian Conifer Thinning and Burning – To Treat or not to Treat - Session

Primary author: Michelle Best  
Oregon Dept of Fish & Wildlife

Co-author(s): Matt Weeber

Presentation type: Poster

Title: "Supplemental" Lamprey Monitoring on the Oregon Coast

Abstract

The Oregon Department of Fish and Wildlife's, Adult Salmonid Inventory and Sampling Project, has been conducting winter steelhead spawning ground surveys on the Oregon Coast since 2003. Spatially balanced, randomly selected surveys are walked or boated, once every 7 to 14 days from February through May, to enumerate steelhead redds. Supplemental to this effort, information on adult Pacific Lamprey abundance, timing, and distribution has also been collected. This information is considered "Supplemental" in part to the abbreviated overlap in spawn timing between the two species. In 2010, in an effort to expand lamprey monitoring, 12 sites were designated for additional monitoring to cover the full timing (through mid-July) of lamprey spawning. This poster summarizes some of that information.

Primary author: Eric Billman  
Oregon State University; Oregon Cooperative Fish Research Unit

Co-author(s): Cameron Sharpe  
Rob Chitwood  
Julia Unrein  
David Noakes  
Carl Schreck

Presentation type: Paper

Title: Determinants of downstream movement behaviors in juvenile spring Chinook salmon

#### Abstract

Evaluation of juvenile spring Chinook passage through Upper Willamette River projects has relied on hatchery-origin fish to accommodate sample sizes required for robust tagging studies. However, differences in morphology, behavior, and physiology between hatchery-origin and wild juveniles could confound estimations of dam passage efficiencies and survival. We are using alternative rearing strategies to produce hatchery-origin juveniles that reflect the migratory and fitness phenotypes of their wild counterparts to be used as wild surrogates for tagging studies. We delivered BY2010, BY2011, and BY2012 juvenile Chinook salmon to researchers for evaluation of reservoir behavior and dam passage in reservoirs in the Upper Willamette River. Currently we are rearing BY2012 and BY2013 juveniles for future tagging studies. The common object of studies that utilize wild fish surrogates is to assess downstream movement behavior of juveniles. When delivered, all evidence suggested that wild fish surrogates were smolting; therefore, their movement patterns should have met the expectations of the studies. To establish rearing tactics for wild fish surrogates, we evaluated the effects of temperature, rearing density, diet formulation, and substrate type on the development of juveniles. Experimental evaluations indicated that in addition to indicators of smoltification, wild fish surrogates exhibited growth patterns, body condition, morphology, and behavior consistent with project goals. In establishing the wild fish target phenotype, we demonstrated that morphological variation is predictive of migratory phenotype; this study suggests that life history differentiation occurs early, perhaps at emergence. Further studies, both experimental and field based, should investigate the factors that contribute to variation in early dispersal of young fish as well as the contribution of juvenile life history tactics to recruitment of spawning adults.

Primary author: Troy Brandt  
River Design Group, Inc.

Co-author(s):

Presentation type: Paper

Title: Fish Passage Improvement in Southern Oregon's Desert Basins

Abstract

River Design Group, Inc. (RDG) is collaborating with stakeholders including local landowners and irrigators, Lake County Watershed Council, U.S. Fish and Wildlife Service, Oregon Department of Fish and Wildlife, and the Lake County Soil and Water Conservation District to improve fish passage in Southern Oregon's desert basins. RDG completed assessments and designs for endemic species passage in the Warner Lakes, Abert Lake, and Goose Lake basins. Fish passage improvement projects completed in 2013 included four culvert replacements, two bypass channels to provide passage around instream diversion weirs, and headcut stabilization efforts. Projects restored or improved passage on mainstem creeks and tributaries important for native fish spawning and rearing habitat. Future project phases will include additional fish passage structures at irrigation weirs that will restore stream connectivity.

Primary author: William R. Brignon  
USFWS

Co-author(s): Jeffrey C. Jolley  
Douglas E. Olson  
Carl B. Schreck  
Howard A. Schaller

Presentation type: Paper

Title: Development of Conservation Hatchery Programs for Imperiled Species (Part 1)

### Abstract

The US Fish and Wildlife Service's National Fish Hatchery (NFH) System is responsible for helping recover species listed under the Endangered Species Act. This is a difficult task considering the funding horizon, climate change predictions, and the status of imperiled populations. The Draft Bull Trout Recovery Plan suggests captive rearing is a potential reintroduction strategy for bull trout conservation and the Pacific Lamprey Conservation Initiative has recognized that conservation hatchery programs may be a useful tool for lamprey conservation as well. However, life in captivity has traditionally been linked to a suite of negative genetic, physiologic, morphologic and behavioral effects to captive individuals. Regardless, as populations decline, decision makers increasingly look to more extreme management strategies to assist with conservation efforts. There is a need to evaluate the efficacy of conservation hatchery programs to maximize benefits from the limited resources (e.g., funding, animals, and habitat) available for conservation and recovery. The goal of our work is to develop a biologically sound conservation hatchery programs for bull trout and Pacific lamprey. We will present an overview of conservation hatchery strategies and our thoughts on how conservation hatchery programs can be integrated with existing programs. We will provide an update of our bull trout captive rearing research that we have been conducting for 2 years. The objectives of this work are to better understand the effects of captivity on the bull trout phenotype and post-release survival of captive reared individuals. This information will then be used to develop a structured decision model with an adaptive framework that evaluates all bull trout reintroduction strategies, informs management decisions, and ultimately promotes bull trout recovery.

Primary author: Abel Brumo  
Stillwater Sciences

Co-author(s): Kelly Coates  
Craig Street

Presentation type: Paper

Title: Pacific Lamprey Spawning and Rearing Habitat in Newly Accessible Reaches of the North Umpqua River Watershed, Oregon

### Abstract

Pacific lamprey populations in the North Umpqua River watershed have declined dramatically from historical levels. Completion of a fish ladder at Soda Springs Dam in November 2012 allowed migratory fish to access habitat in the upper watershed for the first time since 1951. The objective of this study was to assess distribution, quantity, and quality of Pacific and western brook lamprey spawning and rearing habitats in newly accessible reaches. In fall 2013, we conducted field surveys to map suitable habitat patches in Soda Springs Reservoir, the North Umpqua River from the reservoir upstream to Slide Creek Dam, and the lower 5.2 km of Fish Creek, a major tributary. In stream reaches, we documented 286 suitable Pacific lamprey spawning habitat patches (9,339 m<sup>2</sup>) and 93 suitable rearing habitat patches (1,098 m<sup>2</sup>). Both spawning and rearing habitats had patchy distributions within stream reaches. In Soda Spring Reservoir, spawning habitat was minimal and restricted to the uppermost, flowing reaches. However, we documented 18 suitable rearing habitat patches in the reservoir, an area of 62,873 m<sup>2</sup>—more than 57 times that found in the stream reaches. Approximately 97% of the habitat area in the reservoir was from three large patches. Even discounting these large patches, the reservoir had nearly twice the area of ammocoete rearing habitat as stream reaches. This assessment indicates that construction of fish passage has provided access to a substantial amount of suitable lamprey habitat. Notably, rearing habitat within the stream reaches will almost certainly limit lamprey production potential relative to spawning habitat; however, plentiful rearing habitat within the reservoir could offset this limitation, significantly contributing to overall production of Pacific lamprey in the North Umpqua watershed. We recommend future monitoring of lamprey populations to evaluate recolonization success and distribution of spawning and rearing in the reservoir and stream study reaches.

Primary author: Abel Brumo  
Stillwater Sciences

Co-author(s): Stephen Kullmann  
Tim Nelson  
Vincent Dimarzo  
Eddie Koch

Presentation type: Poster

Title: Factors Influencing Pacific Lamprey Passage at Road Crossings

### Abstract

The Wiyot Tribe has lived in the lower portions of the Eel River watershed since time immemorial. Among the many elements that comprise the Wiyot people's intimate relationship with the Eel River is a long-standing dependence on the gou'daw, or Pacific lamprey. In fact, the Eel River received its English name from the once vast numbers of migrating adult Pacific lampreys, colloquially known as "eels". In response to the substantial decline of Eel River lamprey populations, the Wiyot Tribe and Stillwater Sciences have initiated efforts to study and restore this important species in the watershed. As with migratory salmonids, migration barriers are a key threat to Pacific lampreys across their range, and remediating barriers to historical spawning and rearing habitats is one of the most cost-effective ways to recover depressed populations. Many barriers to salmonid passage in the Eel River watershed have already been assessed, but these assessments have generally overlooked lamprey specific considerations and often cannot be applied directly to lamprey passage due to differences in behavior and swimming ability between the species. For example, Pacific lampreys have difficulty navigating fish ladders or culverts with vertical drops or sharp angles. Understanding these differences is critical for implementing lamprey-specific passage assessments. Therefore, we systematically reviewed and summarized information on factors influencing Pacific lamprey passage at road crossings. This was a key component of a larger project to assess Pacific lamprey passage at potential barriers across the Eel River watershed. An important additional goal of this project and poster is to educate resource managers and other stakeholders on Pacific lamprey passage considerations, so that they may be considered when evaluating passage or designing passage improvement projects.

Primary author: Patrick Burns  
Oregon Department Fish and Wildlife

Co-author(s):

Presentation type: Paper

Title: Estimating the Abundance of Adult Salmonids in the West Fork Smith River

Abstract

The Salmonid Life Cycle Monitoring Project of the Oregon Department of Fish and Wildlife has guided monitoring of juvenile and adult salmonid fishes (*Oncorhynchus* spp.) in the West Fork Smith River (Umpqua basin) since 1998. These activities are coordinated under the Oregon Plan for Salmon and Watersheds and are part of a broader effort to monitor populations of salmonids in select Oregon coastal streams. Two objectives of this program are to estimate the abundance of returning adult salmonids and downstream-migrating juvenile salmonids, and estimate the marine and freshwater survival rates for coho salmon (*Oncorhynchus kisutch*).

The focus of my discussion is to describe our methods of estimating the abundance of adult coho salmon and winter steelhead (*Oncorhynchus mykiss*) using an adjusted Peterson mark-recapture methodology, based on the number of fish tagged and passed at the adult trap, a floating weir, and number of tagged and untagged fish observed (live fish and spawned-out carcasses) on surveys.

Primary author: Emily Campbell  
Department of Fisheries and Wildlife, Oregon State University

Co-author(s): Gordon Reeves  
Steve Wondzell

Presentation type: Paper

Title: Linkages between Thermal Heterogeneity and Coho Salmon Emergence in Alaska Streams

### Abstract

Streams on the Copper River Delta, Alaska vary in their thermal and hydrological regimes, thus affording opportunities to examine how fish respond to spatial and temporal variability in these climatic conditions. Insights from these responses can be applied to project how fish may respond to climate-related changes in the future. Here, we evaluate climatic conditions on coho salmon by relating stream thermal regimes to the timing of coho salmon emergence and subsequent effects on resource use and juvenile growth. These objectives were addressed through a field-based comparative study of coho salmon populations in 5 hydroclimatically variable streams on the Copper River Delta from April-October 2013. The study sites included groundwater dominated streams with main-channel temperatures remaining relatively constant all year at 5° C, and surface-water dominated streams that freeze in the winter and reach 15-18° C in the main-channel in the summer. Results showed that coho salmon emerged weeks earlier in streams dominated by groundwater, likely due to warmer over-wintering temperatures. In surface-water dominated streams, coho salmon emerged later and the timing of emergence was more protracted. Emergence timing places important constraints on growth opportunities for coho at the juvenile life-stage by determining what food and thermal resources are available after emergence. Juvenile coho likely exploit lateral off-channel habitats that are often warmer than the main-channel to enhance metabolism and growth, particularly in groundwater streams where main-channel temperatures are far below what is needed for somatic growth. Climate change will likely alter current environmental conditions and cause subsequent shifts in coho salmon phenology, resource use and growth dynamics. This study offers new insight to the potential consequences of climatic shifts to coho salmon fitness and ultimately their life history trajectories.

Primary author: Forrest Carpenter  
Cramer Fish Sciences

Co-author(s): Ian Courter  
Kevin Ceder  
Phil Gaskill

Presentation type: Paper

Title: East Fork Owyhee River Retains the Capacity to Support Salmon and Steelhead

### Abstract

The East Fork Owyhee River has historically supported anadromous runs of Chinook salmon and steelhead trout, but dams and water diversion structures along the Columbia, Snake, and Owyhee Rivers have restricted access to spawning and rearing areas for more than 80 years. The Shoshone-Paiute Tribes has proposed to reintroduce salmon and steelhead by transporting fish from dams on the lower Snake River. Prior to implementing the reintroduction effort, literature reviews, extensive habitat surveys, carrying capacity modeling, and hydraulic modeling were utilized to determine if the basin retained the capacity to support production of anadromous salmonids. Habitat-based carrying capacity estimates were calculated using the Unit Characteristic Method. Dependent on flow and temperature conditions, which vary dramatically with meteorological conditions, we predicted the watershed was capable of producing 3,600 to 41,000 juvenile Chinook salmon and 3,300 to 43,000 juvenile steelhead trout when fully seeded. Spawning capacity estimates were also calculated based on the availability of appropriate substrate and flow conditions for each species. Lower elevations were found to have more potential for supporting spawning adults compared with high gradient canyon reaches in the upper basin. Key limiting factors for anadromous fish production in the East Fork Owyhee River were high summer temperatures, low summer flows, and large amounts of fine sediment substrates. Future restoration activities should focus on addressing these three limiting factors. In spite of decades of habitat degradation and water infrastructure development, the East Fork Owyhee River basin still appears to retain the capacity to support self-sustaining populations of anadromous fish when paired with a truck-and-haul program.

Primary author: Forrest Carpenter  
Cramer Fish Sciences

Co-author(s): Ian Courter  
Kevin Ceder  
Phil Gaskill

Presentation type: Paper

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Primary author: John Cassinelli  
Idaho Fish and Game

Co-author(s): Kevin Meyer  
Martin Koenig

Presentation type: Paper

Title: Idaho's "Tag-You're-It" fish tagging and angler return program: project development, findings, and current applications

### Abstract

Angler exploitation is a valuable piece of information for managing sport fisheries, yet estimates can be difficult and labor intensive to obtain, and unreliable if the assumptions are not met for the method employed. Idaho Fish and Game's "Tag-You're-It" project began in 2006 as a collaboration between research, hatchery, and management staff to use the high-reward tagging method to estimate angler tag reporting rates (information needed to compute exploitation from tag return data) across the state for a variety of fish species. From 2006 to 2009, we tagged and released over 22,000 fish - including wild and hatchery trout, bass, crappie, catfish, walleye, and yellow perch – using T-bar anchor tags worth \$0-\$200. We established a toll-free hotline and webpage for tag reporting, and for each reported tag the angler received a "Thank-You" letter that included the date and size of fish at tagging. Reporting rate averaged 55% for \$0 tags, 70% for \$10 tags, 92% for \$50 tags, and 99% for \$100 and \$200 tags. Non-reward tag reporting rate was highest for harvest-oriented fisheries such as walleye (68%), yellow perch (59%), and crappie (60%), and was lowest for largemouth bass (39%). The techniques developed in this project are now being used to evaluate angler exploitation on our statewide hatchery trout catchable stocking program. From 2011-2013, we tagged and released over 100,000 catchables (~250 mm in length at release) in 83 waters with 304 unique stocking events, including lakes and reservoirs, rivers, and community ponds. This constitutes evaluating angler exploitation for over 60% of the catchable rainbow trout stocking in Idaho each year. Additionally, this new program is studying a variety of parameters that may affect exploitation rates, including differences between bodies of water, the hatchery of origin, raceway rearing density, the season of stocking, and fish size at stocking.

Primary author: Benjamin Clemens  
Oregon Department of Fish and Wildlife

Co-author(s): David Noakes  
van de Wetering Stan

Presentation type: Paper

Title: Anatomy of a workshop: creating a framework to increase knowledge on lamprey

### Abstract

We organized and convened a lamprey workshop with 55 attendees from 22 entities, representing seven tribes or tribal fish commissions; five independent contractors or contracting groups; five federal agencies, two watershed councils, two universities, and one state agency. We identified emerging linkages in biology, research and management of West Coast lampreys, with a focus on Pacific lamprey. The workshop: 1) provided a unique forum to address Pacific lamprey as important cultural and ecological species, including as indicators of ecosystem health; 2) discussed key regional restoration and conservation initiatives; 3) provided expert perspectives; 4) developed collaborations among attendees to address key questions, and 5) set the stage for a subsequent meeting to fill information gaps. A documentary film and a tribal invocation were followed by presentations from six experts on different facets of lamprey biology, lamprey management, and oceanography. The attendees were divided into four workgroups: 1) "evolution and dispersal"; 2) "ocean biology"; 3) "freshwater biology", and 4) "passage", each with a fisheries expert as facilitator. The workgroups identified key unknowns in lamprey biology and management and devised general strategies to address these unknowns. A fifth ad hoc group, "ecosystem services", was also formed. We are working to integrate the products from the workshop into a document that will highlight themes among life stages and ecosystems. Our efforts continue to identify funding sources and productive collaborations that will further the understanding necessary to conserve and restore West Coast lampreys.

Primary author: Kelly Coates  
Cow Creek Band of the Umpqua Tribe of Indians

Co-author(s): Brian Mladenich

Presentation type: Poster

Title: Umpqua Basin Lamprey Distribution Map

#### Abstract

In 2012 the Cow Creek Band of the Umpqua Tribe of Indians was awarded a U.S. Fish and Wildlife Service Tribal Wildlife Grant to hire a Lamprey Coordinator and implement the Tribe's lamprey conservation program. A key component of the program included forming an Umpqua Basin Interagency Lamprey Workgroup and mapping lamprey distribution in the Umpqua Basin. The Tribe worked with local agencies including the U.S. Fish and Wildlife Service, The Oregon Department of Fish and Wildlife, The Bureau of Land Management and the Umpqua National Forest to gather any scientific agency data (historic and current) about Pacific lamprey (*Entosphenus tridentatus*) and western brook lamprey (*Lampetra richardsonii*) in the basin. In addition the Tribe's Fish Biologist interviewed Tribal elders and local residents for traditional and local anecdotal knowledge about lamprey in the basin. Once this data was procured, the Tribe's GIS Coordinator constructed a geo-database that includes an attribute table populated with the scientific and anecdotal information about lamprey including but not limited to; location, life stage, species, numbers of redds, and numbers of fish. This database will serve as a clearinghouse for lamprey data in the Umpqua basin, and is currently being used to determine locations for future lamprey surveys and areas of conservation. Ultimately, this database will be scaled up to a broader regional level, as the database and map have proven to be an effective tool for informing research and conservation planning for lamprey.

Primary author: Kelly Coates  
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Co-author(s): Jason Dunham  
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Michael Heck  
Brandon Kowalski  
Kiira Siitari

Presentation type: Paper

Title: Combining Traditional Tribal Knowledge and Western Science to Further Lamprey Research and Conservation in the Umpqua River Basin

#### Abstract

Over the last year, the Cow Creek Band of the Umpqua Tribe of Indians Fisheries Program has been focusing on research and conservation of Pacific lamprey (*Entosphenus tridentatus*) and western brook lamprey (*Lampetra richardsonii*) in the Umpqua Basin. Our approach to lamprey conservation combines traditional tribal knowledge and western science in order to provide a comprehensive approach to conservation. The Tribe has been working to re-establish past connections with Pacific lamprey through cultural and community education and outreach events including seminars and workshops for Tribal youth. Concurrently, we are focusing on the present status of lamprey within the basin through multiple research projects including; continued work on an Umpqua basin lamprey distribution map and database; partnering with the U.S. Fish and Wildlife Service, the Oregon Department of Fish and Wildlife, Bureau of Land Management, Umpqua National Forest (UNF), and the U.S. Geological Survey FRESA (USGS) on a survey of juvenile lamprey within the basin; partnering with USGS on a smallmouth bass predation on lamprey study; and partnering with the USFS and Stillwater Sciences on a lamprey habitat study in the upper North Umpqua River. We continue to further our work using a collaborative partnership approach and plan to integrate what we have learned from the cultural connection and the current science as we prepare for future lamprey conservation work at a larger scale.

Primary author: Michael Colvin  
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Presentation type: Paper

Title: Upper Willamette River spring Chinook prespawn mortality: data synthesis and prediction of optimal management actions

### Abstract

Upper Willamette River (UWR) spring Chinook salmon represent an ecologically, economically and culturally important threatened species. High head dams block access to high quality spawning areas within UWR tributary basins thereby limiting natural production. Fish are captured at dams and outplanted in upstream spawning habitats to mitigate passage limitations and provide additional natural production essential for species recovery. However, efficacy of outplanting efforts has been limited by high prespawning mortality (PSM) in outplant basins, especially in years associated with elevated water temperatures. Management alternatives have been hypothesized to minimize PSM of outplanted fish by reducing pathogen and thermal exposure within the UWR system. Some management alternatives include: continued direct outplanting after broodstock quotas are met, modification to collection and outplant timing across the run, and collection and holding in ambient or cool pathogen-free water prior to outplanting. A need exists to allow prediction of the optimal management alternative (i.e., the set of management actions that maximize natural production) given environmental and among-tributary variability. We developed a model that stochastically simulated UWR spring Chinook migration, outplanting, and natural production. The model predicted the hypothesized effects of management alternatives on PSM and ultimately natural production in UWR tributary populations. Simulation outputs were then used to parameterize a decision model and evaluate management alternatives. A sensitivity analysis was performed using the decision model to identify model components strongly influencing natural production. For example, results were sensitive to the criteria used in the model to assign fish as prespawning

Primary author: Ron Constable  
Oregon Dept of Fish and Wildlife

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Presentation type: Paper

Title: Estimating productivity and predicting adult returns for the Oregon Coast Coho ESU

#### Abstract

Estimates of salmonid productivity on large spatial scales are informative for managers in understanding limiting factors, predicting adult returns, and guiding harvest. Currently, many productivity measures of coho salmon in the Oregon Coast Evolutionary Significant Unit (ESU) are assessed by the number of recruits (adults) produced per spawner (parent), as determined by spawning ground surveys. While this provides some understanding of productivity, it aggregates all sources of variability throughout the life cycle and has limited abilities to forecast adult returns or inform recovery monitoring. Integrating summer parr and overwinter survival data into productivity calculations can increase understanding of variability, inform recovery monitoring, and improve adult predictions. Analyses of these data suggest limitations in parr production at current spawner abundances and indicate adult-to-parr survival rates are more variable than overwinter or marine survival. Estimates of smolt abundance for the ESU can be generated by applying overwinter survival rates to calibrated parr estimates. Smolt abundance can further inform recovery monitoring and increase accuracy of adult forecasts. Deconstructing the variability in life stage specific survival provides opportunity to understand biological, habitat, and environmental factors related to abundance, distribution, and survival.

Primary author: Ian Courter  
Cramer Fish Sciences

Co-author(s): Tommy Garrison  
Toby Kock  
Russell Perry

Presentation type: Paper

Title: Smolt migration survival is strongly correlated with stream flow in the Yakima River, Washington

#### Abstract

The influence of stream flow on salmon smolt emigration survival is a topic of widespread management interest. In 2013, we completed the second year of a three-year study designed to inform flow management decisions in the Yakima Basin, Washington. Yearling Chinook salmon smolts originating from Cle Elum Hatchery were captured in the spring of 2012 and 2013 at Roza Dam, implanted with radio tags, and released upstream. Each release group of 50 fish was paired with different flow conditions in the river ranging between 600 and >3,500 cfs. Specific, artificially controlled flow treatments were achieved through coordination with river operators, which enabled us to eliminate other confounding survival covariates such as water temperature and migration timing. Fish movements were tracked as tagged fish passed each of six monitoring stations during their migration down the upper Yakima River, through Roza Dam, past the Naches River confluence, and eventually through Prosser Dam in the lower Yakima River, covering a total distance of 130 kilometers. At the conclusion of field data collection, survival rates for each release group were calculated using Cormack-Jolly-Seber mark-recapture models. Yearling Chinook smolt survival estimates were strongly correlated with stream flow, forming an intuitive logistic flow-survival relationship with an asymptote at 1,500-2,000 cfs. Study objectives in 2014 will be focused on further refinement of the flow-survival relationship and differentiating mortality occurring at Roza Dam from other in-river survival factors.

Primary author: Steve Cramer  
Cramer Fish Sciences

Co-author(s): Kevin Ceder  
Kirsten Selheim

Presentation type: Paper

Title: Determining the habitat bottleneck – is it rearing or spawning limited?

### Abstract

Biologists confronted with prescribing minimum flows or choosing which habitat restoration projects get funding have wrestled with the challenge of identifying which habitat factors are the real bottleneck to fish production. We identified relationships between measurable habitat features and fish preferences for rearing and spawning, based on published studies. Rearing capacity is influenced by channel unit type, depth, cover, area, fine sediment, and temperature, while spawning capacity is influenced by depth and area of suitable gravels. We developed methods to measure all of these features on a single survey during base flow, and then predict how the features would differ at the different flows expected in different seasons. We field-tested these methods to estimate production potential of spring Chinook, steelhead, and resident rainbow trout in Battle Creek, California. The factor that was most limiting was strongly affected by the season in which spawning occurs for each species and the size of the spawners. Spring chinook spawn during summer base-flow, while steelhead and rainbow trout spawn during winter-spring high flows. Rearing capacity for the juveniles of both species is constrained by summer low flows. The number of suitable patches for steelhead spawning was substantially greater than for Chinook, because steelhead require half of depth required by Chinook (15 cm vs. 30 cm), and the area defended per spawning pair is only 4 m<sup>2</sup> for steelhead, one fifth of the 20.7 m<sup>2</sup> required per pair of Chinook. These methods clearly distinguished that spawning capacity was most limiting for spring Chinook, while rearing capacity was most limiting for steelhead and rainbow trout. Potential benefits of flow management and specific types of habitat restoration can readily be estimated with the model.

Primary author: Nate Dachtler  
USDA Forest Service

Co-author(s):

Presentation type: Paper

Title: Restoring Fish Passage at the outlet of Suttle Lake – A tale of two dams and a lost sockeye population

#### Abstract

Historically sockeye salmon migrated up the Metolius River, Lake Creek and Suttle Lake to spawn in Link Creek. Suttle Lake was one of two historic sockeye populations in Oregon and was likely the southern extent of their range. A power dam built at the outlet in the 1930's had a fish ladder but passage may have only been possible under the right flows. Others dams on Lake Creek during the same time period had fish passage problems and may have started to contribute to the decline of this sockeye run as early as 1925 and the run was extinct by 1940.

When the 1930's dam began to fail, the Forest Service built a second dam downstream in 1960 to maintain the lake level for recreational facilities. A fish ladder was installed at the 1960 dam but never worked properly and was filled in shortly after the dam was built. The dam restricted fish passage especially during low flows. A native kokanee population still exists in Suttle Lake and some of these fish may contain anadromous life history traits. With fish passage recently restored at other major barriers along Lake Creek, the Dam at Suttle Lake was the last remaining major barrier needing fish passage.

The project provided fish passage at the dam and improved habitat conditions at the outlet of Suttle Lake. This was accomplished by cutting two notches in the concrete dam structure, and removing the dam wing walls and fish ladder. Two roughened riffles were constructed with spawning areas that extended into the lake. Log jams were incorporated into the bank and constructed island which separates the two riffles. After nearly 80 years fish passage was restored to Suttle Lake, Link Creek and Blue Lake.

Primary author: Aaron David  
University of Washington

Co-author(s): Charles Simenstad  
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Presentation type: Paper

Title: The effects of wetland loss and conspecific density on juvenile Chinook salmon foraging in Pacific Northwest estuaries

### Abstract

The transition of juveniles from fresh water to estuarine and marine environments is a critical period in the life cycle of Pacific salmon, during which survival can be strongly size-selective. Because the amount and quality of food consumed are major determinants of juvenile salmon growth, successful acquisition of energy rich prey during estuarine residence is critical for survival. Humans have likely impacted the feeding relationships of juvenile salmon in estuaries by destroying estuarine wetlands and by altering the abundance and timing of juvenile salmon in estuaries. To improve our understanding of the effects of wetland loss and conspecific density on juvenile Chinook salmon consumption rate and diet composition in estuaries, we are assembling Chinook salmon density and diet data from nine U.S. Pacific Northwest estuaries across a range of Chinook salmon abundance and estuary wetland loss. While the estuarine foraging habits of juvenile salmon have been extensively examined, few studies have conducted quantitative comparisons among multiple estuaries. However, for mobile consumers such as juvenile salmon, a useful scale for comparisons of diet composition and consumption rate may be among whole estuaries that differ in the variables of interest. We evaluate the influence of estuarine wetland loss and conspecific density on juvenile Chinook salmon instantaneous ration, a proxy for consumption rate, and whether the effect of density varies among estuaries with different degrees of wetland loss. We also evaluate the influence of multiple variables on the diet composition of juvenile Chinook salmon to identify the primary factors influencing estuarine diet composition. We expect that there will be a negative relationship between instantaneous ration and wetland loss, that density will have a stronger effect in estuaries with greater wetland loss, and that processes operating at both within and among estuary scales will be important drivers of diet composition.

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Joseph O'Neil  
David Noakes

Presentation type: Paper

Title: Innate and learned preferences for natural stream vs. ground water; implications for hatchery practices and natal imprinting in salmonids.

### Abstract

Many hatchery rearing and release practices can dramatically increase the rate of straying by adult salmon returning from the ocean to spawn. Homing is governed by the olfactory discrimination of home-stream water and exposure to the home stream (surface water) during appropriate juvenile stages is critical for olfactory imprinting and successful completion of the adult homing migration. In most hatcheries, the need to control embryonic development rate (temperature) and limit exposure to pathogens dictates that salmon are initially reared on ground water. Salmon often return to the vicinity of their natal site, suggesting that in the wild the period of hatching and emergence may be a critical time for olfactory imprinting. To explore whether exposure to surface water during these embryonic periods is also important for successful imprinting in a hatchery setting, we conducted a series of experiments to examine innate preferences of emergent salmon for surface water vs. ground water and whether prior exposure to these water sources influences these preferences. Embryonic learning studies were conducted with steelhead at the Oregon Hatchery Research Center (OHRC) and spring Chinook salmon at the OHRC and ODFW Leaburg Hatchery. Embryos were reared in surface or ground water at the different facilities and then tested for attraction to different water sources in two-choice mazes. Both steelhead and Chinook salmon consistently demonstrated an innate preference for natural stream water over ground water. Initial incubation in ground water influenced these preference responses, however, suggesting that salmon are learning olfactory cues during these embryonic stages. These results are discussed in the context of olfactory imprinting and potential implications for hatchery rearing practices.

Primary author: Demian Ebert  
AECOM

Co-author(s):

Presentation type: Paper

Title: Development of a Rapid Assessment Method for Nearshore Habitat in Hood Canal, Puget Sound, Washington

### Abstract

Development of in-lieu fee programs that allow a project with adverse impacts project to pay for the impacts rather than implement on-site mitigation requires a method to evaluate the impacts of a project. Rapid assessment methods exist for wetlands but not for the nearshore marine environment in Puget Sound. Therefore, the goal of this nearshore tool is to assess the change in function in the nearshore environment from both built and restoration projects using a rapid assessment method. The tool was developed using funding provided by the US Navy and supported by a science team and a wide array of stakeholders. In the tool we define the nearshore environment, determine the valued ecosystem components (VEC) to address, habitats to evaluate, and indicators to use in the evaluation. Indicators are the basic questions answered during the rapid assessment. The answers to these questions feeds into calculators for each VEC where the site conditions are weighted specifically for the VEC in consideration and used to generate an overall function score for that VEC. Habitat typing at an assessment site creates acreages by habitat type that when multiplied by the function score generates total function acres. The strength of the tool is that a baseline assessment followed by evaluation of changes resulting from a project, generate changes in function scores and function acres that can be used to compare projects, both those with positive and negative impacts. Because function acres are unitless, the net differences can be used to compare project effects in different locations and with different levels of impact on different VECs.

Primary author: Madeleine Eckmann  
Oregon State University

Co-author(s):

Presentation type: Paper

Title: A pain in the gutt- considering bull trout energetics in a lake with conflicting costs and benefits

Abstract

Capital breeding fishes rely on stored energy for reproduction and therefor confer fitness advantages by maximizing growth. Since energy acquisition is closely tied to the overall fitness of capital breeders, growth is often suggested as the ultimate impetus of habitat selection. Bull trout, *Salvelinus confluentus*, are capital breeding fish with growth rates dictated primarily by temperature and prey availability. Temperature and prey availability are a function of depth in stratified lakes, so bull trout can maximize growth by occupying depths with energetically advantageous temperature and prey distributions. In this study I quantified patterns of bull trout depth use and energy accrual; compared observed patterns to bioenergetic simulations modeling maximized growth; and examined growth maximization as a primary impetus for depth selection. Bull trout were tracked with acoustic telemetry tags measuring depth and temperature use in Ross Reservoir, Washington State, in July and August, 2013. We qualified dietary items using angling and gastric lavage. Concurrently, we mapped vertical distributions of temperature and prey. By combining patterns of depth use and diet, with the corresponding temperature and prey distributions, I used bioenergetic modeling to explore the physiological consequences of depth use by bull trout.



Primary author: Matt Falcyn  
ODFW

Co-author(s):

Presentation type: Paper

Title: Estimating spawner abundance of coastal Fall Chinook populations: is non-random sampling optimal?

Abstract

Spawning Fall Chinook have been historically monitored at non-randomly selected index sites on the Oregon Coast. Using these data to estimate spawner population abundance is therefore problematic. I used 2436 observations of peak spawner density at 607 sites spread across 14 populations and 26 years to fit several dynamic landscape models. The best model predicts that relative peak density among sites depends on geomorphology, stream flow, and an interaction between latent population size and geomorphology. Estimates of total population size can be obtained by regressing mark-recapture estimates on the model's population-level output. There is considerable uncertainty in this approach that can be partially overcome with a probabilistic sampling design. However, it is not clear what method yields the optimal precision per dollar. An answer to this question may depend on the extent of our knowledge of spawning Chinook behavior and the cost of taking suboptimal management actions based on imprecise abundance estimates.

Primary author: Matt Falcyn  
ODFW

Co-author(s):

Presentation type: Paper

Title: Exploring patterns in coastal coho abundance and productivity

Abstract

Coastal coho populations display considerable synchrony in adult abundance. However, I was unable to detect a spatial component to synchrony among populations. This suggests that the common environment of the ocean overwhelms any spatially autocorrelated processes affecting freshwater. What is needed, then, is a model of population dynamics that includes temporally varying ocean conditions. I demonstrate how a new quantitative solution, hierarchical Bayes, can be used to address an old question: What drives population synchrony? An information-theoretic criterion indicates that temporal deviations in recruitment can be explained with a single coefficient common to all populations.

Primary author: Matt Fox  
Confederated Tribes of Warm Springs Reservation of Oregon

Co-author(s): Andrew Wildbill

Presentation type: Paper

Title: Pacific lamprey abundance and distribution in Fifteenmile Creek and recolonization in Hood River after removal of Powerdale Dam

### Abstract

Fifteenmile Creek and Hood River, in the mid-Columbia Basin, are traditional sites for Pacific lamprey harvest of the Confederated Tribes of The Warm Springs Reservation of Oregon (CTWSRO). With declining lamprey counts at Columbia River dams since the 1960s and the cultural and environmental value of lamprey to the CTWSRO and other Columbia River tribes, Bonneville Power Administration, under the Columbia River Accords, provided funding for select studies of Pacific lamprey, including Fifteenmile Creek and Hood River. The feasibility study to monitor abundance of Pacific lamprey in Fifteenmile Creek began in 2010. Population estimates, using a two event mark-recapture experiment, were completed in Fifteenmile Creek from 2011 to 2013. Tribal harvest of Pacific lamprey in Fifteenmile Creek was estimated from 2011 to 2013 allowing escapement to be calculated. With the removal of Powerdale Dam in Hood River during fall 2010, recolonization of Pacific lamprey into Hood River was documented in 2012. Other objectives of this study that will be discussed include spawning and juvenile rearing distribution and associated habitats, and migration patterns using half-duplex PIT tag technology. Efforts to identify factors limiting Pacific lamprey production within Fifteenmile Creek Subbasin are underway with the assistance from multiple agencies, stakeholders, and interested parties. Results from this study will contribute to a growing body of information about Pacific lamprey population status and trends in the Columbia Basin as well as advance ecological and biological understanding of this culturally and ecologically important fish.

Primary author: Charles Frady  
Washington Dept. of Fish and Wildlife

Co-author(s):

Presentation type: Paper

Title: Methods for estimating spawning escapement of summer steelhead in the Methow River Basin, WA

Abstract

Spawning ground surveys are used to provide information on the distribution, abundance, and spawn timing of ESA-listed species. However, conducting spawning ground surveys for summer steelhead (*O. mykiss*) can be logistically challenging because of dynamic environmental conditions during the spawning season (i.e., increased discharge and turbidity). Since 2004, WDFW has conducted spawning ground surveys for summer steelhead in the Methow River Basin. The goals and objectives of these monitoring efforts are to produce consistent, long-term trend data, but unpredictable environmental conditions during the survey season and the inability to determine origin of spawning fish limit the utility of stream survey efforts. Emerging PIT tag technology has shown that overall spawner abundance in the Methow Basin has likely been underestimated both in mainstem areas and lower-order tributaries. Detections of PIT-tagged adult summer steelhead at temporary and permanent PIT tag antennas in the Methow Basin were used to evaluate and describe the abundance and distribution of adult summer steelhead by origin throughout the spawning season. In selected tributaries, redd surveys were also conducted to compare overall escapement values derived from redd surveys and PIT tag antennas. These methods should assist managers and researchers in estimating the distribution and abundance of hatchery and wild summer steelhead, and calculating important monitoring variables including the proportion of hatchery fish on spawning grounds.

Primary author: Kinsey Frick  
NOAA - Northwest Fisheries Science Center

Co-author(s): Mary Moser  
Steve Corbett  
Christopher Caudill  
Matthew Keefer

Presentation type: Paper

Title: Improving Adult Pacific Lamprey Passage Using Lamprey Passage Structures and Refuges

#### Abstract

Adult Pacific lamprey (*Entosphenus tridentatus*) experience difficulty navigating large Columbia River hydropower dams using fishways intended for salmonids. Development of lamprey passage structures (LPSs) designed to attract lamprey and capitalize on their unique behaviors has improved passage performance. Efforts to increase adult Pacific lamprey passage in 2013 included structural and operational changes to improve lamprey access to and passage through LPSs at Bonneville Dam.

Lamprey use of these structures was assessed by lamprey-activated counters and passive integrated transponder (PIT) detections. A total of 1,048 lamprey were implanted with PIT tags and released downstream from Bonneville Dam. Using PIT detections we tested whether lamprey used refuge boxes placed in the Washington-shore auxiliary water supply (AWS) channel to improve lamprey retention in this area. Fifteen percent of the lamprey implanted with PIT tags was detected at a refuge box. A large percentage (59%) of these fish was subsequently detected in the Washington-shore LPS immediately upstream from the refuge. Of the PIT-tagged lamprey detected exiting the Washington-shore fishway, 27% had previously used a refuge box. As in previous years, results indicate that lamprey are able to find and take advantage of these relatively small refuge areas.

The Cascades Island LPS is the first lamprey structure to connect from the Bonneville Dam tailrace to its forebay. It was operational for the first time in 2013; lamprey use of this structure and passage success was evaluated. Being a new structure, we saw minimal use by tagged fish released downstream (0.1%), but experiments to determine passage success indicated that 79% of PIT-tagged fish released into the lower part of the structure successfully ascended to the newly extended section and exited to the forebay. Lamprey-specific structures such as LPSs and refuge boxes help mitigate the impediments posed by hydropower dams for Pacific lamprey.

Primary author: Andrew Futerman  
Oregon State University

Co-author(s): Jordan Massie

Presentation type: Poster

Title: The presence and prevalence of trematode parasites in juvenile steelhead trout, *Oncorhynchus mykiss*

### Abstract

Coastal waters of the Pacific Northwest have experienced marked declines in salmonid populations, notably steelhead (*Oncorhynchus mykiss*) over the past few decades. Scientists and managers have grappled with the task of identifying the mechanisms leading to decline in an attempt to mitigate losses and understand the relevant biological and environmental considerations. The freshwater parasite *Nanophyetus salmincola*, a trematode who spends part of its complex life cycle in salmonids, could be a significant source of juvenile mortality, as has been demonstrated in coho, *Oncorhynchus kisutch*, and Chinook salmon, *Oncorhynchus tshawytscha* (Jacobson et al., 2008).

Our objective is to analyze posterior kidney samples for cysts, a known proxy for trematode abundance, to determine differences in prevalence and intensity of the parasite (Jacobson et al., 2008). Differences in density data between sites (Bonneville Dam, Columbia River mouth and marine) may provide insight into mortality of affected fish. The number of parasitic cysts in each sample is recorded. Upon completion of the study, samples from different habitats will be compared.

We expect, as was shown in previous studies, that earlier life stages of steelhead will show the highest density of parasites, followed by estuarine fish, and the lowest density in pelagic juveniles, signifying parasite related mortality events (Jacobsen et al., 2008). Once infected, parasites remain in the fish until death before moving to the next host. These results would imply that lower parasite prevalence later in ontogeny is due to mortality at a younger developmental stage.

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Primary author: Tommy Garrison  
Cramer Fish Sciences

Co-author(s):

Presentation type: Paper

Title: Accounting for individual heterogeneity in Open Jolly-Seber mark-recapture models

### Abstract

Open Jolly-Seber models are frequently used to estimate abundance and other demographic parameters with mark-recapture data. Despite their ubiquity, a common shortcoming of these models is that estimates of abundance are very sensitive to the assumption that all individuals in the population are equally vulnerable to capture. When individuals vary in their capture probabilities, termed “individual heterogeneity” in the mark-recapture literature, the most catchable individuals are likely to be caught first and more often. This leads to capture probability being overestimated and abundance being underestimated. Many attempts have been made to address individual heterogeneity in capture probability over the past 30 years and few have adequately addressed this problem. In the past 5 years, however, Bayesian state-space formulations of the Open Jolly-Seber model have been developed which can readily incorporate individual effects into capture probability by partitioning model parameters into fixed and random components. An in-depth examination of this model is presented. Then, the model is applied to a unique population of adult white sturgeon in the Kootenai River as an example. Adult Kootenai white sturgeon reside both in Kootenay Lake and Kootenai River, but the majority of sampling effort is conducted in the river where individuals are captured during their spawning migrations. Because individuals in this population spawn at different frequencies, some are more or less likely to be captured than others, violating the equal capture probability assumption. As expected, perceived estimates of sturgeon abundance are much lower when individual heterogeneity is ignored in the model compared to when this effect is accounted for using the recently developed state-space version of the model.

Primary author: Rosalinda Gonzalez  
Department of Fisheries and Wildlife Oregon State University

Co-author(s): Jason Dunham

Presentation type: Paper

Title: The Influence of Large Wood Restoration on Larval Lamprey in a Pacific Northwest Stream

Abstract

Stream habitat restoration in the Pacific Northwest often involves placement of large, instream wood. The benefits of this restoration technique have never been evaluated for lamprey, an ecologically and culturally important species. We evaluated influences of large wood on larval Pacific (*Entosphenus tridentata*) and Brook lamprey (*Lampetra richardsoni*) by 1) identifying instream habitat characteristics that influence presence of larval lamprey; and 2) evaluating how these characteristics are influenced by wood. To address habitat use, we determined presence of larval lamprey in 90 pools during summer low flows in small coastal Oregon stream. We focused on a reach of stream where large numbers of large wood pieces and wood jams were introduced to retain sediment in the channel. Preliminary results indicates that presence of lamprey larvae was associated with availability of fine and deeper sediment ( $P < 0.001$ ). Pools with wood, regardless of whether they were formed by wood, had greater coverage of fine sediment and deeper sediment ( $P < 0.001$ ) based on preliminary analyses. Taken together, these preliminary results suggest that instream wood can provide habitat conditions that larval lamprey use, and thus provide benefits to these species.

Primary author: Damon H. Goodman  
USFWS

Co-author(s): Stewart Reid  
Bill Poytress

Presentation type: Paper

Title: Outmigration of Pacific Lamprey in the Sacramento River: environmental factors and implications for streamflow management.

#### Abstract

Little is known about the downstream migration of Pacific Lamprey *macrophthalmia*. Although lamprey data may be collected at some level associated with Salmonid trapping, limited sample timing and attributes collected on non-target species often hampers interpretation. The Red Bluff downstream migration monitoring program in the Sacramento River is unique in at least two ways 1) sampling is conducted year-round including at high streamflows, 2) species and life stage specific information has been collected for all lampreys encountered at the trapping location. This trapping operation consists of an array of rotary screw traps and represents the downstream migration of the Upper Sacramento River system one of the largest rivers in California. We analyzed a decade of lamprey catch data for migratory timing and variation in catch associated with environmental variables. Downstream migration can be characterized as mass migration events occurring primarily between November and May. However, individual catches of *macrophthalmia* occurred in all months over the 10-year period. Large lamprey migrations were strongly associated with peak streamflow events but not to peak streamflow magnitude. The results of this analysis are presented in light of implications for conservation of Pacific Lamprey populations in respect to entrainment and streamflow management.

Primary author: Kevin Goodson  
ODFW

Co-author(s):

Presentation type: Paper

Title: Angler and Public Opinion of Coastal Oregon Fisheries and Wild Fish Conservation

### Abstract

Fish and wildlife agencies often manage harvest opportunities based on the desires of their customers. These desires are often determined through public meetings. These desires are also often presented as testimony at commission or board meetings where rule making is being considered for harvest opportunities. All too often, the opportunity decision is based on “who shows up” more so than what the majority wants. During the development of a fisheries conservation and management plan, ODFW took the opportunity to try and better inform the process by conducting a random survey of Oregon anglers, as well as the general non-angling public. The surveys were designed with the assistance and oversight of the Survey Research Center at Oregon State University. At the same time the surveys were developed and sent out, four regional stakeholder teams were recruited from a broad range of interest groups. Several key issues discussed with the stakeholder groups were also the subject of questions in the surveys. This allowed a comparison of preferences between the stakeholder groups and the licensed anglers, as well as the general public, which provided some interesting results. As an example, when both the stakeholders and anglers were asked about their support for new wild winter steelhead harvest fisheries the two groups had very different reactions with the anglers very supportive of such fisheries and the stakeholders almost unanimously opposed. This disparity between a small group of interested individuals and the average angler shows the difficulty in accurately defining what management opportunities should be. This presentation provides highlights from the surveys, including estimates of angler preferences and opinions, how anglers compare to the general public, and what the results may be telling us about how to manage fisheries and conserve wild fish.

Primary author: Ann Gray  
USFWS

Co-author(s):

Presentation type: Paper

Title: Pacific lamprey passage considerations and biological implications

Abstract

The Pacific lamprey is a native, anadromous fish species, ecologically and culturally important to river systems of Oregon. Passage has been identified as one of the threats to lampreys that has resulted in reduced population abundance and distribution. Since the 1990s, increased attention on this species has helped us better define the challenges facing upstream lamprey migrants and create improved passage conditions for this relatively weak swimming fish. This presentation provides an overview of upstream migrant behavior, types of passage barriers and how barrier affect the species, as well as a brief synopsis of potential passage solutions and their relative effectiveness.

Primary author: Stan Gregory  
Oregon State University

Co-author(s):

Presentation type: Paper

Title: There and Back Again: Trajectories of Change in Native Fish Communities in the Willamette River

Abstract

Aquatic ecosystems in the mainstem Willamette River have been altered by humans over the last 10,000 years, with rapid acceleration of degradation during the last 160 years. Land conversion, industrialization, and human wastes eliminated aquatic habitat and created major temperature and dissolved oxygen blocks in the lower river in the early 1900s. In 2011-2013, measures of fish abundance and species richness remained significantly lower in the reach below Newberg than in the middle and upper mainstem river. Non-native fish have been introduced since the late 1800s; we now have 35 native fish species and 32 non-natives in the basin. Remarkably only one native fish species, fall Chinook salmon, has been extirpated from the Willamette River basin. Flood-control dams have altered discharge and sediment supply to the mainstem river. A flood that historically occurred once every two years now has a recurrence probability of once in 100 years. Recent studies estimate dams have reduced the sediment supply to the Willamette River by 60%. Projected population increase, regional warming, and continued water removal pose major threats to native fish communities. Restoration and conservation actions will never return the Willamette River to the habitats and aquatic communities of the past. So how do we envision the Willamette River of the coming century? How do we design river management for the future instead of the past? How do we discern what is possible and implement effective practices but at the same time recognize properties of the past that are not likely to occur again? These challenges and a few modest suggestions will be illustrated through a spatial analysis of alternative futures for the Willamette River. And in one closing futile gesture, I will offer a suggestion to increase the effectiveness of agencies, institutions, and NGOs and reduce bureaucratic paralysis and infighting.

Primary author: Ann Grote  
USFWS Mid Columbia River Fisheries Resource Office

Co-author(s): Andy Johnsen  
Mark Nelson  
Daniel Sulak  
Cal Yonce  
R.D. Nelle

Presentation type: Paper

Title: PASSAGE OF RADIO-TAGGED ADULT PACIFIC LAMPREY AT YAKIMA RIVER DIVERSION DAMS

#### Abstract

As with many other rivers in the Pacific Northwest, Pacific lamprey in the Yakima River are in decline. Efforts are currently underway to better understand lamprey biology and life history in an attempt to conserve the species; however little is currently known and much information is still needed. Studies have shown that dams often impede the migrations of adult Pacific lampreys in river systems. Such delays may reduce the time and energy available for adults to complete spawning migrations, and may negatively impact lamprey reproduction. The Yakima River has with numerous irrigation diversion dams that may that may prevent or delay the upstream movements of Pacific lampreys; however, the impact of these dams on adult migration is not known. We used radio telemetry to evaluate Pacific lamprey approach timing, residence time, fishway routes, other passage routes, and migration rates at four diversion dams on the lower Yakima River. Translocated lampreys were released in the fall and spring to simulate known migration timing. Most passage events and migratory movements occurred during the spring months. Half of the study group failed to pass each successive dam, with only two lampreys successfully passing all four dams. Passage occurred above a water temperature threshold and usually during increases on the hydrograph. Pacific lamprey explored and utilized multiple passage routes at each dam. The overall time spent at each dam averaged three weeks. After entering a fish ladder, radio-tagged lampreys generally navigated and exited the fishway quickly. Our results suggest that Yakima River diversion dams substantially impact the upstream migration of Pacific lampreys.

Primary author: Steve Haeseker  
U.S. Fish and Wildlife Service

Co-author(s):

Presentation type: Paper

Title: Can Experimental Spill Management reverse declines of Snake River salmon and steelhead populations?

Abstract

Smolt-to-adult return rates (SARs) for spring-summer Chinook salmon and steelhead from the Snake River basin remain well below regional survival goals, hindering progress toward population recovery. Recent research has shown that hydrosystem management actions, such as spilling water over dams during juvenile outmigration, can influence freshwater survival, ocean survival, and SARs. Ocean indices have also been shown to influence ocean survival and SARs. In 2013, scientists participating on the multi-agency Comparative Survival Study convened a workshop attended by regional, national, and international scientists to review and critique the design of an Experimental Spill Management program, where voluntary spill levels would be increased beyond historical levels and population responses monitored. Four levels of spill volumes were assessed, ranging from the current status quo levels up to high spill levels. Using simulation models that accounted for variability in annual flow volumes and variability in ocean conditions, results showed that maintaining status quo spill levels is expected to continue SARs that remain well below regional survival goals. In contrast, simulations at the high spill levels suggest that it may be possible to approach the regional survival goals for both Chinook salmon and steelhead. As with all adaptive management experiments, predictions can only be tested following implementation. However, current tagging programs, detection infrastructure, and analytical capacity provide a rigorous monitoring framework for assessing population responses to Experimental Spill Management, if implemented.

Primary author: James                      Hall  
Oregon State University

Co-author(s):

Presentation type: Paper

Title: Extensive movement of a river lamprey in Michigan: cracking the code 50 years later

Abstract

I studied the life history of a river-dwelling lamprey *Ichthyomyzon castaneus* in the Manistee River from 1959-1962. The prevailing view of movement in stream fishes was that such movement was largely restricted to a few hundred meters during their lifetime. From May-November 1961 I trapped 11,000 lampreys, marked 1,900 with individual marks, and made 2,800 recaptures of marked lampreys. Trapping was initiated in a 1-mile segment, but soon expanded as it became clear that lampreys were moving extensively. I moved traps farther and farther upstream and downstream, eventually capturing lampreys that had been marked in the 1-mile section 12 miles upstream and 24 miles downstream from where they had been marked. About half of the recaptures were made in the 1-mile section.

The mean rate of movement of all recaptures was 0.18 mile per day. One lamprey traveled 25.5 miles downstream in only 6 days, the maximum observed rate of movement.

I attempted to use the data to estimate population size from the trapping data, however the substantial movement made such estimates problematic. I am optimistic that analysis with Program MARK may allow such estimates, which will be presented if successful.

Primary author: Kirk Handley  
Oregon Dept. of Fish and Wildlife

Co-author(s): Chris James  
James Ruzycski  
Richard Carmichael

Presentation type: Poster

Title: Evaluation of PIT Tag Retention and Panjet Mark Longevity in Wild Spring Chinook and Summer Steelhead Parr

### Abstract

Abstract.- Conducting mark recapture studies on juvenile salmonids calls for an efficient and inexpensive marking technique that can be used on small (<60 mm) fish. We evaluated retention rates of external marks on wild spring Chinook salmon and summer steelhead parr. Fish were PIT tagged and marked with either blue or green diluted acrylic paint administered with a dental inoculation gun (panjet). Panjet marks were applied either anterior, mid, or posterior to the anal fin depending on capture at either zero, three, or six weeks, respectively. A final recapture run was conducted at 12 weeks to assess mark retention, but no additional marks were applied at that time. Panjet mark retention rates varied among colors for juvenile Chinook salmon but generally diminished greatly after six weeks. Only two of the sixteen fish that were marked during the first interval and recaptured at the final twelve week interval retained their initial, visible panjet mark. We confirmed two shed PIT tags of the 1,148 double marked fish. Although panjet marking is efficient and seemingly non injurious to the fish, these data suggest that panjet marks should only be used in studies lasting fewer than six weeks during the summer rearing season.

Primary author: Karen Hans  
Oregon Department of Fish and Wildlife

Co-author(s):

Presentation type: Paper

Title: A Creative Solution For Fish Passage at Box Culverts

### Abstract

Box culvert can present obstacles to fish passage. Low water levels create sheet flows across the flat surface only a few centimeters deep. High flows can cause velocity barriers as there is no roughness to slow the water down. Hundreds of box culverts across the landscape pose fish barriers to critical habitat areas. Many of these culverts have 30 years or more left before they will need to be replaced. Adding baffles to the inside of the culverts can offer some improvement to fish passage but can clog with debris. Without routine maintenance, baffles can become fish passage barriers and few agencies have staff to maintain these culverts.

Natural fishways, or roughened chutes, are frequently used to provide fish passage instead of a concrete fish ladder. However these structures must be precisely constructed in order to maintain stability and provide year round fish passage. If not properly constructed, low flows can go subsurface in natural fishways; high flows can erode and destabilize the structure.

In my presentation, I will discuss a hybrid design for a fish passage structure that combines natural stream bed materials with a concrete step pool design structure to provide stability and prevent subsurface flows. This structure has been built on Burkhart Creek, a tributary to the Willamette River in Albany OR. The structure was constructed to backwater a box culvert so, after negotiating their way up the fishway, fish are free to swim up the culvert in 18 to 30 centimeters of water. Large boulders (shadow rocks) placed inside the box culvert slow high water velocities, encourage the accumulation of gravels, and offer refuge areas to fish.

Primary author: Mike Harrington  
Oregon Department of Fish and Wildlife

Co-author(s): Bill Tinniswood

Presentation type: Paper

Title: Roving Statistical Creel of Upper Klamath Lake and Agency Lake

Abstract

Upper Klamath Lake and Agency Lake sustain popular trophy redband trout (*Oncorhynchus mykiss*) fisheries. The current regulation allows anglers to harvest one trout per day; however, angler groups frequently challenge this regulation with more restrictive angling proposals. The Oregon Department of Fish and Wildlife implemented a roving type statistical creel in 2009 and 2010 and compared it to 40 years of non-statistical creel data to determine the need for more restrictive angling regulations. The management objective in Upper Klamath Lake and Agency Lake is 50% of rainbow trout caught to be greater than 20 inches at a catch rate of 0.06 fish/hr. or greater. The average catch rate in 2009 was 0.11 fish/hr. and was 0.10 fish/hr. in 2010; 54% of the fish caught were greater than 20 inches in length according to angler measurements. The median catch rate for the two lakes was 0.09 fish/hr. between 1952 and 2011 (0.02-0.037 fish hr., n = 42), and the percentage of fish caught above 20 inches has only dipped below 50% three times since 1977 (n=14). The Department was consistently meeting management objectives using the current regulation and did not support a more restrictive regulation.

Primary author: Julianne Harris  
U.S. Fish and Wildlife Service

Co-author(s): Courtney Newlon  
Steven Haeseker  
Ryan Koch

Presentation type: Paper

Title: Growth of bull trout from the South Fork of the Walla Walla River: An assessment of individual variability and differences between life history forms

### Abstract

Understanding variability in growth is important for assessment of population viability and conservation. For bull trout, *Salvelinus confluentus*, migratory life history form (i.e., migrant or resident) can dramatically affect growth. We examined patterns and individual variability in growth of bull trout that spawn in the South Fork Walla Walla River, Oregon, using two data sources: changes-in-length with associated movement patterns from recapturing PIT-tagged fish, and back-calculated lengths-at-age from otoliths. Our objectives were to assess possible differences between migrants and residents and to evaluate individual variability and patterns in growth. Growth was evaluated using hierarchical von Bertalanffy models for each data approach separately and then by a combined model including both sources. Models were fit using Bayesian methods. Migratory bull trout obtained larger asymptotic sizes than residents; however, there was also substantial individual variability in growth. Growth may vary by individual based on the specific environmental conditions experienced by that fish. High rates of growth were experienced by some individuals (possibly migrants) at 200-400 mm FL, when fish were estimated to be about 2-4 years old. Transition to a migratory life history likely occurred by 200 mm FL. As individuals approached 200 mm FL, presumed migrants showed a slightly higher average growth rate than residents; thus, growth early in life may impact the probability of becoming migratory. The combined model estimated a population-level asymptotic length of 517 mm FL (95%: 484-557) and a growth coefficient of 0.322 (95%: 0.271-0.376), with migrants expected to reach asymptotic lengths that are 183 mm larger than residents. Combining data from multiple approaches provided a more complete evaluation of growth than either would alone and would likely be productive for rare or listed species, since data from any one source could be limited.

Primary author: Justin Hay  
Oregon Department of Fish and Wildlife

Co-author(s): Michael Lance

Presentation type: Poster

Title: The Effects of Size Dependent Trap Efficiency Rates on Wild Summer Steelhead (*Oncorhynchus mykiss*)  
Downstream Migrant Estimates

### Abstract

Sampling with rotary screw traps is a common method used in fisheries research to estimate annual steelhead (*Oncorhynchus mykiss*) downstream migrant abundance. Screw trap derived abundance estimates are dependent upon trap efficiency calculations made through mark-recapture methodology. However, these trap efficiency estimates can be affected by various factors such as flow and fish size. We will discuss the impact on abundance estimates of fish size dependent trap efficiency rates of naturally produced summer steelhead. We analyzed screw trap capture efficiencies in two streams in Northeast Oregon (Lostine River and Little Sheep Creek) where ongoing long term studies document life history patterns and abundance of juvenile steelhead using rotary screw traps. Trap efficiency rates had a negative linear relationship with fork length ( $r^2 = 0.73-0.84$ ), leaving the potential to overestimate the abundance of small fish and underestimate the abundance of large fish if one trap efficiency rate were used for all size groups. Failure to account for size specific trap efficiency rates in our streams produced overall downstream migrant abundance estimates that were 10-17% lower than estimates that factored in size specific trap efficiency. This analysis illustrates the potential for misrepresentation of steelhead downstream migrant abundance if size specific trap efficiency rates are not used in the calculation of abundance.

Primary author: Scott Heppell  
Oregon State University

Co-author(s): Selina Heppell

Presentation type: Paper

Title: A 40-year shift in benthic marine community dominance in Yaquina Bay, Oregon

Abstract

Alteration to natural shoreline habitat affects the ecology of nearshore fish and invertebrates. Yaquina Bay, Oregon, has undergone intense shoreline development during the last half of the 20th century, resulting in the alteration of 45% of the lower estuary's natural shoreline. In 1967, the United States Environmental Protection Agency (USEPA) conducted a 21-month otter trawl survey of Yaquina Bay to characterize the demersal fish and epibenthic crustacean population. From 2003-2005, we conducted a 25-month otter trawl survey to replicate that work and provide a comparative snapshot of the demersal fish and epibenthic crustacean community. A comparison of the trawl survey data reveals a 91% decline in total catch per unit effort (CPUE) between surveys as well as a decline in five independent measures of biodiversity. The catch data indicate that the benthic marine community of Yaquina Bay has experienced a shift in species dominance from demersal fish in the late 1960's to epibenthic crustaceans in the 2000's, marked most notably by a nine-fold increase in the Dungeness crab CPUE.

Primary author: Kevin Herkamp  
ODFW - HQ

Co-author(s):

Presentation type: Poster

Title: ODFW Fish Restoration and Enhancement Program: How anglers help you to help them.

Abstract

A poster providing an overview and history of the ODFW R&E program and the funding available for fishery related projects. This will highlight the unique nature of these funds, as they originate from a surcharge on anglers.

Primary author: Kevin Herkamp  
ODFW - HQ

Co-author(s):

Presentation type: Paper

Title: STEP up and learn about tools to help engage the community

Abstract

As a fishery professional you have the expertise, now will you take the time to pass that knowledge on to the public and students of your community? This session will highlight the educational components and opportunities of the ODFW Salmon Trout Enhancement Program (STEP). Included will be information on newly developed resources relating to salmon/trout biology for the STEP "Fish Eggs to Fry" classroom incubator program. Come find out what resources are now available to help you engage with your community.

Primary author: Crystal Herron  
Department of Fisheries and Wildlife, Oregon State University

Co-author(s): Michael Colvin  
Michael Kent  
Carl Schreck  
Christopher Caudill

Presentation type: Paper

Title: *Nanophyetus salminicola* burdens in Chinook salmon (*Onchorhynchus tshawytscha*) prespawning in the Willamette Basin

### Abstract

Chinook salmon (*Onchorhynchus tshawytscha*) are anadromous fish. Upon their return to freshwater, cortisol levels increase, suppressing their immune system and making Chinook more susceptible to pathogens. We quantified *Nanophyetus salminicola* burdens in adult Chinook migrating through the Upper Willamette River (UWR). This study branched off of a larger study that aimed to determine the reasons behind the death of adult Chinook before spawning has occurred. Spring run Chinook salmon were sampled from upper and lower locations along the Willamette Basin over four years. Dissections and tissue collection of samples were performed before necrosis of the fish set in. Tissue samples were preserved at -81°C. Counts of *N. salminicola* were performed for kidney, heart and gill tissues under a light microscope at 400x. We found that while progressing through the UWR, Chinook parasite loads increased. High prespawning mortality rates in adult spring Chinook occurred in the UWR. This observation leads us to hypothesize that high parasite infections are associated with prespawning mortality in Chinook. If it is found that a high rate of prespawning mortality in Chinook occurs with high numbers of *N. salminicola*, then future management plans for UWR spring Chinook may benefit by considering actions that limit pathogen exposure.

Primary author: Timothy Hoffnagle  
ODFW

Co-author(s): Sally Gee  
Mike McLean

Presentation type: Paper

Title: Populating Captive Broodstock Programs - Eggs or Parr?

Abstract

Captive broodstock programs can rapidly increase the number of adults in depleted populations by using artificial propagation to dramatically increase survival during critical life stages. The Grande Ronde Basin Spring Chinook Salmon Captive Broodstock Program began by collecting natural parr in 1995 (BY 1994). These parr brought diseases with them, resulting in mortality rates approaching 50%. In an effort to reduce this mortality, co-managers decided to evaluate collecting the captive broodstock as eggs. For broodyears 2005, 2006 and 2008, ~150 eyed eggs were taken from the Conventional Hatchery Program at Lookingglass Hatchery - equal numbers of eggs from each female ('egg' group). These were compared with ~150 parr collected from nature ('parr' group). Disease was not prevalent for these cohorts and survival to spawn exceeded 90% for each group. In both groups, greater than 80% of males matured at ages 2 or 3 and over 80% of females matured at age 4. However, the majority of males in the egg group matured at age 2, compared to age 3 for the parr group. Similarly, a greater percentage of females in the parr group matured at age 5. The egg group were larger at smoltification than those in the parr group and males were larger when maturing at ages 2 and 3 and mature females were larger at age 4. Conversely, males were larger at age 4 and both sexes were larger at age 5 for the parr group. Resulting fecundity was greater for the egg group at age 4 and for the parr group at age 5. Total egg production was similar between groups, as was fertility. We also compared feed conversion and effective population size between groups. Captive rearing of depleted stocks will be an important conservation tool and optimum rearing strategies are needed to make this tool effective.

Primary author: Robert Hogg  
Oregon Department of Fish and Wildlife

Co-author(s): Stephen Coghlan, Jr.  
Joseph Zydlewski  
Kevin Simon

Presentation type: Paper

Title: Anadromous Sea Lampreys Recolonize a Maine Coastal River Tributary After Dam Removal: Ecosystem Engineers?

### Abstract

Sedgeunkedunk Stream, a third-order tributary to the Penobscot River, Maine, historically supported several anadromous fishes including Atlantic Salmon and Sea Lamprey. However, two small dams constructed in the 1800s reduced or eliminated spawning runs entirely. In 2009, efforts to restore marine–freshwater connectivity culminated with removal of the lowermost dam, thus providing access to an additional 4.6-km of lotic habitat. Because Sea Lampreys utilized accessible habitat prior to dam removal, they were chosen as a focal species with which to quantify recolonization. During spawning runs of 2008 through 2011 (before and after dam removal), individuals were marked with PIT-tags and their activity was tracked with daily surveys. Jolly-Seber Population Analysis (POPAN) models indicated a fourfold increase in the annual abundance of spawning-phase Sea Lampreys, with estimates rising from  $59 \pm 4$  ( $N \pm SE$ ) before dam removal (2008) to  $223 \pm 18$  and  $242 \pm 16$  after dam removal (2010 and 2011, respectively). Accompanying the marked increase in annual abundance was a greater than fourfold increase in nesting sites: the number of nests increased from 31 in 2008 to 128 and 131 in 2010 and 2011, respectively. Sea Lampreys disturb the stream-bed during nest construction thereby altering physical habitat and potentially affecting stream-dwelling biota. In order to address the hypothesis that Sea Lampreys serve as ecosystem engineers, we quantified differences in stream depth, current velocity, fine sediment coverage, embeddedness, and benthic invertebrate assemblages among the mounds, pits and undisturbed reference locations of nesting sites. We sampled during two time periods: once in early summer after allowing sufficient time for ammocoete dispersal and again in autumn to determine if any Lamprey-induced changes persisted. Persistent differences between mounds, pits and reference locations were detected for most response variables thereby suggesting that spawning-phase Sea Lampreys are ecosystem engineers in Sedgeunkedunk Stream.





Primary author: Dan Isaak  
US Forest Service  
Co-author(s): Bruce Rieman

Presentation type: Poster

Title: Climate Velocity in Streams: What Does it Mean for Fish?

### Abstract

Climate velocity is the rate at which a temperature isotherm shifts within a stream or river. To ensure persistence this century, species distributions must track the locations of isotherms that delimit thermally suitable habitat as they move upstream with climate warming. Here, we develop the equations for calculating isotherm shift rates (ISRs) in streams that can be used to represent historic or future warming scenarios and be calibrated to individual streams using local measurements of stream temperature and slope. A set of reference equations and formulas are provided for application to most streams. Example calculations for streams with lapse rates of 0.8 °C/100 m and long-term warming rates of 0.1–0.2 °C decade indicate that isotherms shift upstream at 0.13–1.3 km decade in steep streams (2–10% slope) and 1.3–25 km decade in flat streams (0.1–1% slope). Used more generally with global scenarios, the equations predict isotherms shifted 1.5–43 km in many streams during the 20th Century as air temperatures increased by 0.6 °C and would shift another 5–143 km in the first half of the 21st Century if midrange projections of a 2 °C air temperature increase occur. Variability analysis suggests that short-term variation associated with inter-annual stream temperature changes will mask long-term isotherm shifts for several decades in most locations, so extended biological monitoring efforts are required to document anticipated distribution shifts. Resampling of historical sites could yield estimates of biological responses in the short term and should be prioritized to validate bioclimatic models and develop a better understanding about the effects of temperature increases on stream biotas.

Primary author: Dan Isaak  
US Forest Service

Co-author(s): Dona Horan  
Sherry Wollrab

Presentation type: Poster

Title: A Large-Scale Field Assessment Using Underwater Epoxy to Install Annual Temperature Monitoring sites in rivers and streams

### Abstract

Stream temperature regimes are fundamentally important to understanding pattern and process in aquatic communities. Modern digital sensors can provide accurate and repeated temperature measurements that span multiple years, but are rarely deployed for more than a few summer months due to logistical constraints with seasonal stream access and concerns that large annual floods will destroy sensors. We developed an inexpensive, rapid protocol (sensor installation takes ~20 minutes) that uses underwater epoxy to attach sensors to large rocks and cement bridge structures so that annual temperature monitoring is feasible. Initial field trials suggested sensors were not biased by heat conduction through the attachment structure as long as solar shields were used. Subsequently, a large field assessment was initiated during the summers 2010 - 2012 wherein more than 500 temperature monitoring sites were established with epoxy in streams ranging in channel slope from 0.1% - 16% across the northwest U.S. Revisits to 179 sites indicate good sensor retention rates, with 88% – 100 % of sensors retained after one year in low-gradient streams (< 3%) and 70% - 78% retained in high-gradient streams (> 3%). The underwater epoxy technique is viable for installing temperature sensors in a wide range of streams and rivers and can be used anytime during low flows over a wide range of stream temperatures (2°C – 20°C). The technique increases the efficiency of temperature monitoring by reducing the number of site visits to < 1/year rather than the current norm of 2/year for summer data and facilitates the collection of continuous data over multi-year periods for ~\$120 in initial equipment costs (primarily sensor costs).

Primary author: Dan Isaak  
US Forest Service

Co-author(s): Seth Wenger  
Erin Peterson  
Jay Ver Hoef  
Jason Dunham  
Charlie Luce  
Jeff Kershner

Presentation type: Paper

Title: The NorWeST Regional Stream Temperature Database, Model, and Climate Scenarios

### Abstract

Anthropogenic climate change is warming the Earth's rivers and streams and threatens significant changes to aquatic biodiversity. Effective threat response will require prioritization of limited conservation resources and coordinated interagency efforts guided by accurate information about climate, and climate change, at scales relevant to the distributions of species across landscapes. Here, we describe the NorWeST (i.e., NorthWest Stream Temperature) project to develop a comprehensive interagency stream temperature database and high-resolution climate scenarios across Washington, Oregon, Idaho, Montana, and Wyoming (~400,000 stream kilometers). The NorWeST database consists of stream temperature data contributed by >60 state, federal, tribal, and private resource agencies and may be the largest of its kind in the world (>45,000,000 hourly temperature recordings at >15,000 unique monitoring sites). These data are being used with spatial statistical network models to accurately downscale ( $R^2 = 90\%$ ;  $RMSE < 1\text{ }^\circ\text{C}$ ) global climate patterns to all perennially flowing reaches within river networks at 1-kilometer resolution. At present, stream temperature scenarios have been developed for 250,000 stream kilometers across Idaho, Montana, and eastern Oregon using data from more than 8,000 monitoring sites. The raw temperature data and stream climate scenarios are made available as ArcGIS geospatial products for download through the NorWeST website when individual river basins are completed (<http://www.fs.fed.us/rm/boise/AWAE/projects/NorWeST.shtml>). By providing open access to temperature data and scenarios, the project is fostering new research on stream temperatures and better collaborative management of aquatic resources through improved: 1) prioritization of habitat restoration projects, 2) climate vulnerability assessments for sensitive species, 3) decision support tools based on regionally consistent scenarios, and 4) temperature and biological monitoring programs. Additional project details are contained in this Great Northern Landscape Conservation Cooperative newsletter (<http://greatnorthernlcc.org/features/streamtemp-database>).

Primary author: Dan Isaak  
US Forest Service

Co-author(s): Seth Wenger  
Erin Peterson  
Jay Ver Hoef  
Jason Dunham  
Charlie Luce  
Jeff Kershner

Presentation type: Poster

Title: Provisional Oregon stream temperature database for the NorWeST regional archive and modeled stream climate scenario maps

### Abstract

Development of inexpensive digital temperature sensors, combined with concerns about temperature effects on aquatic organisms, has spurred massive data collection efforts in recent decades. Stream temperature data are collected by dozens of resource agencies, but usually only for project specific goals and without strategic prioritization. The NorWeST project is developing a comprehensive, interagency stream temperature database for the Northwest U.S. that could serve as an important step towards better coordination of data collection activities. This poster shows the locations of stream temperature data for the state of Oregon contributed to the NorWeST project. Data from >7,000 unique stream sites representing >20,000 summers of monitoring effort by >50 state, federal, tribal, and private organizations are shown on this poster. In the second phase of this project, stream temperature data are used to fit a spatial statistical stream network model, which is then used to create a consistent set of accurate ( $R^2 \sim 90\%$ ;  $RMSE < 1.0\text{ }^\circ\text{C}$ ), high-resolution (1 kilometer) temperature scenario maps. The model scenarios within each part of the state (typically data from one or two 3rd code HUCs are modeled simultaneously) are then distributed as ArcGIS layers through the NorWeST website for use by the aquatics community. Raw temperature data are also posted to the website at that time if permission was given for their distribution. If you would like to contribute temperature data to this project, please contact a member of our database team (Sherry Wollrab, [sherrywollrab@fs.fed.us](mailto:sherrywollrab@fs.fed.us), 208.373.4371; Gwynne Chandler, [glchandler@fs.fed.us](mailto:glchandler@fs.fed.us), 208.373.4372). Contributing data is easy through a dedicated ftp site (<ftp://ftp2.fs.fed.us/incoming/rmrs/boise/GNLCC/>) and doing so ensures it becomes part of an important regional archive while also making the temperature model predictions in the final scenario maps more accurate. More details regarding the NorWeST project are described here <http://greatnorthernlcc.org/features/streamtemp-database> and at the project website [www.fs.fed.us/rm/boise/AWAE/projects/NorWeST.html](http://www.fs.fed.us/rm/boise/AWAE/projects/NorWeST.html).

Primary author: Dan Isaak  
US Forest Service

Co-author(s): Jay Ver Hoef  
Erin Peterson  
Christian Torgersen  
Seth Wenger  
Ashley Steele  
Chris Jordan

Presentation type: Paper

Title: A New Class of Spatial Statistical Model for Data on Stream Networks: Overview and Applications

### Abstract

Streams and rivers host a significant portion of Earth's biodiversity and provide important ecosystem services for human populations. Accurate information regarding the status and trends of stream resources is vital for their effective conservation and management. Most statistical techniques applied to data measured on stream networks were developed for terrestrial applications and are not optimized for streams. A new class of spatial statistical network model (SSNM), based on valid covariance structures for stream networks, can be used with many common types of stream survey data (e.g., water chemistries, habitat conditions, biological attributes) to develop accurate information at river network scales. The SSNMs account for spatial autocorrelation (i.e., non-independence) among measurements, which allows their application to databases with clustered, non-random measurement locations. Large amounts of stream survey data exist in many areas where spatial statistical analyses could be used to develop novel insights, improve predictions at unsampled sites, and aid in the design of efficient monitoring strategies at relatively low cost. SSNMs require larger sample sizes than non-spatial models ( $n > 50$  or 100 observations) and are computationally demanding (both for data preprocessing and estimation) but provide significant advantages for many stream applications. Here, we briefly review the topic of spatial autocorrelation and its effects on statistical inference, demonstrate the use of spatial statistics with datasets relevant to common research and management questions, and discuss additional applications and development potential for SSNMs. Free software for implementing the spatial models has been developed that enables custom applications with many stream databases. More information and example datasets are available at the SSN/STARS website (<http://www.fs.fed.us/rm/boise/AWAE/projects/SpatialStreamNetworks.shtml>) and the Spatial Stream Networks (SSN) package for R is also available from the CRAN website (<http://cran.r-project.org/web/packages/SSN/index.html>).

Primary author: Ryan Jacobsen  
Oregon Department of Fish and Wildlife

Co-author(s): Jon Nott

Presentation type: Paper

Title: Winter Steelhead Monitoring on the Oregon Coast and Lower Columbia: Past, Present, and Future

Abstract

As part of the Oregon Plan for Salmon and Watersheds, the Oregon Department of Fish and Wildlife (ODFW) initiated a project to monitor spawning winter steelhead (*Oncorhynchus mykiss*) in coastal Oregon streams in 2003. Similar monitoring for winter steelhead in the Lower Columbia has occurred during a number of years, beginning in 2004. In accordance with prior work conducted by ODFW in coastal streams, monitoring of winter steelhead abundance is based on counts of redds, not of live or dead fish. Over the last ten years, sampling for the Oregon Coast and the Lower Columbia has changed in both intensity and scope to adapt to changing management needs and budget constraints. Monitoring in Both ESU continues as a means of providing managers with yearly redd abundance and spatial scale information. Future research for this project includes the calibration of fish to redd ratios through use of several geographically dispersed research sites across the Oregon Coast and Lower Columbia. Such calibration might. These yearly calibration factors will provide insight on how yearly spawning ground conditions alter fish to redd ratios, and will improve estimates of fish abundance based on yearly redd counts across survey areas.

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Co-author(s): Sean Roon  
Jeri Bartholomew  
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Tony Amandi

Presentation type: Paper

Title: ASSESSMENT OF DISEASE OUTBREAK RISKS IN HATCHERIES IN THE WILLAMETTE RIVER SYSTEM: THE HEALTH AND EPIZOOTICS OF THREE OREGON HATCHERIES OVER THREE YEARS

### Abstract

Hatcheries are often perceived as a source of pathogen amplification, potentially increasing disease risk to wild populations; at the same time, wild fish may introduce pathogens into hatcheries through water sources. In 2011-2013 we used sentinel fish exposures to examine pathogen transmission between hatchery and wild fish. In 2011, juvenile rainbow trout and Chinook salmon were held in three hatchery influents and effluents for week-long exposures in June, July, and August, and then transferred to the Salmon Disease Lab, OSU, for monitoring. In 2012, sentinel fish were exposed for two weeks in the hatchery influents and effluents from August through the first week of October to see if pathogen events could be detected before outbreaks occurred at a hatchery. In 2013, sentinel fish were placed only at one hatchery for three, one week exposures from Sept-Oct. Sentinel fish were also exposed during hatchery outbreaks of *Flavobacterium psychrophilum*, *F. columnare*, and *Aeromonas salmonicida*.

Pathogen transmission occurred from the hatchery to sentinel fish during outbreaks of *A. salmonicida* and *F. columnare* during the late summer but not at any other time of the year. There was increased mortality in fish held immediately downstream of the hatchery, but only part of the mortality was attributed to the target pathogens and the effect may be limited dependent on distance, dilution, and pathogen. No target pathogens were detected in sentinels held upstream of the hatcheries during any epizootic or non-epizootic. Low levels of non-target bacteria were detected in sentinels during non-outbreak exposures, and minimal sentinel mortality occurred at this time. Investigations on strain differences in *F. columnare* continue, as downstream mortality trends may indicate additional pathogen sources.

Primary author: Brian Jenkins  
Oregon Department of Fish and Wildlife

Co-author(s): Christopher Claire

Presentation type: Paper

Title: Basin-Wide Evaluation of Winter Steelhead Spawning in the West Fork Smith River

### Abstract

The West Fork Smith River is a strategic watershed for production of Oregon Coast winter steelhead *Oncorhynchus mykiss irrideus*. This 69 square kilometer basin located in Southwestern Oregon has been the focus of extensive stream restoration projects since the 1980's. We conducted an observational study to determine the number of redds a female winter steelhead produced. The project also had a goal to determine redd proximity in relation to constructed boulder/boulder weir structures. The study was conducted December through June of 2012 -2013, the duration of the winter steelhead spawning season. The project utilized floy style tags to mark a total of 379 returning adult steelhead trapped at the West Fork Smith River trap. Once fish were marked, sex was determined, and measured they were released upstream of the trap. Spawning surveys were conducted on 22.1 miles of contiguous stream encompassing the vast majority of available habitat. Fish were counted as tagged or untagged in order to develop a Lincoln-Peterson mark/recapture estimate. Redds were counted, individually marked, and GPS coordinates taken. Redds occurring within 10m of a boulder weir face had their distance recorded. The majority of redds occurring near boulder weirs were located within 1 meter upstream, of the structure. We estimated the total female spawning population to be 236± 14, and a total of 577 redds were counted. Results yielded a value of 2.45 redds per female. Given the difficulty observing live steelhead on surveys, population estimates developed from redds rather than from live fish counts may be a more accurate method for assessing the spawning population. The placement of redds on substrates immediately upstream of constructed boulder weirs suggests that these structures are able to provide spawning habitat that likely mimics or is highly similar to non-anthropogenically related gravels.

Primary author: Jeffrey Jolley  
USFWS - CRFPO

Co-author(s): William Brignon  
Gregory Silver  
Timothy Whitesel  
Howard Schaller

Presentation type: Paper

Title: Development of Conservation Hatchery Programs for Imperiled Species (Part 2)

### Abstract

This presentation builds on the previous presentation focused on developing Conservation Hatchery Programs within the U.S. Fish and Wildlife Service for imperiled species. Conservation hatchery programs may promote successful recovery of species listed under the Endangered Species Act as well as support persistence of Service trust species of which bull trout and Pacific lamprey are examples. A Conservation Agreement for Pacific lamprey was signed in 2012 by interested parties (e.g., Federal, State, Tribal, local governments, NGOs) to collaborate and pool available resources to implement research and conservation actions. This includes development of methods to artificially produce and rear lampreys for use in restoration and research. The goal of our work is to develop a biologically sound conservation hatchery program for Pacific lamprey. We will provide a case history of efforts and vision for Pacific lamprey captive rearing research that we have been conducted in recent years. The objectives of this work are to understand the physiological needs and nutritional requirements for basic rearing, assess the pathogen risk to other species at facilities, and develop protocols to establish wild-sourced larval lampreys at propagation facilities. We will conclude these two presentations by discussing an evaluation of existing facilities that may be suitable to support these types of integrated conservation programs. Characteristics of specific facilities that fit needs for rearing (e.g., location, water source, infrastructure, expertise, disease history, etc.) of various life stages will be inventoried and summarized in the future. We will outline how these research projects will be incorporated into the decision making process. Ultimately the use of a structured decision model that incorporates empirical and theoretical data will inform lamprey and bull trout conservation actions.

Primary author: Kim Jones  
Oregon Department of Fish and Wildlife

Co-author(s): Trevan Cornwell  
Daniel Bottom  
Lance Campbell  
Staci Stein

Presentation type: Paper

Title: Contribution of estuary-resident life histories to the return of adult coho salmon

### Abstract

Extensive tidal-wetland restoration in the Salmon River has afforded a unique opportunity to evaluate the estuary's role in the life-history diversity of a small coastal population of coho salmon. Restoration of most historic wetland habitat in the Salmon River estuary since 1978 has reestablished connectivity between freshwater and estuarine environments, expanding habitat opportunities for juvenile rearing and life history expression. Studies initiated in 2008 have quantified adult and juvenile abundances in the Salmon River basin and determined estuarine habitat use, life history composition, growth, and survival for four successive broods of coho. Subyearling and yearling coho used restored and natural estuarine wetlands, particularly in the spring and winter. Stream-reared yearling smolts spent an average of two weeks in the estuary growing rapidly before entering the ocean. Emergent fry also entered the estuary in the spring, and some resided in a tidal marsh throughout the summer, even as salinities increased to greater than 20. A significant portion of the summer stream-resident population of juvenile coho migrated out of the watershed in the fall and winter, and used estuary wetlands and adjacent streams as alternative winter rearing habitats until the spring when they entered the ocean as yearling smolts. PIT tag returns and juvenile life history reconstructions from otoliths of returning adults revealed that four juvenile life history types contributed to the adult population. Estuarine-associated life-history strategies accounted for 20-35% of the adults returning to spawn in the four brood years, indicating a sizable proportion of the total coho salmon production is ignored by conventional estimates based on stream-habitat capacity. Juvenile coho responses to the reconnection of previously unavailable estuarine habitats has led to greater life history diversity in the population and reflects greater phenotypic plasticity of the species in the Pacific Northwest than previously recognized.

Primary author: Travis Jones  
Oregon Department of Fish and Wildlife

Co-author(s): Lindsey Belcher  
Keith DeHart  
Jim Latshaw  
Ian Tattam  
Jim Ruzycki

Presentation type: Poster

Title: Quantifying forces exerted on a functioning rotary screw trap

#### Abstract

Rotary screw traps are ubiquitous in Pacific Northwest fisheries research and monitoring. The popularity of rotary screw traps stems from their ability to efficiently trap fish moving downstream across varying stream systems. Oregon Department of Fish and Wildlife estimates smolt production in the John Day River and its tributaries by operating 4-6 rotary screw traps to capture out-migrating juvenile salmonids. We utilize two sizes of rotary screw traps to accommodate a large spectrum of stream sizes, and we often operate multiple traps at a single site to further increase efficacy. Despite a widespread deployment of rotary screw traps in the Pacific Northwest, there is a paucity of data available on the working loads exerted on rotary screw trap anchoring systems. Anchor systems vary widely due to varying local conditions. However, our rigging systems have enough similarities so even limited information concerning these forces has aided installations. We measured the force that an operating rotary screw trap, at varying flows, exerts onto its anchor system. Our force estimates provide guidance for rigging requirements as we install new sites and existing sites are maintained or upgraded.

Primary author: Matthew Kaylor  
Oregon State University

Co-author(s): Dana Warren  
Brian VerWey

Presentation type: Poster

Title: Exploring riparian forest controls on stream light availability and bottom-up drivers of fish production in headwater streams

### Abstract

Forested headwater streams are widely viewed as light limited environments where shading from adjacent riparian forests can limit primary productivity at the base of the food web. However, shading in headwater streams is not uniform. Differences in riparian forest structure and canopy complexity can alter stream light availability and associated ecosystem processes. In this study, we explore how riparian forest controls on stream light can influence bottom-up drivers of fish production in headwater ecosystems. We compared light availability, algal growth rates, fish and salamander abundance and biomass, and the growth of juvenile and adult fish in paired reaches flowing through second-growth riparian forests (lower more uniform light) and structurally complex old-growth riparian forests (higher more variable light) in two study streams located in the HJ Andrews Experimental Forest, Oregon. Old-growth reaches had more overall light than second-growth reaches but availability was more variable. The accrual of algal chlorophyll a on ceramic tiles was correlated with associated measurements of stream light availability ( $n=24$ ;  $p<0.01$ ;  $r^2= .66$ ). The abundance and biomass of top predators cutthroat trout (*Oncorhynchus clarkii*) and Pacific Giant Salamanders (*Dicamptodon tenebrosus*) were not significantly different between reaches. Similarly the growth rates of adult PIT-tagged cutthroat trout did not vary significantly between the higher light, old-growth reaches and the lower light, second-growth reaches. However, growth rates of juvenile (age 0) cutthroat trout were significantly higher in old-growth, higher light reaches ( $p < 0.05$  for both streams). Although habitat also differed between reaches (great number of pools in old-growth), we hypothesize that the difference in age-0 growth rate is attributable primarily to greater food availability in the old-growth reaches where more light promotes bottom-up drivers of secondary production. We will explicitly test this hypothesis in future experimental studies.

Primary author: Stacie Kelsey  
Washington Department of Fish and Wildlife

Co-author(s):

Presentation type: Paper

Title: Status of Tiger Musky Introduction on Northern Pikeminnow Populations in Mayfield Lake and Merwin Reservoir, Washington

### Abstract

Mayfield Lake was created in 1963 with the construction of the Mayfield Lake Dam on the Cowlitz River. Within 19 years the northern pikeminnow fish population became dominant putting salmonid populations and fisheries at risk. Merwin Reservoir was created with the completion of Merwin Dam in 1931 and saw similar results of northern pikeminnow population increases.

After much debate, tiger muskie (northern pike x muskellunge cross) were stocked in both waters to reduce the number of pikeminnow; re-establish the salmonid populations and fisheries; and create a trophy fishery for the muskies. A trophy fishery for tiger muskies occurred within three years of stocking in both waters. Within ten years the mean length of northern pikeminnow had decreased indicating predation by the tiger muskies.

WDFW will undertake a follow up survey on both waters to monitor the northern pikeminnow and tiger muskie populations and to determine the following: Are tiger muskie continuing to feed on northern pikeminnow?; Have tiger muskie reduced the northern pikeminnow population?; What is the current status of the northern pikeminnow population today?; What is the current level of angler effort on the tiger muskie population?; and Have salmonid and trout fisheries improved since the introduction of the tiger muskie into Mayfield Lake?

Primary author: Michael Kent  
Oregon State University

Co-author(s): Carl Schreck

Presentation type: Paper

Title: Sporulation of *Ceratomyxa shasta* (Myxozoa) after death in adult Chinook salmon

### Abstract

*Ceratomyxa shasta* (Myxozoa) is a common gastrointestinal pathogen of salmonids in the Pacific Northwest. We have been investigating the parasite in adult Chinook salmon in the Willamette River for the past five years. We have consistently seen large numbers of presporogonic stages in about half the adult salmon fish that survive to spawn in the fall. Few spores occurred in these fish, even though they were exposed for months before spawning. To test the hypothesis that sporulation occurs in carcasses, we collected intestines from adult salmon immediately after artificial spawning in 2013. Intestines of 13 fish with presporogonic infections by histology were examined further. The lower intestines were examined at T0 and T7 held at 17°C for 7 days after dissection from the fish). We observed increases in spore counts at T7, from 1.5 to 14 fold in 6 of the fish. This indicates that under certain conditions presporogonic forms of *C. shasta* are viable and sporulate after death in adult salmon. Considering the life cycles of *C. shasta* and anadromous salmon, the parasite may have evolved two developmental strategies. The parasite sporulates shortly after infection in juveniles, being released before fish migrate to seawater, as the polychaete alternate host only occurs in freshwater. In contrast, spring Chinook become infected shortly after they return to freshwater in the spring and early summer. For several months only presporogonic stages are observed in most fish, even at the time of spawning. Then, shortly after death a signal triggers the viable presporogonic forms to sporulate. As the post-spawned fish occur in the upper reaches of rivers, the spores would be released in a freshwater environment that would provide an opportunity to encounter their polychaete host and hence could thereafter infect other fish.

Primary author: Stephen Koskella  
K&C Environmental Services Inc.

Co-author(s): Robert Coffan  
Scott English

Presentation type: Paper

Title: Addressing Salmonid Homelessness in the Urban Jungle (Restoring Off-Channel Salmon Habitat Within the Urban Zone of Bear Creek)

Abstract

ABSTRACT SUBMITTAL:

Oregon Chapter AFS 50th Annual Meeting  
February 25-28, 2014

Bear Creek, a major tributary to the Rogue River supports Chinook salmon, Steelhead, and native Rainbow and Cutthroat trout as well as diminishing runs of ESA listed Coho salmon. The 400-square mile Bear Creek basin is the most urbanized watershed in Southern Oregon with the main stem flowing through five communities along Interstate 5. While historically a multi-channel system, the creek is now confined to a single thread for most of its length. In addition, past gravel mining in Bear Creek has created a bedrock channel that is wide and shallow and prone to temperature increases. We are conducting a collaborative interdisciplinary study of an urban section of Bear Creek where salmon continue to spawn and there is opportunity to restore historical off-channel habitat. The year-long study includes assessment of groundwater interaction, historic air photos, aquatic habitat, wetlands, and stream temperatures. Initial results indicate that there is an opportunity to reopen a previously existing side channel which would create both off channel rearing habitat and restore the diminished water-holding capacity of the local alluvial aquifer. The groundwater portion of the study found a temperature anomaly near community infrastructure suggesting an anthropogenic heat source, and the side channel location was moved to avoid this area. A preliminary design to create high flow and thermal refuge for rearing salmonids has been completed. More detailed restoration designs and required regulatory permit applications are the next steps in this restoration project.

Primary author: Joe Krieter, M.S.  
ENVIRON International Corporation

Co-author(s): Andy Clodfelter

Presentation type: Paper

Title: Vessel Wake Stranding on the Lower Columbia River — Status and Potential Mitigation Measures

### Abstract

Ship wakes produced by large displacement-hulled vessels on the lower Columbia River (LCR) have been observed to cause stranding of juvenile salmonids. Stranding may occur when fish are caught in vessel wakes and deposited on shore, often resulting in mortality. Fish able to return to the water can experience sublethal effects. Reducing vessel wake stranding has been identified by the National Marine Fisheries Service (NMFS) as one of the strategies to recover salmon and steelhead populations in the LCR. Over the past 35 years, several LCR wake stranding studies have been performed by various agencies and consultants. These studies have increased our understanding of the factors contributing to wake stranding and provided evidence to suggest that wake stranding represents a threat to the survival of some juvenile salmonids. Primary factors that influence stranding risk have been found to include: geographic location, low beach slope, a proxy for ship kinetic energy, tidal height, total wave excursion, and nearshore salmon densities. Given the predicted increase in LCR vessel traffic, regulatory agencies are becoming more concerned about potential effects from port development and shipping activities. Further investigation is needed to identify specific areas that are particularly susceptible to wake stranding along the LCR and to assess and evaluate potential mitigation measures to help reduce the risk to juvenile salmonids. The Port of Portland and ENVIRON are currently working with the US Army Corps of Engineers, NMFS, other sponsor Ports, and stakeholders by evaluating this risk and the potential management actions that could be implemented to reduce wake stranding risk at specific sites. This presentation will summarize the current state of the knowledge on LCR wake stranding and describe potential mitigation measures that could help reduce stranding risk.

Primary author: James Leal  
Bureau of Land Management

Co-author(s): Paul Scheerer  
Alan Mauer

Presentation type: Poster

Title: Wetland Habitat Restoration and Population Response of Foscett Speckled Dace in Southeast Oregon

Abstract

The Foscett speckled dace is represented by a single population that inhabits Foscett Spring on the west side of Coleman Lake in Lake County, Oregon and was listed as threatened under the federal Endangered Species Act in 1985. Foscett Spring is a natural spring that originates at a springhead pool, flows through a narrow spring brook into a series of shallow marshes, and then evaporates or flows into the soil of the normally dry Coleman Lake. Oregon Department of Fish and Wildlife conducted population monitoring from 2007-2013 and noted a substantial reduction in dace abundance, likely resulting from the conversion of open water habitat to emergent vegetated habitat, which is largely unsuitable for dace. The Bureau of Land Management (BLM), in cooperation with the US Fish and Wildlife Service, developed and implemented plans to restore open water habitats. BLM conducted a prescribed burn and with their partners, hand-excavated pool habitat in 2012-13. Abundance of Foscett speckled dace increased dramatically, from approximately 1,848 in 2012 to approximately 13,142 in 2013.

Primary author: David Leer  
OSU College of Forestry, FERM  
Co-author(s): Doug Bateman

Presentation type: Poster

Title: Identifying Potential Fish Predators in Headwater Streams using Trail Cameras: Pros, Cons, and Future Efforts

#### Abstract

As part of two long-term paired watershed studies evaluating the response of coastal cutthroat trout (*Oncorhynchus clarki clarki*) to timber harvest, passive integrated transponder (PIT) tags were used to evaluate fish movement, growth, and survival. Over six years and four watersheds, apparent annual survival for coastal cutthroat trout = 100 mm fork-length ranged from 23-56%. Surveys using mobile PIT antennas conducted 3-5 times annually resulted in observations of PIT tags deposited outside the active channel, on stream adjacent rocks and logs within the active channel, and occasionally in intact scat piles. These findings suggest that predation could potentially account for a substantial portion of annual mortality. Intact scat piles often contained more than one PIT tag suggesting the predation events were episodic in nature and potentially influential with regard to abundance and distribution of coastal cutthroat trout. In an attempt address questions regarding what predators are present, what time of year those predators are active, and which areas of the stream predators use, we deployed a network of stream adjacent trail cameras beginning in May 2013. Cameras were placed in likely travel or feeding areas where fish predators might be detected. Here we discuss camera setups, preliminary findings, problems, and direction of future efforts.

Primary author: Sierra Lewis  
Oregon State University

Co-author(s): Jennifer McKay  
Bruce Morrison  
David Noakes

Presentation type: Paper

Title: RESTORING ANADROMY: IDENTIFYING HISTORICAL FISH PASSAGE BEYOND NATURAL OBSTACLES IN THE OREGON CASCADES WITH STABLE ISOTOPE ANALYSIS

### Abstract

We investigated evidence of historical anadromy throughout the North Umpqua River basin in Oregon. We tested the hypothesis that we could identify undocumented, historical salmon spawning reaches above obstacles using foliar d15N deposition patterns in Douglas fir trees, *P. menziesii*, (>100 years old). Our stable isotope data indicated that the foliar d15N deposition patterns were confounded by elevation. We documented potential “salmon-derived” false positives on the Umpqua National Forest above impassable waterfalls. Overall we found that foliar d15N deposition patterns had high inter and intra-site variability. When grouped by salmon history, our data indicated a statistically significant negative correlation of foliar d15N values with historical salmon presence. Our linear mixed-effects modeling suggests that the presence of salmon is the most important indicator of foliar d15N values, rather than the proximity of a sampled tree to stream flow above or below migratory barriers. We were not able to identify previously undocumented salmon spawning habitat. Our results from the foliar technique suggest that the method may not be as generally applicable as has been suggested in the literature.

Primary author: Scott Lightcap  
Bureau of Land Management, OR/WA State Office

Co-author(s):

Presentation type: Paper

Title: Oregon Coast Coho Salmon - Is There Room for Optimism?

Abstract

In a society bombarded with negative imagery on virtually every front, is there room for some optimism in the world of biology? There is good news out there, but you usually don't stumble upon it by accident, and it's typically drowned out by the negative. Finding and acknowledging the good stuff is a conscious choice, and it requires effort. So in that spirit, let's put on the rose-colored glasses – and consider Oregon Coast Coho Salmon, because the story isn't all bad.

On Federally-managed lands, we no longer do the things that originally contributed to the coho crisis. We no longer use splash-dam logging practices. We don't clear-cut forests down to the water's edge. We don't pull all the wood out of the stream channel. We no longer install barrier culverts, and we aren't constructing new valley-bottom roads. In fact, we have active restoration programs working to correct most of those past legacies. In addition, commercial and recreational fisheries management has improved dramatically - since we no longer catch and kill 75% of the adult fish returning to spawn. And reliance on hatchery fish to solve our problems has all but disappeared.

Average coho adult escapement numbers over the last 10 years have been higher than in any other 10-year period over the last 60 years. Are we out of the woods yet – no way! We have miles to go before we sleep. But if you need a glimmer of hope in an otherwise dark and stormy world, all you need to do is look.

Primary author: Amy Jo Lindsley  
Oregon State University

Co-author(s): Scott Heppell

Presentation type: Paper

Title: The Juvenile Rockfish Of Yaquina Bay, Oregon

Abstract

Oregon estuaries are important nursery habitat for young-of-the-year (YOY) Pacific rockfish and Yaquina Bay has been identified as essential fish habitat (EFH) for juvenile black rockfish (*Sebastes melanops*). YOY yellowtail rockfish (*S. flavidus*), copper rockfish (*S. caurinus*), quillback rockfish (*S. maliger*), widow rockfish (*S. entomelas*) and blue rockfish (*S. mystinus*) have also been detected in Yaquina Bay. I am attempting to determine the rockfish species present and their temporal utilization of Yaquina Bay as nursery habitat, the use of natural eelgrass (*Zostera marina*) habitat versus piers (artificial structure) and gather information about their movement, ontogeny and recruitment to the adult population. Sampling by trap and seine has been conducted during the spring tides for 17 months, and all captured juvenile rockfish are tagged with visible implant elastomer. Abundance fluctuates seasonally but all species demonstrate high site fidelity.



Primary author: Ken Loffink  
ODFW

Co-author(s):

Presentation type: Paper

Title: Multi-species fish passage... Is it possible?

Abstract

Fish ladders have long been designed with a target species in mind, namely adult salmon and steelhead. It has also been widely thought, that no perfect solution exists that will provide passage for all species all the time. Given the high number of artificial obstructions present in the Klamath and great basins of Southern Oregon, the presence of federally listed catostomids (suckers), and the presence and/or potential re-introduction of economically and tribally important species such as redband trout and chinook salmon, the need for adequate multi-species fish passage is looming large. These species have a widely different array of swimming, leaping, and fish passage abilities, yet it remains critically important that we provide adequate passage for all. This talk will serve to present some improvements in fish passage technology, discuss recent fish passage projects, and will largely be an open forum full of discussion amongst professionals. I hope to spend much of the 20 minutes discussing the challenges of the multi-species fish passage conundrum, and brainstorm on potential ways to bring to an end the age-old sucker versus salmon fish passage debate!

Primary author: Robert Magie  
Ocean Associates Inc.

Co-author(s): Matthew Morris  
Jeremy Bender  
Bruce Jonasson  
Richard Ledgerwood

Presentation type: Paper

Title: Use of Large PIT-Tag Antennas on a Pile Dike in the Columbia River Estuary to Estimate Migration Timing and Survival for Adult Salmonids to Upstream Dams

### Abstract

We continued a multi year study to develop a stationary PIT-tag detection system along a pile dike in the Columbia River estuary (rkm 70) to detect returning adult PIT-tagged salmonids. Detection of these adults in the estuary can be compared with their subsequent detection at upstream dams to determine timing and survival during the adult migration. In 2013, we adopted a new transceiver system that allowed us to quadruple the size of fish passage openings to an area of 2.4 × 6.1 m through our detection antennas. In March, we installed three new antennas encased in 10 cm diameter, rigid PVC housing. One of these eventually leaked, and we replaced it in July using an antenna with new housing constructed from 1.9 cm diameter flexible PVC. We also expanded the system with two additional antennas placed further inshore along the pile dike (5 total). Except for interruptions to replace antennas and some brief, late season solar power shortages, the system remained operational from March through October.

In 2013, the pile dike system at rkm 70 (PTAGIS site code PD7) detected 375 adult and jack salmonids including 96 spring Chinook, 104 summer Chinook, 106 fall Chinook, 54 steelhead, 12 sockeye, and 3 coho salmon. These detections represent 2.1, 3.4, 1.2, 0.9, 3.1 and 0.4% of upstream migrants detected at Bonneville Dam, and we estimated respective survival to Bonneville Dam at 90.5 ±15%, 88.2 ±8%, 92.1 ±5%, and 90.7 ±8%, respectively for spring, summer, and fall Chinook salmon and steelhead. Median travel times from detection at PD7 to Bonneville Dam for these fish were 4.0, 3.7, 3.2 and 4.6 d. We also detected 612 juvenile salmonids, 5 sturgeon, 1 pikeminnow, and 32 fish with PIT tags yet to be identified in PTAGIS.

Primary author: Douglas Markle  
Oregon State University

Co-author(s): Torrey Tyler  
David Simon  
Mark Terwilliger

Presentation type: Paper

Title: Successful diversion of larval fishes by a fish screen and the impact of entrainment on overall survival

#### Abstract

We examined entrainment/loss of larval fishes from Upper Klamath Lake through a screened irrigation canal (A Canal) and through Link River, the natural lake outlet. Of an estimated 132 million larvae (< 20 mm) entrained into the A Canal forebay in 2012, 70% were diverted by the fish screen. The proportion diverted by the fish screen was size-dependent with at least 50% diverted at 4 mm SL and 100% at >17 mm SL. More than 81% of endangered sucker larvae were diverted, but about 400,000 sucker larvae were entrained into the A Canal. At Link River, which is unscreened, an estimated 78 million larvae left Upper Klamath Lake, including an estimated 4.9 million suckers. One metric for measuring entrainment loss is reduction from a baseline, but interannual differences in production and mortality confound comparisons. Loss as a function of daily mortality is a better option, but difficult to measure. Relative to one estimate of system-wide mortality and abundance for sucker larvae, entrainment loss through the irrigation diversion represented an additional 7 hours of system-wide mortality while entrainment loss downstream through Link River represented an additional 4 days of system-wide mortality. The latter loss of sucker larvae could substantially reduce abundance of later life history stages.

Primary author: Steven Mazur  
Oregon Department of Fish and Wildlife

Co-author(s):

Presentation type: Paper

Title: Estimating Freshwater Escapement of Anadromous Salmonids in the Rogue River

Abstract

The Rogue River originates at Crater Lake and is a free flowing river downstream of Lost Creek Dam (RM 157). The mainstem and tributaries of the Rogue River produce some of the largest populations of wild anadromous salmonids in Oregon. One of the challenges to managing wild salmonids on the Rogue is estimating freshwater escapement because there are no lower mainstem dams or weirs and the Rogue flows through some of the remotest country in Oregon, which makes traditional monitoring very difficult.

Lost Creek Dam evaluation studies conducted from 1975 to 1986 on the Rogue were used to evaluate the effects of the dam on anadromous salmonids and the best operating strategies to enhance production and harvest of fishery resources. One of the key management tools that came from the studies was the ability to monitor freshwater escapement of late run summer steelhead, half pounder steelhead, fall Chinook, and Coho by beach seining at Huntley Park (RM 8).

Marked Coho salmon released from Cole M. Rivers Hatchery were used to estimate seining efficiencies of salmonids migrating upstream past Huntley Park. River flow, angler harvest, pre spawning mortality, and straying were used to complete the model and build a long term data set that continues to this day to be the backbone of fisheries management on the Rogue.

Primary author: Joshua McCormick  
Oregon Department of Fish and Wildlife

Co-author(s): Matthew Falcy

Presentation type: Paper

Title: Evaluation of Machine Learning and Other Non-Traditional Modeling Techniques for Forecasting Salmon Returns

### Abstract

Forecasting adult salmon abundance is problematic when the number of observations is small relative to the number of potential explanatory variables. Machine learning and other non-traditional techniques employ algorithms designed to prevent model overfitting, thereby inviting analysts to use more explanatory variables than traditional methods can support. We used simulated and real data to evaluate the forecast performance of artificial neural networks (ANN), elastic net (EN), lasso, ridge regression (RR), and principle component regression (PCR). Elastic net had the lowest root mean squared prediction error on the simulated populations, while ANN predicted actual returns the best. Artificial neural networks have the capability to entertain non-linear relationships and interactions that are likely common in the biological process of salmon returns, whereas the other techniques cannot. This may have lead to ANN's improved ability to predict returns of natural populations. There was a weak relationship between cross-validation error and prediction error among modeling techniques, suggesting that there may not be a suitable method to compare forecasting models. The techniques we explored are not an easy solution to a difficult problem, and may result in spurious conclusions about the processes that generate salmon returns.

Primary author: Brian McIlraith  
Columbia River Inter-Tribal Fish Commission

Co-author(s):

Presentation type: Paper

Title: Pacific lamprey restoration and the Tribal perspective; understanding through ACTION

Abstract

Pacific lamprey (*Entosphenus tridentatus*), a culturally and ecologically important fish species, are returning to the Pacific Northwest at a fraction of their historical numbers. These declines have reduced the geographic distribution of lamprey and resulted in limited harvest opportunities for Pacific Northwest Tribes. There has been an increasing effort by the Tribes and other interested parties to (1) highlight the decline of lamprey and their importance to the Pacific Northwest, (2) obtain a better understanding of Pacific lamprey life history, and (3) develop solutions, using the best available knowledge, that address known threats and critical uncertainties associated with the observed decline. The Pacific Northwest Tribes have successfully harvested and managed lamprey (eels) for thousands of years and have been leaders in lamprey research, recovery, and restoration since the late 1990's. Through a diverse set of research, outreach, and on-the-ground restoration projects, the Tribes are contributing significantly to the limited but growing body of lamprey knowledge. This talk will highlight some of these tribally-led projects, provide a brief history of lamprey restoration in the Pacific Northwest, and describe future research, restoration, and management needs for Pacific lamprey.

Primary author: Amanda Meinke  
ODFW

Co-author(s): Nathan Putman  
Ryan Couture  
Joseph O'Neil  
David Noakes

Presentation type: Poster

Title: Exposure to unnatural magnetic field disrupts magnetic navigation in steelhead (*Oncorhynchus mykiss*)

#### Abstract

Steelhead (*Oncorhynchus mykiss*) and Chinook salmon (*O. tshawytscha*) use Earth's magnetic field to guide their movements and distinguish between magnetic fields at the latitudinal extremes of their oceanic range. We tested the hypothesis that exposure to an unnatural magnetic field early in life, such as one present in a hatchery setting, would disrupt this ability. We demonstrated that steelhead parr reared in the ambient magnetic environment of Alsea, Oregon can distinguish between the magnetic fields at the northernmost and southernmost boundaries of their oceanic range. The steelhead differentiated between the two extreme fields by orienting in opposite directions that corresponded with returning to their typical oceanic range. However, when steelhead parr reared in an indoor tank with an unnatural magnetic field were exposed to the same magnetic fields, they failed to distinguish between them. These findings are cause for concern since the magnetic fields we tested are likely the most extreme fields the steelhead would encounter in nature, implying that the ability to extract location information from Earth's magnetic field has been greatly compromised. In addition, the failure of steelhead to orient using the magnetic field could potentially influence hatchery efficiency, straying rates, and catch probability. We recommend further study on the navigation implications and other long-term consequences of rearing salmonids in unnatural magnetic fields.

Primary author: Stephanie Messerle  
Bureau of Land Management

Co-author(s):

Presentation type: Paper

Title: Coos Bay BLM and Watershed Associations: Building Partnerships to Promote Restoration

Abstract

The Coos Bay District BLM has been able to successfully build partnerships with the five Watershed Associations within the District's boundary and others. Working with partners has given BLM the ability to leverage federal funding and in-kind contributions to obtain grant money. Given the declining and changing BLM budgets and staff, partnering with Watershed Associations and others has given BLM the ability to continue to accomplish restoration and monitoring work. Coos Bay BLM has Assistance Agreements in place with the Watershed Associations which facilitates transferring funds and work through the Associations. The types of partnership projects have ranged from aquatic habitat restoration, fish passage, road work, recreation, wildlife restoration, noxious weeds, monitoring, education and outreach. Partnering with Watershed Associations has facilitated restoration work across property boundaries, which is very valuable considering BLM's checkerboard ownership. The benefits of partnership projects for watershed restoration include creating local jobs, bringing in funding to local communities, and improving fish stocks for recreation and commercial fisheries. Coos Bay BLM and its partners have received awards and recognition for the work that has been accomplished. Coos Bay BLM staff also serves on Technical Advisory Committees for Watershed Associations projects. Working on advisory committees has had secondary benefits in that it creates an atmosphere where positive relationships are built with private landowners, timber companies, tribes, and other government agencies. Coos Bay BLM will continue to work with its partners and seek opportunities to develop new partnerships to position itself for future restoration work and funding.

Primary author: Shelly Miller  
Oregon Dept. of Fish and Wildlife

Co-author(s): Brian Riggers  
Jitesh Pattni

Presentation type: Paper

Title: Estimating Chinook spawner abundance using and index survey calibration methodology

### Abstract

Accurate and precise spawner abundance estimates are important for effective management of coastal Chinook stocks in both local and international arenas. Annual sportfishing regulations and international fishing quotas are set, in part, on these estimates and forecasts for the subsequent year. Development of a defensible, reliable, and cost effective methodology is important for long term conservation and continued, sustainable harvest. The Siletz River population of fall Chinook salmon is an economic, cultural, and ecological asset to coastal communities. The existing method of estimating spawner abundance is to expand the number of fish counted in a suite of four surveys. The expansion is based on the amount of habitat surveyed, estimated amount habitat available, and a correction factor that incorporates observation efficiency, a random to standard design conversion value and a peak count to total count conversion value. The expansion equates to an index of total Chinook abundance. Its relationship to actual abundance was not well understood. Therefore, between 2005 and 2012, ODFW research staff undertook an effort to compare or calibrate these index surveys to an estimate of actual abundance generated through a series of mark-recapture experiments. We have compared the results of these mark-recapture experiments to peak counts (maximum count of live and dead adults throughout the survey season) for standard survey sites (historically conducted since 1952). These comparisons identified that the relationship between these surveys and actual abundance was highly variable. We therefore set out to identify additional candidate index survey sites and fish metrics to compare or calibrate to the mark-recapture estimates. Three index surveys and an alternate fish metric (sum of dead) have emerged as viable alternatives due to a consistent relationship with mark-recapture estimates across a range of population sizes and environmental conditions, repeatability, and cost effectiveness.

Primary author: Fred Monzyk  
ODFW

Co-author(s): Jeremy Romer

Presentation type: Paper

Title: Juvenile Spring Chinook Life-history Characteristics in Willamette Valley Reservoirs

#### Abstract

In recent years, adult spring Chinook salmon have been re-planted to historic spawning habitat above Willamette Valley Project (WVP) reservoirs to aid in recovery of the population. Currently, management and structural changes are being implemented at these high-head dams to improve downstream passage of the juvenile progeny. To aid in that effort, we initiated a study to evaluate the migration timing and size of juvenile Chinook salmon entering reservoirs, distribution within reservoirs, growth, and migration timing through dams. The vast majority (~90%) of juvenile Chinook salmon entered WVP reservoirs in the spring as 'fry' (<40 mm fork length). In reservoirs, these subyearlings were closely associated with nearshore habitat and their distribution was skewed towards the head of the reservoirs in early spring, but show gradual dispersion throughout the reservoirs by late spring/early summer. As surface water temperatures increased in the summer, subyearlings moved into deeper water (~30-45 ft) below the thermocline. Subyearlings returned to the surface when water temperatures decreased in the fall. Subyearlings grew quickly while rearing in reservoirs with growth rate approaching 1.0 mm/d in some reservoirs during the May-Oct period. Subyearlings were concentrated near the dam in the fall, coinciding with reservoir drawdown and peak dam passage. Information gained from this study will be used to design structural/operational modifications at dams to improve downstream passage conditions.

Primary author: Matthew Morris  
Ocean Associates, Inc.

Co-author(s): Robert Magie  
Bruce Jonasson  
Jeremy Bender  
Dick Ledgerwood

Presentation type: Paper

Title: Development of a flexible 2.4 by 6.1 m full duplex PIT-tag antenna

### Abstract

During winter 2012-2013 we began testing a new PIT-tag transceiver to develop a full duplex detection system with larger antennas than any we have used to date. This effort was in response to adult salmonid avoidance of our existing detection system on a pile dike in the Columbia River estuary. The new system needed to operate in a remote (off grid) location with power demands/constraints similar to those of the transceiver system used in 2011 and 2012. After significant testing of various antenna components and transceiver configurations, we successfully deployed a single-coil antenna with a 3.0 by 6.1 m fish passage opening. This antenna was constructed out of 10.2 cm diameter PVC, similar to our previous antennas, but with a fish passage opening five times larger. The antenna read tags completely across its opening at a range exceeding 1.2 m front to back. DIDSON surveys in 2013 showed little reluctance of fish to pass through these larger antennas; however, their larger size created challenges for deployment and increased the potential for leakage due to stress fractures in the rigid PVC. To make handling and installation easier, and to resolve the leak issues, we developed a 2.4 by 6.1 m antenna encased in 1.9 cm diameter flexible rubber housing. We successfully deployed multiple flexible antennas in July through October 2013, with performance similar to that achieved using the rigid PVC housing. Here we describe a new antenna design that has significantly reduced material and labor costs and fish avoidance while improving deployment and transportation logistics. We also describe its potential for towed and anchored uses in small streams, rivers, reservoirs, and lakes.

Primary author: Mary Moser  
NOAA Fisheries

Co-author(s): Aaron Jackson  
Alexa Maine

Presentation type: Paper

Title: Assessing behavior of juvenile Pacific lamprey using passive integrated transponders

Abstract

With the miniaturization of passive integrated transponder (PIT) tags, the opportunities for assessing juvenile Pacific lamprey (*Entosphenus tridentatus*) movements, outmigration timing, and behavior have dramatically increased. We used 8.4 mm "pico" tags to: 1) assess the tagging limits for larval lamprey (ammocoetes), and 2) document the timing and outmigration rates of metamorphosed juveniles (macrophthalmia). In winter 2013-2014 ammocoetes were collected via electrofishing and either acclimated to laboratory conditions or held in ambient stream sediments. The fish were then anesthetized, weighed, measured and implanted with a pico tag. Rates of recovery from tagging and PIT retention were compared between treatment groups. Macrophthalmia were collected using a screw trap in December - March, anesthetized, weighed, measured, and implanted with a pico tag and released upstream from the capture site. Relatively high recapture rates at the trap site indicated rapid macrophthalmia recovery and resumption of outmigration. Detections of PIT-tagged juveniles at tributary and mainstem Columbia River bypass structures provided insights into entrainment rates, outmigration timing and rate of downstream migration. These data are critically needed to focus conservation efforts for early life stages of this imperiled species.



Primary author: Mark Nelson  
U.S. Fish and Wildlife Service

Co-author(s): Jordan Sanford  
Andy Johnsen  
Tom Desgroseillier

Presentation type: Paper

Title: Using Incidental Captures to Document Pacific Lamprey in the Entiat River, Washington

### Abstract

Detailed records of Pacific lamprey (*Entosphenus tridentatus*) in tributaries of the upper Mid-Columbia River are few and often limited to anecdotal evidence. Lampreys are usually not considered during fisheries management studies and are rarely detailed in agency reports. Rotary-screw trap operations and electrofishing surveys encounter lamprey but salmonid monitoring programs treat them as non-targeted, incidental by-catch. However, programs often record captures in their databases, providing a largely untapped information resource. Since 2003, salmonid studies conducted by the USFWS have captured and recorded juvenile lampreys in the Entiat River, Washington. Although incidental in nature, this dataset represents ten years of consistent monitoring and can be used to document juvenile spatial/temporal distribution and determine seasonal timing of emigrations. A total of 26,070 Pacific lampreys were recorded from 2003 to 2012. During salmonid electrofishing surveys, juvenile lampreys were detected in the anadromous zone of the Entiat River but were absent from sites in the Mad River. Nearly all (99%) of the lampreys were captured in rotary-screw traps and 98% were ammocoetes. Juvenile movements were often associated with discharge events, although pulses of out-migrants occurred during periods of steady flow. Emigration took place primarily in the spring, with up to 65% of the annual catch occurring between March and May. Macrophthalmia were captured in all years except 2011 and 2012 and were collected mostly in the spring. Although adults were not targeted, six individuals were caught in rotary-screw traps and provide clues to spawn timing. Compilation of this incidental data represents the first long-term record of trends in abundance of juvenile Pacific lamprey within a tributary of the mid-Columbia River. We encourage other programs to explore their datasets for incidental captures and help create a more refined picture of Pacific lamprey population dynamics across the region.

Primary author: Matthew Nesbit  
NOAA Fisheries

Co-author(s): Gordon Axel

Presentation type: Paper

Title: Passage Behavior and Survival of Juvenile Spring Chinook during the 2012/13 Fall Creek Reservoir Drawdown

### Abstract

Fall Creek Dam was constructed in 1966 and is one of 13 flood control reservoirs in the Willamette River drainage operated by the U.S. Army Corps of Engineers. Elevation is controlled through a regulating outlet(RO) at Fall Creek Dam. Full reservoir pool elevation is 832 ft msl during the spring and summer recreational season. In fall and winter, the reservoir has been drawn down to a minimum conservation pool of 728 ft to aid in flood control and passage of juvenile salmonids through the regulating outlet. In recent years, the reservoir has been drawn down to the streambed level of 680 ft msl to facilitate improved passage and survival for juvenile fish.

In 2012, we radio tagged and released two groups of juvenile hatchery spring Chinook salmon *Oncorhynchus tshawytscha* for different "reservoir treatments" to characterize migration and survival through the regulating outlet (RO) of Fall Creek Dam. We compared survival probabilities and monitored behavior of radio tagged fish released into Fall Creek Reservoir during different elevations and operating conditions at the RO. We used 30 MHz NMFS radio telemetry monitoring systems to determine passage behavior and survival with respect to project operations at Fall Creek Dam for juvenile Chinook salmon smolts between the upper end of Fall Creek Reservoir and the confluence of Fall Creek and the Middle Fork of the Willamette.

Reservoir behavior varied greatly between treatments with a median forebay delay of 8.4 days under the first treatment to 4.3 hours under the second treatment. Project and dam survival were 79% and 80% respectively for fish released under the first treatment while project and dam survival was 98% for fish under the second treatment. Survival through the regulating outlet was 89% for fish released under the first treatment and 99% for fish released under the second treatment.

Primary author: Matthew Nesbit  
NOAA Fisheries

Co-author(s): Jesse Lamb

Presentation type: Poster

Title: Using Carbon Dioxide in the Field as Anesthesia for Adult Salmonids

#### Abstract

In September of 2007 an instream PIT-tag system was installed near McDonald Ferry on the John Day River, OR. From 2008 through 2011 we evaluated the detection efficiency of the system using adult steelhead tagged with both PIT and radio tags.

In the midst of a popular recreational fishery our sampling permit required the use of an FDA approved anesthetic. Unable to use MS-222 because of the mandatory 21-day holding period, the only FDA approved anesthetic that allowed fish to be released directly back into a sport fishery was carbon dioxide (CO<sub>2</sub>). After an extensive literature search we decided to follow the guidelines reported in Prince et al. (1995) with some modifications specific to our study.

Glacial Acetic Acid and Sodium Bicarbonate were measured to create the desired anesthetic concentration and pH level in a cooler. The treated water was able to accommodate a tagging session of up to 8 fish. Fish were transported to and from the river in PVC holding tubes that could be placed in the cooler and served to immobilize the fish while undergoing anesthesia.

Over the course of our evaluation we were able to collect, anesthetize, and tag 119 adult steelhead and monitor their movement and passage over the PIT-tag antennas. There were no observed mortalities for the duration of this study. This method is very simple and adaptable for use in remote field applications.

Primary author: Jonathan Nott  
Oregon Dept of Fish and Wildlife

Co-author(s): Ryan Jacobsen

Presentation type: Poster

Title: Adult Chum Salmon Monitoring in Oregon

Abstract

The Oregon Department of Fish and Wildlife's, Adult Salmonid Inventory and Sampling Project, conducts salmon spawning ground surveys across the Oregon Coast and Lower Columbia. In addition to random coho and standard Chinook surveys, 21 index surveys have been conducted to monitor Chum salmon returns on the Oregon Coast for the past 25 years. These surveys are the limit to monitoring Chum salmon returns on the Oregon Coast, however, Chum salmon are occasionally observed in other surveys. This poster summarizes our current understanding of Chum salmon distribution and spawn timing and outlines our current monitoring efforts, but also opens the question to what the historical distribution may have been and how we might improve our monitoring efforts for Chum salmon.

Primary author: Doug Olson  
U.S. Fish and Wildlife Service

Co-author(s): Steve Pastor  
David Hand  
Rod Engle  
Bill Brignon  
Maureen Kavanagh

Presentation type: Paper

Title: National Fish Hatchery Assessment in the Columbia River: Lessons Learned

Abstract

There are 12 National Fish Hatcheries in the Columbia River basin producing Chinook and coho salmon and steelhead trout for harvest, largely as mitigation for compromised habitat and Federal dams. At all of our hatcheries we assess smolt-to-adult survival and harvest contribution based on coded-wire tag recoveries. At many of these facilities we also do control-treatment hatchery evaluations to assess fish performance and survival. This presentation will provide a summary of recent findings from our hatchery assessment of spring Chinook salmon programs at Carson, Little White Salmon, and Warm Springs National Fish Hatcheries. A number of assessments will be touched on, including rearing density evaluations, fall and spring releases, baffled raceways, homing & straying, and marking.

Primary author: Jeremiah Osborne-Gowey  
Feather River Consulting & Oregon State University

Co-author(s): Mary Fuka  
Daniel Fuka

Presentation type: Poster

Title: Shifting species ranges and changing phenology: A new approach to mining social media for ecosystems observations

### Abstract

Ecologists are increasingly using social media to solicit 'citizen scientists' to participate in data collection. However, social media users are a largely untapped resource of spontaneous, unsolicited observations of the natural world. Of particular interest are observations of species phenology & range to better develop a predictive understanding of how ecosystems are affected by changing climate and human--mediated influences. Social media users' observations include information on phenological & biological phenomena such as flowers blooming, native & invasive species sightings, unusual behaviors, etc. Here, we mine Twitter for a number of North American species and ecosystem observations to determine usefulness for environmental applications such as: 1) supplementing existing databases, 2) identifying outlier phenomena, 3) guiding additional crowd-sourced studies and data collection efforts, 4) recruiting citizen scientists, 5) gauging sentiment about the observations and 6) informing ecosystems policy-making and education.

We present the results for our evaluation of a representative sample from a list of 200+ species for which we've collected data since August 2011. Our results include frequency of reports and sightings by day, week and month. We discuss challenges, best practices and tools for distilling information from crowd-sourced observations gathered via Twitter. For example, geolocation is a critical issue. Despite the prevalence of smart phones, specific latitudinal/longitudinal coordinates are included in fewer than 10% of the observations. This number can be substantially increased at both local and regional scales by using user profile and contextual geolocation algorithms. We identify potential outlier observations, map ranges, and evaluate usefulness of citizen sentiment conveyed in observations as a potential metric for policy makers and managers. Based on these results we draw conclusions on best applications for use of crowd- sourced social media observations: Identifying outliers, front -tracking, guiding traditional data collection efforts and informing policy- and decision- makers about citizen sentiment toward resources.

Primary author: Rachel Palmer  
Oregon Cooperative Fish and Wildlife Research Unit, Department of Fisheries and Wildlife,  
Oregon State University

Co-author(s): Eric Billman  
Cameron Sharpe  
David Noakes  
Carl Schreck

Presentation type: Poster

Title: Variation in smolt quality of juvenile spring Chinook salmon.

### Abstract

As juvenile salmon migrate from freshwater into saltwater, physiological changes must occur to allow fish to osmoregulate in the marine environment. Juvenile spring Chinook salmon migrate to the ocean at different time periods, most notably in the fall (August – November; i.e. fall smolts) and spring (February – May; i.e. spring smolts) after their first summer of rearing. We tested the ability of laboratory reared fall and spring smolts to osmoregulate when placed in salt water from freshwater by comparing differences in plasma sodium concentration after a 24-hr salt water challenge. The fish were reared under two different regimes in which we manipulated temperature and feed in order to produce different growth rates such that fall smolts exhibited a faster growth rate. We conducted four salt water challenges from 28 August – 11 December (approximately once per month). Interestingly, spring smolts when tested in the fall still were able to regulate sodium when placed in saltwater. All fish survived the salt water challenges. Fall smolts had significantly lower plasma sodium concentrations in the first two challenges, indicating a higher smolt quality. However, plasma sodium concentrations in fall smolts increased each month, suggesting they were perhaps reverting to the parr stage. Spring smolts had mean plasma sodium concentrations below the 170 mM/L threshold, which has been suggestive of smoltification; low plasma sodium levels indicate fish can regulate sodium in salt water. However, spring smolts had greater variation in plasma sodium concentrations with approximately 65% of the fish having levels below the smoltification threshold, compared to > 85% in fall smolts. The ability of fall and spring smolts to regulate plasma sodium during salt water challenges indicated both groups could survive in the ocean, suggesting that fall and spring smolts would migrate if there was a match between physiological and environmental factors.

Primary author: Brooke Penaluna  
PNW Research, Forest Service

Co-author(s):

Presentation type: Paper

Title: Local variability explains vulnerability of trout populations to land use and climate change

### Abstract

The effects of climate and land use change can act independently or interactively to influence species and populations. Studies examining their combined effects have occurred at a broad scale, but local variability (both spatial and temporal) has been overlooked and may play a key role for understanding actual species' responses to climate and land use change. Here we use an individual-based model of coastal cutthroat trout parameterized with daily measurements of stream temperature, flow, and turbidity over multiple years, as well as, field measurements of habitat structure and trout abundance. We simulated the independent and combined effects of contemporary forest harvest and climate change in four nearby streams over 63 years by manipulating stream temperature and flow regimes. Although we applied identical scenarios across modeled streams, we found a high degree of local variability in trout responses. Climate change had greater effects than contemporary forest harvest on fry emergence, survival, or growth of age-0 trout across streams, but, those composite effects did not consistently translate into a change in population biomass. Even though contemporary forest harvest effects on demographic rates were small, they transpired at the population-level. These nuanced responses among stream-living populations imply that some populations are more vulnerable to the effects of contemporary forest harvest and/or climate change than others. This variability is likely due to contrasting habitat features among streams suggesting that local habitat can buffer the effects of forest harvest and climate change.

Primary author: Stuart Perlmeter  
WELL Project, Springfield Public Schools

Co-author(s): Jared Weybright

Presentation type: Paper

Title: Stream Habitat Surveys: A modified approach using high school students

### Abstract

In-stream habitat surveys provide important quantitative data on physical makeup of streams and are a necessary component of any stream restoration plan. While these inventories are an important tool for agencies they can be time consuming and a low priority in these times of budget constraints. The WELL Project's Habitat Assessment Team, one of eleven teams associated with the Advanced Water Team Program, has been conducting in-stream habitat surveys in the McKenzie River basin since 2008. Using teams of between 10-14 high school students, we have developed a modified version of the ODFW Aquatic Inventories Project protocol that effectively allows for participation of an expanded number of students, while producing high quality data. The system we have developed divides the team into three or four small groups, each of which collects data on three to four sets of parameters. This method can improve the reliability and accuracy of the data by relying on direct measurements as opposed to estimates wherever possible. Waterproof iPads are used for some aspects of data collection in order to streamline data management. Methodology has been modified to accommodate specific projects such as incorporating data on large wood project installations. This presentation will highlight the practical methods to our madness, our division of labor and the accompanying data sheets and a demonstration of the database we are using for imputing data in the field. The success of the program can serve as a model that can be replicated by other agencies to collect cost-effective and high quality information about the health of in-stream and riparian areas. In-stream habitat data from the Soda Fork Creek Large Wood Project, Middle McKenzie Side Channel Enhancement Project and Cedar Creek in East Springfield will be presented to demonstrate the effectiveness and the application of the data.

Primary author: Erin Peterson  
Oregon State University

Co-author(s): Kendra Hoekzema  
Whitcomb Bronaugh  
Brian Sidlauskas

Presentation type: Paper

Title: Morphological diversity of the speckled dace (*Rhinichthys osculus*) in Oregon's desert springs

#### Abstract

The speckled dace (*Rhinichthys osculus*) is the most widespread native freshwater fish (Family: Cyprinidae) in western North America. It is a habitat generalist that has diversified widely across its range, both morphologically and genetically, and inhabits both streams and springs. Our ongoing work aims to describe diversity within speckled dace in the state of Oregon, and in particular to test whether isolation in desert springs drives convergent morphological divergence away from the stream phenotype. The results from the latest morphological analysis, which added stream and spring populations from the Owyhee and Malheur Lakes drainages to preliminary results reported last year, showed that some, but not all spring populations are morphologically distinct from stream populations. Rinehart Spring (Owyhee drainage) and springs from the Klamath drainage did not separate from the stream morphologies, but the three springs from the Inland, Malheur Lakes drainage (Stinking Lake Spring, Hibbard Spring, and Barnyard Spring) were distinct, as was the population in Foskett Spring, which is federally listed as threatened. These findings suggest that there is no universal spring phenotype; rather local environment plays a significant role in determining morphology. Interestingly, this pattern does not seem to hold for stream fish, which have similar morphologies across their range in Oregon. The morphologic differences described by this study give insight in to the evolutionary history of this species complex and how geography has influenced the diversification of *R. osculus*.

Primary author: Nathan Putman  
Oregon State University

Co-author(s): Michelle Scanlan  
Amanda Meinke  
David Noakes

Presentation type: Paper

Title: Implications of geomagnetic navigation in Pacific salmon for marine fisheries management

### Abstract

Numerous marine animals undergo ontogenetic shifts in habitat utilization, maximizing fitness by exploiting distant oceanic regions that are more favorable during a particular life-stage. The navigation mechanisms that underpin such life-history strategies, however, are poorly known. We used laboratory experiments to demonstrate that Chinook salmon (*Oncorhynchus tshawytscha*) and steelhead trout (*O. mykiss*) extract positional information from the Earth's magnetic field to assess their location in the North Pacific. Geomagnetic fields characteristic of the northern part of their oceanic range elicit southward orientation whereas magnetic fields characteristic of the southern part of their oceanic range elicit northward orientation. These results imply that their ocean migrations are guided, in part, by the subtle variations in Earth's magnetic field. This leads to the prediction that, over time, gradual drift of the geomagnetic field could alter the migratory routes used by these fishes. We used fisheries datasets spanning more than 50 years to show that geomagnetic drift predicts much of the annual variation in the migratory routes of pink (*O. gorbuscha*) and sockeye salmon (*O. nerka*) returning to the Fraser River. Including geomagnetic drift in the models presently used by fisheries managers to forecast migration routes increased the variance predicted from 17% to 50% in pink salmon and from 41% to 65% in sockeye salmon. We suggest that for salmon, and other animals with complex life histories, a renewed focus on navigation mechanisms will provide elegant and intuitive ways to predict spatiotemporal variation in migratory routes as well as a useful context for understanding the ecological, evolutionary, and economic implications of long-distance movement.

Primary author: Rachel Reagan  
U.S. Geological Survey

Co-author(s): Jason Dunham

Presentation type: Paper

Title: Where the Stream Meets the Road: Prioritizing Culvert Replacement for Fish Passage

### Abstract

Streams across the Pacific Northwest have been highly fragmented due to the presence of in-stream barriers (dams and stream-road crossings), many of which are not passable and restrict/block fish passage. Fish passage barriers fragment habitat and restrict movement for all aquatic species, including anadromous fishes. Modification or replacement of these structures is a top priority for restoring connectivity to native aquatic species in the North Pacific region, including salmon and trout, which provide important ecosystem services, subsistence fisheries, and commercial and recreational values. Decisions to replace or modify structures at stream-road crossings are of particular importance, involving literally thousands of bridges, culverts, dams, and massive economic investments. Additionally, incorporating climate effects to both stream and infrastructure will be important to making effective decisions over the long-term.

This presentation will focus on the development and methodology to prioritize culvert replacements across the Siuslaw National Forest, OR, to improve fish passage. There are currently 303 full or partial barriers identified as important to fish species. Our goal is to maximize the benefits of passage restoration to anadromous fish and the diversity of fish species, by evaluating biotic, physical, economic, and climate elements. This project builds upon existing data and collaborations to incorporate climate change and economic considerations into a decision support framework for prioritizing restoration of passage. We seek to develop tools to guide on-the-ground decisions in terms of adapting to anticipated climate effects, allocating limited resources for restoration, and providing tools that can be adapted across the Pacific Northwest.

Primary author: Gordon Reeves  
Pacific Northwest Research Station

Co-author(s): Steve Wondzell

Presentation type: Paper

Title: The Challenges of Managing and Restoring Riparian Ecosystems in Eastern Oregon

Abstract

Riparian ecosystems in much of eastern Oregon are in degraded states as a result of past management and fire control policies and practices. Restoration will require establishment of the processes that provide for the range of states that these systems move through over time. Thus, the focus should not be on developing a single ideal set of conditions in any one location or across the landscape but, rather, there should be suite of conditions that are expected to move around the landscape through time. Additionally, specific conditions will vary depending on location in the stream network and local climatic and geomorphic features. Some critical factors to consider are grazing and browsing from livestock and wildlife, lack of disturbance from fire, and interactions between these factors. Taken together, these factors have reduced the abundance of native riparian hardwoods throughout the intermountain west. Wide spread re-establishment of native hardwoods is likely to prove difficult under current grazing and browsing regimes, and in some places, closed canopy stands dominated by conifers may further limit the potential for hardwood establishment. Where riparian woody vegetation is lacking, reestablishment of native trees, including hardwoods, may help buffer these ecosystems and the organisms that depend on them from the potential impacts of climate change.



Primary author: Brian Riggers  
Oregon Department of Fish & Wildlife

Co-author(s): Shelly Miller

Presentation type: Paper

Title: Using aerial redd counts and six years of mark-recapture data to estimate Chinook abundance in South Umpqua, Oregon.

### Abstract

Aerial spawning surveys for fall Chinook salmon have been conducted by the Oregon Department of Fish and Wildlife (ODFW) on both the South Umpqua River and Cow Creek since 1978. Aerial spawning fish surveys began as part of Douglas County's mitigation plan for the construction and operation of Galesville Dam on upper Cow Creek. Changes to the Pacific Salmon Treaty in 1998 and increasing concerns with international harvest management prompted local managers to develop a strategy to efficiently estimate Chinook spawner abundance.

The ODFW's Coastal Chinook Research and Monitoring Project received a multi-year funding grant in 1998 through Pacific Salmon Commission's Chinook Technical Committee, to improve abundance estimates to meet international Chinook management guidelines. Calibration studies were conducted from 1998 through 2004 (excluding 2001) in the South Umpqua River/Cow creek watershed to determine the relationship of the aerial redd count index to relatively precise estimates of spawner escapement as determined through mark-recapture experiments. The mean number of fish per redd estimated across these six years is 3.6 with a coefficient of variation of 29%. Although the relative precision of the population estimate in 1998 is high (C.V. =47%), it has been included in this analysis. While we have confidence in our calibrated redd counts to derive fall Chinook spawner abundance in the South Umpqua/Cow Creek portion of the basin, the relationship of these estimates to the basin are unclear.

Primary author: Brian Riggers  
Oregon Department of Fish & Wildlife

Co-author(s): Shelly Miller

Presentation type: Paper

Title: An evaluation of an index survey calibration technique to estimate fall Chinook spawners in the South Fork Coos River, Oregon.

### Abstract

ODFW has conducted spawning ground surveys in standard locations for more than 50 years to monitor the status of Chinook stocks along coastal Oregon. A total of 56 standard index surveys (45.8 miles) are monitored annually throughout 1,500 miles of available spawning habitat to estimate peak escapement levels and track trends of north-migrating stocks. Although counts in these standard surveys may be sufficient to index long-term trends of spawner escapement, they are considered inadequate for deriving dependable annual estimates of spawner abundance. In an attempt to provide accurate and precise estimates of true escapements, index counts were calibrated to actual abundance estimates through a series of mark-recapture experiments.

Funding to assess the feasibility of a visual indexed survey design to estimate Chinook spawner abundance was granted by the Pacific Salmon Commission for 2000-2002. ODFW conducted an investigation of the relationship between two standard index surveys and precise abundance estimates derived through mark-recapture(MR)experiments in the South Fork Coos River. Subsequent MR experiments were performed by the district from 2009- 2012 as part of a study to assess the composition of hatchery origin fish. Abundance estimates ranged from 2,400 to 3,200 adult Chinook during the initial period (2000-2002) and 4,400 to 9,400 from 2009 to 2012. The hypothesis was that adding additional years to the analysis would improve the method by increasing both the range of population sizes and the variation in annual environmental conditions captured. A calibration value was derived for both the 3-year and 7-year data sets, with each depicting a positive relationship between the peak count index and overall abundance estimates (C.V. = 11% & 21% respectively). Results from a retrospective analysis indicate that the calibration values from both data sets estimated population size well with a MAPE value of 15% for each.

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Co-author(s): Fred R. Monzyk

Presentation type: Paper

Title: Adfluvial Life History in Spring Chinook Salmon from Quartzville Creek, Oregon.

#### Abstract

Through spawning ground and snorkel surveys, we confirmed the presence of adfluvial spring Chinook salmon *Oncorhynchus tshawytscha* behind Green Peter Dam, a high-head dam in the upper Willamette River. During our first survey year (2012), we recovered six carcasses of adfluvial Chinook salmon, identified nine live adults, and counted nine redds. Scale analyses from carcasses revealed that adult fish were age 5 or 6, with no evidence of accelerated growth as associated with ocean entry for anadromous salmon. Otolith microchemistry results from an unmarked adult female Chinook did not indicate ocean residence, and no hatchery thermal marks were observed. In 2013, we observed one live, unclipped adult and several juvenile Chinook salmon. We conclude that a small adfluvial population of spring Chinook salmon exists in Green Peter Reservoir. Although this is the first documentation of an adfluvial Chinook population in Oregon, a growing body of evidence suggests that similar populations may exist above other Willamette River reservoirs and needs to be considered in the context of ongoing research, monitoring, reintroduction, and recovery actions pertaining to threatened Willamette spring Chinook salmon. We recommend that future research and monitoring efforts be designed to identify and describe additional adfluvial populations.

Primary author: Sean Roon  
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Jeri Bartholomew

Presentation type: Paper

Title: Pathogen and parasite survey of juvenile salmon populations in proximity to Willamette River basin hatcheries

### Abstract

Most salmon and trout hatcheries along the Willamette River Basin, Oregon, USA, utilize an untreated river water supply for their rearing ponds and release this water untreated, back into the river. This creates a potential for waterborne pathogens present in wild hosts to be transmitted through the water supply to hatchery populations. Moreover, any hatchery epizootic can amplify pathogens and release these into the water, which could have a direct impact on wild or naturally-reared populations exposed to those pathogens in hatchery effluent. We conducted a fish health survey as a component to a project seeking to assess pathogen transmission risks at this interface. Documenting the distribution of pathogen infections throughout this system is an essential first step for assessment of transmission between these populations. Furthermore, wild populations are normally infected with parasites, which may impact susceptibility to pathogen infection. Therefore, our survey documented the pathogen and parasite prevalence within salmonid populations collected. We examined Chinook salmon (*Oncorhynchus tshawytscha*) and rainbow trout (*O. mykiss*) for five bacterial and viral pathogens known to be problematic for hatchery populations in the Willamette River basin. Overall, we observed low prevalence of bacterial and viral pathogens; a few instances of *Renibacterium salmoninarum*, causative agent of Bacterial Kidney Disease, were detected at low infection levels. *Nanophyetus salmincola* was the most common parasite, recorded at high prevalence at three hatchery sites. Additional parasites commonly observed were: *Apophallus* sp., *Sanguinicola* sp., and *Myxobolus insidiosus*. Parasite assemblages were similar across all sites. Low pathogen prevalence throughout the sample population suggests low impact on the wild fish near the hatchery sites.

Primary author: Gary Rule  
NOAA Fisheries

Co-author(s):

Presentation type: Poster

Title: NOAA Fisheries Guidelines for Operating Fish Weirs

Abstract

The purpose of this document is to provide guidelines for the safe use of fish weirs in waters containing salmonids listed by the National Marine Fisheries Service (NMFS) under the Endangered Species Act (ESA). It is expected that these guidelines will help improve fish weir design and operation in ways which will limit fish passage delays and increase weir efficiency. These guidelines and sampling protocol were developed from NMFS research experience and input from fishery researchers. This document outlines procedures and guidelines that NMFS has determined to be necessary and advisable when working in freshwater systems where threatened or endangered salmon and steelhead may be found. As such, the guidelines provide a basis for reviewing proposed fish weir projects submitted to NMFS in the context of ESA Section 10(a)(1)(A) scientific research permit applications as well as scientific research activities proposed for coverage under the ESA Section 4(d) rules for salmon and steelhead.

Primary author: Jessica Saenz  
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Co-author(s): James T. Peterson

Presentation type: Paper

Title: A Structured Decision Making Approach for Managing Least Chub in Desert Wetlands

### Abstract

Arid wetlands in the western United States are an important resource for humans and wildlife. Managers of these systems are frequently tasked with balancing multiple, competing uses including: recreation, human consumption, grazing, and wildlife conservation. Information on arid wetlands biota and dynamics are often limited, forcing managers to make decisions under substantial uncertainty and risk. Structured decision making is an explicit, transparent process that allows managers to formalize what they know, identify key uncertainties, and improve future decision making while managing. Thus, structured decision making could provide managers with a valuable tool in desert wetland management. To illustrate, we present a case study on the development of a decision model for conserving at risk least chub (*Lotichthys phlegethontis*) populations in western Utah wetlands. The decision model is a spatially explicit patch dynamics model that tracks the reproduction and persistence of least chub in response to variation in water levels, vegetative structure, and ungulate grazing. Model simulations suggested that moderate levels of cattle grazing or other vegetation management would benefit least chub populations. However, sensitivity analysis indicated that model predictions were strongly influenced by groundwater levels. We intend this as an adaptive framework, within which model components will be iteratively improved with better understanding of mechanisms linking ground water, vegetative, and ungulate grazing dynamics to wetland characteristics and ultimately least chub populations.

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Presentation type: Poster

Title: Steelhead trout use magnetic field for 3-dimensional orientation

Abstract

Use of the magnetic field for orientation and navigation is a trait widely-shared among phylogenetically diverse organisms. Most attention has been paid to the function of magnetic orientation in the horizontal plane. Here, we show that steelhead trout fry (*Oncorhynchus mykiss*) can use the magnetic field to orient their vertical movement as they emerge from gravel nests. Fry in a normal magnetic field travel farther upwards through substrate than did fry tested with the vertical component of the field reversed. These results, combined with previous research, indicate that the *Oncorhynchus* genus uses the magnetic field for orientation and navigation throughout their life-cycle and suggest that animals can derive three-dimensional orientation information from Earth's magnetic field.

Primary author: Paul Scheerer  
Oregon Department of Fish and Wildlife

Co-author(s): Brad Bauman  
Shaun Clements

Presentation type: Paper

Title: The Status of Alvord Chub, *Siphateles alvordensis*, in the Alvord Desert in SE Oregon and NW Nevada

#### Abstract

The Alvord chub, *Siphateles alvordensis*, is endemic to the Alvord Basin, an endorheic basin located in southeastern Oregon and northwestern Nevada. Historically, they were widely distributed; however historical data on the Alvord Basin chubs is limited. In 1948, Hubbs and Miller provided a brief description of the uniqueness of the native Alvord Basin fishes and their isolation, which included documentation of Alvord chub in several unnamed locations in Oregon and Nevada. In 1983, Williams and Bond conducted a comprehensive survey of Alvord chub and described their distribution and relative abundance at locations throughout the Alvord basin. Since then, limited sampling has been conducted by Oregon Department of Fish and Wildlife (ODFW) and Nevada Department of Wildlife (NDOW). Based on this recent sampling, we became concerned that the range of this species may have contracted, thereby warranting a more robust assessment of species status. In 2013, ODFW conducted a robust survey, in cooperation with NDOW, to describe the current distribution and to estimate the abundance of Alvord chub in the Alvord basin. We sampled historical (and other) locations, using a combination of gear types and estimated population abundance at these locations. We also described the current habitat conditions and threats at each location.

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Co-author(s): Mariah Mayfield  
Lance Wyss  
Gabe Sheoships  
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Carl Schreck

Presentation type: Paper

Title: Habitat associations of larval Pacific lamprey in the Willamette River Basin: implications for species recovery

### Abstract

Addressing the ongoing decline of Pacific Lamprey *Entosphenus tridentatus* in western North America will require research and monitoring efforts directed at multiple life history stages. Our objective was to evaluate habitat associations of larval Pacific lamprey in the Willamette River Basin, a population that appears to be relatively large compared to other locations in the Columbia River system where declines seemingly have been much more severe. During 2011 to 2013, we sampled Pacific lamprey and quantified stream habitat in wadeable streams throughout the basin. Pacific lamprey was nearly ubiquitous across the basin, and all locations where Pacific lamprey was not detected were associated with anthropogenic barriers to migration. We used hierarchical linear modeling to account for spatial autocorrelation between sampling locations and describe reach scale habitat associations of larval Pacific lamprey. Larvae were most abundant in low velocity habitats with fine sediments, particularly off-channel habitat, and positively associated with deep sediments, yet the degree of this relationship varied considerably among tributary subbasins. These habitat affinities were shared with brook lampreys (*Lampetra* spp.) and are similar to other lamprey species. We used size structure data to characterize larval mortality patterns across tributary subbasins and bootstrapping techniques to provide optimum sample size requirements to describe larval length frequencies in future sampling. Strategies aimed at restoration and conservation of critical larval habitats and improved fish passage will benefit larvae. Our results can be used to address these and other limiting factors implicated in the ongoing decline of Pacific lamprey, prioritize conservation actions, and implement monitoring programs across its range.

Primary author: Luke Schultz  
Oregon State University

Co-author(s): Mariah Mayfield  
Lance Wyss  
Carl Schreck

Presentation type: Paper

Title: Redd counts as a population monitoring tool: assessing spatial and temporal patterns of spawning activity to determine appropriate sampling methods

### Abstract

Addressing the ongoing decline of Pacific lamprey *Entosphenus tridentatus* across their range will require an understanding of all life history phases. Currently, spawning surveys (redd counts) are a common tool used for monitoring returning adult salmonids, but the methodologies are in their infancy for Pacific lamprey. To better understand the spawning life history stage of Pacific lamprey, our objectives were to 1) assess temporal spawning trends, redd abundance, habitat use, and the spatial patterns of spawning activity at multiple scales in the Willamette River Basin, and 2) to evaluate survey length requirements for future Pacific lamprey spawning surveys. Redd density varied considerably across surveyed reaches, but were often constructed in pool tailouts dominated by gravel, similar to where salmonid redds are found. At the basin scale, Pacific lamprey selected reaches with alluvial geology and redd density was highest in streams dominated by alluvial sediment. We used spatial resampling of georeferenced Pacific lamprey redd locations to assess the minimum survey segment length required to detect presence of and obtain abundance estimates for spawning activity of Pacific lamprey. The minimum survey length for Pacific lamprey redd detection was inversely related to the observed redd density and the availability of suitable spawning habitat, but was always less than 1.2 km. Reliable spawning abundance estimates ( $\pm 20\%$  of observed redd densities) were also inversely related to redd density and habitat availability and varied between 1.3 km and 13.7 km. Our results suggest that spawning surveys provide a reliable tool for monitoring adult Pacific lamprey, but the specific objectives of monitoring programs and acknowledgement of unknowns, such as the number of redds each adult constructs and the viability of those redds, must be considered prior to implementing spawning surveys.

Primary author: Cameron Sharpe  
ODFW/Corvallis Research Lab

Co-author(s):

Presentation type: Paper

Title: Willamette Spring Chinook Salmon: Assessing Trends in Abundance, Distribution, and Diversity

Abstract

Spawner surveys for Chinook salmon were conducted in the North and South Santiam rivers, McKenzie River, and Middle Fork Willamette River and we present results from work conducted from 2005 through 2012. Surveys were conducted below project dams for volitionally returning fish and above project dams for spawners trucked from hatcheries and other sites for outplanting. We used the peak redd count expansion method to estimate spawner escapement whereby (1) in each survey reach the largest redd count recorded over the course of the survey season was assumed to represent the total number of redds constructed, and (2) each redd represented 2.5 spawners. We used cumulative redd counts over the course of each survey season to estimate peak time of spawning in each subbasin below project dams. Carcasses were sampled during the survey season to obtain biometric data (fork length, spawning status, presence of fin clips, other marks and tags), and biological specimens (scales, DNA samples, and otoliths). Spawner distribution was monitored using recreational grade GPS mapping. Diversity was monitored by estimating (1) abundance of hatchery- and natural-origin spawners, (2) age structure, (3) spawn timing, and (4) genetic diversity.

Primary author: Gabe Sheoships  
Oregon Cooperative Fish and Wildlife Research Unit, Fisheries and Wildlife

Co-author(s): Luke Schultz  
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Carl Schreck

Presentation type: Paper

Title: The nature of stream substrate affects the abundance of larval Pacific Lamprey *Entosphenus tridentatus* in the Willamette Basin.

### Abstract

The Willamette River currently supports one of the last traditional Native American harvest sites of Pacific Lamprey *Entosphenus tridentatus* at Willamette Falls, and consists of a population that continues to persist given the greater losses in adjacent basins. Recent studies directed at the rangewide decline of Pacific Lamprey have addressed spawning activity, adult migration, and larval abundance. To further address research and monitoring needs of all life stages, we studied two individual microhabitat associations of larval lamprey in the Willamette River Basin. Study objectives were to 1) estimate the substrate size most closely associated with larval lamprey abundance, and 2) to estimate the influence of organic material upon larval lamprey abundance. We used a backpack electrofisher to sample larval lamprey in six wadeable Willamette River tributaries. In each tributary we used a nested two-pass sample design at a lower, middle, and upper reach (each reach composed of ten 1-m<sup>2</sup> quadrats). We collected a stream sediment core sample from each available quadrat area to examine ammocoete habitat quality and associations with larval lamprey CPUE. We used particle size sieve analysis to estimate dominant substrate size class per sample, and measured organic matter by loss on ignition. Larvae were present in each reach, and detected in 37% of the quadrats. Results indicate larval presence was strongly associated with habitats with predominantly medium fine sand (0.25-0.50 mm) substrate, while organic material was not associated with larval presence. Our study indicates that substrate particle size was an important variable for larval lamprey habitat. To promote conservation of the Pacific Lamprey, activities that promote natural river flow and distribution of fine sediment may be of benefit.

Primary author: Terry Shrader  
Oregon Dept. of Fish and Wildlife

Co-author(s):

Presentation type: Paper

Title: When rotenone just won't do...

Abstract

Overly abundant populations of non-targeted fish species in a water can often impact the success or quality of featured fisheries. In many waters in Oregon, the ability of ODFW to sustain important recreational trout fisheries in standing waters with hatchery fingerling outplants has been seriously compromised by expansion of illegally-introduced fish populations. Diamond Lake is a prime example. In the case of Diamond Lake, ODFW was able to eradicate the offending species – tui chub – through a rotenone treatment project. In cases however, where chemical treatment is not a viable option, reduction in density through mechanical removal may provide another avenue for fisheries enhancement. In this paper, case studies of mechanical removal – yellow perch from Phillips Reservoir and chub from East Lake and Paulina Lake – will be compared and contrasted in an exploration of the factors that may affect the success of such projects.

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Presentation type: Paper

Title: New Developments in Biodiversity Research and Bioinformatics at the Oregon State Ichthyology Collection

### Abstract

The quarter million specimens preserved in the Oregon State Ichthyology Collection (OSIC) document the fish biodiversity of the Pacific Northwest, the North Pacific and beyond in exceptional detail. Recent funding from the National Science Foundation has permitted the digitization of the collection's historic card catalog, and data documenting 85% of the specimens and more than 2000 species can now be accessed online through the FishNet2 webportal. We will demonstrate the portal's interface (which can be searched taxonomically, geographically and temporally) and highlight recent research that utilizes the collection's holdings. Current projects include investigations of the genetic and morphological diversification of Speckled Dace (*Rhinichthys osculus*) across Oregon, evaluation of the taxonomic status of Foskett Spring Speckled Dace and Blue Rockfish (*Sebastes mystinus*), phylogenetic inference using next-generation sequencing of the tree-of-life linking 200 species of Neotropical fishes, and description of several species new to science. The OSIC's holdings are available for study and loan to all interested researchers, and we encourage ORAFS members to use the OSIC in their research and to deposit new samples for continued genetic and morphological analysis.

Primary author: Phil Simpson  
ODFW

Co-author(s): Robert Reagan

Presentation type: Paper

Title: Utilizing radiotelemetry to estimate adult steelhead abundance and habitat use in the Hood River

### Abstract

Supplementation of ESA-listed (Lower Columbia DPS) Hood River winter steelhead (*Oncorhynchus mykiss*) has occurred annually since 1992. During the run years 1995 – 2010, approximately 21 – 53% of the returning adults released onto the spawning grounds were hatchery offspring produced from native (predominantly wild) broodstock. Fisheries managers were able to control the relative proportion of spawner origin due to the presence of Powerdale Dam, a full upstream migration barrier. Since the dam was removed in 2010, producing accurate assessments of hatchery and wild winter steelhead returns is essential towards ensuring consistency of supplementation strategies and to help managers refine production goals. We employed radiotelemetry techniques as an alternative method to estimate adult escapement of wild and hatchery winter steelhead using mark-resight modeling. Additionally, we compared manual relocation data with past telemetry data (1994 – 1996) to evaluate potential changes in spatial and temporal spawning patterns. Adult steelhead were collected in the lower subbasin by hook-and-line and, if determined to be in pre-spawn condition, received a radio tag (gastric implant, LOTEK model MCFT2-3A). Four passive detection stations were established and manual tracking of telemetered steelhead occurred at least twice per week. To evaluate habitat use, we incorporated manual relocation data with habitat data (ODFW Aquatic Inventory Project) and assessed subsequent habitat selection. A total of 15 winter steelhead were tagged (9 wild, 6 hatchery) and 125 manual relocations were recorded during 2013. Preliminary results indicate that mark-resight modeling may provide a viable alternative to estimate adult escapement. Analysis of manual relocation data to ascertain changes in migratory behavior and spawning patterns will be discussed. Understanding current escapement and spawning distribution may assist conservation and recovery efforts and ensure that ongoing restoration efforts are successful.

Primary author: Kyle Smith  
Calapooia Watershed Council

Co-author(s):

Presentation type: Poster

Title: Watershed Education in Linn County

Abstract

Elementary students provide the ideal audience for sparking interest in fisheries stewardship and management. In Oregon, we have at our disposal a number of resources that can make youth watershed and fisheries education an exciting and captivating experience. Working with staff from the Oregon Department of Fish and Wildlife, the US Forest Service, the City of Albany, and a number of other local stakeholders, the Calapooia and South Santiam Watershed Councils have developed a core curriculum designed to engage Linn County elementary school students in watershed and fisheries stewardship. This presentation provides an overview of the program these two watershed councils are working to bring to students in Linn County, along with the resources they utilized to make the program a hands-on, place-based learning experience.

Primary author: Briana Sounhein  
Oregon Department of Fish and Wildlife

Co-author(s): Mark Lewis

Presentation type: Paper

Title: Coho Monitoring on the Oregon Coast: Past, Present, and Future

#### Abstract

From 1950 through 2004 spawning surveys for coho salmon were conducted in standard index areas along the Oregon Coast to assess trends in the escapement to natural spawning grounds. Multiple reviews indicated that the adequacy of this method to provide the level of monitoring data needed for management of Oregon's coho salmon populations was insufficient. In 1990 a stratified random sampling (SRS) program was initiated to address these inefficiencies and provide annual estimates of the abundance of naturally spawning Oregon Coastal Natural (OCN) coho. Sites were surveyed about weekly through the fall/winter coho spawning season to generate an area-under-the-curve (AUC) estimate of the number coho spawning at each site. The AUC estimate and the proportion of hatchery coho were then used to generate estimates of the abundance and proportion of hatchery coho in naturally spawning coho populations by ODFW management district and basin groupings. This methodology was used for the 1990 through 1997 spawning seasons. As part of the implementation of the Oregon Plan for Salmon and Watersheds (OPSW) in 1998, ODFW established an integrated monitoring program for Oregon coastal salmonids using the EPA's. Projects under the OPSW utilize the EPA's Generalized Random Tessellation Stratified (GRTS) sampling design to establish a shared set of random, spatially balanced sample points. Beginning in 1998 the GRTS design replaced the SRS method for selection of spawning ground surveys in the OC Coho ESU. This methodology, with modifications, has been in use since those dates.

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Presentation type: Paper

Title: The Effect of Diet and Ration on Smolting and Early Male Maturation in White River Spring Chinook

#### Abstract

Minijacks are ubiquitous in spring Chinook hatchery programs. Data suggests that current hatchery practices of high fat, high ration diets may contribute to producing higher rates of early male maturation than are found in wild populations. In White River spring Chinook, an ESA listed species, rates of minijacks have been found to be as high as 70%. In order to assess what types of manipulations with respect to diet could be done to decrease the high rates of minijacks an experiment was created using a low and high fat diet combined with size targets at release. Four treatment groups were produced; a low fat 18 fish per pound (LF18), a low fat 22 fish per pound (LF22), a high fat 20 fish per pound (HF20), and a high fat 24 fish per pound (HF24). Fish were sampled approximately monthly starting in September up until release in May and monitored for size, condition factor, gill Na<sup>+</sup>/K<sup>+</sup> ATPase, whole body lipid, and minijack rates. Differences were found with respect to a variety of the parameters measured. This experiment demonstrates that diet composition and ration can significantly influence the quality of smolts being released from hatcheries.

Primary author: Bob Spateholts  
Portland General Electric Company

Co-author(s):

Presentation type: Paper

Title: Lower Deschutes River Redband Trout Embryo Survival Study

#### Abstract

The FERC license for the Pelton Round Butte Hydroelectric Project (Project) requires studies of the survival of redband trout embryos at spawning study sites in the lower Deschutes River in years 2 (2011) and 4 (2013) following activation of the Round Butte selective water withdrawal facility. Triplicate sites were grouped: 1. below the Project to Shitike Creek, the first downstream tributary confluence, 2. downstream of Shitike Creek, and, 3. on experimental gravel augmentation sites between the Project and Shitike Creek. In the 2011 study, mature redband trout were captured from the Deschutes River, artificially spawned, and fertilized eggs were placed in artificial incubators at the study sites. Embryo mortality was 100 percent in all incubators due to buildup of fungus and algae. A entirely new study design was developed for the 2013 study. We sampled substrate composition, dissolved oxygen and gravel permeability within three naturally spawned redds at each site. Four index parameters based on published studies of trout embryo survival (minimum intergravel dissolved oxygen, Fredle index, Tappel and Bjornn index, Barnard and McBain index) were developed to compare predicted redband trout embryo survival of spawning gravel between the sites. Analysis of variance (ANOVA) was used to compare statistical differences in mean values of substrate composition and index embryo survival parameters between grouped sites. Pairwise comparisons of the four separate parameters indicated there were no significant differences in mean embryo survival at sites upstream versus downstream of Shitike Creek. The experimental gravel augmentation sites were significantly different from upstream and downstream sites in substrate composition parameters, minimum IGDO and Fredle Index. In general, redds at upstream, downstream and gravel augmentation sites all had conditions which would support highly successful emergence survival.

Primary author: Thomas Spies  
USDA Forest Service PNW Research Station

Co-author(s):

Presentation type: Paper

Title: Effects of thinning on production of dead trees and stand structure

### Abstract

The future abundance of dead wood in aquatic and terrestrial systems is difficult to accurately predict because the natural processes that produce dead wood in ecosystems are highly variable. In stream networks, dead wood abundance and structure is a function of four major processes: stand mortality, bank erosion that recruits trees from streamside areas, debris flows and landslides that recruit trees and/or redistribute wood across stream networks, and wood depletion (loss) in streams. General predictions about the long-term effect of thinning on dead wood production are also difficult to make because of variation in thinning prescriptions and stand conditions, as well as the absence of empirical long-term scientific studies and the limited number of modeling studies. In this presentation I will cover what we know about: 1) dead tree production following thinning; 2) size of future dead and live trees; and 3) effects of different thinning prescriptions including no thinning. Based on the literature and unpublished studies from coastal Oregon, I will draw the following conclusions: 1) conventional thinning (wood removal) generally produces fewer large dead trees compared to unthinned stands; 2) conventional thinning can accelerate development of very large dead trees by 1-20 years; and 3) thinning that leaves some or all of the dead wood can more rapidly produce dead trees compared with unthinned stands.

Primary author: Steve Starcevich  
ODFW Native Fish Program  
Co-author(s): Shaun Clements

Presentation type: Paper

Title: Larval lamprey distribution and habitat use in small stream channels on the Oregon coast

#### Abstract

Potential fish passage barriers have been identified in over 4,100 small streams (i.e., <8 m wide) in coastal Oregon basins from the Nehalem River south to the Coos River and may be blocking Pacific lamprey access to spawning and rearing habitat. The impact of these barriers is unknown because of a lack of information on how Pacific lampreys use these small stream habitats. We conducted a pilot study using multi-state occupancy modeling to better understand distribution, habitat use, and sampling detection of larval Pacific lampreys in small streams to improve monitoring techniques and begin to evaluate the effect of barriers on lampreys in the Coastal Oregon Province. Electrofishing surveys were conducted by a two-person field crew from July through October, 2012. Sampling occurred in two small wilderness basins and streams in the Siuslaw, Umpqua, and Coos river basins. Streams channels ranged from 0.8 to 20 m wetted width and contained no known barriers to upstream migratory fish passage. Pacific lamprey larvae occupied all streams in the sample frame and overlapped substantially with Western brook lamprey in longitudinal distribution patterns. Detection probability of larvae in the low abundance state was high ( $p=0.85$ ). Larvae in general were more likely to occupy pools than fast-water units and were rarely detected in high abundance in fast-water units. Pacific larvae were more abundant and occupied a greater proportion of the sample sites compared to Western brook larvae. Pacific lamprey larvae were detected in stream channels as small as 4 m wide. Larval occupancy and detection estimates obtained in this study are useful for designing future studies. Several improvements to the study design will lead to more precise estimates and greater scope of inference in continued research into larval distribution in small stream channels.

Primary author: Adam Stebbins  
Benton County

Co-author(s):

Presentation type: Paper

Title: The Benton County Voluntary Program for Riparian Resources

### Abstract

Since 2009 Benton County, Oregon has led development of a program to support and enhance natural functions of riparian corridors. From 2009-2011 the Benton County Riparian and Wetlands Project staff completed an inventory report to fulfill Benton County Comprehensive Plan goals to support protection and enhance fish and wildlife habitat, in addition to addressing state water quality requirements. Landowner opposition to riparian and wetland regulations threatened to undermine not only the County's riparian and wetland protection efforts but the robust enhancement efforts of the local watershed council and other NGOs.

Public comments from over 30 community meetings with Benton County streamside landowners during 2009-2011 included many requests that Benton County work to develop a non-regulatory riparian vegetation monitoring, outreach and education program. In November 2012, project staff worked with local partners (watershed councils, SWCD, agency/academic experts, landowners) to develop a voluntary program for monitoring riparian corridor conditions while implementing an outreach and education partnership with local partners. The goal for the partnership is to enhance and support riparian resources without additional regulations, while monitoring conditions of riparian resources.

Benton County has worked consistently and effectively with the Oregon Department of Environmental Quality (DEQ) water quality division staff since October 2011 regarding the development of a non-regulatory riparian corridor vegetation program, to comply with Willamette Basin TMDL requirements specifically meeting Division 42 TMDL 'reasonable assurance'. In January, 2013 DEQ approved the voluntary program. The Benton County Board of Commissioners voted unanimously for an implementation start date of August 1, 2013. The community response has been overwhelmingly positive.

By means of education, outreach, collaboration, monitoring, and adaptive management, Benton County works with streamside property owners to ensure that native riparian and wetland resources are protected and enhanced.

Primary author: Dana Stroud  
Cramer Fish Science

Co-author(s): Allan Scholz

Presentation type: Poster

Title: Detection efficacy of Lake Roosevelt acoustic receivers using multistate modeling

Abstract

Recent modeling efforts indicate considerably larger numbers of fish are entraining at Grand Coulee Dam from Lake Roosevelt than acoustic tracking studies have historically detected. Acoustic receiver coverage downstream of the Dam is incomplete at best, painting the picture of relatively low emigration from Lake Roosevelt at 3-17% (range, 2010-2012) for hatchery kokanee salmon and 8-12% for wild kokanee salmon (range, 2009-2011). We used robust design multistate mark-recapture modeling to estimate the probability of capture, or detection efficacy, just up and down-stream from the Dam to better understand what proportion of fish were likely entraining undetected at these receivers. The modeling efforts are further supported by the sudden disappearance of an additional 3-12% of hatchery and 8-24% wild kokanee from the Lake Roosevelt array directly upstream from the Dam during times of reservoir drawdown.

Primary author: Erik Suring  
Oregon Department of Fish and Wildlife

Co-author(s): Mark Lewis

Presentation type: Paper

Title: Predicting coho salmon marine survival by combining biologic and oceanographic data

#### Abstract

Amendment 13 (A13) to the Pacific Fishery Management Council's (PFMC) Pacific Coast Salmon Fishery Management Plan sets Oregon Coastal Natural (OCN) coho salmon harvest impact rates through a two dimensional matrix with parental status and a marine survival index as the axes. When A13 was developed available data on wild coho salmon marine survival was limited and the Oregon Production Index Hatchery (OPIH) jack/smolt ratio, as a predictor of OPIH adult marine survival, was used as a proxy. The Oregon Department of Fish and Wildlife (ODFW) as part of the Oregon Plan for Salmon and Watersheds has conducted monitoring on OCN abundance, survival, and habitat since 1998. These data show that OPIH abundance and survival are not correlated with OCN abundance and survival. In 2013 ODFW proposed and PFMC accepted using an ensemble forecast from seven generalized additive models (GAMs) incorporating biologic and oceanographic indicators as a new predictor of wild adult marine survival. In a retrospective analysis from 1999 to 2012 the predictor would have provided greater differentiation in impact rates between the top three recruitment years, middle eight recruitment years, and bottom three recruitment years than the OPIH predictor. Allowable impact rates would have been 28%, 22%, and 10% for the high, middle, and low abundance years under the current proposal versus 15%, 13%, and 12% for the OPIH predictor. The predictor is robust to a change in any single indicator; it appropriately limits impact rates when survival is expected to be low but allows harvest opportunity when it is expected to be high.

Primary author: Ian Tattam  
ODFW

Co-author(s): Jim Ruzycki

Presentation type: Paper

Title: Length and Condition of Wild Spring Chinook Salmon Smolts Influence Age at Maturity

Abstract

Anadromous Spring Chinook Salmon *Oncorhynchus tshawytscha* commonly mature at 3, 4, or 5 years of age. Age at maturity is an important measure of population diversity, and also has ecological and economic importance. We individually tagged 24,240 John Day River wild Spring Chinook Salmon smolts from ten successive cohorts and subsequently monitored their age when returning to freshwater. We used multinomial logistic regression and multi-model selection to assess the influence of biotic and abiotic factors on age at maturity. Smolt length and condition factor both had significant associations with age at maturity. Conversely, we found no significant association between our abiotic factors and age at maturity. The probability of age-3 maturation increased concomitant with increased smolt length. In contrast, the probability of age-5 maturation increased with decreasing smolt condition factor. Smolt abundance estimates across the ten cohorts we studied suggest that freshwater density-dependence influenced age at maturity. Less abundant cohorts produced larger smolts, which were ultimately associated with a younger age at maturity.

Primary author: Maria Thi Mai  
Department of Interior, Bureau of Land Management

Co-author(s):

Presentation type: Paper

Title: Neanderthal Brain to Homosapian Mind: The Evolution of Social Media in the Science World

Abstract

In our new universe, where Facebook likes, Instagram posts, tweets, YouTube views and Pinterest pins are important forms of political, social, intellectual and cultural expression, many of us have a Neanderthal brain when it comes to social media science.

From Justin Bieber's tweet to his 45 million followers about wanting to do a concert in space where NASA saw a huge uptick in its follower count to the 53 million YouTube streams of Austrian daredevil Felix Baumgartner's supersonic record breaking jump from a balloon, no one could dispel the fact that social media and science have found each other.

At a time when funding for restoration and research seems to be like a threatened species, science is becoming trendy. And social media seems to be driving it.

How we evolve from our Neanderthal brain and turn followers into funding and retweets into restoring programs is what this presentation is about. This session explores the world of social media science and how you can use this science to advance your program, secure funding, and gain support.

Primary author: Neil Thompson  
Oregon State University

Co-author(s): Kathleen Cole  
David Noakes  
Bruce Morrison  
Michael Blouin  
Carl Schreck

Presentation type: Paper

Title: Are we going to lose the female sex? Effects of exposure to elevated temperature on early sexual development in *Oncorhynchus mykiss*

#### Abstract

Conditions experienced during early development can have a significant impact on phenotypic variation and subsequent life history expression, particularly among species that can express multiple phenotypes. With projections for continued warming of aquatic environments associated with climate change we investigated the effects of increased temperature on sex ratio and the incidence of sex reversal in wild and hatchery *Oncorhynchus mykiss*. Five wild families and four hatchery families were used. Each family was split into two treatments (heated [+5°C] and ambient) with two replicates per treatment. Temperature treatment was applied until the swim-up developmental stage. All fish were sampled for length and weight, tissue was excised for genetic determination of sex and the remaining body was preserved for histology. From both genetic and phenotypic estimation of sex ratio there was no difference from a 50:50 expectation at the ambient temperature treatment. No evidence for sex reversal was found in either treatment and source (wild v. hatchery) had no effect. In conclusion, we did not find any evidence to support that an increase of temperature by 5°C will affect sex ratio or sexual development of juvenile *O. mykiss*.

Primary author: Neil Thompson  
Oregon State University

Co-author(s): Camille LeBlanc  
Jeremy Romer  
Michael Blouin  
Carl Schreck  
David Noakes

Presentation type: Paper

Title: Sex biased survival and differences in migration of wild steelhead (*Oncorhynchus mykiss*) smolts from two coastal Oregon Rivers

### Abstract

Sex-biased migration has been documented in several populations of anadromous salmonids. Such information contributes to a better understanding of the variation in life-history in salmonids, and may help management strategies of populations. However, little information is available regarding the effect of sex on migration and survival of smolts. We used rotary screw traps to sample wild steelhead (*Oncorhynchus mykiss*) outmigrant populations. Fin tissue samples were collected for genetic sex determination, and acoustic tags were implanted to monitor downstream migration and survival to the Pacific Ocean. We then tested for differences in survival based on sex during smolt migration in two coastal rivers (Oregon, USA). Two years of data were collected in the Alsea River and a single year in the Nehalem River. There was no effect of sex on survival of smolts in the Nehalem River, or in the Alsea River during 2010. However, males exhibited substantially lower survival than females in the Alsea River in 2009. Larger males had higher odds of survival than smaller males in 2009, but the body size of females did not affect survival. The environmental conditions differed vastly between years in the Alsea and likely affected overall survival. In 2010 water flows and turbidity were higher than in 2009, and survival of both sexes was also much higher in 2010. Thus, the sex-specific effect may be apparent only under stressful environmental conditions. A possible explanation for the sex-biased difference in survival observed in 2009 is a difference in migration duration or timing between sexes. We found no effect of sex on the timing of migration or migration duration through the river or the estuary in either river. Our data suggest that sex may affect smolt survival, but only during stressful migration conditions.

Primary author: Abby Tillotson  
University of Washington and NOAA Fisheries

Co-author(s): Brian Beckman  
Donald Larsen

Presentation type: Poster

Title: Impacts of changing thermal regimes on development and emergence timing of chinook salmon

### Abstract

Dams supply services that cultivate and sustain civilization such as flood control, navigation, electricity, and even recreation. Due to thermal stratification in reservoirs, the water released by dams is often a different temperature from environments further upstream on both daily and seasonal time scales. The impacts of flow regulation on temperature are important because of the influence that temperature has on development and distribution of species. Salmon are particularly vulnerable to anthropogenic habitat and temperature changes because their reproductive and early development life phases are spent in freshwater systems. Since salmon return to their native stream to spawn, localized regime changes may influence genetic and phenotypic expression, and possibly spur local adaptation. Using a common garden type laboratory incubation experiment, I measured hatch and emergence timing of eggs from four Spring chinook populations originating from Oregon and Washington river systems affected by hydropower dams. Four family groups were created from each of the four populations (Clackamas, McKenzie, S. Santiam, and Yakima). Each family was exposed to four different thermal regimes from fertilization until emergence, to test the following hypotheses: 1) Altered temperature regimes can cause disparity in development timing between families and across populations. 2) Reaction norms for development timing under different temperature regimes are unique depending on family and population origin. 3) The condition of fry at emergence (amount of yolk remaining) differs across thermal regimes, and may depend on local adaptation of a population. Results from this experiment will be presented.

Primary author: Christina Uh  
USFWS - CRFPO

Co-author(s): Jeffrey Jolley  
Gregory Silver  
Timothy Whitesel

Presentation type: Poster

Title: Larval Pacific lamprey feeding and growth in captive reared environments

#### Abstract

Pacific lamprey populations have declined across their entire range. Although conservation through hatchery programs could be vital to conservation of this species, there is limited information available regarding rearing and feeding requirements of larvae. Our goal was to investigate growth and condition of larvae given different diets and dosages. In our 2012 experiment we examined the growth response of larvae given four food types and an unfed control group, and evaluated assimilation of those foods by tracking the carbon and nitrogen stable isotopic signatures. Food types were salmon carcass analog, algae, leaves, and a yeast/larval fish food combination. Food was ground into a powder and delivered as a slurry weekly. We found high survival (94%) and larvae grew most on salmon analog and algae treatments and moderately on yeast/larval fish food diet. Growth was minimal or negative on groups fed leaves or not fed. Calorimetry indicated that the salmon analog had the highest energy density while the leaves had the lowest. Preliminary results indicate that the food items had unique isotopic signatures; final analyses are ongoing. In our 2013 experiment, we examined growth response to four dosage treatments of salmon analog (i.e., 0.2g/larvae, 0.4g/larvae, 0.8g/larvae/week, and 0.8g/larvae/2wks, and unfed control group). Preliminary results (after 3 months) indicate that all fed groups showed positive growth. Those fed 0.8g/wk, 0.4g/wk, and 0.8 g/2 wk grew most. Those fed 0.2g/wk or not fed had negative growth. Although we have not found doses of salmon analog that maximize growth, we have documented positive growth in two years and identified food types and doses that are inappropriate to sustain larval growth. Results from our work inform the requirements for establishing captive larval lamprey populations to assist conservation.

Primary author: Julia Unrein  
Department of Fisheries and Wildlife, Oregon State University

Co-author(s): Erin Fedewa  
Rosalinda Gonzalez  
Martha Patricia Rincón Diaz

Presentation type: Poster

Title: Is the fate of Pacific lamprey (*Entosphenus tridentatus*) written in the cloud?

### Abstract

Recovery of Pacific Lamprey, *Entosphenus tridentatus*, (PLA) in the Columbia River Basin depends on effective communication and cooperation among researchers, managers, policy makers, stakeholders and the general public. We are developing a recovery plan framework that can evolve into a living repository for information regarding historic and present PLA distribution, spawning and rearing habitat characteristics, population structure, biology and ecology, threats to habitat, and juvenile and adult passage barriers. We used a free cloud-based program, SpiderScribe, to create a nine year decision tree timeline divided into three phases: data gathering and development of projects, implementation of studies and monitoring programs and project evaluation and adaptation. The recovery plan targets four main issues facing PLA: knowledge gaps and public perception, habitat loss and degradation, water quality and contaminants, and passage barriers. This resource should function as a record for past and current PLA projects in the basin, help researchers identify new areas for cooperative research aims to help prioritize and streamline habitat restoration projects, barrier removal or passage improvements and monitoring efforts. SpiderScribe can be used to organize ideas generated in meetings and workshops, allowing for many people to work remotely while editing and accessing only the most recent body of work. As a publicly accessible visualization of past, present and future work, it can also serve as an educational tool, describing what we know about the biology of PLA and their habitat needs as well as what remains to be studied. In a time of funding uncertainty, PLA and many other imperiled native species remain in a state of decline. If we are to prevent extirpation and restore populations to ecologically functional levels, we must share what we know in a contemporary, cooperative, and streamlined system that encourages public education and stakeholder involvement.

Primary author: Julia Unrein  
Department of Fisheries and Wildlife, Oregon State University

Co-author(s): Eric Billman  
Rob Chitwood  
David Noakes  
Carl Schreck

Presentation type: Paper

Title: Vertical orientation in Chinook fry may predict life history tactics: Management, conservation and fish culture implications.

### Abstract

Determining the effect of food delivery location on behavior, morphology and growth trajectory in juvenile Chinook salmon (*Oncorhynchus tshawytscha*) is crucial for understanding how changes to feeding orientation may drive selection in the hatchery and in the wild. We have documented Chinook fry exhibiting surface and bottom orientation within days after first feeding in both 2011 and 2012 brood years from both McKenzie Hatchery and Marion Forks Hatchery broodstock. In 2013, groups of surface and bottom oriented fry were reared separately for 9 months and fed either at the surface or subsurface. Growth was recorded monthly and digital images were obtained for morphometric analysis at three points during rearing. At 7 months, a suite of behavioral assessments were made using a subset of 30 fish, including emergence timing from the refuge area, number of compartment crossings made in 30 minutes, and time spent interacting with their mirror image. After nine months of rearing, surface type fish, were larger than bottom type fish (98.5 and 89.8 mm, respectively). Morphological differences were detected between the surface and bottom phenotypes. Interestingly, the differences seen in body shape between the surface and bottom oriented groups were similar to differences exhibited between wild subyearling and yearling life history types in the Willamette River Basin. Results of the behavioral assessments indicated that the surface oriented groups spent significantly more time, on average, interacting with their mirror image than the bottom oriented groups despite the feeding location treatment (166.1 and 56.7 seconds, respectively). The differences exhibited between the surface and bottom groups may indicate potential for predicting juvenile life history trajectory early in life, allowing for targeted rearing methods to be developed for designated fall and spring

Primary author: Brian VerWey  
Oregon State University - Department of Fisheries and Wildlife

Co-author(s):

Presentation type: Paper

Title: Summetime movement of Coastal cutthroat trout and Pacific giant salamanders in Cascade Mountain headwater streams

#### Abstract

Identifying patterns and drivers of movement is critical for understanding species biology, population dynamics, and community ecology. While studied individually, the movement of fish and salamander species has not been studied concurrently in lotic environments despite their importance as vertebrate predators. We conducted a mark-recapture survey of Coastal cutthroat trout (*Oncorhynchus clarkii*) and Pacific giant salamanders (*Dicamptodon tenebrosus*) in two reaches of a 3rd order Cascade Mountain headwater stream to determine concurrent movement patterns during summer low flow. We found *O. clarkii* are display no net movement throughout the summer. In contrast, *D. tenebrosus* show distinct upstream movement with larger individuals moving significantly greater distances than smaller individuals. We suggest these differences in species movement patterns are attributable to the step-pool structure of headwater streams in this region, where salamanders are able to traverse obstacles such as cascades while the summer low flow conditions likely dissuaded the upstream movement of cutthroat trout.

Primary author: Mark Villers  
Blue Ridge Timber Cutting, Inc  
Co-author(s): Michael Crawford

Presentation type: Poster

Title: Can Legacy Log Structures Be Modified Without Loosing Pool Habitat

Abstract

The early restoration of large wood to streams included those perpendicular and level logs "Legacy Logs" buried in the stream bank, with heavy wire mesh and road fabric attached to the up-stream side. While these did perform well at capturing substrates and causing plunge pools to form down stream, they did create a juvenile passage problem. In many cases during low flow the structures prevented up stream passage of small fish. This poster will present the problem and how we were attempting to correct it, and if our solution would sacrifice the pools that had been created by those structures. Could we keep or improve the pool habitat while removing the barriers that caused juvenile salmon and trout to be trapped during the low flow season?

Primary author: Gary Vonderohe  
Oregon Dept. of Fish & Wildlife

Co-author(s):

Presentation type: Paper

Title: Floy tagging of two different fish species in the Tenmile Lakes.

Abstract

Tenmile Lakes, which is made up by Tenmile and North Tenmile lakes, is situated in northern Coos County, Oregon. Combined these lakes cover just over 2,600 surface acres and are a popular fishing destination along the southern Oregon coast. Anglers fishing Tenmile Lakes have the opportunity to catch trout (cutthroat and hatchery rainbows), bluegills, largemouth bass, yellow perch, brown bullheads, and on some years wild coho salmon. The most popular fisheries on Tenmile Lakes are for trout and largemouth bass.

Numbered floy tags have been used on both largemouth bass and hatchery rainbow trout in Tenmile Lakes. Volunteers from the Tenmile Bass Club have been floy tagging largemouth bass for five seasons and ODFW staff have floy tagged hatchery rainbows for two seasons. In my presentation I will discuss the project objectives for tagging each species and some of the results to date.

Primary author: Tom Wainwright  
NOAA Northwest Fisheries Science Center

Co-author(s):

Presentation type: Paper

Title: Quantifying recovery goals and action effects for southern eulachon

Abstract

The southern populations of eulachon (*Thaleichthys pacificus*) were listed as a threatened species under the U.S. Endangered Species Act in March 2010, with critical habitat designated in October 2011. Recovery planning started in early 2013, with a goal of completing a recovery plan by the fall of 2016. Initial tasks in this planning process are developing biological viability criteria and analyzing the role of climate variation, climate change, and other threats to the species. The recovery team is developing a set of models to inform these processes, starting with a conceptual model of the drivers and controls of eulachon population dynamics. Beginning with that conceptual model, I will discuss possible approaches to quantifying the effects of management scenarios on eulachon population viability, with the goal of choosing a robust and transparent quantitative approach that can serve as a core element of a structured decision making process for recovery planning.

Primary author: Bill Wall  
USFS - Prairie City Ranger District

Co-author(s):

Presentation type: Paper

Title: Introduction - Riparian Conifer Thinning and Burning – To Treat or not to Treat

Abstract

THis is an introduction to this session. For effective interdisciplinary discussion, an agreement on sufficient terminology is necessary. Since management activities such as harvesting, thinning, and burning must show a benefit to the riparian reserve/RHCA; a clear understanding of these benefits must be communicated. Fisheries biologists and riparian ecologists must clearly identify the desired future conditions so that factors necessary to meet these changes can be clearly defined. THis allows a better understanding of the risks and provides decision makers the ability to make effective decisions - to treat or not to treat.

Primary author: Spencer Ware  
USFS - Prairie City, Ranger District

Co-author(s):

Presentation type: Paper

Title: Understanding of the risks and outcomes of prescribed fire within Riparian Reserves / RHCAs

Abstract

The objective is to introduce an intradisciplinary discussion of the values of prescribed burning and discuss risk management within riparian reserves as it relates to fire management. There should be a clear understanding of the trade-offs between planning low intensity prescribe fire or dealing with the effects from suppression activities related to high intensity fire suppression within these riparian reserves. Adequate planning includes an interdisciplinary understanding of when and what pre-treatment (mechanical reduction of ladder fuels) conditions are needed for effective and safe prescribed fires within these reserves.

Primary author: Matt Weeber  
Oregon Department of Fish & Wildlife

Co-author(s): Mark Lewis  
Chris Lorion  
Holly Huchko

Presentation type: Paper

Title: Coho Monitoring on the Oregon Coast: AUC Calibration Studies

#### Abstract

The Oregon Department of Fish and Wildlife's coastal coho escapement estimation methodology uses weekly counts of live adults to make an area under the curve (AUC) estimate to determine the number of coho that spawned in each survey site. The AUC methodology includes estimates of the probability of a surveyor observing a live coho (75%), and the average length of time a coho is alive on the spawning survey (11.3 days). These are used as constants in the calculation. Deviation in the actual years values from these constants or other sources of errors bias counts, compromising the AUC methodology. We compared our AUC estimates to other methods of determining coho abundance at three sites as means of looking for errors and bias in our methods. The sites include: the North Umpqua River; Mill Creek (Siletz Population); and Smith River (Lower Umpqua Population). We compare mark-recapture estimates done at the Mill Creek and Smith River sites to an AUC estimate. Winchester dam on the North Umpqua River produces a yearly count of coho passing the facility. Basin size and yearly population density play an important role in how well estimation techniques match.

Primary author: Laurie Weitkamp  
NOAA Fisheries, NWFSC

Co-author(s): Susan Hinton  
Paul Bentley

Presentation type: Paper

Title: Seasonal abundance, size, and host selection of Pacific and River Lamprey in the Columbia River estuary

### Abstract

Very little is known about the basic biology and ecology of most native lamprey species. To address this deficiency, we provide the first study of anadromous Pacific and River (*Lampetra ayresii*) Lamprey in the Columbia River estuary, using data from two fish community studies that bracket three decades (1980-81 and 2001-12). River and Pacific Lamprey adults and macrophthalmia showed consistent seasonal abundance patterns: Pacific Lamprey adults were present in the estuary from January through May, Pacific Lamprey macrophthalmia were present from December to March with a small peak in June, and River Lamprey were present from April until September. Differences in catch by gear type (purse seines versus trawls) indicated Lamprey position in the water column: Pacific Lamprey adults were primarily pelagic, Pacific Lamprey macrophthalmia were largely demersal, and River Lamprey (or their hosts) apparently occupied both habitats. During 2008-2012 we also observed lamprey wounds on eight fish species caught in the estuary. The most commonly wounded fishes were non-native American Shad, subyearling Chinook Salmon, Shiner Perch, and Pacific Herring. We believe wounds were made by River Lamprey, which may be resident in the estuary during the summer. This basic information about Pacific and River Lamprey in the Columbia River estuary adds to the growing body of regional research that should aid conservation efforts. Our results also highlight the fact that life history traits such as timing, size, and residency, as well as host selectivity, likely vary among lamprey populations.

Primary author: Steven Whitlock  
University of Idaho

Co-author(s): Andrew Dux

Presentation type: Paper

Title: Measuring the Effects of Water Level Management on Kokanee in Lake Pend Oreille, ID Using a Bootstrap Stock-Recruitment Model

### Abstract

Kokanee were the centerpiece of a productive commercial and recreational fishery in Lake Pend Oreille, Idaho for decades, before declining substantially in the late 1960s. The decline has been attributed to poor recruitment caused by a reduction in quality shoreline spawning habitat, which was linked to a hydropower-related shift to a lower minimum water level. Since 1996, the Idaho Department of Fish and Game has alternated between the preexisting water level and an experimentally raised lake elevation, to determine if raising winter water-levels would increase kokanee recruitment. In this study, the existing method for assessing the water-level strategy was evaluated using sensitivity analysis and shown to be unreliable. An improved assessment method was developed using a bootstrap-based generalized Ricker model. This approach improved upon the previous assessment method by allowing the abundance of spawners to be modeled implicitly and intra-annual sampling variability to be incorporated into parameter estimates. No recruitment response to water-level management was detected. This research illustrates the value of bootstrapping for propagating sampling uncertainty within bioassessment programs.

Primary author: Luke Whitman  
Oregon Department of Fish and Wildlife

Co-author(s): Kirk Schroeder  
Kurt Kremers

Presentation type: Paper

Title: Mortality, growth, and tag retention of juvenile spring Chinook salmon implanted with two types of PIT tags

#### Abstract

Passive Integrated Transponder (PIT) tags of two different sizes were implanted in juvenile Chinook salmon to compare growth, mortality, and tag retention. A random block design was used to allocate treatments for comparing groups of fish implanted with 8 mm PIT tags, 12 mm PIT tags, and a control without PIT tags. Juvenile salmon were 45–60 mm in fork length, with an average length of 52 mm. Each group was checked daily for mortality and tag loss. Length measurements of all fish were taken weekly. All mortality and tag loss occurred during the first two weeks of the study. No difference in mortality was found between control groups and those tagged with 8 mm PIT tags. Mortality was higher in groups tagged with 12 mm PIT tags. Tag retention was higher in groups tagged with 8 mm PIT tags than those implanted with 12 mm PIT tags. Growth in length of fish with 12 mm tags was lower during the first couple months, although these fish grew at a faster rate later in the study. These results suggest that 8 mm tags can be implanted in juvenile salmon as small as 45 mm fork length.

Primary author: Garth Wyatt  
Portland General Electric

Co-author(s):

Presentation type: Paper

Title: "Hey you, get your hands off my wild fish!" An Overview of Portland General Electric's new Adult Fish Sorting Facility Located at the North Fork Dam Adult Fish Ladder on the Clackamas River near Estacada, OR.

### Abstract

In 1999 the Oregon Department of Fish and Wildlife (ODFW) designated the Clackamas River upstream of North Fork dam as a wild fish sanctuary. This designation necessitated a change in hatchery fish management from an integrated program to segregated program. The result was physically handling all upstream migrating fish to selectively remove hatchery origin adult fish at the existing Buckley style adult fish trap, circa 1957, located on the North Fork dam adult fish ladder. In May of 2013 Portland General Electric (PGE) commissioned the North Fork adult fish sorting facility and effectively eliminated the physical handling associated with segregation. The facility utilizes a false weir to elicit volitional passage into a flume system equipped with two observation tanks where the visual determination of fish origin is made. Once fish origin is determined, the operator depresses the corresponding species/origin button that evacuates the fish/water into a flume system routing fish to either one of three holding tanks for loading onto a liberation truck or the North Fork adult fish ladder to continue their upstream migration.

The North Fork adult fish sorting facility is an integral component to meeting PGE's upstream fish passage goals, facilitates a segregated hatchery program, and enables ODFW to meet the performance standards set forth in the hatchery genetic management plan for the Clackamas River.

Primary author: Michael Young  
Rocky Mountain Research Station

Co-author(s): Kevin McKelvey  
Richard Cronn  
Michael Schwartz

Presentation type: Paper

Title: Building the freshwater biodiversity atlas: DNA barcoding at riverscape scales to identify conservation units of sculpins and westslope cutthroat trout

### Abstract

There is growing interest in broad-scale biodiversity assessments that can serve as benchmarks for identifying ecological change. Genetic tools have been used for such assessments for decades, but spatial sampling considerations have largely been overlooked. Limited geographical coverage of many species represented in public databases, as well as sample misidentification and a poorly developed taxonomy, also represent a challenge to species assignment and discovery. Here, we demonstrate how intensive sampling efforts across a large geographic scale can influence identification of taxa and conservation units. We used sequences of two mtDNA regions as indicators of biodiversity and species identity of the taxonomically challenging sculpins of the northern Rocky Mountains. Analyses of fish collected in all major watersheds revealed eight groups with species-level differences that were also geographically circumscribed. Six of these groups, however, did not assign to recognized taxa, and one has now been described as a new species. Similarly, preliminary analyses of whole-mitome sequences of westslope cutthroat trout from throughout their North American range revealed broad divergence between some populations in adjacent river basins and shed light on the evolutionary history of this subspecies. Genetic assessments based on spatially robust sampling designs hold promise to reveal previously unrecognized biodiversity among freshwater fishes, even within well-studied taxa.