U.S. FISH & WILDLIFE SERVICE

DEPARTMENT OF THE INTERIOR

Science Of The Service

Pacific Region
April 19 - June 21, 2023

Welcome to

SCIENCE OF THE SERVICE

April 19 - June 21, 2023

Hosted by the
Pacific Region
of the
U.S. Fish & Wildlife Service

Science Of The Service Planning Team (in alphabetical order): *Karen Colson (Ecological Services), Mike Green (Migratory Birds & Habitat Program), Nicole Hams (Fish & Aquatic Conservation), Leana Goetze (National Wildlife Refuge System), Kaitlyn Landfield (Science Applications), Megan Laut (Ecological Services), David Leonard (Ecological Services), Alexa Martinez (National Wildlife Refuge System), Jennifer Urmston (Migratory Birds & Habitat Program) & Tim Whitesel (Fish & Aquatic Conservation).*

Front Cover*:* Deputy Refuge Manager, Eldridge Naboa (Midway Atoll National Wildlife Refuge) conducting an endangered koloa pōhaka (Laysan duck) survey on Eastern Island (part of Kuaihelani). An ʻewaʻewa (Sooty tern) found a special landing spot from which to watch the surveys!

Photo Credit: Eldridge Naboa, U.S. Fish & Wildlife Service

Back Cover*:* A word cloud associated with scientific method.

Original Image Credit: Workforce Institute @ UKG

"The resources we manage are too important, and we must lead for the future," (Deputy.Director Wendi Weber, 2023). I'm writing this a day after the U.N. Intergovernmental Panel on Climate Change released its latest synthesis report finding that global surface temperature will likely exceed 1.5°C during the 21st century. The environmental effects of this change will continue to create significant challenges we are seeing for wildlife, plants, and the human communities that depend on them. I know it seems daunting, but it also creates a unique opportunity for you to lead, regardless of where you serve in the Pacific Region.

Much has changed over the past year, creating new opportunities. The Service is helping to implement the Bipartisan Infrastructure Law (BIL) and Inflation Reduction Acts (IRA), which are once-in-a-generation investments in the nation's infrastructure and economic competitiveness. In the Pacific Region, this means $162 million over five years from BIL to support habitat restoration and water right acquisition to help restore the Klamath ecosystem, as well as for enhanced fish hatchery production of listed Klamath species. Work includes our response to unprecedented challenges due to ongoing drought conditions, including issues that arise due to limited water supply and the diverse needs in the Klamath Basin. Additional BIL funding will also help to restore resilient ecosystems impacted by climate change, such as addressing avian malaria spread by invasive mosquitoes in Hawai'i; and restoring aquatic habitat connectivity, ensuring that fish and other aquatic can be more resilient in the face of climate change. Nature-based solutions are being incorporated as a primary means to achieve climate adaptation and resiliency in IRA-funded projects in the National Wildlife Refuge System and State Wildlife Management Areas.

To ensure BIL and IRA funds are being spent wisely, we must base management decisions on the best possible science and high quality, accessible data. The Service's data — *your* data that you generate in your work — serves as the foundation for conservation success. Funding initiatives like BIL and IRA highlight how proper data management is a fundamental and mission-critical responsibility of all Service employees. When properly catalogued and managed, it is your work, *your data*, that will drive where these investments touch the ground.

New opportunities exist in many other areas. For example, the Service continues to normalize the Resist-Accept-Direct Framework (RAD) in the face of ecological transformation. The Pacific Region's work to develop a Conservation Introduction decision support framework is not only important to the Region, but it has also been fundamental to the development of a national policy on this issue. Together with the other DOI bureaus, we're working to improve the science and data foundation to ensure underrepresented communities have the tools and resources they need to make sound conservation decisions benefiting their communities. These are just a few of the many opportunities where the Service is making an impact.

So, yes, challenges lie ahead. But, we face those challenges with the people and the expertise we need to continue making a difference. This is an exciting time because we have an extraordinary opportunity to help the Service adapt and respond to the greatest conservation challenges of our time. Your expertise is vital and continues to make a difference. You and your work are vital and ensures we are doing all we can to effectively manage resources for the benefit of the American people and generations to come.

John Schmerfeld, (Senior Projects Officer & Acting Division Manager, Science Applications, Headquarters)

Overview: The mission of the U.S. Fish & Wildlife Service (Service) is working with others to conserve, protect and enhance fish, wildlife, and plants and their habitats for the continuing benefit of the American people. Sound science and relevant data are essential to inform management decisions. Excellence in science is thus critical to the mission and is a hallmark of the Service. A primary goal of the Service is to strengthen the agency's tradition of scientific excellence in the conservation of fish, wildlife, plants, and their habitats. As outlined by the *Science Excellence Initiative* (http://www.fws.gov/science/), to accomplish this goal, there is a commitment to:

- Expand the capacity to acquire, apply, and communicate scientific information,
- Promote active involvement of employees in the scientific community,
- Encourage strengthened partnerships with other scientific organizations, and
- Grow the next generation of scientists.

Purpose: In the spirit of the Service's mission and to strengthen our conservation efforts through scientific excellence, staff gather annually to share and discuss the science of the Pacific Region. The 2023 event is the 8th annual gathering. The purpose of Science Of The Service is to enhance awareness and understanding of the scientific information, findings, techniques and approaches being conducted, produced or applied in the Pacific Region. This will, in turn, highlight the role of science in decisions, promote efficiency and effectiveness of activities, improve the quality of outcomes and products, increase the appreciation of what and how the science is being used, as well as help justify a continued commitment to and investment in the science of the Service. The essence of who we are and all that we do is driven by the Service's commitment to conducting, producing and applying sound science.

Final Disposition: Abstracts from the scheduled presentations are compiled into this program. The compilation will be posted online at *https://doimspp.sharepoint.com/sites/fws-FF01D00000/SitePages/Past-Presentations.aspx*

PROGRAM

(All times Pacific Zone and approximate)

April 19, 2023

13:00-15:00 **– Session I - Kick-Off**

Host: Kaitlyn Landfield (Science Of The Service Planning Team Member; Pacific Regional Office, Science Applications)

13:00 – **Orientation**

13:10 – **SOTS 2023: Salutation & Introduction** – Hugh Morrison (Regional Director, Pacific Regional Office)

13:20 – **Keynote Address** – The role of science and the good scientist – Charisa Morris (National Science Advisor/Scientific Integrity Officer, Office of the Director, Headquarters)

14:10 – **Q&A**

14:25 – **Presentation of the 2023 Data Management Champion Award** – Jeff Burgett (Acting Assistant Regional Director, Science Applications, Pacific Islands Fish & Wildlife Office)

14:40 – **Kick-Off Recap** – Jason Holm (Acting Deputy Regional Director, Pacific Regional Office)

14:50 – **Summary**

15:00 – **Adjourn**

13:00-15:00 **– Session II – Oral Presentations**

Host: Alexa Martinez (Science Of The Service Planning Team Member; Malheur National Wildlife Refuge, National Wildlife Refuge System)

13:00 – **Orientation**

13:10 – Evaluating the reliability of visual surveys and eDNA to detect a new invasion of New Zealand mudsnail – Jenifer Poirier (Columbia River Fish & Wildlife Conservation Office, Fish & Aquatic Conservation)

13:35 – Expanding our understanding of bull trout viability – Dan Nolfi (Idaho Fish & Wildlife Office, Ecological Services)

14:00 – Sagebrush restoration beyond the core: Sagebrush lizard habitat management – Sarah Trujillo (McNary National Wildlife Refuge, National Wildlife Refuge System)

14:25 – Documenting populations of giant clams (*Tridacna* spp.) and listed coral species at Wake Atoll – Nadiera Sukhraj (Pacific Islands Fish & Wildlife Office, Ecological Services)

14:50 – **Summary**

15:00 – **Adjourn**

13:00-15:00 – **Session III – Science Briefs *(Student Presentations)***

Host: Nicole Hams (Science Of The Service Planning Team Member; Columbia River Fish & Wildlife Conservation Office, Fish & Aquatic Conservation)

13:00 – **Orientation**

13:10 – Using acoustic monitors to detect bats in the University of Idaho Experimental Forest -Klara McKay (Department of Fish & Wildlife Sciences, University of Idaho)

13:18 – Wild bee diversity declines rapidly with time since harvest in intensively managed Douglas-fir plantations - Rachel Zitomer - (Department of Forest Ecosystems & Society, Oregon State University)

13:26 – Developing monitoring targets to better inform adaptive management of an aquatic invasive species - Brielle Thompson - (Washington Cooperative Fish & Wildlife Research Unit, University of Washington)

13:34 – The relationship between circadian gene transcription and cellular metabolism in hibernating grizzly bears – Ellery Vincent – (School of Biological Sciences, Washington State University)

13:42 – Characterization and comparison of gut microbial communities in a threatened herbivore - Morgan Calahan - (Department of Biological Sciences, Boise State University)

13:50 – A literature review: a brief history of sea lion management and conservation - Nancy Huffman - (Department of Fisheries, Wildlife & Conservation Sciences, Oregon State University)

13:58 – Environmental variability in Hawaiian fishponds under restoration - Hina Ioane - (School of Natural Sciences & Mathematics, Chaminade University of Honolulu)

14:06 – Four decades of green turtle (*Chelonia mydas*) strandings on Hawai'i Island (1983 - 2022): identifying causes and assessing trends - Skylar Dentlinger - (Marine Science Department, University of Hawai‘i at Hilo)

14:14 – Surveying suburban barred owls in Olympia, Washington - Alex Seebeck - (Graduate Program on the Environment, The Evergreen State College)

14:22 – **Summary**

14:30 – **Adjourn**

13:00-15:00 **– Session IV – Oral Presentations**

Host: David Leonard (Science Of The Service Planning Team Member; Pacific Regional Office, Ecological Services)

13:00 – **Orientation**

13:10 – Retention of passive integrated transponder tags in hatchery YY male brook trout: effect of tag size, implantation site, and double tagging – Matthew Piteo (Abernathy Fish Technology Center, Fish & Aquatic Conservation)

13:35 – Identifying breeding areas for the Tahiti petrel (*Pseudobulweria rostrata*) and other Procellariform seabirds on Tutuila Island – Andre Raine (Science Director, Archipelago Research and Conservation), Roberta Swift (Pacific Regional Office, Migratory Birds & Habitat Program) & Holly Freifeld (Pacific Regional Office, Ecological Services)

14:00 – Using external morphological features to diagnose internal spinal deformities in hatchery Chinook salmon (*Oncorhynchus tshawytscha*) – Ian MacDonald (Columbia River Fish & Wildlife Conservation Office, Fish & Aquatic Conservation)

14:35 – Are all tall structures the same to sage-grouse? An evaluation of sage-grouse mortality and nest depredation risk in response to communication towers and avian predators – Jacqueline Cupples (Oregon Fish & Wildlife Office, Ecological Services), Shawn Szabo (Department of Animal & Rangeland Sciences, Oregon State University) & Sarah Webster (Western Ecological Research Center, U.S. Geological Services)

14:50 – **Summary**

15:00 – **Adjourn**

13:00-15:00 **– Session V – Oral Presentations**

Host: Karen Colson (Science Of The Service Planning Team Member; Pacific Regional Office, Ecological Services)

13:00 – **Orientation**

13:10 – Supporting trials for direct treatments to fight white-nose syndrome – Erin Adams (Washington Fish & Wildlife Office, Ecological Services) & Daniel Nolfi (Idaho Fish & Wildlife Office, Ecological Services)

13:35 – 10-Years of adult Chinook Salmon contribution to the Pacific Ocean and Columbia River from Columbia River Gorge National Fish Hatcheries – Todd Gilmore (Columbia River Fish & Wildlife Conservation Office, Fish & Aquatic Conservation)

14:00 – Will warming winter temperatures resulting from climate change influence larval metamorphosis in Pacific lamprey? – William Simpson (Columbia River Fish & Wildlife Conservation Office, Fish & Aquatic Conservation)

14:35 – Applying conservation genomics to non-game fishes: A reference genome for Colorado pikeminnow – Steven Mussmann (Abernathy Fish Technology Center, Fish & Aquatic Conservation)

14:50 – **Summary**

15:00 – **Adjourn**

13:00-15:00 **– Session VI – Science Briefs *(Student Presentations)***

Host: Jennifer Urmston (Science Of The Service Planning Team Member; Pacific Regional Office, Migratory Birds & Habitat Program)

13:00 – **Orientation**

13:10 – Investigating threshold relationships between native bull trout and nonnative brook trout in Idaho – Nicholas Voss – (Idaho Cooperative Fish & Wildlife Research Unit, University of Idaho)

13:18 – Guam's green sea turtles exhibit multiple strategies for inter-nesting movements and post-nesting migrations into the Western Pacific – Josefa Munoz – (Hawaii Institute of Marine Biology, University of Hawaii at Manoa)

13:26 – The last meal: diet analysis of stranded green turtles (*Chelonia mydas*) on east Hawai'I Island–- Miranda Maassen–- (Marine Science Department, University of Hawai'i at Hilo)

13:34 – Spatial analysis of trends in tufted puffin (*Fratercula cirrhata*) breeding habitat on the Oregon coast–- Carina Kusaka–- (Department of Fisheries, Wildlife & Conservation Sciences, Oregon State University)

13:42 – Impacts of stage 0 restoration on water temperature and macroinvertebrates in Whychus Creek, Oregon–- Wesley Noone–- (Department of Environmental Science & Management, Portland State University)

13:50 – Population demographics and dynamics of juvenile bull trout in a montane ecosystem–- Sage Unsworth–- (Idaho Cooperative Fish & Wildlife Research Unit, University of Idaho)

13:58 – Putting their eggs in one basket: An inventory of western and Clar''s grebe breeding lakes across North America–- Anne Yen–- (Department of Fish & Wildlife Sciences, University of Idaho)

14:06 – Community dynamics of native and non-native fish in a changing ecosystem–- Aleah Dew–- (Department of Fisheries, Wildlife & Conservation Sciences, Oregon State University)

14:14 – Whitaker Ponds Natural Area remediation project: response of macroinvertebrate communities one year post-remediation–- Andrea Bryant – (Environmental Science & Management, Portland State University)

14:22 – **Summary**

14:30 – **Adjourn**

13:00-15:00 **– Session VII – Oral Presentations**

Host: Megan Laut (Science Of The Service Planning Team Member; Pacific Islands Fish & Wildlife Office, Ecological Services)

13:00 – **Orientation**

13:10 – Efficiently finding the needle in the haystack: Using eDNA and active capture to quickly locate and assess an undocumented, low-density bull trout population – Jose Vazquez (Mid-Columbia Fish & Wildlife Conservation Office, Fish & Aquatic Conservation)

13:35 – Minimizing hybridization risk of golden paintbrush (*Castilleja levisecta*): Lessoned learned and a path forward – Erin Gray, Daniel Grosboll & Jeffrey Chan (Washington Fish & Wildlife Conservation Office, Ecological Services)

14:00 – Capturing coho salmon escapement on the Big Quilcene River and understanding habitat production capacity – Benjamin Cross (Western Washington Fish & Wildlife Conservation Office, Fish & Aquatic Conservation)

14:35 – Empowering the change we need through effective climate change communication – Leah Schrodt (Oregon Fish & Wildlife Office, Ecological Services) & Kaitlyn Landfield (Pacific Regional Office, Science Applications)

14:50 – **Summary**

15:00 – **Adjourn**

13:00-15:00 **– Session VIII – Oral Presentations**

Host: Leana Goetze (Science Of The Service Planning Team Member; Pacific Regional Office, National Wildlife Refuge System)

13:00 – **Orientation**

13:10 – Impacts of redd superimposition on the spawning success of listed tule fall Chinook salmon in the White Salmon River, Washington – Justin Baker (Columbia River Fish & Wildlife Conservation Office, Fish & Aquatic Conservation)

13:35 – Predicting pathogen prevalence in salmon populations using pooled tissue samples – Christine Parker-Graham (Western Washington Fish & Wildlife Conservation Office, Fish & Aquatic Conservation)

14:00 – Spalding's catchfly (*Silene spaldingii*) recovery efforts on the Palouse prairie – Brenda Erhardt (Latah Soil & Water Conservation District, Moscow, Idaho) & Brittany Morlin (Idaho Fish & Wildlife Office – Coeur d'Alene, Ecological Services)

14:35 – Reintroduction of bull trout to the Clackamas River, Oregon–- A 10-year retrospective – Chris Allen (Oregon Fish & Wildlife Office, Ecological Services)

14:50 – **Summary**

14:45 – **Adjourn**

13:00-15:00 – **Session IX – Panel for Science**

Host: Michael Green (Science Of The Service Planning Team Member; Pacific Regional Office, Migratory Birds & Habitat Program)

13:00 – **Orientation**

Status and Conservation of Pollinators in Region 1

13:10 – Insect declines and threats – Alan Yanahan (Pacific Regional Office, Science Applications)

13:25 – Bumble bees: Declines, threats and conservation – Jeff Everett (Oregon Fish & Wildlife Office, Ecological Services)

13:40 – Butterfly research and outreach – Sam Derrenbacher (Oregon Fish & Wildlife Office, Ecological Services)

13:55 – Partnerships on private forest lands – Vicki Finn (Pacific Regional Office, Science Applications)

14:10 – Panel Discussion – *moderated by* Mike Green

14:50 –**SOTS 2023: Conclusion & Valediction** – Hugh Morrison (Regional Director, Pacific Regional Office)

15:00 – **Adjourn**

13:00-14:30 – **Special Session – Theodore Roosevelt Genius Prize**

Guest Host: Erin Abernethy (Oregon Fish & Wildlife Office, Ecological Services)

13:00 – **Orientation**

13:05 – Innovation for Conservation: Theodore Roosevelt Genius Prize Competitions – Stephanie Rickabaugh (Headquarters Office, Partners)

13:15 – Preventing Wildlife Poaching and Trafficking: The NABIT- Rapid, portable genetic testing tool for combating wildlife trafficking – David Baisch (Molecular Innovations Director, Conservation X Labs)

13:30 – Promotion of Wildlife Conservation: Harnessing Machine Learning to Connect Urban Residents to Wildlife Conservation through Social Media – Jason Holmberg (Executive Director, Wild Me) & Seth Magie (Executive Director, Urban Wildlife Information Network)

13:45 – Protecting Endangered Species: Expanding the Use of Photo-Identification Technology to include Tiny, Flight, and Ephemeral species – Jenny Shrum

14:00 – Promoting Nonlethal Human-Wildlife Conflict: Creating a No-Fly Zone for Birds – Tim Shields (Founder & CEO, Hardshell Labs, Inc.)

14:15 – Reducing Human-Predator Conflict, using nonlethal means: Cattle-producer designed Automated Mineral Bin – Cameron Krebs (Fifth-generation Rancher, Northeast Oregon)

14:30 – **Adjourn**

Abstracts

(in order of scheduled presentation)

The role of science and the good scientist

Do you strive to achieve scientific rigor, quality, and integrity? Do you want to make a lasting contribution to conservation science? Have you experienced or witnessed burnout, in pursuit of these goals? Join us if you are interested in learning more about amplifying your scientific contributions, the role of science in evidence-building and decision-making, protecting the scientific record in the face of external pressures, addressing bias in scientific methodology and dissemination, and more. We'll explore lessons learned, best practices, and "better science" concepts that can help us reach new heights while also, and most importantly, preserving our sanity.

Author: *Charisa Morris (National Science Advisor/Scientific Integrity Officer, Office of the Director, Headquarters)*

Presenter: *Charisa Morris, U.S. Fish & Wildlife Service, National Science Advisor/Scientific Integrity Officer, Office of the Director, Headquarters, 849 C St NW, Washington, District of Columbia 20240 phone: 301-875-8937 email: charisa_morris@fws.gov*

Evaluating the reliability of visual surveys and eDNA to detect a new invasion of New Zealand mudsnail

Aquatic invasive species (AIS) including New Zealand mudsnail (NZMS), pose a threat to National Fish Hatcheries (NFHs). Routine operations (e.g., fish stocking, fish or egg transfers) can introduce or spread AIS between waterbodies and/or hatcheries. Early detection of AIS is crucial for effective management and control. Conventional monitoring techniques may not reliably detect new infestations of NZMS due to the species' small size and cryptic coloration. The environmental DNA (eDNA) technique is a popular tool for early detection of AIS due to its high sensitivity and potential to detect species at low densities. We used visual and eDNA sampling techniques to detect the potential presence of NZMS at NFHs and reference locations. We assessed detection probability of NZMS sampled by eDNA and visual surveys using an occupancy model. Detection probability of eDNA was 0.73 (95% CI: 0.55–0.86) in large rivers and 0.92 (95% CI: 0.81–0.98) in small-medium rivers. Detection probability of visual sampling was 0.29 (95% CI: 0.09–0.56) in large rivers and 0.68 (95% CI: 0.39–0.89) in small-medium rivers. Average eDNA of NZMS (copies/ml) was higher at sites where NZMS were detected visually than those where they were not detected visually. Our work indicates that both eDNA and visual surveys are viable options for early detection of NZMS at NFHs and elsewhere. Environmental DNA provides an early signal of NZMS presence and is useful for monitoring large, deep, or difficult to sample areas, while visual surveys can pinpoint the precise location and relative abundance of NZMS.

Authors: *Jennifer Poirier & Julianne Harris (U.S. Fish & Wildlife Service)*

Presenter: *Jennifer Poirier; U.S. Fish & Wildlife Service, Columbia River Fish & Wildlife Conservation Office, 1211 SE Cardinal Ct., Suite 100, Vancouver, Washington 98683 phone: 360-604-2500 email: jennifer_poirtier @fws.gov*

Expanding our understanding of bull trout viability

Ongoing management and policy decisions for threatened and endangered species can be challenging in the face of limited data. Bull trout across all coterminous U.S populations were listed in 1998 as threatened under the Endangered Species Act (Act). Since listing, the Service has conducted two 5-year status reviews pursuant to section 4 of the Act, resulting in decisions to continue with protections afforded by the Act. In our current/upcoming 5-year review, we are/will utilize the recent species status assessment (SSA) for the bull trout to inform our recommendation of whether to maintain or change the status of the species. The SSA provides Service decisionmakers with a characterization of species viability. For bull trout, we characterize viability based on an analysis of 118 bull trout core areas comprised of over 600 local populations. Although considerable information and data exists on bull trout, datasets sufficient to describe viability across the range are limited. The Service relied on core area working groups, which included external partners, to provide expert level support in core areas with limited data. As a result, the Service was able to evaluate demographic and habitat factors to assess the resiliency of core areas for bull trout across their range. The process we used may provide insight that can be useful in implementation of the Act for other species with limited data.

Authors: *Dan Nolfi [1], Brett Bowersox [2], Dan Brewer [1], Jeff Chan [1], Molly Good [1], Stephanie Gunckel [3] & Marie Winkowski [4] ([1] U.S. Fish & Wildlife Service, [2] Idaho Department of Fish & Game, [3] Oregon Department of Fish & Wildlife, [4] Washington Department of Fish & Wildlife)*

Presenter: *Dan Nolfi, U.S. Fish & Wildlife Service, Idaho Fish & Wildlife Office – Chubbuck, 4425 Burley Drive., Suite# A, Chubbuck, Idaho 83202 phone: 208-237-6975 email: daniel_nolfi @fws.gov*

Sagebrush restoration beyond the core: Sagebrush lizard habitat management

Land use conversion, climate change, and the introduction of invasive species has led to the loss of half of the original sagebrush ecosystem across the intermountain west. Sagebrush conservation goals are largely focused on landscape level priorities, relying on strategic decisions to focus efforts on sagebrush core areas with a higher level of integrity and lower cumulative threats. However, this framework for restoration is difficult to implement successfully throughout much of the historic range of the sagebrush ecosystem which is currently considered highly degraded. Specifically, 80% of the sagebrush ecosystem in southeastern Washington and the Columbia Basin has been lost to land use conversion and the remaining landscape is highly degraded by invasive annual weeds. While regional priorities overlook the Columbia Basin, there is still a need for restoration efforts for several species of concern that depend on sagebrush ecosystems. Furthermore, National Wildlife Refuges (NWRs), guided by Comprehensive Conservation Plans, seek to restore highly degraded sagebrush ecosystems to manage habitats for priority species. At Umatilla NWR, the need for sagebrush lizard (*Sceloporus graciosus*) conservation provides us with an opportunity to use species specific habitat requirements to provide science-backed restoration objectives for landscapes outside sagebrush core areas. By comparing the occupation and density of sagebrush lizards in naturally occurring habitat, Refuge created habitat, and random points representing the characteristics of the landscape prior to management actions, we will determine if managing sagebrush lizard habitat can serve as an effective framework for small scale restoration of highly degraded sagebrush ecosystems.

Author: *Sarah Trujillo (U.S. Fish & Wildlife Service)*

Presenter: *Sarah Trujillo, U.S. Fish & Wildlife Service, McNary National Wildlife Refuge, 64 Maple Street, Burbank, Washington 99323 phone: 509-803-7961 email: sarah_trujillo@fws.gov*

Documenting populations of giant clams (*Tridacna* spp.) and listed coral species at Wake Atoll

Biologists were tasked with documenting Endangered Species Act corals (*Acropora globiceps* and *A. retusa*) across the atoll in order to inform future management actions and decisions. During those field surveys, biologists noted a high number of giant clams (Tridacninae, CITES listed). The agencies agreed that further exploration of the population of giant clams could also assist in a broader understanding of the marine ecosystem and any future recovery efforts, as there are no basic population metrics for Wake Atoll. The ESA listed corals were sized and georeferenced for the lagoon and western reef flat, adding to a broader scientific record for the Pacific region. A dense population of *Tridacna maxima* was documented at the western reef flat. T. maxima also densely populated favorable limestone and hard bottom substrate throughout the central and west lagoon and was much less abundant in sand bottom areas. The benthic habitat maps produced for both corals and giant clams can now be used as a partial distribution map for the species at the atoll. In addition to recording traditional data metrics, the biologists also ground truthed derived satellite imagery of live coral cover. For most areas, the bare limestone was covered in macroalgae, *T. maxima*, or sponges. The remote sensing imagery initially intended to characterize coral cover within Wake lagoon could be more appropriate for estimating populations of giant clams.

Author: *Nadiera Sukhraj (U.S. Fish & Wildlife Service)*

Presenter: *Nadiera Sukhraj, U.S. Fish & Wildlife Service, Pacific Islands Fish & Wildlife Office, 300 Ala Moana Boulevard, Room 3-122, Honolulu, Hawaii 96850 phone: 808-792-9410 email: nadiera_mccarthy@fws.gov*

Using acoustic monitors to detect bats in the University of Idaho Experimental Forest

There are over 1,400 species of bats, which means bats comprise approximately 20% of all mammalian species. Their vast diversity in diet, echolocation abilities, and other characteristics allow bats to perform several ecosystem services essential to the environments they occupy. For example, frugivorous bats pollinate plants, while insectivorous bats control populations of pests that damage crops. Despite their important roles in various ecosystems, bats are universally understudied, with over a third of all bat species considered data deficient by the IUCN. This is no less true for the fourteen species of bats in Idaho. This study aimed to bridge that knowledge gap by using acoustic monitoring to build a species inventory and characterize foraging activity of bats in the University of Idaho Experimental Forest. From late May to early August in 2022, fourteen AudioMoth acoustic monitors were stationed in strategic locations to maximize detection. After the data collection period, all recordings were collected and processed through Kaleidoscope Pro software which filtered out files not containing bat calls and provided an automatic species identification. These automatic identifications were then manually verified to create a final species inventory. Thirteen species were detected, the most common of which was *Lasionycteris noctivagans*. Next, the data was analyzed for correlations in habitat type, temperature, precipitation, and other geographical and temporal features related to bat activity. This research will provide essential ecological information to UIEF and northern Idaho wildlife agencies that will better equip them to make informed decisions for the management of native bats.

Authors: *Klara McKay, Elyce Gosselin, Robert Keefe & Lisette Waits (University of Idaho)*

Presenter: *Klara McKay, University of Idaho, Department of Fish & Wildlife Science, 875 Perimeter Drive, Moscow, Idaho 83844 phone: 208-885-6111 email: klarajmckay@gmail.com*

Wild bee diversity declines rapidly with time since harvest in intensively managed Douglas-fir plantations

Despite growing interest in pollinator conservation in non-agricultural ecosystems, little is known about the impacts of forest management practices on wild bee communities, particularly in forests managed intensively for wood production. We assessed bee communities and habitat characteristics (i.e., floral and nesting resources, vegetation structure, and extent of early seral forest in the surrounding landscape) across a chronosequence of 60 intensively managed Douglas-fir (*Pseudotsuga menziesii*) stands spanning a typical harvest rotation in 2018 and 2019. Bee abundance and richness were relatively high in recently harvested stands but declined rapidly with stand age and observed and estimated diversity were lowest in stands >11 y post-harvest (the mean age of canopy closure). Changes in community composition with stand age were explained by species loss rather than turnover and no species were uniquely associated with closed-canopy conditions. Bee abundance–but not richness–was positively associated with floral resource density, and neither was related to floral richness. Amount of early seral forest in the surrounding landscape seemed to enhance bee species richness in older, closed-canopy stands, but otherwise had little effect. Our study demonstrates that Douglas-fir plantations develop diverse wild bee communities shortly after harvest, but diversity erodes rapidly as forest canopies close. Therefore, stand-scale management activities that prolong the pre-canopy closure period and enhance floral density during this stage of stand regeneration will provide the greatest opportunity to enhance bee diversity in intensively managed conifer forests.

Authors: *Rachel A. Zitomer [1], Sara M. Galbraith [1], Matthew G. Betts [1], Andrew R. Moldenke [1], Robert A. Progar [2] & James W. Rivers [1] ([1] Oregon State University, [2] U.S. Forest Service)*

Presenter: *Rachel A. Zitomer, Oregon State University, Department of Forest Ecosystems & Society, Corvallis, Oregon 97331 phone: 541-737-2004 email: rachel.zitomer@oregonstate.edu*

Developing monitoring targets to better inform adaptive management of an aquatic invasive species

Estimates of population spread and growth rates are fundamental to identification of optimal allocation of invasive species removal effort. Novel insights into invasive population dynamics can be gained from spatially-structured removal and monitoring data collected during a removal effort. Monitoring data can also be used to assess and revise management, in an iterative process known as adaptive management. Adaptive management has the potential to be a useful decision-analytic approach for invasive species management problems as practitioners grapple with the challenges of accounting for uncertainty in the decision-making process. However, it has been used relatively infrequently to guide aquatic invasive species management. In this study we built a population model within the context of an adaptive management framework to simulate invasive rusty crayfish (*Faxonius rusticus*) population growth, spread, and response to possible management actions in the John Day River, a major tributary of the Columbia River. We simulated population dynamics, monitoring data, and management outcomes for a fixed time and at the end of each simulation, the number of individuals remaining on the landscape, total river length occupied, and downstream movement was assessed. We found that integrating all available monitoring data streams could produce the best management outcome and most accurate abundance measures. In addition to potentially informing rusty crayfish monitoring and management, the modeling framework provided in this study could be applied to a variety of aquatic invasive species contexts.

Authors: *Brielle K. Thompson [1], Julian D. Olden [1], Sarah J. Converse [2], Theresa Thom [3] & Amy A. Yackel Adams [2] ([1] University of Washington, [2] U.S. Geological Survey, [3] U.S. Fish & Wildlife Service)*

Presenter: *Brielle K. Thompson, University of Washington, Quantitative Ecology & Resource Management, Ocean Teaching Building, Suite 300, Seattle, Washington 98195 phone: 206-616-9571 email: bkwarta@uw.edu*

The relationship between circadian gene transcription and cellular metabolism in hibernating grizzly bears

Hibernation is a highly seasonal physiological adaptation that allows animals to survive periods of low food availability for up to eight months at a time. Grizzly (brown) bears (*Ursus arctos horribilis)* rely solely on fat reserves that were obtained during the active season (May-July) and hyperphagia (August-October) and subsequently lower their metabolic rate and their body temperature by 3-7°C to conserve energy during hibernation. Similarly, circadian rhythms conserve energy by coordinating body processes to optimized times of day that match the daily environmental light: dark cycles. However, research has only begun to scratch the surface of what physiologically allows grizzlies to survive these long bouts without food. In contrast to other hibernating species, grizzly bears have been shown to display circadian rhythms *in vivo* and *in vitro* throughout the year, which exemplifies the importance of understanding the relationship between energy metabolism physiology and circadian gene rhythmicity. This research aims to elucidate the link between circadian rhythms and cellular energetics by investigating rhythmic gene transcription and ATP production *in vitro*. We assessed this through time-series RNA sequencing and cyclical measurements of ATP production in fibroblasts of each season type (active and hibernation) at two different temperatures (37°C and 34°C). It was determined that numerous genes in all experimental conditions exhibited rhythmic gene transcription and had a significant time effect of ATP production under the combined effects of season and temperature. This research builds upon previous evidence that confirms the presence of circadian rhythms in hibernating grizzly bears.

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Characterization and comparison of gut microbial communities in a threatened herbivore

The microbiomes of herbivores can serve important roles in host health and local adaptation. For example, the Greater Sage-grouse (*Centrocercus urophasianus*), whose diet consists of chemically defended plants (e.g., sagebrush, *Artemisia spp.*), may have locally-adapted gut microbial communities that are involved in the digestion and detoxification of consumed plants. We use 16S amplicon sequencing to investigate and characterize the microbial communities in gut compartments of Greater Sage-grouse using non-invasively collected fecal and cecal samples. Samples were collected in spring of 2019 across two sites in central Washington: Sagebrush Flat, a vegetation recovery site surrounded by agricultural wheat fields, and Mary Jane, an area central to one of the few large leks remaining in native habitat. Here, we characterize differences in microbial communities between fecal and cecal samples and between sites to identify the potential role of microbes in a locally adapted herbivore experiencing land use changes. Characterizing microbiomes of Greater Sage-grouse across both native habitat as well as "recovered" or "managed" habitat may help us identify a functional mechanism for adaptation. Initial results suggest that cecal samples had a higher median diversity, but lesser range of diversity than fecal samples. Further analysis of alpha and beta diversity between metrics, as well as identification of microbial taxa are being conducted. Results may reveal the significance of considering microbial relationships and local adaptation when applying management methods as species face habitat loss, fragmentation, climate change, and human disturbance.

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A literature review: a brief history of sea lion management and conservation

Today, there are six extant species of sea lion around the world, with the seventh (the Japanese sea lion) already having gone extinct due to a lack of proper conservation management. Because each of the surviving 6 sea lion species differ slightly in their anatomy, behavior, reproduction, and local habitats, they have often been treated as entirely different entities in regard to their conservation. This literature review will generate a more collective body of work on all sea lion species, to address their current conservation statuses, what efforts (or lack thereof) led them to that point, and how conservationists can use this knowledge to better manage their populations around the world. This review will serve as a comprehensive, digestible, and neutral source of information on all sea lion conservation to date. It will simultaneously identify any knowledge gaps that present themselves within the literature that require further research to be done. Readers may utilize this report in its entirety, or as an encyclopedia of sorts, where sections may be consumed individually as needed.

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Environmental variability in Hawaiian fishponds under restoration

Hawaiian fishponds (loko i'a) have always held high value here in the islands, they are seen as an important food source and are sacred to the native people (kanaka). Hawaiians understood the connection of fresh and marine water, creating an optimal habitat for diverse fish species. Currently several loko i'a are being stewarded by community groups that are finding ways to restore them. We have been working in collaboration with Maunalua Fishpond Heritage Center to monitor environmental conditions during the restoration process. For this study we focused on one loko i'a located on the south-east side of Oahu known as Kalauha'iha'i. During the fall 2022 semester we gathered temperature, conductivity, pH, and dissolved oxygen concentration data over a span of five weeks. In the data, we observed environmental variability in all measured parameters. Monitoring the loko i'a helps us identify what factors affect the fishpond and the marine life within it. We noticed that every night the dissolved oxygen dropped to hypoxic levels, this causes stress on the fish as there is minimal amounts of oxygen. Restoring the loko i'a will alleviate the stress of marine life within the fishpond. It will also bring balance back to our native ecosystem by inviting indigenous marine and terrestrial life that once inhabited this area. As we continue to collaborate with Maunalua Fishpond Heritage Center in monitoring the health of the loko i'a, we look for solutions to further the restoration process.

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Four decades of green turtle (*Chelonia mydas)* strandings on Hawai‘i Island (1983 – 2022): identifying causes and assessing trends

Hawaiian populations of green turtles (*Chelonia mydas*) have increased since Federal and State protections were implemented in the mid 1970s, and consequently, reported stranding events have also increased. Analyzing stranding data can provide valuable information for resource managers, policy-makers, and the public. This study analyzed Hawai‘i Island data: stranding location, date, size, sex, presence/absence of tumors, stranding status, and cause of stranding. A total of 754 stranded green turtles were reported from 1983 – 2022: 378 stranded on the east (leeward) coast of Hawai’i Island and 376 on the west (windward) coast. Strandings peaked in 2011 and 2018, and were highest from March to August. The most common known cause of stranding was hook-and-line fishing gear (21.4% of total strandings), followed by fibropapillomatosis (7.2%), human take (4.3%), miscellaneous (3.7%), boat impact (3.3%), shark attack (3.2%), and net (2.1%); however, 54.8% of strandings had no known cause. Stranded turtles on east Hawai‘i Island had a higher frequency of fibropapillomatosis, whereas west Hawai‘i stranded turtles showed higher incidence of shark attacks. These results provide the first analyses of stranding data from Hawai‘i Island and provide information that can inform managers and the public about the various types and magnitudes of impacts, anthropogenic and natural, to green turtles so that mitigation measures can be put into practice.

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Surveying suburban barred owls in Olympia, Washington

During the past 50 years Barred Owls (*Strix varia*) have invaded the Pacific Northwest (PNW) and now compete with endangered Spotted Owls (*Strix occidentalis caurina*). Spotted Owls require old-growth forests while Barred Owls inhabit suburban areas. Attempts by wildlife managers to eliminate Barred Owls from Spotted Owl territories failed because new Barred Owls moved in and quickly reoccupied those areas. This study aims to better understand the full distribution of Barred Owls in the PNW. The west peninsula of Olympia, WA is a mix of dense urban, suburban, and areas of fragmented forests. During two months in the summer of 2022 a conspecific audio-broadcast survey was conducted to locate fledgling Barred Owls. Responses were classified, based on the maximum number of owls recorded in a single survey, into Single, Pair, or if young were found, Family. Forty-two individuals were located in 15.77 km^2, which is a density similar to Barred Owls living in developed environments in the eastern United States. Eleven young Barred Owls were confirmed at six locations. A buffer with a 500m radius was created around result locations to characterize the habitat. One family was found in a neighborhood that contained more developed areas than forest cover. This limited survey shows that Barred Owls have adapted to suburban environments in the PNW and indicates how successful and widespread their populations are. Wildlife managers should realize that eliminating competition by Barred Owls is impossible and instead focus on Spotted Owl habitat conservation, restoration, and expansion.

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Retention of passive integrated transponder tags in hatchery YY male brook trout: effect of tag size, implantation site, and double tagging

Tag retention is a fundamental consideration in mark-recapture studies. We conducted a laboratory study to evaluate retention of 8-mm full-duplex and 12-mm half-duplex passive integrated transponder (PIT) tags implanted in the abdomen, cheek musculature, and dorsal sinus of age-0+ YY male brook trout (Salvelinus fontinalis). Treatments included both single- and double-tagged fish. We monitored survival, growth, and tag retention for 181–187 days for 640 tagged fish and 80 untagged controls (range 83–195 mm FL). Survival averaged 98.3% and was unrelated to tagging treatments. A transient effect of tagging on growth in mass was noted for some tagged fish during the first recapture interval (13–17 d). Tag retention was 100% for the dorsal implantation site, 83% with 8-mm tags for the cheek, 97.5% with 8-mm tags for the abdomen, and 99.6% with 12-mm tags for the abdomen. Retention of 8-mm tags at the cheek site was higher for larger fish. Across treatments, 78% of the tag loss occurred within 30 d of tagging, and no tags were lost after 90 d. Tag loss was independent of whether fish were single or double tagged. Double tagging with one full- and one half-duplex tag may be useful for field applications. Double tagging may also be useful in hatchery applications where tag shedding is a concern and individual fish identification is integral to a program's success (e.g., genetic management of broodstock).

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Identifying breeding areas for the Tahiti petrel (*Pseudobulweria rostrata*) and other Procellariform seabirds on Tutuila Island

We conducted acoustic monitoring surveys on Tutuila Island, American Samoa, to locate breeding colonies of Tahiti petrels (*Pseudobulweria rostrata*) and assess the prevalence of three other nocturnal, burrow-nesting Procellariiform seabird species. American Samoa in an unincorporated territory of the United States in the South Pacific. The territory lies within the breeding range of the Tahiti petrel, which is identified as Near Threatened on the Red List of Threatened Species although its distribution is poorly known. Between 2020 and 2022, we deployed autonomous recording units and cameras in 17 known or suspected montane breeding areas to capture seabird vocalizations. Although the Covid-19 pandemic created logistical challenges that left temporal gaps in our data collection, song meters detected Tahiti petrels and tropical shearwaters (*Puffinus bailloni*) in 16 of 17 survey areas and identified multiple previously unknown colonies. Acoustic data collected from these units also identified peak calling periods for Tahiti Petrel, data critical for focusing future survey efforts for this species. One camera trap also recorded a Tahiti petrel on multiple days; these are the first trail camera images of this species in American Samoa. Unfortunately, all camera traps documented the presence of rats, cats, and/or dogs—all known predators of nesting seabirds. These results highlight the importance of Tutuila's forested, montane ridges as breeding habitat for these sensitive seabirds and the threat that pervasive, nonnative predators likely pose to breeding birds, their eggs, and their chicks.

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Using external morphological features to diagnose internal spinal deformities in hatchery Chinook salmon (*Oncorhynchus tshawytscha*)

Fish with skeletal deformities are a normal part of hatchery chinook production at hatcheries throughout the Pacific Northwest. Although many deformities are easy to detect visually (scoliosis, conjoined twins, etc.), others may be more difficult to detect due to variance in body shape, the degree of deformity, and the prevalence of deformed fish within the hatchery population. This study focused on deformities of the spinal column in Chinook salmon (*Oncorhynchus tshawytscha*). We collected samples of normal and deformed fish from 5 strains of Chinook (spring chinook, tule fall chinook, and upriver bright chinook) from 4 federal hatcheries (Little White Salmon, Carson, Spring Creek, Willard). We created morphological “standards” using morphometric data and diaphonized spinal columns from morphologically normal and deformed fish from each hatchery. We provide some simple morphological metrics that can be used to easily diagnose deformities from external morphological features to aid in the identification of these less obvious deformities. Additionally, we provide insights into the sub-lethality of some of these deformities that may allow deformed juveniles to return as adults.

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Are all tall structures the same to sage-grouse? An evaluation of sage-grouse mortality and nest depredation risk in response to communication towers and avian predators

Communication infrastructure development, particularly tower structures, have the potential to negatively impact sensitive species such as greater sage-grouse (*Centrocercus urophasianus*) and also provide nesting/perching substrates for avian predators throughout sagebrush ecosystems. However, the impacts of communication towers (hereafter, towers) on sage-grouse populations are not well understood. We explored the impact of towers on sage-grouse across a large portion of their range using two approaches, a field study to determine how tower attributes (i.e., design, arrangement) influence perching/nesting by avian predators and a desktop analysis to explore impacts of towers on sage-grouse population demographics. For the desktop analysis, we used a Bayesian hierarchical state-space model to estimate population growth for each lek from 1996 – 2020 and explore impacts of towers and landcover features on population trends over multiple spatiotemporal scales. Models revealed evidence of adverse influences on sage-grouse population growth, but these findings varied geographically and by time period. For the field study, we visited 603 tower sites across California, Idaho, Nevada, Oregon, and Wyoming. At each site we conducted a point count survey, inventoried avian predator nests and nesting substrate, and collected samples for dietary analysis. We discovered predator nests at 72/603 (11.9%) tower sites. Preliminary data suggest avian predators preferentially nested on certain tower and antenna types. Dietary analyses revealed that avian predators nesting at tower sites consumed a diverse diet that included sage-grouse and other species of conservation concern. These findings are preliminary, provided for timely science communication, and subject to change.

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Supporting trials for direct treatments to fight white-nose syndrome

White-nose syndrome (WNS) is a disease that has decimated bat populations of the genus Myotis since its first detection in New York in 2006-2007. WNS is caused by the fungus *Pseudogymnoascus destructans* (Pd), which continues to spread across North America. Pd has been detected in many western states including Idaho, and WNS has been confirmed in Washington since 2018-2019 where some localized bat population declines have been noted. The U.S. Fish and Wildlife Service's (USFWS) National WNS program leads a state-federal-tribal-provincial response to WNS. One priority of the program is to work with partners in developing direct and indirect treatment tools to fight WNS. Current treatment options range from vaccines and topical probiotics administered to bats, to disinfection of roosts and hibernacula and other beneficial actions to support bat survival. In USFWS's Region 1, multiple partner projects are being conducted with USFWS support to administer direct and developing treatments for bats threatened by WNS. In 2021 and 2022 state wildlife agencies, U.S. Geological Survey, and U.S. Forest Service, with support from partners and USFWS field offices, participated in field trials to administer a WNS vaccine to Myotids in Idaho and Washington. Additionally, other research projects are currently testing the efficacy of treatments at summer roosts to reduce Pd loads on bats. The data anticipated from these efforts in the Pacific Northwest will provide valuable insight for future treatment trials at different locations and stages of infection against this extremely challenging disease.

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10-Years of adult Chinook Salmon contribution to the Pacific Ocean and Columbia River from Columbia River Gorge National Fish Hatcheries

The Columbia River Gorge National Fish Hatcheries (NFH; Carson NFH, Little White Salmon NFH, Spring Creek NFH, Willard NFH, and Warm Springs NFH) release approximately 20 million juvenile Chinook salmon each year with about nine percent being released with a coded-wire tag. For juvenile Chinook salmon released between 2008 and 2017 (brood years 2006 to 2015) from the Columbia River Gorge NFHs, adults recovered with a coded-wire tag were analyzed to determine the contribution to freshwater and ocean fisheries. Over this 10-year period, the Columbia River Gorge NFHs contributed more than one million adult Chinook salmon to the Pacific Ocean and Columbia River, including harvest (sport, commercial and tribal fisheries), hatchery returns, and spawning ground coded-wire tag recoveries. Tule fall Chinook contributed to ocean fisheries in Washington (53.8%), British Columbia (25.5%), Oregon (19.8%), Alaska (0.6%) and California (0.2%), with a 10-year total contribution of more than 245,000 adults. For the Columbia River, tule fall Chinook contributed more than 615,000 adults over 10-years, where 61.3% were harvested in freshwater, 38.3% returned to hatcheries, and 0.4% were recovered on spawning grounds. Upriver bright fall Chinook contributed to ocean fisheries in Alaska (44.7%), British Columbia (41.4%), Washington (9.7%), Oregon (3.7%), and California (0.5%), with a 10-year total contribution of more than 45,000 adults. Within the Columbia River, upriver bright fall Chinook contributed more than 165,000 adults over 10-years, with 31% harvested in freshwater, 46% returned to hatcheries, and 23% were recovered on spawning grounds. Spring Chinook contributed more than 170,000 adults over 10-years to the Columbia River, where 42% were harvested in freshwater, 55% returned to hatcheries and 3% were recovered on spawning grounds. Less than 1% (246 adults over 10-years) of spring Chinook recoveries contributed to ocean fisheries.

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Will warming winter temperatures resulting from climate change influence larval metamorphosis in Pacific lamprey?

Pacific Lamprey is a fish species native to the Pacific Northwest that has declined significantly throughout its range. Although Pacific Lamprey are anadromous and coincide with salmonids, they are morphologically and behaviorally distinct. Lamprey begin life as blind, filter-feeding larvae that burrow into fine sediments in freshwater. Eventually Pacific Lamprey larvae undergo a true metamorphosis, resulting in the development of eyes and an oral disk with teeth, and allowing lamprey to parasitize other fish by consuming their blood and tissue. It is thought that Pacific Lamprey larvae need to accumulate lipids and be exposed to cold winter temperatures to initiate metamorphosis. Presumably as a result of climate change, winter warming has been documented or is anticipated in some Pacific Northwest streams. We exposed captive-reared larval Pacific Lamprey to different temperature treatments between December and April. Fish were checked for metamorphosis after one and two years of rearing. We used a treatment that employed ambient river temperatures and a warm treatment that prevented ambient tank temperatures from falling below 9°C. The proportion of larvae that underwent metamorphosis annually ranged from 6 to 67%. The warm temperature treatment did not appear to affect metamorphosis. However, the first year of rearing resulted in one fish cohort with low overall rates of metamorphosis, and the other cohort likely grew at unnaturally high rates. We are currently rearing a third fish cohort under two feeding treatments to determine if metamorphosis in moderate growth fish is affected by warm winter temperatures.

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Applying conservation genomics to non-game fishes: A reference genome for Colorado pikeminnow

Genome sequencing technique advancements have brought unprecedented accessibility of high-throughput sequencing to species of conservation interest. The potential knowledge gained from application of these techniques is maximized by availability of high-quality, annotated reference genomes. However, these vital resources are lacking for many non-game fish species. Reference genomes from close evolutionary relatives can be substituted for certain genomic applications, but such workarounds often lower resolution of resulting analyses. Furthermore, the ability to perform these substitutions for non-game western North American fishes is often limited by a lack of closely related species. This resource deficit is remedied in part by sequencing of the first reference genome for Colorado Pikeminnow (*Ptychocheilus lucius*). Pacific Biosciences HiFi sequencing technology was combined with long-range chromatin interaction data (Hi-C) to assemble a chromosome-level reference genome. RNA sequence data were also obtained to develop a reference transcriptome and conduct annotation of the reference genome. Analysis of the resulting 1.1 gigabasepair reference indicates a high level of completeness. Ninety-seven percent of the reference genome is contained within 25 contiguous DNA sequences, consistent with the known number of chromosomes for Colorado Pikeminnow. Additionally, 98% of 3,650 genes conserved among other bony fishes were found in the Colorado Pikeminnow reference genome and 97% were present in its transcriptome. Reference genome annotation is ongoing, but its current state already adds to a growing number of genomic resources for non-game western North American fishes. Potential future applications of reference genomes in conservation genomic research will also be discussed.

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Investigating threshold relationships between native bull trout and nonnative brook trout in Idaho

Bull Trout (*Salvelinus confluentus*) are iconic coldwater salmonids native to the Pacific Northwest that face a wide array of biotic and abiotic stressors, which can make identifying the primary threat in a given locality difficult. Nonnative Brook Trout (*S. fontinalis*) threaten Bull Trout persistence across western North America. We sought to identify reach-scale threshold or "tipping-point" densities of Brook Trout beyond which they may become the principal threat to juvenile or stream-resident Bull Trout. Such values could aid in broad-scale threat assessments, help inform which management tools may be most effective in a given area, or set goals for Brook Trout suppression efforts. We combined a large set of salmonid surveys in Idaho with publicly available stream habitat data and identified locations with conditions suitable to both Brook Trout and Bull Trout ≤250 mm TL. We then tested for threshold Brook Trout densities associated with significant declines in Bull Trout across the full range of abiotic conditions over which the two species cooccur. Bull Trout in Idaho were consistently rare or absent in reaches where Brook Trout exceeded a threshold density of 0.54 fish/100m^2, irrespective of abiotic conditions. However, Brook Trout rarely exceeded threshold densities in habitat (i.e., stream temperatures, gradients, and discharges) where Bull Trout density was predicted to be highest. Our results support existing hypotheses that the long-term co-occurrence of these two species may be inherently "unstable". We discuss our results in the context of Bull Trout conservation strategies and suggest directions for future research.

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Guam's green sea turtles exhibit multiple strategies for inter-nesting movements and post-nesting migrations into the Western Pacific

Understanding the inter-nesting movement and reproductive migration of sea turtles is crucial for local and international conservation, especially in the Central West Pacific (CWP) Distinct Population Segment (DPS), where green turtles (*Chelonia mydas*) are listed as endangered. Within the CWP, Guam and the Northern Mariana Islands are the only U.S. Territory and Commonwealth, respectively, where green sea turtle nesting occurs, but no data are available on the spatial ecology of Guam's nesting females. Further, there is limited information available on the inter-nesting movements of green sea turtles in general, especially using high-precision GPS satellite tags. We equipped 16 nesting females with Fast-loc GPS satellite tags on five of Guam's beaches from 2016 to 2022 to elucidate inter-nesting movements and post-nesting migrations. We observed three patterns of movement during the inter-nesting period, which includes 1) individuals remaining <2 km adjacent to the nesting beach, 2) traveling up to 35 km along the coast near other nesting beaches, and 3) inter-island movement. Fifteen of the 16 turtles departed Guam after completing oviposition, traveling to multiple countries in the Western Pacific and exhibiting three distinct migratory pathways with destinations ranging from Japan to Indonesia. Combined, these findings highlight the importance of marine habitats adjacent to nesting beaches for females nesting at various locations in Guam and the Mariana Archipelago. Overall, Guam's nesting green turtles exhibit variability in both their inter-nesting and post-nesting movements. Despite these differences, our findings also illustrate the need for international approaches for green turtle management in the Western Pacific.

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The last meal: diet analysis of stranded green turtles (*Chelonia mydas*) on East Hawai‘i Island

Green turtles, *Chelonia mydas*, in the Hawaiian Islands consume primarily marine macroalgae and less frequently sea grasses. The quality and amount of the food that green turtles ingest are important factors in growth rate, age of maturity, survivorship to adulthood, reproductive output, and population growth. In this study, the esophagus, crop, and stomach contents of 16 juvenile and subadult green turtles found stranded on the east (windward) coast of Hawai‘i Island were sorted and identified to the lowest possible taxonomic level, and the dry weights were measured. Red macroalgae from phylum Rhodophyta was the most common and most abundant type of algae. Members of Chlorophyta (greens) and Phaeophyceae (browns) were also present in the samples. Macroalgae comprised the majority of the diet of the sampled green turtles, but non-algal and non-food items were also found. Some of these items included terrestrial grass, segmented worms, plastics (films and fibers), fishing line, small rope, *Cricocephalus albus* (Trematoda), hair, small shell pieces, and sand. The fill and condition of the esophagus, crop, and stomach varied among the turtles. This is the first diet analysis of green turtles in the Hilo Bay area. Dietary studies are important for effective management of this protected species, its habitat, and the macroalgae critical for green turtle survival.

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Spatial analysis of trends in tufted puffin breeding habitat on the Oregon Coast

Tufted puffins (*Fratercula cirrhata*) are an iconic species in the Pacific Northwest that provide a wide range of ecological, economic, and historically important services such as ecotourism for local communities- and bringing marine derived nutrients to terrestrial habitats. Further, tufted puffins are sensitive to changes in prey availability and as such, are good indicators of overfishing and ecosystem disturbance. Tufted puffin populations on the Oregon Coast have declined dramatically over the past 30 years from over 5,000 birds in 1989 to only 550 birds in 2021. In 2018, the tufted puffin Species Status Assessment (SSA) determined that factors related to breeding site conditions are one of the most probable causes of puffin decline; however, little is known about the specific characteristics of nesting habitat along the Oregon Coast, or how it relates to their population demographics. To address this knowledge gap, we conducted a spatial analysis to examine the distribution of suitable breeding habitat for tufted puffins on the Oregon Islands National Wildlife Refuge, OR, USA. Specifically, we compared the percent cover of vegetation at tufted puffin breeding sites from 1979 to 2021 using a combination of ground truth data, aerial photos of the islands, data from the National Agriculture Imagery Program (NAIP), and other remote sensing data sets. Preliminary results suggest a decrease in the percent cover of live vegetation at critical breeding habitat. After measuring the magnitude of habitat change, we related vegetation loss to site-specific, climatic, and environmental variables to determine potential key drivers of habitat change. Assessing how suitable puffin breeding habitat characteristics have changed over time will provide necessary information to guide refuge managers in habitat restoration and support adaptive management decisions.

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Impacts of floodplain restoration on water temperature and macroinvertebrates in Whychus Creek, Oregon

Stream restoration is a proposed climate adaptation tool, however, outcomes of floodplain restoration on stream temperature have been debated. Despite a growing number of studies that investigated water temperature in restored streams, few have quantified thermal heterogeneity in new habitat-types created by restored hydrogeomorphic processes and the impact of thermal diversity on the aquatic macroinvertebrate community. In this study, we tested three hypotheses: 1) restoration increases habitat diversity, 2) habitat diversity increases water temperature heterogeneity, and 3) restored reaches have more diverse macroinvertebrate communities. We collected a total of 40 macroinvertebrate samples and characterized environmental conditions in three reaches (degraded as control, recently restored as transitional, and restored) in Whychus Creek, Oregon, USA in summer, 2021. Temperature loggers were deployed to collect data at 30-minute intervals for multiple days at the location of each macroinvertebrate sample. Shannon index scores for habitat diversity were more than two times higher in restored reaches than in the control reach. Water temperature coefficient of variation for three common temperature metrics ranged from 5.5%-20.2% in two restored reaches, two times or more variability compared to the control reach. Median taxa richness was 19, 18, and 13 for the restored, control, and transitional reaches, respectively. Off-channel habitats in the restored reaches included 16 unique taxa. Range in weighted mean thermal optima for macroinvertebrates was 1.5-2 times more in restored reaches compared to the control. Results from this study support the idea that floodplain restoration creates thermal heterogeneity for diverse macroinvertebrate communities in streams.

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Population demographics and dynamics of juvenile bull trout in a montane ecosystem

Bull Trout *Salvelinus confluentus* (BLT) was listed as threatened in the conterminous United States in 1998 under the Endangered Species Act. Although some populations of BLT within the U.S. Fish and Wildlife Service's designated core areas of recovery are stable or increasing, BLT in the Coeur d'Alene Core Area (CDACA) have experienced dramatic declines. Furthermore, results of spawning ground surveys conducted annually since 1992 by Idaho Department of Fish and Game indicate that BLT spawning activity in the upper St. Joe River basin continues to decline. Spawning ground surveys provide insight into the distribution and abundance of spawning activity, but they do not provide information on the abundance of early life stages. Implementation of effective conservation strategies will require a thorough understanding of the population demographics and dynamics of the juvenile component of the BLT population. In 2022, we sampled 95 stream reaches on the mainstem St. Joe River and four tributaries (Heller Creek, Medicine Creek, Sherlock Creek, Wisdom Creek). In total, we sampled 579 Bull Trout in the upper St. Joe River basin. For all Bull Trout greater than 70 mm, total length was recorded to the nearest millimeter, scales were removed for ageing, a small portion of the anal fin was removed for genetic analysis, and a passive integrated transponder (PIT) tag was injected into the body cavity. Fish movement is being tracked throughout the basin using five PIT tag arrays. Additionally, habitat surveys were conducted at a subset of study sites to evaluate dominant habitat associations.

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Putting their eggs in one basket – an inventory of western and clark's grebe breeding lakes across North America

The number of breeding birds in North America has declined by 25% over the past 50 years and 90 *On Alert* species have experienced population declines >50% (State of the Birds Report; NABCI 2022). Two of those species are the Western grebe (*Aechmophorus occidentalis*) and the Clark's grebe (*Aechmophorus clarkia*). These grebes face various threats at their breeding and wintering sites. However, no data or past studies are available to assess which of these threats are most responsible for the population declines. Moreover, threats to Western and Clark's grebe populations may vary regionally and declines may not be attributable to just one causal factor. To better assess threats and monitor their status, we need more rigorous data on Western and Clark's grebe abundance, distribution, and population trends. We compiled published and unpublished data summarizing the status of current, recent, and historical grebe populations on breeding lakes across North America. Preliminary results show that the largest concentrations of adults (>1000) and nests across any survey year were documented in only 5% of the breeding lakes (39 out of 741 breeding lakes). Very few (4) of these major breeding lakes were surveyed for grebes within the last 5 years. We do not know if some of these lakes still support a nesting colony and if not, what are the conditions of the lake that no longer support a colony. Our results will help inform priorities for future monitoring locations and allow USFWS to better assess the status of these 2 at-risk waterbirds.

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Community dynamics of native and non-native fish in a changing ecosystem

The Goose Lake Basin is an endorheic desert valley on the border of Oregon and California that has been heavily impacted by drought, wildfire, and other environmental stressors. The basin is a region of concern for state and federal agencies because it is home to endemic fish species like the Goose Lake redband trout, Goose Lake lamprey, Goose Lake tui chub, and Goose Lake sucker. These endemics coexist with native and non-native species, including the recently delisted Modoc sucker. Consequently, the Thomas Creek –Goose Lake area has been listed as a “Conservation Opportunity Area” in the Oregon Conservation Strategy. Prior to 2022, consistent monitoring efforts had not been conducted in the Basin for over a decade despite sensitivity to disturbance events and its status as priority habitat for native fish. We comprehensively sampled 36 sites during the 2022 field season, all of which sites that were previously sampled by ODFW in 2007.An additional 35 randomly generated sites were sampled for eDNA only. In our preliminary results, fish abundances appeared to have declined between 2007 and 2022, although community composition remained relatively unchanged. Sucker species declined the most, likely due to absences in lower Drews and Dry Creeks where they were highly abundant in 2007. This project will provide updated abundance and distribution estimates to inform state and federal managers as to the population status of at-risk native species, while the spatial database of aquatic habitats, eDNA assay for target species, and population risk assessment will support actionable management outcomes.

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Whitaker Ponds Natural Area remediation project: response of macroinvertebrate communities one year post-remediation

East and West Whitaker Ponds are located along the Columbia Slough, surrounded by industrialization. Metro Metals, a metal recycling plant behind East Whitaker Pond, drained untreated water into the pond until 2008 when stormwater treatment was added. After the Department of Environmental Quality (DEQ), discovered contaminants, including heavy metals, pesticides, PCBs, and PAHs in East Whitaker Pond. Metro Metals and DEQ collaborated on remediation of the pond in 2021 by placing a protective six-inch cap on the contaminated sand. After remediation, the pond was refilled by rainwater and groundwater to allow aquatic plants and animals to repopulate the area. We collected three years of pre-remediation (2018-2020) and one year of post-remediation (2022) aquatic invertebrate community samples. Samples were taken once per month from April to October from six locations in Whitaker Ponds, four locations in the East Pond and two in West Pond. Aquatic invertebrates were identified to family, richness and abundance were determined. A non-metric multidimensional scaling (NMDS) and linear regression analysis was performed in R to examine community shifts pre- and post-remediation. With only one year of post-remediation data, the NMDS did not show a community shift. However, linear regressions over time did show a modest increase in richness and abundance. With our initial year of post-remediation data, Whitaker Ponds tentatively appears to be an example of an urban aquatic community's resilience to contamination. Based on the positive aquatic community to remediation, this study can inform management decisions on how to use capping as a tool in restoration.

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Efficiently finding the needle in the haystack: Using eDNA and active capture to quickly locate and assess an undocumented, low-density bull trout population

Bull Trout were considered extirpated from upper Eightmile Creek in the Methow Basin due to the introduction of Brook Trout; however, recent eDNA and observer data, indicates Bull Trout may still be present within this system. To confirm Bull Trout presence and assess current Bull Trout distributions within upper Eightmile Creek, in 2022 the MCFWCO combined a rapid eDNA assessment with targeted night snorkel surveys that together could quickly identify areas occupied by Bull Trout and maximize Bull Trout observation probability. Environmental DNA was collected in Eightmile Creek at 500m intervals from the 21.1rkm of potential Bull Trout habitat in upper Eightmile Creek. Bull Trout eDNA was then quantified using qPCR. Night snorkel surveys were performed at four 200m reaches beginning at locations where high relative Bull Trout eDNA concentrations were detected. Analysis of eDNA samples indicated Bull Trout eDNA was detected at 34 of 44 sites. Snorkel surveys found a total of ten juvenile Bull Trout within two of the four reaches, while between 119 and 150 Brook Trout were found within each reach. The presence of juvenile Bull Trout within the snorkel reaches indicates Bull Trout are spawning and rearing within upper Eightmile Creek; however, the low densities of Bull Trout and high densities of Brook Trout at high-relative Bull Trout eDNA concentration locations indicates upper Eightmile Creek Bull Trout densities are likely low and may originate from intermittent migratory-adult spawning. These results will be applicable to local management decisions, including proposed passage improvements at downstream barriers.

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Minimizing hybridization risk of golden paintbrush (*Castilleja levisecta*): Lessoned learned and a path forward

Due to loss and modification prairie ecosystems in the Pacific Northwest, available sites to implement recovery of listed prairie-obligate species are limited. In the South Puget Sound region of Washington, recovery efforts for two listed species, the threatened golden paintbrush (*Castilleja levisecta*), and the endangered Taylor's checkerspot butterfly (*Euphydryas editha taylori*) have occasionally occurred on the same sites. Taylor's checkerspot butterfly recovery actions have included outplanting of its preferred larval host plant, harsh paintbrush, and in 2007 the Service and partners began to recognize that this plant was hybridizing at some sites with golden paintbrush. This hybridization eventually led to the loss of three recovery sites for golden paintbrush. To minimize hybridization risk at other sites, the Service collaborated with the Washington Department of Natural Resources and the Washington Department of Fish and Wildlife to develop and implement the Strategy and Guidance for Minimizing Hybridization Risk of Golden Paintbrush (2021). The guidance integrates science and policy to outline a landscape level, long-term strategy for outplanting golden paintbrush and harsh paintbrush. We utilized the best available science to implement a decision making framework for new plantings, considering pollinator distance and regional priority. This interagency collaboration strikes a critical balance in the conservation of both golden paintbrush and Taylor's checkerspot butterfly, providing an approach that will benefit both species into the future. Furthermore, golden paintbrush has now been proposed for delisting, and its overall recovery will be sustained in part by this innovative and collaborative science-guided pathway to minimize future risk.

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Capturing coho salmon escapement on the Big Quilcene River and understanding habitat production capacity

Determining salmon spawner escapement, smolt production, and habitat rearing capacity are important for developing escapement objectives and understanding potential habitat productivity constraints. Salmon spawner escapement objectives are often developed to fully utilize the available spawning and rearing habitat based on habitat surveys when empirical data is not available to estimate maximum sustainable yield. At the Quilcene National Fish Hatchery on the Big Quilcene River, volitional escapement of Coho Salmon above the hatchery weir occurs when river flows exceed approximately 75 cfs. In our study, we monitored Coho Salmon adult escapement above the Quilcene National Fish Hatchery weir in 2019 and 2020 and corresponding pre-smolt production in the winters of 2021 and 2022. Pre-smolt production estimates from surveys were compared to modeled habitat-based estimates. Spawner escapement estimates above the hatchery weir ranged from 901 to 3,428, however, habitat-based pre-smolt production estimates from those years were similar at 1,347 and 1,058, respectively. Snorkel survey estimates of pre-smolt production were similar to the habitat-based estimates for side channel habitats but well below the habitat-based estimates for the primary river channel. The pre-smolt estimates from snorkel surveys were also greater in side channels compared to the primary channel, demonstrating the importance of off-channel habitats for Coho Salmon winter rearing. Our results indicate that spawner escapement exceeds pre-smolt production capacity in some years, and the area may be fully seeded with approximately 27 to 101 adult spawning pairs based on snorkel and habitat-based production estimates, respectively.

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Empowering the change we need through effective climate change communication

Effectively communicating about conservation science is a refined skill and is not always easy. The multifaceted, interdisciplinary topic of climate change adds another level of complexity that can be difficult for even the most skilled communicators to tackle. And yet, climate change IS the defining challenge of our time and we are at a defining moment. Not only does it impact almost every aspect of our work within the Service, climate change is also impacting everyone's lived experience. Successfully achieving our mission means we need all Service staff to be skillfully talking about it, including successfully galvanizing collective efforts of response. The Climate Change Communications Working Group has been hard at work over the last year and a half to help meet this need through synthesizing the best-available information on climate change communication into a collection of resources tailored to our agency. Resources combine research from the fields of Social Science, Strategic Communications, Public Affairs, Interpretation and Environmental Education. Our presentation will cover our team's synthesis of climate change communication best practices and provide a brief overview of the following topics: the psychology of behavior change, environmental justice and climate change, climate change visual guidance, and interpretive and visitor engagement. We will also provide information and access to a multitude of follow-up resources available for additional learning to further empower attendees to address climate change through skillful communication.

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Impacts of redd superimposition on the spawning success of listed tule fall Chinook salmon in the White Salmon River, Washington

Upriver bright (URB) fall Chinook salmon reared and released from the Little White Salmon and Willard National Fish Hatcheries are known to stray into the White Salmon River. Interactions between hatchery-origin URB strays and ESA-listed tule fall Chinook salmon are believed to lead to a loss in productivity of the native tule population through hybridization and redd superimposition. Tule fall Chinook salmon generally spawn earlier in the fall (September – October) which puts their redds at risk to superimposition by URB fall Chinook salmon that typically spawn later (late-October – November). Superimposition may result in egg displacement and reduce egg-to-fry survival leading to a loss in productivity of the tule fall Chinook population. A feasibility study was conducted in the fall (September – November) of 2022 to assess superimposition of tule redds by URB fall Chinook salmon within the lower White Salmon River. Redd locations were documented during weekly spawning ground surveys using ArcGIS Field Maps and an Arrow RTK GNSS Receiver resulting in centimeter-level location accuracy. The degree of overlap and level of disturbance to tule redds were used to document superimposition. The relative percent of tule redds that were superimposed will be discussed, as well as potential spatial or temporal components to superimposition. Results from this initial feasibility study will be used to make informed decisions and potential changes to the methodology for surveys in 2023.

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Predicting pathogen prevalence in salmon populations using pooled tissue samples

Pooling tissue samples for virology and bacteriology is common practice for fish health screening. It has been difficult to estimate actual pathogen prevalence in a population when pooled samples are used. In order to provide a basis for these estimations, we used simulation to examine estimates of pathogen prevalence under a sampling scenario of 150 fish sampled in 30 randomly selected pools of five individuals each at different pathogen prevalence levels. We used a binomial model to estimate pathogen prevalence (with precision) for this specific pooling scenario and to estimate pathogen prevalence of infectious hematopoietic necrosis virus (IHNV) in some NFH populations of Chinook Salmon (*Oncorhynchus tshawytscha*) and Steelhead (Oncorhynchus mykiss). When 150 fish were sampled in 30 randomly selected pools of five individuals each, estimates of pathogen prevalence could be obtained with good precision (95% confidence within 6% of the true value) when pathogen prevalence was less than about 10% (≤ 12 positive pools out of 30); however, estimates with usable precision (95% confidence within 50% of the true value) could be made when pathogen prevalence as up to about 50% (≤ 29 positive pools out of 30). Precision of pathogen prevalence estimates increased with the number of pools and with the addition of smaller-sized pools and even individual samples. Estimates of IHNV in the populations examined ranged from 0.0% (95% confidence: 0.0-0.7% prevalence) to 46.5% (95% confidence: 36.7 – 57.2% prevalence), suggesting that current collection protocols at NFHs can be used to estimate pathogen prevalence with adequate precision.

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Spalding's catchfly (*Silene spaldingii*) recovery efforts on the Palouse prairie

The Latah Soil and Water Conservation District (Latah SWCD) has been implementing *Silene spaldingii* (Spalding's catchfly, ESA-listed Threatened) recovery efforts in partnership with USFWS on the Palouse Prairie since 2013, including outplantings, broadcast and drill-seeding, and annual follow-up monitoring. To date, Latah SWCD has planted over 3,000 Spalding's catchfly with the ultimate goal of maintaining a population of 500 or more individuals. A conservative estimate of monitoring data suggests that we are nearing the 400 individual mark. Determining long-term outplanting survival rates requires a minimum of 4 years of monitoring data and many of the planting locations now have upwards of this. Ongoing and consistent monitoring continues to provide up-to-date and accurate population information, which is highly valuable for a plant with a complicated life history like Spalding's catchfly. Identification of best planting locations, comparisons of survival rates between fall versus spring season plantings, and development of best planting methods have also resulted from this multi-year planting/seeding/monitoring effort. Direct seeding efforts will continue as broadcast seeding would be an efficient strategy for Spalding's catchfly recovery, if a successful methodology can be found. Preliminary results from a recent drill-seeding was notably successful and future monitoring results will inform best methods for Spalding's catchfly seeding.

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Reintroduction of bull trout to the Clackamas River, Oregon - A 10-year retrospective

Bull Trout (*Salvelinus confluentus*), a species of char present in five western states, are a threatened species under the federal Endangered Species Act. Due to a significant reduction in their distribution, reintroduction has been proposed as a tool to promote recovery in portions of the species' range. Planning for a Bull Trout reintroduction in the Clackamas River, Oregon, began in 2005 and translocations using multiple life-stages of wild donor stock from the Metolius River occurred annually from 2011-2016. Translocated adults (age 5 or older) remained in their new basin and have been observed spawning annually since 2011. Translocated juveniles (ages 1-4) have survived to adulthood demonstrating the ability of the Clackamas River to support Bull Trout growth, survival, and maturation. However, recruitment of Clackamas-born progeny has not been detected in the spawning population to date despite verification of embryos in redds. In addition, attempts to detect juvenile Bull Trout have been unsuccessful. These results have led to concern that unknown factors may be limiting survival of early life-stages and ultimately may prevent the reestablishment of a self-sustaining Bull Trout population in the Clackamas River. This talk will highlight milestones of the project over the last decade including current efforts to monitor Clackamas-born survival to adulthood and a lab study evaluating the relative survival and development of fry from embryos hydraulically sampled from redds in tributaries of the Clackamas and Metolius rivers to determine if developmental abnormalities may be contributing to mortality in early life stages of Bull Trout in the Clackamas River.

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Innovation for Conservation: Theodore Roosevelt Genius Prize Competitions

The public now can help reimagine what drives wildlife conservation in the 21st century by participating in the U.S. Fish and Wildlife Service's Theodore Roosevelt Genius Prize Competitions. Watch for upcoming announcements. Check out this link to learn more about the 2022 winners - https://www.fws.gov/media/trgpc-2022-winners-summary-slides

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Preventing Wildlife Poaching and Trafficking: The NABIT- Rapid, portable genetic testing tool for combating wildlife trafficking

When poached game or illicit wildlife products are processed, into steaks, filets, powders, or other forms, identifying the source species by visual inspection can be difficult. Conservation X Labs developed the NABIT, a portable battery-powered system, to rapidly perform a simple and non-technical genetic test. This system was designed for use by enforcement officials to quickly test a sample suspected of being poached or part of illegal trade. The NABIT could transform how genetics are used in conservation by enabling routine DNA sampling and identification by enforcement officials and agents directly at the site where they encounter a suspicious product or specimen. Timely genetic results will be clearly delivered on the screen of the device allowing officials to make decisions and act on what they have uncovered. This eliminates the need to send samples to labs and wait days or weeks to receive results. The goal of the proposed work is to deploy the NABIT in order to detect substitute and illicit wildlife products, including meat and other tissues.

Author & Presenter: *David Baisch, Molecular Innovations Director, Conservation X Labs*

Promotion of Wildlife Conservation: Harnessing Machine Learning to Connect Urban Residents to Wildlife Conservation through Social Media

By harnessing machine learning to connect urban residents to wildlife conservation through social media, this innovation facilitates a deeper connection to engaged Americans in conservation. Using proven artificial intelligence software to identify media content and social media posts about urban wildlife, the innovation aims to collect important ecological data and create dialogue between users and scientists via their posts. Resulting dialog can be used to 1) notify users' about their contribution and relationship to research, 2) collect further ecological data on observed species, and 3) peak users' investment in future conservation initiatives.

Authors & Presenters: *Jason Holmberg, Executive Director, Wild Me & Seth Magie, Executive Director, Urban Wildlife Information Network*

Protecting Endangered Species: Expanding the Use of Photo-Identification Technology to include Tiny, Flight, and Ephemeral species

This innovation aims to expand photo-identification technology to the individual insect level *and use* photo-identification to resolve information gaps for rare butterflies, such as the island marble butterfly (*Euchloe ausinodes insulanus*). Advances in digital cameras, accelerating database processing, and improved artificial intelligence software combined with the general availability of these technologies can continue to advance the methods of protecting endangered species.

Author & Presenter: *Jenny Schrum*

Promoting Nonlethal Human-Wildlife Conflict: Creating a No-Fly Zone for Birds

This innovation aims to greatly improve laser repulsion of nuisance birds by using species specific responses to different colored lasers and flash patterns. Incorporation of artificial intelligence and field-hardy mesh communication networks will allow semi-autonomous and autonomous laser operation to deter birds from treatment areas. Birds maybe considered nuisance when human health and safety concerns arise. Future plans include systematizing the use of these refined lasers to provide efficient protection of sensitive species habitat and nesting grounds, agricultural resources, electrical infrastructure, and waste treatment facilities.

Author & Presenter: *Tim Shields, Founder & CEO, Hardshell Labs, Incorporated*

Reducing Human-Predator Conflict, using nonlethal means: Cattle-producer designed Automated Mineral Bin

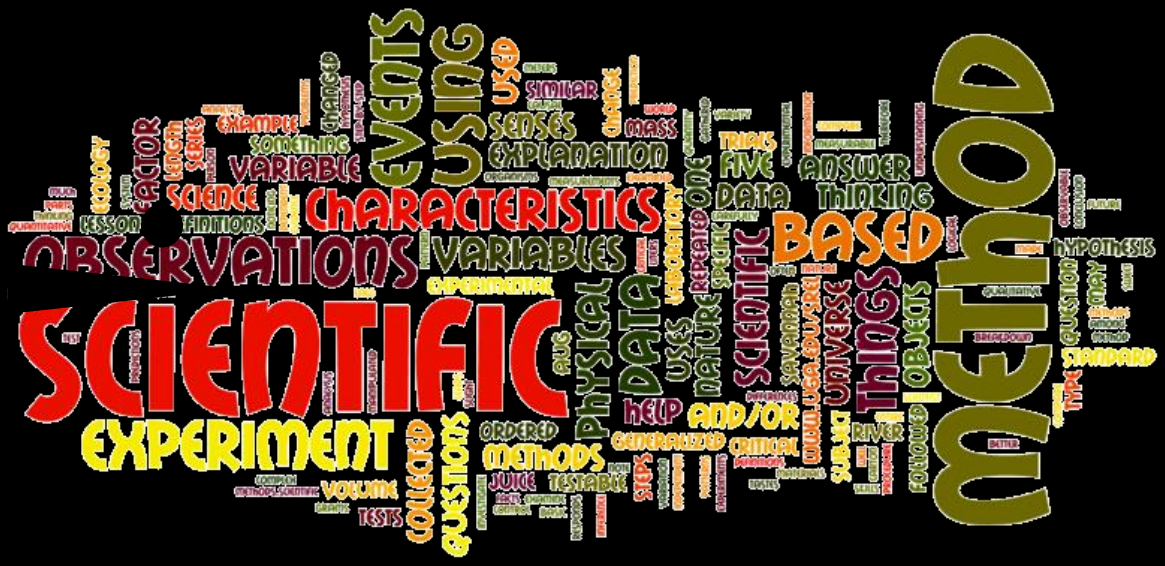
The innovation's Automated Mineral Bin is a strategy for reducing human-predator conflict that combines standard livestock handling practices with robotic technology. Created by a 5th-generation Oregon sheep and cattle rancher, the project leverages the natural defensive behaviors of cattle and is easy for producers to implement. The project uses an automated salt bin to herd livestock into larger groups, reducing the risk of predation by large predators.

Author & Presenter: *Cameron Krebs, Fifth-generation Rancher, Northeast Oregon*

“The important thing is not to stop questioning.”

(Albert Einstein)

The findings and conclusions in this document are those of the authors and presenters and do not necessarily represent those of the U.S. Fish & Wildlife Service. Reference to trade names does not imply endorsement by the U.S. Government.



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