Region 1 Science Update

Issue #28: November 2017

A periodic e-newsletter aimed at helping Pacific Region employees stay connected to the science that is integral to our conservation work.

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Science Award Nominations Due November 9

Region 1 has extended the deadline for Service Science Awards nominations, so there is still time to consider recognizing your colleagues. It's the 10th anniversary of the Service's annual recognition of outstanding scientific endeavors among our ranks. Last year, Paul Henson brought honors to Region 1 as recipient of the Science Leadership Award. Two other nomination categories exist as well: the Sam D. Hamilton Award for Transformational Conservation Science, and the Rachel Carson Award for Exemplary Scientific Accomplishment. Check out the national Science Awards internal website for more information and the on-line nomination form. You can also view a recently broadcast webinar on the 2017 process by clicking here.

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Dynamic Databases

New emphases on information access and landscape-level synthesis, along with ongoing innovations in the tech world, are fueling a boon in valuable data tools for fish and wildlife managers. Here are a few cool resources that have surfaced recently:

- Although still in beta form, FWSpecies goes live on November 13. Sponsored by the Inventory & Monitoring program, this new application contains data on the occurrence and status of species within National Wildlife Refuge System units.

- The U.S. Geological Survey has developed the Species Conservation Analysis Tool to help link together species listed in State Wildlife Action Plans and their distribution among taxa groups and geographies. Before a compiled view could be accomplished, consistent naming of species amongst the states' plans had to be achieved using the Integrated Taxonomic Information System.

- To explore a conservation toolbox at the international scale, check out this

helpful [Conservation Planning Specialist Group website](#) under the wings of the International Union for the Conservation of Nature. This extensive resource includes a species conservation planning tools library, and a set of quantitative analysis tools (e.g., "Vortex" - a computer model that simulates changes in wildlife population dynamics relative to human-caused threats on the landscape).

- Did you know there is an Organization of Fish and Wildlife Information Managers? Their [Resources webpage](#) includes an extensive user-generated table of data tools, and a Project Discovery Guide that helps data managers and data users select or develop analytical tools that best address an information gap.

Have you encountered a new science information source that would interest your Region 1 colleagues? Please [share it with us](#) and we'll include a mention in the next Science Update!

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Webinars & Classes & Conferences – Oh My!

So many opportunities, so little time…but here's a brief digest of some upcoming events that are particularly noteworthy for Region 1 science fans:

- November 7: [Decision Support Tools for Natural Resource Managers in Sagebrush Communities and Across the Pacific Northwest](#) - The Conservation Biology Institute, the Great Basin Landscape Conservation Cooperative, Oregon State University, and EcoAdapt are hosting a workshop on a series of decision support tools for Pacific NW land managers. Discover and learn how to use web tools and explore how these tools can help inform protection and restoration priorities as well as site management decisions. While some presentations will focus on sage-steppe in Oregon, most applications have been developed for a larger portion of the Pacific Northwest or Great Basin. The **entire workshop will be webcast.**

- December 7, 9 a.m. PST: [Management of Novel Hawaiian Ecosystems](#) - This double-header webinar will feature Susan Cordell from the Forest Service's Institute of Pacific Islands Forestry presenting on "The Potential for Restoration to Break the Grass/Fire Cycle in Dryland Ecosystems in Hawaii", and Becky Ostertag from the University of Hawaii presenting on "Developing Novel Ecosystems that Enhance Carbon Storage, Native Biodiversity, and Human Mobility in Lowland Hawaiian Forests"

- NCTC classes: It's IDP time and the National Conservation Training Center (NCTC) has new staff and new classes to meet your training needs in data management, statistics and modeling, including:

  ➢ [CSP1003 - Field Data Management using MS Access](#) (Dec. 4-8)
  - Turn a long-term or a multi-user project with a mess of data into a smart and clean relational database to answer questions otherwise not possible

  ➢ [CLM8204 – Communicating Science: Distilling Your Message](#) (Dec. 4-6)
  - Learn to communicate more effectively about science with people outside

their field, including the general public, policy makers, the media, or funders and prospective collaborators in other disciplines. Participants will take part in improvisational theater exercises aimed at helping them connect more directly and spontaneously with different audiences.

> CSP1104 – Conservation Biology and Modeling (Dec. 26-Jan. 12: ONLINE)
- This course will cover population viability analysis, metapopulation and source-sink dynamics (including ecological traps and edge effects), principles of conservation genetics, recognizing critical habitats, and reserve design.

> CSP2101 - Applied Landscape-Scale Conservation Biology (Jan. 8-12)
- Within the context of landscape conservation and climate change, the course entails a variety of exercises covering species diversity, genetic drift, effective population size, demographic and environmental stochasticity, single population and meta-population viability analyses, habitat fragmentation and connectivity.

> CSP4200 - Making Sense of Biological Data using R (Jan. 22-26)
- Learn how to visualize your data, ask questions about your data, perform hypothesis tests and explore how sampling effort affects your ability to make conclusions.

> CSP4210 - Statistical Modeling for Conservation (Apr. 23-27)
- Develop, interpret and validate linear regression and generalized linear models (i.e., logistic regression) to examine trends and population-habitat relationships

> CSP1004 – Data Wrangling (May 21-25, 2018 - Ft. Collins, CO)
- With no prior experience in R, learn how to reshape and clean messy data, perform summaries and create remarkable graphs. NEW CLASS!

• March 1-2: Science Talk '18
- This conference debuted in 2017 and will return to Portland with a variety of presentations and activities focused on improving science communications to the media, decision-makers, and a variety of other audiences

• April 17-18: Science of the Service
- Don't miss the 3rd annual gathering of Region 1 folks to celebrate and learn about the diverse scientific information we generate and use. A call for abstracts will be coming out soon!

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Thumbs Up to Recently-Published Region 1 Employees!

Yellow crazy ants (*Anoplolepis gracilipes*) reduce numbers and impede development of a burrow-nesting seabird

Sheldon Plentovich is lead author of this recent paper published in *Biological Invasions*. It reports on the effects of ant invasion, and subsequent control, on burrow-nesting seabirds following the invasion of a wedge-tailed shearwater colony on O'ahu. The number of active seabird

burrows in invaded areas dropped from 125 in 2006 to 6 in 2010, with no corresponding decline in active burrows in adjacent, uninvaded areas. Ant control efforts in 2011 reduced ant densities by more than 97% and resulted in a substantial increase in active burrows. In invaded areas, burrows appeared to be abandoned by adults prior to egg-laying. Chicks surviving in invaded areas exhibited mild to severe developmental abnormalities, and overall had shorter culmens, tarsi and wingchords, smaller eye diameters, and lower weights than chicks outside invaded areas. The authors conclude that yellow crazy ants constitute a significant, and likely underestimated and growing, risk to groundnesting seabirds, which in turn has implications for nutrient inputs and plant communities and faunal composition.

Improving Bullfrog Capture Methods in Areas Managed for Hawaii's Endangered Endemic Waterbirds

Jared Underwood, with co-author Kenzie Letchworth, recently published this article in the *Proceedings of the 27th Vertebrate Pest Conference*. Their study addressed control of American bullfrogs at James Campbell National Wildlife Refuge, where bullfrogs have been documented as a major predator of newly hatched endangered waterbird chicks. Existing trapping methods employ a simple fish-style funnel trap with red flagging used as an attractant. As part of an effort to improve efficacy of bullfrog capture methods, Jared and Kenzie investigated the effectiveness of different attractants, including light, bullfrog call acoustic recordings, and life-size bullfrog decoys. The results showed that most of the treatments were no more effective than the control (no attractant). Improvement of trap yields may support greater chick survival.

Changes in Streambed Composition in Salmonid Spawning Habitat of the Elwha River during Dam Removal

Roger Peters is the lead author, and Paul Bakke is a co-author, of this new article published in the *Journal of the American Water Resources Association*. Changes to sediment deposition and associated streambed composition in the Elwha River were monitored prior to (2010-2011) and during (2012-2014) the simultaneous removal of two large dams. Changes in the surface layer substrate composition during dam removal varied by year and channel type. Riffles in floodplain channels downstream of the dams remained sand dominated throughout the study period, and exceeded levels known to be detrimental to incubating salmonids. Mainstem riffles tended to fine to gravel, but appear to be trending toward cobble after the majority of the sediment was released and transported through system. Thus, salmonid spawning habitats in the mainstem appear to have been minimally impacted while those in floodplain channels appear to have been severely impacted during dam removal.

Impacts of Feral Horse Use on Herbaceous Riparian Vegetation within a Sagebrush Steppe Ecosystem

Gail Collins is a co-author for this article recently published in *Rangeland Ecology and Management*. The study characterized impacts of a free-ranging horse population on the structure and composition of riparian plant communities in the sagebrush steppe ecosystem within Sheldon National Wildlife Refuge. Exclosures were constructed in 2008. Herbaceous plant utilization was measured from 2009 to 2013. Herbaceous production and vertical structure were measured in 2013, and plant functional group and ground cover components were estimated in 2012–2013. Herbaceous utilization ranged from 27% to 84%, and herbaceous production did not

differ by grazing treatment. Grazed plots had seven-fold higher bare ground cover, 60% less litter cover, and the basal cover index was 65% higher. Grazing increased rush density by 50% but did not affect sedge density. Grazing decreased herbaceous stubble height up to 80% and visual obstruction by about 70%. Deep-rooted hydrophytic plant species did not increase with grazing exclusion, but greater vertical structure in excluded plots could improve hiding and nesting habitat for some riparian-associated wildlife species. Additionally, decreased bare ground with grazing exclusion could reduce erosion potential and susceptibility to invasive plant species.

Assessing the potential of translocating vulnerable forest birds by searching for novel and enduring climatic ranges

Lucas Fortini is the primary author, with Adam Vorsino among the co-authors, of this new paper in *Ecology and Evolution*. Their project evaluated the feasibility of interisland translocation by projecting baseline and future climate-based ranges of the critically endangered 'akeke'e and 'akikiki across the Hawaiian archipelago. For islands where compatible climates for these species were projected to endure through end-of-century, an additional climatic niche overlap analysis compared the spatial overlap between Kaua'i endemics and current native species on prospective destination islands. Suitable climate-based ranges exist on Maui and Hawai'i for these Kaua'i endemics that offer climatically distinct areas compared to niche distributions of destination island endemics. The authors recognized that beyond ecological and climate-based compatibility, any decision to translocate birds will include assessing numerous additional social, political, and other biological factors.

Roads to ruin: conservation threats to a sentinel species across an urban gradient

Steven Damm and Jay Davis are both co-authors of this article just out in *Ecological Applications*. The study assessed threats of urbanization to coho salmon by measuring mortality rates in field surveys of 51 spawning site across an urban gradient in the Puget Sound Basin. Spatial analyses measured landscape attributes (e.g., roadways) and climatic variables (annual summer and fall precipitation) associated with each site. Structural equation modeling revealed a latent urbanization gradient that was associated with road density and traffic intensity, among other variables, and positively related to coho mortality. Across years within sites, mortality increased with summer and fall precipitation, but the effect of rainfall was strongest in the least developed areas and was essentially neutral in the most urbanized streams. A structural equation model generated a predictive mortality risk map for the entire Puget Sound Basin, indicating ongoing and widespread loss of spawners across much of the Puget Sound population segment. These findings show where green infrastructure and similar clean water strategies could prove most useful for promoting species conservation and recovery. Click here to read a recent Seattle Times story on the study.

Effects of dietary lipid and light source on steatitis in steelhead, *Oncorhynchus mykiss*

Ron Twibell is the lead author - accompanied by Ann Gannam, James Barron, Kyle Hanson, and Doug Peterson as co-authors, of this paper recently published in *Aquaculture*. The high marine fish oil content of salmonid feeds is likely a contributing factor in a disease called steatitis. Lesions associated with steatitis have been observed when affected fish were transferred from enclosed hatchery buildings to outdoor rearing units

exposed to sunlight. This study examined possible interactive effects of dietary lipid source and ultraviolet (UV) radiation on growth responses, histology and tissue fatty acid profiles of juvenile steelhead. For 10 weeks, fish were fed diets containing canola oil (CO), fish oil (FO) or oxidized fish oil (OFO) while exposed to fluorescent or UV light. The main effects of lipid and light source on growth responses and survival were not statistically significant, but percent weight gain was significantly affected by interaction of the main effects. Whole body histopathology revealed more severe steatitis scores in fish fed FO or OFO compared with fish fed CO and in fish exposed to UV light compared with fish exposed to fluorescent light. Whole body lipid concentration and tissue fatty acid profile were significantly affected by lipid and light source but not their interaction. These results suggest reducing dietary LC-PUFAs and minimizing UV light exposure may reduce steatitis in steelhead.

Age and Method of Release Affect Migratory Performance of Hatchery Steelhead

Matt Cooper, Bill Gale, Benjamen Kennedy, and Chris Pasley are co-authors of this article in the *North American Journal of Fisheries Management.* Their study compared survival and travel rates of PIT-tagged steelhead smolts released at age 1 (S1 rearing strategy) or age 2 (S2 rearing strategy) over five release years at Winthrop National Fish Hatchery. An S2 rearing cycle produced larger smolts with more uniform size distributions, resulting in higher survival during the first portion of out-migration than for S1 smolts in three of the five release years. S2 smolts migrated more rapidly to the ocean than S1 smolts in all years except 2011 and arrived in the Columbia River estuary 5.4 days earlier on average than S1 smolts. The S1 steelhead that did not leave during the volitional release were subsequently forced from the hatchery to measure their survival. Nonvolitional S1 migrants were smaller and had survival rates that were 2.3–66.3 times lower than those of S1 steelhead that left WNFH on their own. The same was true for S2 steelhead, but the magnitude of the survival difference between volitional migrants and fish forced from the raceways was less variable and ranged from 2.5- to 4.6-fold. The authors conclude that S2 rearing can be a successful strategy for producing smolts from local natural-origin broodstock, with out-migration survival and travel times that are equivalent to or better than those of S1 smolts produced from nonlocal broodstock.

Combined effects of diets and temperature on mitochondrial function, growth and nutrient efficiency in rainbow trout (*Oncorhynchus mykiss*)

Ann Gannam is a co-author of this new paper in the journal *Comparative Biochemistry and Physiology Part B: Biochemistry and Molecular Biology.* The subject experiment evaluated the effects of two dietary protein sources (mixed fishmeal/plant protein, and plant protein), two dietary lipid levels (10% and 20%) and three water temperatures (10 °C, 14 °C, and 18 °C) on the growth performance, nutrient utilization efficiencies and mitochondrial enzyme complex activities in rainbow trout. At the end of the experiment, weight gain, condition factor (CF), and feed efficiency were significantly affected by diet × temperature interaction. Specific growth rate was significantly affected by increasing temperature. The plant protein-based diets led to a higher CF than the mixed fishmeal/plant protein-based diets. The protein productive value, protein efficiency ratio, lipid efficiency ratio, and lipid productive value were all significantly affected by diet × temperature interaction. The diet × temperature interaction also had significant effects on mitochondrial enzyme complexes in the liver, intestine, and muscle. The significant temperature x diet interaction

observed has practical ecological implications explicitly demonstrating how changes in temperature regimens as anticipated in the rising global temperature can influence organismal performance in relation to changes in dietary formulations (replacing fishmeal based diet with plant protein based ingredients). The most economical and cost effective way to produce rainbow trout would be to use 40/10PP diet at 14 °C.

Panmixia and Limited Interspecific Introgression in Coyotes (*Canis latrans*) from West Virginia and Virginia, USA

Justin Bohling serves as lead author for this article recently published in the *Journal of Heredity.* The study examined the genetic characteristics of 121 coyotes from the mid-Atlantic states of West Virginia and Virginia by genotyping 17 polymorphic nuclear DNA microsatellite loci. These genotypes were compared with those from other canid populations to evaluate the extent of genetic introgression. Spatial clustering analyses and spatial autocorrelation were used to assess genetic structure among sampled coyotes. Coyotes across the 2 states had high genetic diversity with no evidence of genetic structure. Six to sixteen percent of individuals displayed some evidence of genetic introgression from other species depending on the method and criteria used, but the population possessed predominantly coyote ancestry. These findings suggested introgression from other canid populations has played less of a role in shaping the genetic character of coyotes in these states compared with populations closer to the Canadian border. Coyotes appear to display a panmictic population structure despite high habitat heterogeneity and heavy human influence in the spatial environment, underscoring the adaptability of the species.

Do you have a new published article you would like to get the word out about to other R1 employees? Please send it our way with a brief description so that we can congratulate you and let folks know about all the great work you do!

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Helplful Links and Other Info:

o **Literature resources:**

Journal of Fish and Wildlife Management and North American Fauna
http://www.fwspubs.org/

Search Service at NCTC
https://inside.fws.gov/go/post/NCTC-FWS-LSS-Literature-Search-Service

Not able to access an article you need at these sources? Send a note to the NCTC Conservation Library at library@fws.gov

o **USFWS Science Excellence website**
http://www.fws.gov/science/index.html

o **Region 1 Science Applications web page**

http://www.fws.gov/pacific/science/

o **Region 1 Science Applications Sharepoint site:**
https://fishnet.fws.doi.net/regions/1/science/SitePages/Home.aspx

o **Region 1 Peer Review Agenda**
http://www.fws.gov/pacific/informationquality/

o **Region 1 Information Management Strategy website**
https://sites.google.com/a/fws.gov/rims3/

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Thoughts, Comments, Contributions? Send them to paul_heimowitz@fws.gov

"Science is built up of facts, as a house is built of stones; but an accumulation of facts is no more a science than a heap of stones is a house."

- **Henri Poincare'**