SPORTSMEN AND THE NON-LEAD ALTERNATIVE. JIM AKENSON*, *Oregon Hunters Association*, *72531 Farmers Ln.*, *Enterprise*, *OR 97828*; *jim@oregonhunters.org*.

American sportsmen have a heritage of embracing wildlife conservation issues dating back to, and even before, the efforts of Teddy Roosevelt. However, regulating the basic "tools of the trade" used by hunters have not been as notable as wise habitat and species stewardship. Just a couple decades ago, converting from lead to steel shot for waterfowl hunting took education, regulation, and time to accomplish. Now, with a parallel non-lead movement getting started in Oregon with rifle and pistol ammunition used for hunting, there needs to be lessons applied from initial efforts, using examples from California and Arizona, to achieve any broader scale success. Gaining acceptance from sportsmen in today's world of information will take a coordinated three-pronged approach mixed with patience and leadership. One prong involves continuing the current efforts informing hunters of the technical efficiency of alternatives-to-lead ammunition. Another prong deals with the science on how lead effects terrestrial mammal and scavenging bird populations, through the food-chain. The third prong involves establishing a voluntary non-lead bullet use program which includes enough incentives to appeal to a significant number of hunters in Oregon. The Oregon Hunters Association recognizes the importance of this educational effort and is actively partnering with the Oregon Zoo, Oregon Department of Fish and Wildlife, the Oregon Nature Conservancy, and others to achieve success with this important conservation effort.

UPDATING THE CONSERVATION STATUS OF THE CASCADE RED FOX USING NONINVASIVE METHODS. JOCELYN AKINS*, *Cascades Carnivore Project*, *1514 Belmont Ave.*, *Hood River*, *OR 97031*; *jakins@ucdavis.edu*; KEITH AUBRY, *USFS PNW*; *kaubry@fs.fed.us*; BEN SACKS, *UC Davis*; *bnsacks@ucdavis.edu*.

The Cascade Red Fox (*Vulpes vulpes cascadensis*) is part of the mountain red fox subclade, which has a distinct evolutionary history in North America. These foxes became isolated into sky-island populations and may be experiencing a dramatic range contraction. However, the cause(s) of this apparent decline remains unclear. We conducted noninvasive camera surveys and genetic sampling in southern Washington from 2008 to 2016. Our objectives were to (1) determine distribution in southern Washington and predict rangewide occurrence, (2) assess genetic integrity and potential hybridization, and (3) determine how landscape features influence connectivity. First, we developed species distribution models that reflect the key habitat correlates of fox occurrence and estimate occupancy. Second, we identified 51 foxes genetically and found that individuals in the southern portion of their range comprise a single widespread population with a very low contemporary genetic effective population size. Third, we applied a landscape genetics approach and found that subalpine parklands and upper montane forests facilitate gene flow. While this study improves our understanding of their conservation status, a lack of knowledge of their basic ecology suggests the impacts of climate change in the mountains, which we are currently witnessing, remain largely unknown. Moving forward, a clearer understanding of threats to their long-term persistence is fundamental to effectively conserving this unique, montane carnivore.

WILDLIFE SERVICES' NON-LEAD AMMUNITION SELECTION PROCESS. MATTHEW ALEX*, *USDA-APHIS-Wildlife Services*, *6135 NE 80th Ave.*, *Portland*, *OR 97218; matthew.j.alex@aphis.usda.gov*; KEVIN CHRISTENSEN, *USDA-APHIS-Wildlife Services*; *kevin.l.christensen@aphis.usda.gov.*

USDA Wildlife Services (WS) in Oregon provides assistance to the public, government agencies, tribes, and other entities on integrated wildlife damage management (IWDM) to protect human/pet health and safety, threatened and endangered species, livestock, crops, and property. The WS Decision Model provides for the consideration of non-lethal and lethal methods and allows WS to use and recommend the most effective and practical methods available, while accounting for the many variables in each unique IWDM situation. Given the diversity of calls for assistance that WS receives, selecting the right tool for the job is critical to achieving IWDM objectives in an effective, reliable, and safe manner. When using firearms, it is essential that the ammunition selected performs in such a way to ensure minimal opportunities for pass-through; versatility given the wide variety of species and locales; reliability of performance in all IWDM situations (which have a low tolerance for error); and humane euthanasia through instantaneous incapacitation. With this in mind, we will discuss our decision process for selecting non-lead ammunition alternatives, the associated challenges, and the opportunities for further research and use.

WHAT'S HURTING OUR HERPS? MAJOR DISEASES OF REPTILES AND AMPHIBIANS IN THE PACIFIC NORTHWEST. MATT ALLENDER*, *Wildlife Epidemiology Laboratory*, *College of Veterinary Medicine*, *University of Illinois*, *Urbana*, *IL 61802*; KATIE HAMAN, *Wildlife Program*, *Washington Department of Fish and Wildlife*, *Olympia*, *WA 98501*; LAURA ADAMOVICZ, *Wildlife Epidemiology Laboratory*, *College of Veterinary Medicine*, *University of Illinois*, *Urbana*, *IL 61802*; SARAH BAKER, *Wildlife Epidemiology Laboratory*, *College of Veterinary Medicine*, *University of Illinois*, *Urbana*, *IL 61802*; KELSEY LOW, *Wildlife Epidemiology Laboratory*, *College of Veterinary Medicine*, *University of Illinois*, *Urbana*, *IL 61802*.

The North American landscape has undergone unprecedented change in the last 100 years, and many environments no longer resemble the ecosystems where species evolved. In some cases, these changes have created ideal conditions for the emergence of infectious diseases. Herpetofauna are among the most imperiled vertebrate taxa, and pathogens are playing a role in their decline. In the past 15 years, widespread epidemics have been observed, such as those associated with *Batrachochytrium dendrobatidis* (a type of chytrid fungus) and ranavirus. Recently, *Ophidiomyces ophiodiicola* (Snake Fungal Disease) in the eastern and midwestern U.S. and a new species of chytrid fungus in Europe (*B. salamandrivorans*) emerged. In Washington, a shell disease of unknown etiology is impacting populations of western pond turtle and potentially limiting recovery of this state endangered species. Conserving the health of herpetofaunal populations is fundamental to conserving the integrity and biodiversity of ecosystems. With disease at the forefront of amphibian and reptile population decline issues, a new Herpetofauna Disease Alert System has been created by the PARC Disease Task Team (http://parcplace.org/parcplace/resources/disease-task-team.html). This team and the alert system aim to expedite communication of disease events to relevant authorities in North America. The presentation will review shell disease in western pond turtles in Washington as well as other

common diseases (i.e., ranaviruses and snake fungal disease) and focus on disease recognition, response, and population impacts.

WESTERN POND TURTLE VISUAL ENCOUNTER SURVEYS. DON T .ASHTON*, *McBain Associates, 980 7th Street, Arcata, CA 95521; ashton.don@gmail.com*; R. BRUCE BURY, *Retired*; *burybr@peak.org*; STEVE NIEMELA, *Oregon Dept of Fish and Wildlife; steve.a.niemela@state.or.us;* JASON REILLY, *Bureau of Land Management*; *jreilly@blm.gov*; SIMON WRAY, *Oregon Dept of Fish and Wildlife*; *Simon.n.wray@state.or.us*; CHRISTOPHER YEE, *Oregon Dept of Fish and Wildlife*; *christopher.g.yee@state.or.us*.

The Jefferson Turtle Group (Southern Oregon/Northern California Chapter of the Oregon Native Turtle Working Group) has refined a standardized visual encounter survey protocol to document turtle presence at sites across the potential range of the species. The survey protocol draws elements from several published resources to provide a hierarchal sampling scheme with simple, repeatable methods applicable across the sampling frame. The protocol will be tested and employed over the next three years (2018-2020) using a sampling frame based on historical survey data and modeled high-quality habitat that is within and adjacent to the known range. Sampling is stratified by watershed. An online data portal allows for handy submission of survey data, and welcomes opportunistic observations (ArcGIS Survey123, iNaturalist). The protocol aims to accommodate for a variety of data needs and habitat types, including flowing (e.g., streams, rivers) and standing waters (e.g., ponds, reservoirs). There are budget constraints. Thus, to cover a large area and reduce associated field costs, we are seeking participation from Western Pond Turtle Working Group members, agency biologists, consultants, and citizens scientists to conduct surveys and submit data online. This protocol fulfills one of the many objectives outlined in the recently awarded Competitive State Wildlife Grant titled "Advancing Western Pond Turtle Conservation in Washington, Oregon, and California." More rigorous survey efforts will be required for assessing detectability, demographic trends, and life history features, including continued monitoring of long-term study sites.

WESTERN POND TURTLE CONSERVATION – A SUMMARY OF RANGE-WIDE COLLABORATIVE EFFORTS. SUSAN BARNES*, *Oregon Department of Fish and Wildlife*, *West Region Office*, *17330 SE Evelyn St.*, *Clackamas, OR 97015*; *susan.p.barnes@state.or.us*.

The Western Pond Turtle (*Actinemys marmorata*) is identified as a Species of Greatest Conservation Need in State Wildlife Action Plans for Washington, Oregon, California, and Nevada. The species is scheduled to soon undergo a Species Status Review by the U.S. Fish and Wildlife Service. This presentation will provide an overview of conservation actions accomplished to date range-wide, from British Columbia where the species is considered extirpated to Baja-Mexico where little is still known about species population distribution and abundance. Oregon's Native Turtle Working Group serves as a model for building partnerships and leveraging funds for on-the ground action focused on Western Pond Turtle conservation in Oregon. Key accomplishments include development of *Guidance for Conserving Oregon's Native Turtles including Best Management Practices*" and identification of Priority Turtle Conservation Areas. Western Pond Turtle conservation partners in Washington, Oregon and California were recently awarded a Multi-State Competitive State Wildlife Grant aimed at implementing key conservation actions during 2018 – 2020. A summary of the grant project,

"*Advancing Western Pond Turtle Conservation in Washington, Oregon and California*", will be provided, highlighting anticipated results within the context of the U.S. Fish and Wildlife Services' current Species Status Review Workplan.

STATUS OF FISHER POPULATIONS IN WESTERN OREGON. BRENT BARRY*, *Oregon State University*, *Room 104 Nash Hall*, *Corvallis*, *OR 97330*; *brent.barry@oregonstate.edu*; KATIE MORIARTY, *USFS Pacific Northwest Research Station*; *kmoriarty02@fs.fed.us*; TAAL LEVI, *Oregon State University*; *Taal.Levi@oregonstate.edu*; DAVID GREEN; *Oregon State University*; *greendav@oregonstate.edu*.

Fishers (*Pekania pennanti*) are medium sized mustelids endemic to North America. Two Fisher populations persist in Oregon: an indigenous population in southwestern Oregon, and a reintroduced population in the southern Cascades. Despite candidacy for the Endangered Species Act, current information on Fisher populations in Oregon is scarce. We conducted surveys using motion-activated cameras and scat detecting dog (*Canus familiaris*) teams to assess the distribution and detectability of Fishers employing an occupancy modeling framework. To quantify the potential for the reintroduced population to expand, we used a spatially explicit reaction-diffusion equation. We deployed 2543 camera survey stations equating to 636 sample units operational for >35 and >60 days during winter and summer, respectively, collecting >4 million photographs (surveys 2015-2017). Detection dog teams surveyed 223 sample units. We detected Fishers at 67 unique sample units and 121 individual survey stations, confirming the presence of the indigenous and introduced populations. The southern Cascades reintroduced population appears to have shifted or contracted. Population extent was less than expected, except under our slowest growth model. We confirmed a larger indigenous population, but also with range reductions. There was no evidence of population expansion into historically occupied forests in the Cascades despite predicted habitat suitability.

SHELL DISEASE IN WESTERN POND TURTLES IN WASHINGTON. STEFANIE BERGH*, *Washington Department of Fish and Wildlife*, *PO Box 484*, *White Salmon*, *WA 98672*; *stefanie.bergh@dfw.wa.gov*; KATHERINE HAMAN, *Washington Deptarment of Fish and Wildlife*; *Katherine.Haman@dfw.wa.gov*; WESTERN POND TURTLE HEALTH TEAM.

All 6 populations of the Washington state endangered Western Pond Turtle (*Actinemys marmorata*) are afflicted with an unknown shell disease. This shell disease was noted around 2012, but photo records show the disease was present as early as 2003. Clinical signs of the disease range from discoloration and flaking of the keratin to severe, deep lesions that penetrate the body cavity. Methods have been developed to identify and assess the disease in hand. Also, the use of CT scans has revealed that some turtles with no external clinical signs of shell disease do have subclinical indications of the disease or have a greater severity of disease than outward indications. Photo records and tracking of individual turtles show that the disease progresses slowly, but its effects on survival and reproduction are unknown. A potential fungal pathogen has been identified, but more study on the etiology of the disease is needed. Treatment of moderate and severely affected turtles has been tried and the evaluation of this treatment is ongoing. The Washington Department of Fish and Wildlife has formed a Western Pond Turtle Health Team comprised of experts from across the country. This presentation will summarize the efforts of that team.

SAVING AN EMPERILED POPULATION OF NORTHERN RED-LEGGED FROGS: HOW CITIZENS CAME TOGETHER TO PROTECT A LOCAL SPECIES DECLINING DUE TO HABITAT LOSS, CLIMATE CHANGE AND OTHER HUMAN INDUCED THREATS. SUE G. BEILKE*, *Harborton Frog Project*, *11755 SW 114th Pl.*, *Tigard*, *OR 97223*; *beilkesue@gmail.com*; PANOS STRATIS, *Harborton Frog Project*; *panos.stratis87@gmail.com*.

The Northern Red-legged Frog (*Rana aurora aurora*) was once common throughout the Willamette Valley in Oregon, but populations are declining due to a number of factors including habitat loss and fragmentation, climate change and human caused barriers to movement. In 2013, local citizens found over 60 dead Red-legged Frogs hit by cars on a local street just north of Portland, moving to their breeding site. This finding spurred a local biologist and citizens to begin a project that included determining where the frogs were coming from, where they were going, and how to get them safely across a busy four lane highway to the wetlands. Over the past four years, our project has transported over 800 Red-legged Frogs each year, helping to conserve this imperiled species. Through our efforts we have also collected and analyzed data on Red-legged Frog biology, which has allowed us to predict when movement will occur and how it is influenced by various factors including local weather patterns and fluctuations in temperature and rainfall.

SLLOPPS: HABITAT IN DRY FOREST FUELS REDUCTIONS. KENNETH R. BEVIS*, *WADept of Natural Resources*, *39 Rising Eagle Rd.*, *Twisp*, *WA 98856*; *Ken.Bevis@dnr.wa.gov.*

Fuels reduction and forest health are drivers for many hectares of active forest thinning projects in eastern Washington and Oregon. Unfortunately, simplistic prescriptions often leave these stands with greatly reduced habitat quality by way of aggressive "Parking Out" the stands. Habitat elements can be incorporated into these treatments easily with some forethought. SLLOPPS. Snags, Logs, Legacy, Openings, Patches, Piles and Shrubs.

METRO HABITAT CONNECTIVITY TOOLKIT: BRINGING CONNECTIVITY TO AN ACTIONABLE SCALE. LESLIE L. BLISS-KETCHUM*, *Portland State University*, *335 NW 87th Ave.*, *Portland*, *OR 97229*; *blissket@pdx.edu*; MARTIN LAFRENZ, *PSU Geography Dept*; *lafrenz@pdx.edu*; CATHERINE DE RIVERA, *PSU Environmental Science Dept*; *derivera@pdx.edu*; LORI HENNINGS, *Metro Regional Government; Lori.Hennings@oregonmetro.gov*.

Habitat fragmentation is a serious threat to maintaining biodiversity particularly in urbanizing areas. Methods exist to model habitat connectivity, however many of these are applied at large scales and rely on data that may be a decade or older, resulting in inaccuracies when compared to on the ground conditions, particularly in dynamic urban systems that experience rapid change. These issues make taking action to preserve or enhance these connectivity zones difficult, if not impossible. The Metro Regional Habitat Connectivity Toolkit approaches this problem by combining GIS analysis with on the ground assessments at realistic scales for land acquisition, restoration projects and/or barrier mitigation. We employed a surrogate species approach to address connectivity needs in a way that incorporates empirical data. Local information and research was combined with other habitat attributes to focus development of field assessments for habitat quality and barrier permeability. The field assessments allow technicians to verify GIS data, identify barriers and record habitat attributes in

a way that is comparable across multiple habitat connectivity zones and for multiple species. Once assessments are concluded the resulting information is used to generate 2 species specific scores for habitat quality and barrier permeability. These scores identify where on the landscape restoration and/or land acquisitions would provide the most connectivity benefit vs areas where mitigation for barriers such as wildlife passages structures across roads are the priority. This toolkit is in the final stages of development and is currently being testing in pilot areas in the Portland Metro region.

DON'T LET IT LOOSE IN OREGON. RICK BOATNER*, *Oregon Department of Fish and Wildlife, 4034 Fairview Industrial Dr. SE*, *Salem*, *OR 97302*; *rick.j.boatner@state.or.us*.

In 1996, Oregon Dept. of Fish and Wildlife developed and implemented the "Wildlife Integrity" rules in Oregon Administrative Rules Division 56. In part, these rules were developed to allow private ownership of some non-native wildlife species and prohibited the private ownership of other wildlife species. Some of the criteria used, to determine how to classify a species were: potential to introduce disease or parasites, potential to interbreed or hybridize, potential for competition with native wildlife and whether they could survive in Oregon. If a species was a high risk for any of the 12 criteria, than that animal was classified as prohibited and not allowed in Oregon, Unfortunately, many individuals never think that a state might have laws in place that prohibited ownership of some animals or they know about the law and chose to ignore them. With the ease of on-line shopping, this makes thing more problematic with people making the assumption that "if I can get it on-line it must be legal to own" and most on-line companies will not inform the person about state laws or the full life history of their purchase. Therefore, many people do not understand the responsibility of pet ownership or have knowledge of the life history of their new pet. After a few days, months, or years a person realizes that their silver dollar size hatchling turtle that was so cute is now growing up and requires a bigger tank, better filtering system, more time, etc.… and the children are now bored with it. So the options are: 1) try to sell it and find out it was illegal to have; 2) release it into the wild where it will be happy, and will frolic in the fields with its friends and my one critter couldn't hurt anything; or 3) give it away so it becomes someone else's problem. Whatever the reasoning or rational people often choose the releasing option. Because of this action we now have reproducing populations of some prohibited species in Oregon. In this talk we will look at some of the more common prohibited species that are found in Oregon. Learn how to identify these species and how you can help remove these species from Oregon.

STEPPING INTO A LARGER WORLD: INCORPORATING POST-METAMORPHIC MOVEMENT RESEARCH INTO AMPHIBIAN ECOLOGY. EVAN M. BREDEWEG*, *Oregon State University*, *945 NW Anjni Cir.*, *Corvallis*, *OR 97330*; *evan.bredeweg@oregonstate.edu*; TIFFANY GARCIA, *Oregon State University*; *tiffany.garcia@oregonstate.edu*; ANITA MORZILLO, *University of Connecticut*; *anita.morzillo@uconn.edu*.

Movement is a fundamental process integral to an organisms' ecology, ranging from daily resource acquisition to gene flow. Although technological advances have created a wealth of potential animal tracking options and theoretical frameworks have been developed, strong analytical approaches to breakdown the ecological drivers of movement are still needed. Amphibian species present a particularly useful opportunity to study drivers of movement as

they are a group of conservation concern, yet only rudimentary knowledge of their terrestrial behaviors exists. Using an experimental approach, our research has examined the impact of inherent species differences, direct environmental conditions, and latent effects of larval environments on the movement of post-metamorphic juvenile amphibians. Importantly, we also examined the interactive effects of these factors in an inherently multifaceted behavioral response. We found that innate behavioral differences in species create significantly distinct movement behaviors in three northwest native species. Direct environmental conditions impacted movement behavior with dry substrates reducing movement likelihood while distance displaced increased. The latent effects of larval rearing conditions did not change juvenile movement behavior, but it did influence individual size (snout-vent length), a strong predictor of movement ability. Our results highlight the need for experimental work on movement behavior to compliment tracking and theoretical work. We describe future work incorporating this information into models of amphibian populations. This information is critical to validate or challenge long held assumptions about amphibian movement that are central to their effective conservation.

NON-LEAD HUNTING EDUCATION: PAST & FUTURE. LELAND BROWN*, *Oregon Zoo*, *4001 SW Canyon Rd.*, *Portland*, *OR 97221*; *leland.brown@oregonzoo.org.*

Behavior change to accomplish conservation goals is challenging, and often complicated. Change that challenges traditions and long-held beliefs can be controversial, and must be approached with respect for stakeholder's history and concerns. The Non-lead Hunting Education Program was initiated in February of 2015, in an effort to address an emerging conservation issue. Originally funded for 3 years, the focus of the program is to develop partnerships with stakeholders to increase the use of non-lead ammunition, reducing the unintended consequences of lead remnants in the ecosystem on broad suite of species. The first 3 years of the program have resulted in substantial outreach efforts, and been successful in building relationships with partners that were initially hesitant about engaging on this conservation issue. The program has engaged over 12,000 individuals, as well as over 60 organizations, through education and outreach efforts. These have included evaluation methodology to measure impacts, which show success in creating change in intended behavior. Partnerships have also created stand alone programs to increase the use of non-lead ammunition in specific areas. Solid relationships built over the past years have developed into funding for an additional 3 years of education and outreach, and includes expansion of the program to create incentives for stakeholders that will assist in reducing barriers to change statewide.

ENVIRONMENTAL DNA AND OTHER NONLETHAL METHODS OF DETECTING AMPHIBIAN PATHOGENS IN CAPTIVITY AND TRADE: RANAVIRUS AS A CASE STUDY. JESSE L. BRUNNER*, *Washington State University*, *Washington State University*, *Pullman*, *WA 99164*; *jesse.brunner@wsu.edu*; ANJULIE OLSON, *WSU*; *anjulie.olson@wsu.edu*; JEREMY RICE, *WSU*; *jeremy_rice4@hotmail.com*; MITCHELL LE SAGE, *WSU*; *mitchell.lesage@wsu.edu*; JENNIFER CUNDIFF, *WSU*; *jcundiff@wsu.edu*; CAREN GOLDBERG, *WSU*; *caren.goldberg@wsu.edu*; ALLEN PESSIER, *WSU*; *pessier@vetmed.wsu.edu*.

Amphibian pathogens are moved regionally and internationally with the trade of live animals and can then spillover into wild and captive populations (e.g., zoos, aquaculture). While they often cause quiescent infections with little or no apparent mortality, spillover can also cause

mass mortality events. Both *Batrachochytrium dendrobatidis* and Ranavirus are OIE (World Animal Health Organization)-notifiable, screening animals for infection in captivity and trade is difficult and remains uncommon. Nonlethal samples (i.e., tail or toe-clips, swabs) have relatively low sensitivity and are poorly validated for detecting asymptomatic infections, and the large sample sizes required to ensure a disease-free status are prohibitive. To address these issues, we empirically evaluated the diagnostic performance of tail or toe-clips, swabs, and environmental DNA (eDNA) samples, combined with a quantitative real-time PCR assay, to detect ranavirus infections in American Bullfrogs (*Lithobates catesbeianus*). We then incorporated our empirical findings into a probabilistic framework with which to design and interpret sampling protocols, with an emphasis on detecting at least one infection in closed populations. All samples had low sensitivity, especially for inapparent infections, and performance changed through time and with environmental temperature. Because eDNA samples collect virus shed from the entire population, however, they are much more efficient at detecting rare, low-level infections in captive populations than more sensitive individual-level samples.

BAT POPULATION MONITORING AT A SIGNIFICANT MATERNITY ROOST IN BRITISH COLUMBIA.
PATRICK R. W. BURKE*, *South Coast Bat Conservation Society*, *4200-6270 University Boulevard*, *Vancouver*, *BC V6T 1Z4*; *burke@zoology.ubc.ca*.

The fungal disease White-nose Syndrome (WNS) has been described as the most significant wildlife disease in the modern era. In southwest British Columbia, eight species of colony-roosting bats are at risk of population-level impacts from this disease, including seven species with unknown disease response. We know little about the winter ecology or hibernation locations for these species in western North America, which inhibits our ability to assess and manage the disease. In order to monitor local population trends for two common species, we implemented a mark-recapture study at a significant maternity roost at Deas Island Regional Park. Our research objective is to assess long-term population trends, individual longevity, colony stability, and frequency of roost switching at multiple mixed-species bat maternity colonies across southwestern British Columbia as WNS advances through the region. In 2017, we marked 160 bats with passive integrated transponders (PIT tags), approximately 5.3% of the entire colony. We also conducted ten colony emergence counts and assessed over 250 bats for WNS scarring and lesions. The purpose of the 2017 study at Deas Island was to test and refine methods for future automated population trend monitoring. Here we present results from the first year of monitoring and outline plans for expanding the research program in 2018 and 2019.

SCIENTIFIC COLLECTING PERMITS: TOWARDS IMPROVED AND MORE EFFECTIVE REGULATIONS.
R. BRUCE BURY*, *1410 NW 12th St.*, *Corvallis*, *OR 97330*; *burybr@peak.org*.

Many colleagues doing research on wildlife report that obtainment of animal care and scientific collecting permits are annoying or time consuming parts of their work. Complaints occur due to uneven restrictions, delays (≥1 year), and relatively high costs (e.g., the highest fees are for Pacific States). In 1988, R. B. Finley published guidelines for the management of scientific collecting permits. Little progress has been made since. My objectives are to expel some misconceptions, artificial barriers and other ‘goblins’ between reasonable field studies and necessary regulations. I offer a perspective as one who developed regulations on take, as well as securing 100+ permits over 4 decades. Although sometimes forgotten, research scientists and

those entrusted to carry out regulations are usually both dedicated to conserving species and protecting populations Thus, we need to encourage improved trust between research quarters and permitting offices. One approach is for research subjects to be considered more like game species and fall under the same principles of sustainable harvest (compensatory mortality). Many projects are multi-year, so permits need to cover longer periods (e.g., a 3-year study). I suggest consideration of: (1) Master Permits (3 to 5 years) for established scientists or programs; (2) standardized regulations not unlike those for game species; and (3) licenses or prompt approval except for rare problem cases. These and other steps will make permitting and field research more efficient for all involved.

WESTERN POND TURTLE STATUS AND TRENDS: LESS DOGMA, MORE DATA. R. BRUCE BURY*, *U.S. Geological Survey*, *1410 NW 12th St.*, *Corvallis*, *OR 97330*; *burybr@peak.org*; GWEN W. BURY, *Department of Fisheries and Wildlife, Oregon State University, Corvallis, OR 97731*; *buryg@oregonstate.edu*.

There is increasing attention being paid to the status and population sizes of the Western Pond Turtle (*Actinemys marmorata*) in the Pacific Northwest because it is now under review for Federal listing. We have studied the species over several decades and our data shows important patterns: (1) Distribution— A. marmorata is widespread but current distribution maps are not representative. This turtle is tied to water, and should only be shown near flowing waterways and adjacent standing waters (ponds, etc.). (2) Losses—Some biologists claim that Bullfrogs (*Lithobates catesbeiana*) are depleting populations but there is limited data here. In one study at an isolated pond, removal of the invasive *L. catesbeiana* resulted in higher survival of juvenile turtles but, regionally, these frogs are too numerous for effective curtailment. Further, many populations of *A. marmorata* remain robust in the presence of *L. catesbeiana*. (3) Sampling issues - Small turtles are not captured using current sampling methods, even when the young are abundant. Recording only size, not age, of adult *A. marmorata* leads to misrepresentation of the distribution of young vs. adult turtles in the population. This turtle may be long-lived so there are many adults in a healthy population. Population trends need to be based on estimates (e.g., mark/recapture). Too many biologists now rely on unpublished information when making management decisions. It is time to collect original data sets and employ the latest techniques to improve our understanding of the occurrence and trends in numbers of *A. marmorata*.

NEW PERSPECTIVES ON GRAY WHALES FEEDING IN THE PACIFIC NORTHWEST EXAMINED WITH NEW SUCTION-CUP ATTACHED VIDEO TAGS. JOHN CALAMBOKIDIS*, *Cascadia Research*, *218 ½ W 4th Ave.*, *Olympia*, *WA 98501*; *calambokidis@cascadiaresearch.org*; DAVE CADE, *Cascadia Research*, *Stanford University*, *Hopkins Marine Station*, *120 Ocean View Blvd.*, *Pacific Grove*, *CA 9395*; *davecade@stanford.edu*; JAMES FAHLBUSCH, *Cascadia Research*, *Stanford University*, *Hopkins Marine Station*, *120 Ocean View Blvd.*, *Pacific Grove*, *CA 93950*; ANGELA SZESCIORKA, *Marine Bioacoustics Lab*, *Scripps Institution of Oceanography*, *9500 Gilman Dr. MC 0205*, *La Jolla*, *CA 92093-0205*; *aszesciorka@cascadiaresearch.org*; ANN ALLEN, *NMFS Pacific Islands Fisheries Science Center*, *1845 Wasp Blvd.*, *Building 176*, *Honolulu*, *HI 96818*; *ann.allen@noaa.gov*; JEREMY GOLDBOGEN, *Goldbogen Lab*, *Hopkins Marine Station*, *120 Ocean View Blvd.*, *Pacific Grove*, *CA 93950*; *jergold@stanford.edu*.

Gray Whales (*Eschrichtius robustus*) were considered specialized feeders, almost exclusively targeting benthic amphipods in the Arctic. Increasingly Gray Whales have been revealed to be much more versatile and adaptive in their feeding strategies and variety of prey. We examined the feeding behavior of a group of a dozen Gray Whales that return annually (some for over 25 years) to the waters of northern Puget Sound for 2 to 3 months each spring to feed. This location is over 200 km off the migration corridor for Gray Whales and they began using this areas starting in 2 periods (1990-91 and 1999 to 2000). We examined Gray Whale feeding and social behavior from 11 deployments of suction-cup attached multi-sensor video tags in spring of 2015 and 2016. The tags gathered 132 hours of data including one of the longest deployments we are aware of for a suction cup tag (>67h attachment with 38h of data). Video and kinematic data revealed that Gray Whales fed almost exclusively on intertidal Ghost Shrimp (Thalassinidea) during high tide periods when whales could access these areas. Typical dive depths during feeding were 2.5 to 3 m (barely enough waters to swim) and some areas were over 2 km from deeper water. Feeding periods ranged from <1h to >6h skewed towards the incoming period around the high tide. Gray whales spent extensive periods milling in several other areas during other portions of the tide cycle but the tags revealed they were not engaged in feeding and showed a high degree of social interaction among whales including frequent body contact with other whales. Gray whales appear to have discovered this area during two difficult periods for the Gray Whale population when they were in search of alternative prey. This justified the initial risk but now they are able to exploit this source annually.

IMPLEMENTATION OF BAT MONITORING AND WHITE-NOSE SYNDROME SURVEILLANCE IN THE NORTH COAST CASCADES NETWORK IN RESPONSE TO DISEASE DETECTION IN WESTERN WASHINGTON. TARA CHESTNUT*, *Mount Rainier National Park, Ashford, WA; tara_chestnut@nps.gov.*

In response to the 2016 *Pseudogymnoascus destructans* (Pd) detection in Washington State, the National Park Service (NPS) North Coast Cascades Network implemented bat monitoring and white-nose syndrome (WNS) surveillance following recommendations outlined in the NPS Pacific West Region WNS response plan. The primary goals were to identify known bat colonies, conduct WNS surveillance, and assess bat species occurrence in network parks using acoustic monitoring. To identify known bat colonies, we surveyed park natural resource and maintenance staff to identify buildings where bats have been observed and compiled data from the 2000 NPS Natural Resources Challenge inventory. We conducted direct Pd/WNS sampling by swabbing bats in the hand, and passive Pd surveillance by placing clean plastic sheeting at known sites and collecting fresh guano. Finally, we implemented acoustic monitoring at all seven NCCN parks and an elevational study of bat occurrence at Mount Rainier National Park. We report on the preliminary results and lessons learned in project implementation.

CULTURAL COMPETENCE IN CONSERVATION BIOLOGY: A CASE STUDY BY THE WASHINGTON CASCADES FISHER RESTORATION TEAM. TARA CHESTNUT *, *Mount Rainier National Park, Ashford, WA*; *tara_chestnut@nps.gov*; JASON RANSOM, *North Cascades National Park Service Complex, Sedro Wooley, WA*; DAVE WERNTZ, *Conservation Northwest, Twisp, WA*; JEFF LEWIS AND HANNAH ANDERSON, *Washington Department of Fish and Wildlife, Olympia, WA*; KRISTY PALMANTIER, *BC Ministry of Forest, Lands and Natural Resources Operations, Williams Lake, BC*; HANFORD MCCLOUD, *Nisqually Indian Tribe, Olympia, WA*; MARK NUETZMANN,

Confederated Tribes and Bands of the Yakama Nation, *Toppenish*, *WA*; BILL IYALL, *Cowlitz Indian Tribe*, *Longview*, *WA.*

Conservation biology is an interdisciplinary field of study focused on the protection of biodiversity, which includes species, their habitats, and ecosystems. Each discipline brings diverse interests and values that are considered during the decision-making process. Policies such as the National Environmental Policy Act (NEPA) and Canadian Environmental Assessment Act (CEAA) are in place to ensure federal agencies assess the environmental effects of a proposed action prior to decision making, including human health, economic, and social effects. Additionally, consultations with co-managers ensure an opportunity for Tribal and First Nations input on proposed actions and decision-making. These policies and consultations have direct implications to conservation projects which may alter project implementation based the outcome of interdisciplinary evaluations. Using a model of cultural competence that extends beyond established policies and consultations can facilitate more effective collaborations between disciplines and co-managers, which can provide opportunities for new insights, and result in increased trust and long-term conservation successes. The Washington Cascades Fisher Restoration Team presents an example of cultural competence in practice that was implemented during Fisher translocations from central British Columbia and release events in the southern Washington Cascades.

MANAGING THE SPREAD OF PSEUDOGYMNOASCUS DESTRUCTANS AND CONSERVING BATS THREATENED BY WHITE-SYNDROME NORTH AMERICA. JEREMY T. H. COLEMAN*, *U.S. Fish and Wildlife Service, Hadley, MA*, ANN FROSCHAUER, *U.S. Fish and Wildlife Service, Lacey, WA*; *ann_froschauer@fws.gov*, RICH GEBOY, *U.S. Fish and Wildlife Service, Bloomington, IN,* BRONWYN HOGAN, *U.S. Fish and Wildlife Service, Sacramento, CA*, JULIE REEVES, *U.S. Fish and Wildlife Service, Cheyenne, WY,* and JONATHAN REICHARD, *U.S. Fish and Wildlife Service, Hadley, MA.*

White-nose syndrome (WNS) is an infectious disease, caused by the fungus *Pseudogymnoascus destructans (Pd),* which is responsible for decimating hibernating bat populations in eastern North America. WNS continues to spread and now has been confirmed in 9 North American bat species in 31 states and 5 Canadian provinces. The fungus infects torpid bats resulting in physiological and behavioral impacts, often leading to mortality. Corresponding population declines exceeding 90% have been documented at many hibernacula. *Pd* was likely recently introduced to North America and it has been documented on numerous bat species across Europe and Asia. Coordinated plans in both the U.S. and Canada provide the framework for a comprehensive North American response and working groups have been established to address the research and management needs for affected bats. The U.S. Fish and Wildlife Service is the lead federal agency coordinating the response to WNS in the U.S., and since 2008 has provided considerable technical and financial assistance to researchers, states, and federal agencies to address WNS. These coordinated efforts have served to advance our understanding of bat hibernation physiology, population dynamics, disease ecology, and general bat behavior, with the goal of developing effective disease treatment and management strategies. Recent documentation of WNS and *Pd* in Washington State marks the first detection in western North America. Combined with the relative lack of knowledge about western bat hibernation behavior

as compared to eastern species, this detection highlights the need for increased coordination and collaboration in western bat research, management, and conservation.

A BEHAVIORAL-BASED WILDLIFE CROSSING GUILD APPROACH TO EVALUATE WILDLIFE CONNECTIVITY AND CROSSING DESIGN. SHANNON R. CROSSEN*, *ICF Jones & Stokes*, *1108 11th St. Suite 301*, *Bellingham*, *WA 98225*; *shannon.crossen@icf.com*; SANDRA JACOBSON, *USFS*, *Samara Group*; *sandrajacobson@ymail.com.*

Habitat connectivity is essential to maintaining ecosystem function, wildlife movement and migration, and viable wildlife populations. Transportation infrastructure is widely known to fragment habitats, obstruct wildlife movement, and is a substantial source of wildlife mortality. Traditional approaches to assessing connectivity and designing wildlife crossings entail consideration of species size classes (e.g., small, medium, and large bodied species). This approach is useful, though lacks consideration of differential behaviors within and across taxa, which are independent of species size and are critically important to consider when assessing wildlife connectivity and designing transportation infrastructure and wildlife crossings. Here we present a case study of a transportation project that utilized a behavioral-based "Wildlife Crossing Guild" approach to 1) identify focal species, 2) assess connectivity, and 3) design wildlife crossings and infrastructure as a function of focal species and their associated Wildlife Crossing Guilds. This approach resulted in robust analyses and an assemblage of proposed wildlife crossings with design elements targeted specifically for focal species versus frameworks based solely on size class or approaches conducted entirely without a structured framework. This case study illustrates the importance of implementing a structured framework to conduct connectivity analyses and wildlife crossing design and demonstrates the value and benefits in using a behavioral-based framework.

THE HIGH LIFE: ECOLOGY AND CONSERVATION OF MONTANE REPTILES. JUSTIN A. DEMIANEW*, *Department of Wildlife*, *Humboldt State University*, *1 Harpst St.*, *Arcata*, *CA 95521*; ADRIAN MACEDO, *Department of Biology*, *Humboldt State University*, *1 Harpst St.*, *Arcata, CA 95521*; JUSTIN GARWOOD, *California Department of Fish and Wildlife*, *5241 Ericson Way*, *Arcata*, *CA 95521*; DANIEL BARTON, *Department of Wildlife*, *Humboldt State University*, *1 Harpst St.*, *Arcata*, *CA 95521*.

Conservation issues facing herpetofauna have grown in recent decades, but research programs assessing the type, prevalence, and magnitude of these issues have generally focused on amphibians. While reptiles are a much more speciose clade, identifying their conservation threats is often challenging. This may be especially true at high latitudes and elevations where reptile diversity and abundance is often low. Despite the fact many high elevation populations may be at lower risk from some threats (e.g., agriculture), such simple communities in montane environments may be particularly susceptible to perturbations caused by invasion, extinction, or climate change since simpler food webs tend to have stronger interactions and less redundancy than more complex food webs. We briefly discuss conservation concerns in montane reptiles across the Pacific Northwest with a particular emphasis on the potential secondary effects of invasive species and the role they play in restructuring native food webs. We provide a case study highlighting the ecology of two sympatric species of gartersnake (*Thamnophis spp*.), one of which depends entirely on native amphibians, especially the imperiled Cascades Frog (*Rana*

cascadae), while the other consumes both native anurans and an invasive salmonid. We then identify the conservation threats present in this system and illustrate how restoration-based management is helping to mitigate these threats and reshape and restore the native food web.

MENTORSHIP FOR LIFE. PAUL A. DI SALVO*, *USDA-APHIS-Wildlife Services*, *145 NE Morgan St.*, *Portland*, *OR 97211*; *pdisalvo25@gmail.com*.

Mentorship is extremely important for building successful wildlife professionals, expanding careers, and exploring new skills. Traditionally, senior leaders and retirees have been a mentor for early career professionals and recent graduates. However, no matter where you are in your career, you are never too old to be a mentee or too young to be a mentor. The Mentorship for Life concept urges wildlife professionals from all stages, career paths, and specializations to build connections with others in a formalized way through mentorship. Learn the beginning steps to finding a mentor or mentee, building a professional relationship, and achieving personal career goals through mentorship!

VEGETATION RESPONSE TO JUNIPER REDUCTION AND GRAZING EXCLUSION IN SAGEBRUSH-STEPPE HABITAT IN EASTERN OREGON. JACOB W. DITTEL*, *Department of Fisheries and Wildlife*, *Oregon State University*, *104 Nash Hall*, *Corvallis*, *OR 97331*; *jacob.dittel@oregonstate.edu*; DANA SANCHEZ, *Department of Fisheries and Wildlife*, *Oregon State University*; *dana.sanchez@oregonstate.edu*; LISA ELLSWORTH, *Department of Fisheries and Wildlife*, *Oregon State University; lisa.ellsworth@oregonstate.edu*; CONNOR MOROZUMI, *Population Biology*, *Ecology*, *and Evolution Program*, *Emory University*; *connor.morozumi@emory.edu*; RICARDO MATA-GONZALEZ, *Department of Animal and Rangeland Sciences*, *Oregon State University*; *Ricardo.MataGonzalez@oregonstate.edu*.

Western Juniper (*Junpierus occidentalis*) expansion is one of the largest threats to conserving sagebrush (*Artemisia spp*.) steppe ecosystems in the northwestern United States. Juniper expansion has degraded the sagebrush steppe by altering fire regimes and out-competing native shrubs and herbaceous vegetation for limited resources. We characterized the effect of juniper removal in a severely degraded sagebrush steppe habitat for 3 years following juniper cutting. In addition, we measured the effect of low intensity seasonal grazing on plant community recovery through Cattle (*Bos taurus*) exclusion treatments. We monitored plant community composition (exotic annual grasses, preferred grasses, preferred forbs, and shrubs), fuel loads, and juniper recruitment in a factorial design of juniper removal and grazing exclusion. We found that while there were significant differences between cut and uncut juniper treatments, there were no consistent trends across all three years. Our results suggest that other factors, such as timing of precipitation may also have strong short-term effects on plant community composition. We detected no significant grazing effects during the study period, suggesting the current grazing regime is appropriate for the area. The cutting of juniper increased total fuel loads as well as herbaceous fuel loads. Compared to open interspace, a 2-fold increase in juniper seedlings and saplings were detected beneath juniper piles, which will act as sources for future juniper encroachment.

AN OVERVIEW OF WHITE-NOSE SYNDROME SURVEILLANCE EFFORTS IN OREGON. RAY DODD*, *Oregon Fish and Wildlife*, *7118 NE Vandenberg Ave.*, *Corvallis*, *OR 97330*; *raymond.w.dodd@state.or.us*.

Monitoring for the presence of *Pseudogymnoascus destructans* (Pd) on bats and via environmental sampling in hibernacula and maternity roosts is critical in early detection of White-Nose Syndrome (WNS) in Oregon bats. An understanding of susceptible species, their distribution, and identification of congregations or potential roosting areas can only be accomplished through cooperative interagency field surveys and planning efforts to survey known and historic hibernaculum and maternity roost sites. Since 2014, ODFW and cooperators have conducted surveys at hibernacula (n = 34) and maternity roosts (n = 9) with no detection of the fungus on sampled bats or their local environment. This presentation will quantify Oregon surveillance efforts for Pd and discuss bat ecology and distribution in the state, including sampling challenges and plans to expand surveillance.

THE SAGE GROUSE INITIATIVE - WASHINGTON'S WORKING LANDS FOR WILDLIFE CONSERVATION. HELEN E. DOWLING*, *Pheasants Forever Inc.*, *NRCS*, *103 N Baker St.*, *Waterville, WA 98858*; *ldowling@pheasantsforever.org*; JULIE UNFRIED, *Pheasants Forever Inc.; NRCS*; *junfried@pheasantsforever.org*; SCOTT SCROGGIE, *NRCS*; *Scott.Scroggie!wa.usda.gov;* DOMINIC BACHMAN, *NRCS*; *Dominic.Bachman@wa.usda.gov*.

Over the last 7 years, Washington's Sage Grouse Initiative (SGI) has changed the way conservation is implemented on the landscape. Through the Natural Resource Conservation Service's 'Working Lands For Wildlife' Initiative, SGI is traditionally based on the core mission of 'Wildlife Conservation Through Sustainable Ranching'. This effort has led to over 75 conservation plans on rangelands in the core areas for Greater Sage-grouse (*Centrocercus urophasianus*). Building off this success, our team has branched into new and exciting programs that open up opportunities for cropland producers to 'grow habitat'. The goal of SGI Crop is to enhance the agricultural areas adjacent to quality habitat and increase cover and connectivity across the landscape through the creation of islands and eyebrows of conservation cover. Under the umbrella of SGI Crop, producers can use the SGI Transitional program to permanently convert active or remnant cropland, as well as expiring acres enrolled in the Conservation Reserve program (CRP), into a sustainable working ranch operation. In addition to our Farm Bill programs, SGI in Washington has several partner-based projects that enhance the sage grouse habitat and program implementation. Finally, Washington will see for the first time ever, easement funding dedicated to the protection of shrub-steppe habitat that is specific for sage grouse. By diversifying our programs, SGI has expanded the umbrella of options for private landowners to work to conserve habitat for Greater Sage-grouse in Washington State.

ESTIMATING BALD EAGLE OCCUPANCY IN THE CHESAPEAKE BAY WATERSHED. BETHANY DRAHOTA*, *West Virginia University*, *14725 56th Ave. W*, *Edmonds*, *WA 98026*; *bdrahota@gmx.com*; ADAM DUERR, *West Virginia University*; *Bloom Biological, Inc.*; *adamduerr@bloombiological.com*; JEFF COOPER, *Virginia Department of Game and Inland Fisheries; jeff.cooper@dgif.virginia.gov;* JAMES ANDERSON, *West Virginia University*; *jim.anderson@mail.wvu.edu;* SERGIO HARDING, *Virginia Department of Game and Inland*

Fisheries; *sergio.harding@dgif.virginia.gov*; TODD KATZNER, *U.S. Geological Survey*; *tkatzner@usgs.gov*.

The Bald Eagle (*Haliaeetus leucocephalus*) is a newly recovered species, and as such, little is known about its modern population dynamics and how they may be affecting habitat ecology. With the recent expansion of eagle populations, managers have begun to question assumptions about Bald Eagles, including their sensitivity to disturbances. Discerning how individual eagles react to both outside influences and internal factors is crucial for eagle conservation considerations. The goal of this study was to determine the habitat associations and number of bald eagles in concentration areas within the Chesapeake Bay (Rappahannock, James, Potomac, York rivers). To achieve this goal, we analyzed survey data from the =Virginia Department of Game and Inland Fisheries (VDGIF) collected from 2006 to 2012 in conjunction with a suite of intrinsic and extrinsic covariates. Bald Eagle occupancy was seasonally variable, with different covariates influencing eagles at different times of the year. Patterns of occupancy by non-breeding populations (summer months) responded to salinity, land cover, and recreational disturbance. Patterns of occupancy by Bald Eagles in winter (breeding season) responded to salinity type and were age-specific. In both seasons, lower saline waters (tidal fresh and oligohaline) were more frequently occupied. High occupancy and a relative resistance to recreational disturbances suggests that this population is growing, which may lead to increased management difficulties in the future.

SCIENCE AND LAW AND THE ESA LISTING PROCESS. JONATHAN DRAKE*, *NOAA Fisheries Northwest Fisheries Science Center*, *2725 Montlake Blvd. E*, *Seattle, WA 98112*; *jon.drake@noaa.gov*.

Federal listing decisions under the Endangered Species Act (ESA) involve a combination of both science and law. Most ESA listing procedures commence when the public files a petition for ESA listing. At that point, the "best available science" standard for listing determinations means that agencies must decide which scientific data to consider and which to exclude during a listing decision. Problems arise when scientific data does not appear in the listing petition, or simply does not exist, or conflicts with other data, or when the data otherwise fails to lead to an ESA listing conclusion. Also, problems arise because agencies can decide to ignore data, or favor some data over other types. Because there is no requirement that agencies conduct their own research in response to an ESA listing petition, agencies can become immobilized during listing decisions. Or, the final ESA decision may appear to the public to be incomplete, ill-considered, or unfair. The federal Administrative Procedures Act (APA) purports to allow the public to obtain judicial review of agency decision making. However, judicial review of ESA listing decisions under the APA presents numerous hurdles and bias against public review. First, the judge must apply the "arbitrary and capricious, or abuse of discretion" standard in order to overturn an agency decision. Second, the court lacks authority to conduct its own evidence hearing - review is limited to the contents of the administrative record. Finally, the court can not examine the qualifications of the scientist nor the truthfulness of the scientific data.

SPACE USE AND COVER SELECTION OF KIT FOXES AT THEIR DISTRIBUTIONAL PERIPHERY. CAROLYN A. ECKRICH*, *Oregon Department of Fish and Wildlife*, *1401 Gekeler Lane*, *La Grande*, *OR 97850*; *carolyn.a.eckrich@state.or.us*; MATTHEW WARREN, *Idaho Department of*

Water Resources; *matt.james.warren@gmail.com*; DARREN CLARK, *Oregon Department of Fish and Wildlife; darren.a.clark@state.or.us;* PHILLIP MILBURN, *Oregon Department of Fish and Wildlife; philip.j.milburn@state.or.us;* SCOTT TORLAND, *Oregon Department of Fish and Wildlife*; *scott.j.torland@state.or.us*; TIM HILLER, *Wildlife Ecology Institute*; *tim.hiller@wildlifeecology.org*.

Determining the factors that constrain the distribution of a species may have important management and conservation implications. We quantified space use and cover selection of Kit Foxes (*Vulpes macrotis*) at the northern periphery of their distribution in southeastern Oregon, 2014 to 2015. We used GPS locations from collared foxes to estimate seasonal utilization distributions (UD) with a biased random bridge. We also estimated seasonal intensity distributions (ID) and recursion distributions (RD) to identify areas with increased residence time and areas that are frequently visited, respectively. Mean 95% UD size for all foxes was 37.41 km^2 during breeding, 21.44 km^2 during pup-rearing and 20.11 km^2 during dispersal. Male UDs during breeding (mean = 37.68 km^2) were larger than during dispersal (mean = 18.70 km^2). Selection ratios showed selection for desert scrub and sparsely vegetated cover across all seasons at the population level. Within 30% IDs, foxes selected sparsely vegetated cover with seasonal selection of desert scrub. Within 30% RDs, foxes selected sparsely vegetated cover and grasslands throughout the year. At all levels, there was individual variation in patterns and strength of selection. A heterogeneous landscape with sparsely vegetated and desert scrub cover (i.e., intensive foraging areas and den sites) mixed with grasslands (i.e., rapid foraging areas) may provide suitable habitat for Kit Foxes while minimizing predation risk from other canids that may use densely vegetated areas. Identifying patterns of resource use of this species at their periphery will improve conservation strategies for Kit Foxes in Oregon and throughout their range.

DEVELOPING AN OCCUPANCY MODEL AND MONITORING FRAMEWORK FOR WOLVERINES IN THE CASCADES. ROBERT L. EMMET*, *University of Washington*, *1215 Northeast 64th St.*, *Seattle*, *WA 98115*; *robert.l.emmet@gmail.com*; BETH GARDNER, *University of Washington*; *bg43@uw.edu*; ROBERT LONG, *Woodland Park Zoo*; *Robert.Long@zoo.org*.

Wolverines (*Gulo gulo*) are recolonizing formerly occupied range in the continental U.S., including the Cascade Mountains. Their reliance on spring snow cover, however, makes them vulnerable to climate change, making an effective and efficient monitoring framework necessary. Given Wolverines' inherently low population density and difficulty obtaining "recaptures", an occupancy-based monitoring method is likely to be more successful than abundance-based methods. Unfortunately, Wolverines' large home ranges violate standard occupancy model assumptions, and may result in inaccurate and imprecise occupancy estimates. Therefore, we propose a novel continuous-time dynamic occupancy model that can account for the long-distance movements and low densities of Wolverines and similar species. We will test our model against several other candidate models using both simulated data and empirical wolverine occurrence data, and will discuss the specific biases and assumptions of our model. Finally, we will place our model in context, outlining several alternative Wolverine monitoring frameworks that will best make use of this model.

TRANSLOCATIONS AS ROADMAPS FOR CONSERVATION PLANNING: THE CASE OF FISHERS IN OREGON. AARON N. FACKA*, *Oregon State University*, *Institute for Natural Resources*, *Portland*, *OR 97207*; *aaron.facka@oregonstate.edu*.

Translocations for the purposes of conservation are widely used actions aimed at preserving or restoring organisms or ecosystems. Translocations often appear as isolated, discrete actions that occur over relatively short periods. In reality, translocations are long processes that require knowledge of potential threats, status of extant populations, evaluations of potential release areas and their habitats, ecosystem structures before and after release of organisms, and long-term regional objectives and strategies. Thus, translocations are projects that fundamentally benefit, if not require, knowledge integrated across multiple scales and disciples. I contend that translocations are useful conceptual goals that help prioritize conservation needs and for gaining scientific insight. I use the hypothetical decision to pursue Fisher (*Pekania pennanti*) translocations in Oregon as an example of structuring conservation and scientific goals under one unifying framework. Fishers are largely absent throughout Oregon and their distribution is confined to the southern portion of the state. Forested areas in northern Oregon have potentially suitable habitat for Fishers; yet, their absence cannot be easily distinguished between unsuitability of the habitat or because of an inability for Fishers to disperse. Assessing the feasibility of one, or multiple, translocations of Fishers would require analysis and synthesis of existing and potential research, testing of Fisher habitat, and assessing the potential of existing population to disperse into new areas. Additionally, managers and researchers must address the viability of potential source populations, effects on ecosystems, and regulatory implications. Rigorously dealing with these diverse and interacting issues provides a unique framework for conservation of Fishers.

"THE BIG THINK": FINDING NATURAL RESOURCE SOLUTIONS THROUGH COALITION BUILDING. CAROLINE FITCHETT, *Mazama's*; *carolineffitchett@gmail.com*.

This is the 4th presentation in the session: Facing the Sixth Extinction Crisis: Finding Broader Relevancy and Greater Funding for Fish and Wildlife Conservation. Oregonians understand that quality of life includes good jobs, equal access to quality education, safe communities, efficient public services, and a healthy environment. These factors are intertwined and interdependent, and they rely on the conservation, protection and sustainable use of the state's most basic natural resources – the land, air, water and soil that sustain all life. Yet, our agencies and lands are seeing vast challenges. More Oregonians are choosing to live in cities with little access to the outdoors. Attracted by new technology, youth are spending less time outdoors. Social and environmental concerns have led to major changes for the state's traditional natural resource industries. Tourism is booming and people are moving to Oregon putting pressure on urban growth boundaries, infrastructure and natural resources. We are experiencing some of the results of climate change such as longer summers with minimal rain, longer fire seasons. These stressors pose a challenge to human health, economic growth, natural systems and quality of life, as well as public services. The Big Think is yearlong initiative to engage Oregonians throughout the state in a collaborative process to ensure the sustainability of Oregon's natural resources for both present and future generations. The Big Think will develop policy and funding strategies to meet the needs of Oregon's lands, waters, wildlife, and local economies through a process led by citizen leaders across the state.

CAMERA TRAP PLACEMENT AND THE POTENTIAL FOR BIAS DUE TO HABITAT FEATURES. TAVIS FORRESTER*, *Oregon Dept. of Fish and Wildlife, 1401 Gekeler Lane, La Grande, OR 97850; tavis.d.forrester@state.or.us*; JOSEPH KOLOWSKI, *Smithsonian Institution*; *kolowskij@si.edu*.

Camera trapping has become an increasingly widespread tool for wildlife ecologists, with large numbers of studies relying on photo capture rates or presence/absence information. It is increasingly clear that camera placement can directly impact this kind of data, yet these biases are poorly understood. We used a paired camera design to investigate the effect of small-scale habitat features on species richness estimates, and capture rate and detection probability of several mammal species in the Shenandoah Valley of Virginia, USA. Cameras were deployed at either log features or on game trails with a paired camera at a nearby random location. Overall capture rates were significantly higher at trail and log cameras compared to their paired random cameras, and some species showed capture rates as much as 9.7 times greater at feature-based cameras. We recorded more species at both log (17) and trail features (15) than at their paired control cameras (13 and 12 species, respectively), yet richness estimates were indistinguishable after 659 and 385 camera nights of survey effort, respectively. We detected significant increases (ranging from 11–33%) in detection probability for 5 species resulting from the presence of game trails. Our results indicate that small-scale factors, including the presence of game trails and other features, can have significant impacts on species detection when camera traps are employed. Significant biases may result if the presence and quality of these features are not documented and either incorporated into analytical procedures, or controlled for in study design.

THE OREGON SAGE-GROUSE DEVELOPMENT SITING TOOL: A SPATIALLY EXPLICIT APPLICATION FOR PROMOTING SAGE-GROUSE HABITAT CONSERVATION AND SUSTAINABLE ECONOMIC DEVELOPMENT. LEE FOSTER*, *Oregon Department of Fish and Wildlife*, *237 Hwy 20 S.*, *Hines*, *OR 97738*; *lee.j.foster@state.or.us*; MEGAN CREUTZBERG, *Institute for Natural Resources*, *Oregon State University*, *2112 SW 5th Ave.*, *Portland*, *OR 97201*; *megan.creutzberg@oregonstate.edu*.

In 2015, Oregon Department of Fish and Wildlife (ODFW) and Oregon Department of Land Conservation and Development implemented state rules instituting a comprehensive mitigation program for development in Greater Sage-grouse (*Centrocercus urophasianus*) habitat to ensure a net conservation benefit, in terms of Sage-grouse habitat functionality, is generated following human development projects impacting Sage-grouse habitat. The provisions in these rules are complex, and can be difficult to communicate in a clear manner to organizations and companies seeking to pursue energy, or other development projects, in south-eastern Oregon. To remedy this problem, ODFW, in cooperation with Oregon State University Institute for Natural Resources, The Nature Conservancy, and Oregon Explorer, has developed an interactive web application to provide potential project developers important information regarding the Sage-grouse Mitigation Rules, and to allow developers to assess the relative impact of potential future projects to Sage-grouse habitat. The goal of this tool is to promote targeted development siting in south-eastern Oregon so that developers can minimize development impacts to Sage-grouse habitat, and subsequently minimize the monetary mitigation burden incurred by development projects. This presentation will provide an overview of the Oregon Sage-grouse Mitigation Rules, and a demonstration of the Development Siting Tool.

SOUTHEAST ALASKA HUMPBACK WHALES INCREASE NON-SONG SOURCE LEVELS IN HIGHER NATURAL OR MANMADE AMBIENT NOISE. MICHELLE FOURNET*, *Department of Fisheries and Wildlife*, *Oregon State University*, *Corvallis, OR 97330*, *Cooperative Institute for Marine Resources Studies*, *Oregon State University and NMFS Pacific Marine Environmental Laboratory*, *Newport*, *OR 97365*; *michelle.fournet@gmail.com*; LEANNA MATTHEWS, *Biology Department*, *Syracuse University*, *Syracuse*, *NY 13244*; *lematthe@syr.edu*; CHRISTINE GABRIELE, *Humpback Whale Monitoring Program*, *Glacier Bay National Park and Preserve*, *Gustavus*, *AK 99826*; *Chris_Gabriele@nps.gov*; DAVID MELLINGER, *Cooperative Institute for Marine Resources Studies*, *Oregon State University and NOAA Pacific Marine Environmental Laboratory*, *Newport*, *OR*, *97365*; *david.k.mellinger@noaa.gov*; HOLGER KLINCK, *Bioacoustics Research Program*, *Cornell Lab of Ornithology*, *Cornell University*, *Ithaca*, *NY 14850*, *Cooperative Institute for Marine Resources Studies*, *Oregon State University and NOAA Pacific Marine Environmental Laboratory*, *Newport*, *OR 97365*; *Holger.Klinck@oregonstate.edu*

Anthropogenic noise is a pervasive and persistent environmental feature for acoustically oriented marine mammals. Vessel noise in particular has been identified as potentially harmful to low-frequency specialists, including Humpback Whales (*Megaptera novaeangliae*), that produce vocalizations in the same frequency band as engine noise. On the Southeast Alaska feeding grounds, Humpback Whales produce a wide range of calls known as non-song vocalizations, which thus-far are poorly understood. In Glacier Bay National Park (GBNP), a collaborative two-year study aims to describe Humpback Whale vocalizations and investigate shifts in calling behavior that may occur in response to vessel noise. We used a four element bottom-mounted hydrophone array to [1] measure the loudness of Humpback Whale non-song vocalizations and [2] assess whether Humpback Whales adjust source levels in response to ambient noise. The average source level for Humpback Whale non-song vocalizations was 137 dB $_{RMS}$ re 1 µPa @ 1m (n = 426, 95% CI: 136, 138 range= 117:157 dB); this is quieter than what has been described for Humpback Whales in other regions. Results of a linear regression indicated that ambient noise explained over half the variance in non-song source levels (R^2=.55, $F_{1,424}$= 517.53, P< 2.2e-16). In GBNP a 1 dB increase in ambient noise levels resulted in an average source level increase of 0.8 dB (95% C.I.: 0.72 to 0.86 dB). In this study Humpback Whales increased the source level of their vocalizations in response to both environmental and anthropogenic noise equally (ANCOVA: P=0.178, $F_{d.f=1,422}$=1.82).

FISH AND WILDLIFE BUDGETS IN OREGON AND WASHINGTON STATE: AN OVERVIEW OF THE NUMBERS. ROGER FUHRMAN*. *Oregon Department of Wildlife*; *roger.w.fuhrman@state.or.us*.

This is the first paper in the session: Finding Broader Relevancy and Greater Funding for Fish and Wildlife Conservation. The Oregon Department of Fish and Wildlife and the Washington Department of Fish and Wildlife will provide a brief overview of their budgets. The overview will include an orientation of major fund sources and how the restrictions on the use of those funds influence agency activities. The presenters will discuss recent trends in funding and how that may affect the future of the departments. The presentation will lay the groundwork for further discussion about why new funding is needed to support future conservation initiatives.

SNOWY PLOVER JUVENILE SURVIVAL IN OREGON. ELEANOR P. GAINES*, *Institute for Natural Resources*, *PO Box 751*, *Portland*, *OR 97207*; *egaines@pdx.edu*; MICHAEL MURPHY, *Portland State University*; *murphym@pdx.edu*; STEPHEN DINSMORE, *Iowa State University*; *cootjr@iastate.edu*.

The Snowy Plover, (*Charadrius nivosus nivosus*) a ground nesting shorebird, is listed as Threatened along the Oregon coast by U.S. Fish and Wildlife Service and Oregon Department of Fish and Wildlife. Land management agencies in Oregon collaborate to recover plover populations, and although monitoring has been intensive, the effect of management on individual life stages is largely unknown. Here, we report on an analysis of 25 years of mark-resight data to estimate age-specific apparent survival, detection probability, and the effects of environmental and management variables on these vital rates. We found strong differences in survival and detection probability between adult and juvenile birds, but no effect of sex on survival of either age group. Juvenile plover survival rates declined over the course of the study, but rebounded slightly after implementation of lethal predator management. Adult survival exhibited a positive trend over the study. Vital rates from this analysis will be combined with recent analyses of other life stages in a population model to explore how management affects overall population growth for this recovering species.

REPRODUCTIVE RESPONSE OF A NATIVE SOLITARY BEE ACROSS A GRADIENT OF FOREST WILDFIRE SEVERITY. SARA M. GALBRAITH*, *Oregon State University*, *344 Richardson Hall*, *Corvallis*, *OR 97331*; *sara.galbraith@oregonstate.edu*; JAMES W. RIVERS, *Oregon State University*; *jim.rivers@oregonstate.edu*; JAMES H. CANE, *USDA-ARS*; *jim.cane@usda.ars.gov*.

Wildfire is a large-scale disturbance present among many ecosystems. In mixed-conifer forests of western North America, fire can foster biodiversity. Native bees, which are critical pollinators of crops and wild plants, are thought to respond positively to wildfires on a community level, but their demographic response is poorly understood. We investigated the influence of wildfire severity on reproductive success of the Blue Orchard Bee (*Osmia lignaria*) in the Douglas Complex, a 19,425 ha area of forest that burned in 2013 in southwestern Oregon. We predicted that more severely burned stands would support provisioning of more bee offspring and a female-biased sex ratio due to the abundant bloom expected after high severity wildfire. We placed nesting blocks in stands across the fire severity continuum, and seeded each block with 30 male and 20 female Blue Orchard Bee cocoons. We surveyed stands for relevant habitat characteristics (canopy cover, flowering plant density, and daytime temperature), and monitored the blocks for bees' foraging activity and nest completion. At the end of the season, we X-rayed the contents of each nest to quantify the number and sex ratio of cocoons. We found that females' output of progeny was high across the continuum of fire severity, but differing proportions of female offspring suggest differences in resource availability among stands. Our findings provide new insights on how wildfire influences pollinator populations in forest ecosystems.

FIRE, FRAGMENTATION, AND THE FARMBILL: UNIQUE DEVELOPMENTS AND CHALLENGES IN THE RECOVERY OF COLUMBIA BASIN PYGMY RABBITS. JONATHAN A. GALLIE*, *Washington Department of Fish and Wildlife*, *1550 Alder St. NW*, *Ephrata*, *WA 98823*; *jon.gallie@dfw.wa.gov*

Since 2011, WDFW has collaborated with multiple partners in an intensive reintroduction and recovery effort for the federally endangered Columbia Basin Pygmy Rabbit (*Brachylagus idahoensis*). This effort navigates complex landscape challenges where 50% of the native habitat was converted to dry-land farming or the Conservation Reserve Program (CRP), and the remnant patches being highly fragmented and further degraded by noxious weeds and wildfire. Despite these challenges, we have seen some success in re-establishing one wild population and are in the process of establishing a second one, both in areas historically occupied. However, the results have been completely counterintuitive. Using data from burrow census efforts conducted in winter months (2012 to 2017), we have found higher post-release survival in recovery areas where the native shrubsteppe habitat is more fragmented, higher burrow establishment in CRP than native shrubsteppe habitat, and higher wild reproduction in CRP and fragmented habitat than native shrubsteppe. These habitat use patterns are unique within Pygmy Rabbit research and in contrast with most other shrubsteppe obligate recovery work. Among the contributing factors to these results are higher occurrence of wildfires in less fragmented landscapes and the inherent site differences where CRP is located, being former crop fields they presumably have better soil characteristics, which as a burrow obligate, would be beneficial for Pygmy Rabbits. These results are encouraging in that they demonstrate a higher degree of adaptability than previously thought for an endangered shrubsteppe obligate, where fire, fragmentation, and farmbill programs define the landscape.

EVALUATING BAT GUANO AT SUMMER ROOST SITES AS AN ALTERNATIVE SAMPLING STRATEGY FOR SURVEILLANCE OF *PSEUDOGYMNOASCUS DESTRUCTANS*. KYLE G. GEORGE*, *U.S. Geological Survey National Wildlife Health Center*, *6006 Schroeder Rd.*, *Madison*, *WI 53711*; *kgeorge@usgs.gov*; ANNE BALLMANN, *U.S. Geological Survey National Wildlife Health Center*; *aballmann@usgs.gov*; ELIZABETH BOHUSKI, *U.S. Geological Survey National Wildlife Health Center*; *ebohuski@usgs.gov*; CHRIS ANDERSON, *Washington Department of Fish and Wildlife*; *christopher.anderson@dfw.wa.gov*; ABIGAIL TOBIN, *Washington Department of Fish and Wildlife*; *abigail.tobin@dfw.wa.gov*; JENNIFER YU, *Tufts University-Cumming School of Veterinary Medicine*; *jennhyu@gmail.com*.

Surveillance strategies for detection of *Pseudogymnoascus destructans* (Pd), the causative fungus of white-nose syndrome, consist primarily of collecting skin swabs from bats during hibernation. However, hibernacula are not always accessible, and locations where susceptible species overwinter are not always known. Alternative strategies for early detection of Pd are warranted. Pooled guano was collected from underneath bat roosts in Wisconsin (n = 3) and Washington (n = 1) at 7- and 28-day intervals between May and August 2017. Real-time PCR indicated the presence of Pd DNA in pooled guano at all roost locations for nearly every time point sampled throughout the summer with 28-day collection intervals demonstrating more reliable Pd detectability during mid-summer. Skin swabs and guano from individual Little Brown Bats (*Myotis lucifugus*) captured at the 3 Wisconsin roosts were also positive for Pd as long as 15 weeks post-hibernation, and overall Pd prevalence remained between 10% to 38% into early August. One source of Pd exposure in Wisconsin during the summer appeared to be the bat boxes which tested positive for Pd presence as did 24% of juvenile bats. As expected, all sample types (pooled guano, skin swabs, and guano from individual bats) showed a trend of increasing Ct values as the summer progressed, indicating decreased amounts of detectable Pd

DNA. Cultures to assess the viability of Pd at summer roosts are underway. Recommendations for the use of bat guano as a sampling strategy for Pd surveillance when primary strategies are not feasible will be discussed.

FERAL AND FREE-RANGING CAT MANAGEMENT ON STATE CONSERVATION LANDS: AN ASSOCIATION OF FISH AND WILDLIFE AGENCIES WORKING GROUP INITIATIVE. COLIN M. GILLIN*, *Oregon Dept. of Fish and Wildlife*, *7118 NE Vandenburg Ave.*, *Corvallis*, *OR 97330*; *colin.m.gillin@state.or.us*; SARA SCHWEITZER, *North Carolina Wildlife Resources Commission*; *sara.schweitzer@ncwildlife.org*; JUDITH SCARL, *Association of Fish and Wildlife Agencies*; *jscarl@fishwildlife.org*.

In March 2016, an Association of Fish and Wildlife Agencies (AFWA) interdisciplinary Working Group advanced the issue that feral and free-ranging Cats (*Felis catus*) pose health and significant predation impacts to native wildlife. This issue is supported by the 1997 AFWA Resolution on Feral Cats and other professional wildlife associations. The actions for the Work Group include:(1) evaluating current national regulatory language on restrictions on release, feeding, and/or maintaining feral and free-ranging Cats on state lands managed for native wildlife conservation purposes; (2) identifying existing regulations for domestic animals that may encompass feral and free-ranging Cats; (3) proposing actions and alternatives for state agencies lacking regulations to control the unlawful release, and/or feeding of feral and free-ranging Cats. Regulatory information has been collected from all 50 states and Washington DC, and this group is currently implementing a survey to identify the scope of the issue on a state basis and ask questions to acquire a better understanding from states concerning their experiences related to feral and free-ranging Cats. This effort will provide examples of successful methods state agencies are using to remove feral and free-ranging Cats from conservation lands and help understand what potential strategies might be most effective when addressing feral and free-ranging Cat issues. The working group will develop proactive best management practices on state lands managed for native wildlife and their habitats and a comprehensive bibliography of supportive materials.

FINDING REGIONAL LEVERAGE FOR WILDLIFE AGENCY IMPROVEMENT: A PANEL & AUDIENCE DISCUSSION. JOHN GOODELL*, *ORTWS*, *jfiskegoodell@gmail.com*; HARRIET ALLEN, *Northwest Section Representative, TWS*; PENNY BECKER, *Wildlife Diversity Division Manager*, *Washington Department of Fish and Wildlife*; RUTH MUSGRAVE, *Conservation and Climate Adaptation Coordinator*, *National Caucus of Environmental Legislators*; DON MOORE, *representing Pacific Northwest Zoos & Aquariums*; BOB REES, *Association of Northwest Steelheaders*.

This is the 6th and final presentation/discussion in the session titled:Facing the Sixth Extinction Crisis: Finding Broader Relevancy and Greater Funding for Fish and Wildlife Conservation. This discussion will focus on 2 important questions: 1) How can wildlife professionals in Oregon and Washington work together to strengthen their individual state efforts to increase agency relevancy and funding? And 2) How can a larger, engaged public audience be developed in Oregon, Washington and nationally to advocate for increased state and federal spending to conserve the full diversity of wildlife species and ecosystems?

THE EFFECTS OF MIXED-SEVERITY WILDFIRES ON FISHER POPULATION DYNAMICS. DAVID GREEN*, *Oregon State University*, *Institute for Natural Resources/INR*, *Portland*, *OR 97207*; *greendav@oregonstate.edu*; SEAN MATTHEWS, *Oregon State University*; *sean.matthews@oregonstate.edu*; LAURA FINLEY, *United States Fish and Wildlife Service*; *Laura_Finley@fws.gov*; ROGER POWELL, *North Carolina State University*; *rpowell@ncsu.edu*.

The combination of many years of fire suppression and global climate change is predicted to increase the frequency and intensity of wildfires in certain parts of the world, especially in the western United States. Large-scale wildfires have the capacity to reduce, fragment, or permanently change habitat, and are a major source of conservation and management concern for forest obligate carnivores. Here we used data collected from a long-term monitoring program to investigate the effects of a naturally-occurring mixed-severity wildfire on a population of Fishers (*Pekania pennanti*) in northern California and southern Oregon. Using genetic data collected with hair snares, we applied spatial capture-recapture models to estimate Fisher density the year before the fires, the year of the fires, and the 2 years immediately following the fires. This population of Fishers showed no decline in numbers the year of the fires, but declined by 35 % in the years following the fire. Fisher numbers declined the most in areas of more than 50 % change in canopy. Our findings help identify how a species of conservation concern are affected by landscape level ecological disturbances, and can also help to inform fire management decisions in the western United States for forest obligate species.

ZOOLOGICAL RESPONSE TO CLIMATE CHANGE IN THE PACIFIC ARCTIC WATERS OF ALASKA – PART 1. ARCTIC CLIMATE - THE OLD NORMAL; AND PART 2. CLIMATE CHANGE IN ARTIC - THE NEW NORMAL. GREGORY A. GREEN*, *Owl Ridge Natural Resource Consultants*, *Inc.*; *22116 45th Ave. SE Bothell*, *WA 98021*; *www.owlridgenrc.com*.

Increased global temperatures due to climate change have resulted in warmer waters transported to the Arctic marine waters of Alaska causing a dramatic loss in summer sea ice. As a result, there has been a shift in the Pacific Arctic food web from a benthic-dominated marine ecosystem, tied to annual primary production of sea ice algae and phytoplankton, to a pelagic zooplankton-dominated ecosystem with increased Krill (Euphausiacea) production. It is expected that marine wildlife species more dependent on ice-inhabiting Arctic Cod (*Arctogadus glacialis*) or benthic resources will decline as warming trends continue, and wildlife species more dependent on zooplankton will benefit. Further, subarctic planktivores are beginning to invade the Arctic in numbers as Krill populations increase. Marine wildlife responses to date to this climate shift are discussed.

PRE- AND POST-CONSTRUCTION MONITORING. MICHAEL GREEN*, *Migratory Birds and Habitat Program*, *USFWS, Pacific Region*; *Michael_green@fws.gov*

The value of pre- and post-construction monitoring at renewable energy facilities is often debated. In this talk I will review the Service's usual and evolving recommendations at wind and solar facilities, discuss what uses are being made of these data, and touch on related monitoring issues.

OREGON FOREST PEST DETECTORS: AN ARMY IN OREGON'S DEFENSE AGAINST INVASIVE

FOREST PESTS. AMY GROTTA*, *Oregon State University Extension Service*, *505 N. Columbia River Hwy*, *St. Helens*, *OR 97051*; *amy.grotta@oregonstate.edu*; BRANDY SAFFELL, *Oregon State University Extension Service*; *brandy.saffell@oregonstate.edu*; WYATT WILLIAMS, *Oregon Department of Forestry*; *wyatt.williams@oregon.gov*.

The Oregon Forest Pest Detector (OFPD) program trains professionals and volunteers from the natural resources and green industry sectors to recognize and report potential introductions of exotic forest insect pests. To date, OFPD has focused on four pests that threaten Oregon's forest ecosystems: emerald ash borer (Agrilus planipennis), Asian Longhorned Beetle (*Anoplophora glapbripennis*), Asian Gypsy Moth (*Lymantria dispar asiatica*), and Goldspotted Oak Borer (*Agrilus auroguttatus*). OFPD's goal is to increase the chances of successful early detection and rapid response to these high-priority pests that have killed millions of trees and caused billions of dollars in damage in other states. Launched in 2015, the OFPD training is offered in a hybrid format. A self-paced online course covers an overview of forest invasives in Oregon; insect life-cycles and signs and symptoms; and reporting mechanisms. A subsequent field workshop gives participants hands-on practice at recognizing pest infestations by challenging them to identify "infested" host trees with pseudo signs and symptoms. To date we have trained over 400 participants, including arborists, parks & natural areas managers, landscape contractors, Master Gardeners, and urban foresters. Particularly in the case of Emerald Ash Borer (EAB, *Agrilus planipennis*) bird watchers represent an audience of interest because of the phenomenon of woodpecker foraging as an early indicator of EAB presence.

STATUS OF THE STRIPED WHIPSNAKE (*MASTICOPHIS TAENIATUS*) IN WASHINGTON. LISA ANN HALLOCK*, *Washington Department of Fish and Wildlife*, *PO Box 43141*, *Olympia, WA 98504-3200*; *Lisa.Hallock@dfw.wa.gov*.

The Striped Whipsnake (*Masticophis taeniatus*) reaches the northern extent of its geographic range in Washington State. Seventeen occurrences have been documented since the first observation in the state was reported in 1941. Concern about its status was triggered when no observations were made during large scale herpetological inventories in Washington in the 1990s. In 2004, a population was found and the first Washington study was initiated. This study produced important information about the local population and a more efficient inventory method that involved searching for shed skins at specific times of the year. In 2006 and 2007, historical sites were surveyed using this method. Only one additional occupied site was found that was about 7 km from the other occupied site. In 2015, a genetic study was initiated using 184 shed skins and 2 road mortality specimens collected from 2006-2015 at the two Washington sites. The study objectives included determining the genetic isolation of these populations in relation to their nearest neighbors in Oregon and Idaho and determining recent genetic bottlenecks and current gene flow. Preliminary results will be presented. The two extant Washington populations are threatened primarily by agriculture conversion, vehicular traffic and vegetation changes, especially those caused by Cheatgrass (*Bromus tectorum*). Conservation efforts are underway and inventory efforts are expanding. Additionally, Washington Department of Fish and Wildlife is determining if additional protections are needed.

DETERMINING EFFECTIVE DISTANCE RADIUS OF PASSIVE ACOUSTIC TECHNOLOGY FOR NORTHERN SPOTTED OWL (STRIX OCCIDENTALIS) SURVEYS. MATTHEW HANE*, *Weyerhaeuser*,

785 North 42nd St., *Springfield*, *OR 97478*; *matt.hane@weyerhaeuser.com*; JAMIE THORNTON, *Weyerhaeuser*; *jamie.thornton@weyerhaeuser.com*.

Passive acoustic technologies have emerged as a potential solution to some logistical and experimental challenges of bird surveys. However, there has been very little work quantifying the relationship between distance and detection probability for a calling bird recorded on these devices. We examined effects of site specific, temporal and environmental variables on the effective detection limits at two locations that are part of a broader study of Spotted Owl (*Strix occidentalis*) acoustic dynamics. Both sites had a single Wildlife Acoustics Song Meter SM2+ device with both microphones attached to 100m cables. We experimentally broadcast Spotted Owl four-note location calls 10 times on multiple sampling occasions from 19 calling points surrounding each site. We used automated detection software to identify location calls recorded at varying distances from the microphones to estimate detection probabilities. We modeled detection first as a binary function (yes if Spotted Owls were detected at least once), and secondly based on the proportion of calls correctly identified. With this approach, we estimated the probability of detection based on distance from each microphone and environmental covariates. Understanding the advantages and limitations of passive acoustic technologies will increase our confidence in using them to supplement traditional Spotted Owl surveys.

USING SATELLITE-TAG LOCATIONS AND ACOUSTIC DETECTION DATA TO INFORM CRITICAL HABITAT REVISION FOR ENDANGERED SOUTHERN RESIDENT KILLER WHALES. M. BRADLEY HANSON*, *Northwest Fisheries Science Center*, *2725 Montlake Blvd. East*, *Seattle*, *WA 98112*; *brad.hanson@noaa.gov*; CANDICE EMMONS, MICHAEL FORD, MEREDITH EVERETT, KIM PARSONS, JENNIFER HEMPELMANN, DONALD VAN DOORNIK, GREGORY SCHORR, JEFF JACOBSEN, MARK SEARS, JOHN SNEVA, ROBIN BAIRD, LYNNE BARRE.

Accurately determining species occurrence is essential to inform management actions, and such is the case with the revision of Critical Habitat for ESA-listed southern resident Killer Whales (*Orcinus orca*, SRKW). Remotely deployed telemetry tags were used to assess the movements and occurrence of these whales in the winter, and passive acoustic recorders were used to assess their seasonal occurrence in these areas. Tagged SRKWs were observed to remain in continental shelf waters from central Vancouver Island to northern California. K and L pods occurred primarily along the Washington coast with the highest use area mainly between Grays Harbor and the Columbia River. J pod's primary high use areas were in northern Georgia Strait and the western Strait of Juan de Fuca. Detections from autonomous passive acoustic recorders documented at least some use of Washington coastal waters in all seasons. Informing the Essential Features component of the Critical Habitat revision process required determination of diet and where their prey are being taken. Past diet studies in their summer range in the inland waters of Washington and southern British Columbia found that they specialize on fish, almost exclusively salmon, and in particular Chinook Salmon (*Oncorhynchus tshawytscha*). Predation event and fecal samples were collected by following the whales during the fall, winter, and spring. Identification of species and, for Chinook stock, were obtained from the prey samples and a quantitative analysis of proportional diet composition from prey DNA in the feces. Both types of samples showed that Chinook continued to be an important prey item although their diet was more diverse in these seasons and areas. In Puget Sound in the fall, Chum (*O. keta*) and Coho (*O. kisutch*) salmon played important roles in the diet. On the coast in the winter and

spring Steelhead (*O. mykiss*), Lingcod (*Opiodon elongates*), and Halibut (*Hippoglossus stenolepis*) made notable contributions to the diet. The majority of Chinook taken in the winter in coastal waters originated from the Columbia River, Central Valley, and Puget Sound. These new data on the fall, winter, and spring occurrence and diet of SRKW will sufficiently inform the Critical Habitat revision process.

TOP-DOWN TROPHIC EFFECTS OF BIRDS ON ARTHROPODS AND PLANTS MEDIATED BY FOREST MANAGEMENT INTENSITY. SCOTT H. HARRIS*, *Oregon State University, 24128 Cardwell Hill Dr, Philomath, OR 97370; scott.harris@oregonstate.edu*; MATTHEW BETTS, *Oregon State University*; *matt.betts@oregonstate.edu*; URS KORMANN, *Oregon State University*; *urs.kormann@oregonstate.edu;* THOMAS STOKELY, *Oregon State University*; *thomas.stokely@oregonstate.edu*; JAKE VERSCHUYL, *NCASI*; *jverschuyl@NCASI.org*.

Our study addresses how herbicide use in forest management influences tri-trophic cascades. Our 4-year dataset, consisting of 156,000 arthropods representing 107 families, was collected as part of the Intensive Forest Management (IFM) experiment in the Oregon Coast Range. Treatments included applying 3 levels of herbicide and a no-herbicide control at the stand scale, as well as excluding birds from 225 m^2 plots. Using a generalized linear mixed-model approach, we tested how the experimental treatments affected arthropods and plants. Trophic theory predicts that birds should exert a positive and indirect top-down influence on plant growth by mediating the abundance of herbivorous arthropods. However, recent studies have shown that additional mechanisms such as intraguild predation and mutualisms mediate the strength of this cascade. Preliminary results show that 1) birds do exert a top-down control on arthropods, but not on the growth of Douglas-fir (*Pseudotsuga menziesii*), and 2) that herbicides do not affect the abundance of arthropods. Additional analyses will explore underlying mechanisms to explain these trends. The results of this study will allow forest managers to better understand the biodiversity implications of intensive forest management, and the potential ecosystem services that birds can provide in plantation forests.

EXPLORING HABITAT CONTROLS ON THE NORTHERN RED-LEGGED FROG: IMPLICATIONS FOR CONSERVATION ON URBANIZING LANDSCAPES IN THE PACIFIC NORTHWEST. MARC P. HAYES*, *Washington Department of Fish and Wildlife*, *2636 59th Avenue NW*, *Olympia*, *WA 98502*; *Marc.Hayes@dfw.wa.gov*; LAUREN GRAND, *College of Forestry*, *Oregon State University*; KRISTIINA VOGT, *School of Environmental and Forest Sciences*, *University of Washington*; DANIEL VOGT, *School of Environmental and Forest Sciences*, *University of Washington*; PAUL YARNOLD, *Optimal Data Analysis LLC*; CHRISOPHER ANDERSON, *Washington Department of Fish and Wildlife*; KLAUS RICHTER, *King County Department of Natural Resources (retired)*; ELISSA OSTERGAARD, *King County Department of Natural Resources*; JO WILHELM, *King County Department of Natural Resources*.

Research addressing lentic-breeding amphibian population vulnerability has emphasized aquatic habitats, often neglecting terrestrial habitats. Consequently, wetland protection and restoration frequently fails to preserve or restore adjacent uplands lentic-breeding amphibians require. Inattention to the juxtaposition and connectivity of uplands to wetlands could locally extirpate lentic-breeding amphibians. Our objective was to identify the relative importance of juxtaposed terrestrial and aquatic habitats in a lentic-breeding amphibian, the Northern Red-

legged Frog (*Rana aurora*), by evaluating the relationship between its occurrence and abundance with its aquatic and terrestrial habitats. We used egg mass counts to quantify *R. aurora* populations in 30 stillwater habitats across an urbanization gradient, and GIS to measure seven descriptors of aquatic and surrounding terrestrial habitats to evaluate their relationships to *R. aurora* occurrence and abundance. *Rana aurora* occurrence and breeding abundance both strongly reflect the forested area around wetland breeding sites and forest connectivity to those sites. *Rana aurora* breeding abundance also strongly reflects the percent of forested perimeter around wetland breeding sites. Forest habitat most important for *R. aurora* breeding abundance seems to be >200 m from the breeding wetlands. The American Bullfrog (*Lithobates catesbeianus*) presence and the two aquatic parameters measured, wetland area and vegetated area, were unrelated to *R. aurora* occurrence and breeding abundance. Area and connectivity of juxtaposed forested terrestrial habitat may represent a basic control on *R. aurora* presence and population size. Urban development policies should consider preservation and restoration of upland forest habitats beyond current fixed-width buffers and wetland habitat area at landscape scales.

PILOT ERADICATION ATTEMPT OF RANAVIRUS-CARRYING AFRICAN CLAWED FROGS IN WESTERN WASHINGTON STATE. MARC P. HAYES*, *Washington Department of Fish and Wildlife*, *Habitat Program, Science Division*, *PO Box 43200*, *Olympia*, *WA 98504*; Marc.Hayes@dfw.wa.gov; KATHERINE HAMAN, *Washington Department of Fish and Wildlife*, *Wildlife Program*, *Science Division, PO Box 43200*, *Olympia*, *WA 98504*; ALLEN PLEUS, JESSE SCHULTZ and RICHARD VISSER II, *Washington Department of Fish and Wildlife*, *Fish Program*, *Fish Management Division*, *Aquatic Invasive Species Section*, *PO Box 43200*, *Olympia*, *WA 98504*; JACKSON GROSS, *University of California at Davis*, *Department of Animal Science*, *2117 Meyer Hall*, *1 Shields Ave.*, *Davis*, *CA 95616*; JULIE TYSON AND KEITH DOUVILLE, *Washington Department of Fish and Wildlife, Habitat Program*, *Science Division*, *PO Box 43200*, *Olympia*, *WA 98504*; JUSTIN BUSH, *Washington Invasive Species Council*, *Washington Recreation and Conservation Office*, *1111 Washington St. SE*, *Olympia*, *WA 98501.*

African Clawed Frogs (*Xenopus laevis*; ACF) have emerged globally as an invasive and pathogen-vector problem. The alarming discovery of ACF in stormwater ponds in Lacey, Washington in July 2015 led to evaluating the local threat. Evaluation revealed these frogs carried a potentially high-risk ranavirus. Ponds were ringed with silt fences to limit frog movement, and removal trapping and euthanasia began in August 2015 while plans for a pilot treatment effort were developed. After considering eradication options, we evaluated the effectiveness of salt (NaCl) to eradicate ACF. Laboratory experiments determined that 16 ppt NaCl (0.55 Osmol) was lethal to post-metamorphic ACFs within 24 hours. Trapping of the solitary pond prior to pilot application removed 3,009 ACF and 1,323 other exotics (1,123 Goldfish [*Carassius auratus*] and 200 American Bullfrogs [*Rana catesbeiana*]) and 18 individuals of 3 native amphibian species. Due to risks ranaviruses pose, all animals trapped were MS-222 euthanized and frozen for later evaluation and safe disposal. The WSDA labeled NaCl for treatment, WDOE provided the permit to discharge it in July 2017, and application occurred on 10 and 22 August 2017. Treatment enabled capturing 10,445 individuals of 4 exotic species (9,671 Goldfish, 513 ACF, 3 American Bullfrogs, 1 Black Crappie [*Pomoxis nigromaculatus*]) and 258 individuals of 2 native amphibian species, 257 of which were Roughskin Newts (*Taricha granulosa*). Subsequent pilot pond trapping failed to discover

additional ACF until one adult male was recorded on 3 November 2017. Implications of this trapping and complications of the pilot treatment will be discussed.

UNDERSTANDING AND ADDRESSING DOMESTIC AND INTERNATIONAL IMPACTS TO BATS. CRIS HEIN*, *Bat Conservation International*; *chein@batcon.org*.

The perception of bats is shifting in a positive direction and more people recognize their intrinsic, ecological, and economic value. Yet, bats face unprecedented challenges around the world, such as persecution, disease, toxins, wind turbine-caused fatality, climate change, and habitat loss or alteration. Understanding how to resolve these issues is challenging because bats are notoriously difficult to study; they are small, nocturnal, volant, and emit sounds above our hearing range. However, advances in technology offer new insights into the biology and behavior of these animals and provide opportunities to develop solutions to these issues. Examples include 1) securing miniaturized GPS transmitters to track long-distance movement patterns, 2) recording bat behavior at wind turbines using thermal video cameras to help improve impact reduction strategies, and 3) testing potential remedies in laboratory and field settings to inhibit the fungus causing White-nose Syndrome. Addressing these complex challenges requires collaboration at local, regional, and global scales. Here, I will present an overview of the impacts to bat and the technology used for research. I will use the interactions between bats and wind turbines as an example of how regional strategies can address global challenges.

OREGON'S SEARCH FOR ALTERNATIVE FUNDING FOR FISH, WILDLIFE AND RELATED OUTDOOR RECREATION AND EDUCATION – TASK FORCE RECOMMENDATIONS AND LEGISLATIVE EFFORTS. KEN HELM*, *Oregon State Representative, House District 34*; *Rep.KenHelm@oregonlegislature.gov*.

This is the second paper in the session: Finding Broader Relevancy and Greater Funding for Fish and Wildlife Conservation. The Oregon Department of Fish and Wildlife and the Washington Department of Fish and Wildlife will provide a brief overview of their budgets. The overview will include an orientation of major fund sources and how the restrictions on the use of those funds influence agency activities. The presenters will discuss recent trends in funding and how that may affect the future of the departments. The presentation will lay the groundwork for further discussion about why new funding is needed to support future conservation initiatives.

MOTIVATIONS, BENEFITS, AND SOCIAL VALUES OF BIG GAME HUNTING IN NORTHEAST OREGON. MATTHEW HELMER*, *U.S. Forest Service*, *400 N. 34th Street*, *Seattle*, *WA 98103*; *mhelmer@fs.fed.us*; MARY ROWLAND, *U.S. Forest Service*; *mrowland@fs.fed.us*; LEE CERVENY, *U.S. Forest Service*; *lcerveny@fs.fed.us*; DALE BLAHNA, *U.S. Forest Service*; *dblahna@fs.fed.us*; MICHAEL WISDOM, *U.S. Forest Service*; *mwisdom@fs.fed.us*; DARREN CLARK, *Oregon Department of Fish and Wildlife*; *darren.a.clark@state.or.us*.

Big game hunting is a cornerstone of outdoor recreation and plays a key role in wildlife conservation and management, yet hunting has declined in many locales as rural populations have moved to urban areas and adopted alternative leisure activities. In 2017, the Oregon Department of Fish and Wildlife conducted a survey of 75 hunters participating in controlled elk and deer hunts at the Starkey Experimental Forest and Range in northeast Oregon. The survey

was designed to gain information about big game hunting motivations, perceived human-ecosystem benefits, preferences of hunters regarding road and off-highway vehicle access, and satisfaction from the Starkey hunts as well as hunting overall. Results indicate that Starkey hunters were primarily motivated by the general opportunity to harvest an animal, followed by the overall experience of the hunt. The opportunity to harvest a trophy animal ranked lowest among these three choices. Feeling connected to wildlife and the outdoors, escaping everyday stresses, and spending time with friends and family ranked highest among the benefits ascribed to big game hunting. Views toward road access and OHV use on public lands varied considerably across hunter types. This survey forms part of a multi-year research effort to better understand the goals and demographics of today's hunter, and to aid in the general management of controlled big game hunts in Oregon. This research will contribute to a more sustainable relationship among hunters, wildlife, and land conservation and inform access management on public lands.

TOOLS FOR ASSESSMENT AND PROTECTION OF WILDLIFE HABITAT CORRIDORS WITHIN AN URBANIZING ENVIRONMENT - DEVELOPED FOR DUVALL, WASHINGTON. CHRISTINA L. HERSUM*, *Environmental Science Associates*, *5309 Shilshole Ave. NW*, *Seattle*, *WA 98107*; *chersum@esassoc.com*; AARON BOOY, *Environmental Science Associates*; *abooy@esassoc.com*.

The City of Duvall has experienced significant population growth over the last 20 years. Growth pressures will likely lead to rapid change in the years ahead. Development has affected wildlife habitat and riparian corridors, degraded streams, and reduced connectivity to surrounding rural landscapes within Duvall. As future development occurs, new tools for assessment and management of wildlife habitat corridors are needed to preserve and enhance critical habitats and connections. All Washington State communities are required to protect critical habitats, including wetlands and streams, through adoption of critical areas regulations. However, too frequently these protections result in habitat patches surrounded by development and infrastructure. Over the last year, ESA partnered with Duvall to develop innovative tools for wildlife corridor assessment and management applicable to Pacific Northwest species. Newly developed regulations established a network of wildlife habitat corridor management zones across the city and surrounding areas. Corridor zones are 213 m wide, connecting habitat areas along tributary streams with critical areas, open spaces, parks, and forested uplands. For future development within these zones, we developed an assessment tool to score development sites on a combination of site- and corridor-scale parameters using a series of questions. Answers to questions regarding extent of habitat(s), interspersion of habitat types, canopy cover, and distance to roads, among other site characteristics result in a score that determines expectations for habitat corridor protection and restoration actions. The tool considers zoning designations and development scale, and provides a suite of management measures that maintain flexibility for property owners and developers.

FLUKEBOOK: COLLABORATIVE CETACEAN MONITORING WITH A DASH OF A.I. JASON HOLMBERG*, *Wildbook*, *Wild Me*, *Portland OR*; *jason@wildme.org*.

As a result of their large spatial and temporal ranges, cetacean research can significantly benefit from collaboration between diverse stakeholders - researchers, governments, the public, and others. If properly structured and designed, these broader collaborations can increase data

collection and support analyses of greater depth and breadth, but they also come with challenges around data management, standards enforcement, scalability, and efficiency. Flukebook (flukebook.org) is the first web platform that engages both the research, technology, and citizen science aspects of cetacean conservation. Based on the Wildbook open source platform (wildbook.org), it provides researchers with the detailed scientific tools needed for analysis and transboundary collaboration without sacrificing interactivity or approachability for citizen scientists wanting to engage in the project. Researchers have access to data management tools; photo-matching algorithms and a global catalog of individuals; and connectivity to common analytical tools for mark-recapture; genetic, and socio-ecological studies. At the research level, data sharing is accomplished on a peer-approval basis which leads to growing inclusiveness. For citizens scientists, Flukebook enables participants to receive automatic profile updates on individuals they have sighted, encouraging repeat participation and engagement in conservation initiatives in those regions. Importantly, the platform blends multiple forms of A.I. to scale data management and curation in the face of significantly increased data collection through collaboration and citizen science. We present Flukebook's development journey and the exciting path ahead as intelligent agents work in tandem with people to study cetaceans.

EFFECTS OF VESSELS AND NOISE ON KILLER WHALES. MARLA M. HOLT*, *Marine Mammal & Seabird Ecology Team*, *Conservation Biology Division, NMFS Northwest Fisheries Science Center*, *2725 Montlake Blvd. East*, *Seattle*, *WA 98112*; *marla.holt@noaa.gov.*

Prey availability and disturbance from vessels and noise are identified threats to the recovery of endangered Southern Resident Killer Whales (Orcinus orca). Vessels and noise can mask echolocation signals used to capture fish prey and/or disrupt foraging behavior with implications for energy acquisition. In the U.S., vessel regulations have been implemented since 2011 to protect killer whales from vessel disturbance, particularly given the extent of whale-watching activities in the Salish Sea. We utilized suction cup-attached digital acoustic recording tags (DTAGs), consisting of hydrophones and movement sensors, to measure received noise levels, understanding Killer Whale use of sound, and determine effects of vessels and noise on subsurface behavior. During the 29 tag deployments on individually identified Killer Whales, we collected detailed geo-referenced vessel data concurrently as conditions allowed, along with opportunistic observations of predation to validate feeding. Received noise levels (dB re 1 (Pa)) were significantly different across years but not consistently lower after the implementation of vessel regulations. Of the vessel factors considered, both vessel count and speed, but not distance, explained differences in noise levels, which may reflect changes in whale-watching vessel practices after regulations implementation. Additionally, the analysis of data from these animal-borne tags allow us to better understand subsurface foraging behavior involving the use of sound, to quantify foraging rates at an individual level, and to understand detailed vessel and noise effects. The results, along with those of other related studies, inform conservation and management measures that aim to promote Southern Resident recovery.

HABITAT ENHANCEMENT AND MONITORING FOR POLLINATORS, OLYMPIC NATIONAL FOREST. KAREN K. HOLTROP*, *U.S. Forest Service*, *PO Box 280/295142 Hwy 101*, *Quilcene*, *WA 98376*; *kholtrop@fs.fed.us*; CHERYL BARTLETT, *U.S. Forest Service*; *cbartlett02@fs.fed.us*; DAVID HAYS, *Washington Department of Fish and Wildlife*; *David.Hays@dfw.wa.gov*.

We carried out vegetation treatments annually 2012 to 2017 to enhance habitat for pollinators, including the endangered Taylor's Checkerspot Butterfly (*Euphydryas editha taylori*), in the Dungeness watershed, Olympic National Forest. Treatments included cutting encroaching woody vegetation, girdling conifers, and piling woody debris in existing small openings. Monitoring included Taylor's checkerspot pre-diapause larvae and adult butterfly surveys. We have found 39 plants with pre-diapause larvae (about 12 per ha) in the vegetation treatment areas. Adult Taylor's Checkerspots, as well as other butterflies, hummingbirds and bumblebees have been detected in the areas. More recently we initiated revegetation with species utilized by pollinators. Seed increase fields were established by Center for Natural Lands Management for Harsh Paintbrush (*Castilleja hispida*), Sea Blush (*Plectritis congesta*), Blue-Eyed Mary (*Collinsia parviflora*), Oregon Sunshine (*Eriophyllum lanatum*) and Spring Gold (*Lomatium utriculatum*). In fall 2016 the first available Sea Blush and Blue-Eyed Mary seed was applied in habitat areas, and germination appeared very successful the following spring. In 2017 we initiated harsh paintbrush and spring gold 2 x 2 meter seed monitoring plots to be inspected in 2018. In addition, we have seed increase fields of several additional pollinator-friendly forb species established, with the intent of integrating pollinator habitat enhancement into a variety of projects across the Olympic National Forest.

WHAT ARE YOU DOING TO PROMOTE DIVERSITY? JESSICA A. HOMYACK*, *Weyerhaeuser*, *505 North Pearl St.*, *Centralia*, *WA 98531*; *jessica.homyack@weyerhaeuser.com*.

Implicit bias, micro-aggressions, primary diversity – what do all these terms mean and how and why should you promote a diverse workforce in your organization? Here, I will provide information about The Ethnic and Gender Diversity Working Group's role in increasing diversity of underrepresented people in natural resources and the resources available for you to set in motion a positive path forward.

POST-FIRE RECOVERY AND SPATIAL POPULATION DYNAMICS OF TAILED FROGS. BLAKE HOSSACK*, *U.S. Geological Survey*, *790 E. Beckwith Ave.*, *Missoula*, *MT 59801*; *blake_hossack@usgs.gov*; KEN HONEYCUTT, *U.S. Geological Survey*; *rhoneycutt@usgs.gov*.

During the last two decades, a wide range of responses by amphibian populations to wildfire has been documented. Most of these responses have been documented only during the first few years after fire, and for species that are negatively affected by wildfire, we still know little about the temporal or spatial components of population recovery. I will review documented responses of amphibians to wildfire in the Northwest, including a recent case study focused on post-fire recovery of Rocky Mountain Tailed Frogs (*Ascaphus montanus*).

MUCORMYCOSIS: AN EMERGING DISEASE IN CETACEANS OF THE SALISH SEA. JESSICA L HUGGINS*, *Cascadia Research Collective*, *218 1/2 W 4th Ave.*, *Olympia*, *WA 98501*; *jhuggins@cascadiaresearch.org*; DYANNA LAMBOURN, *Washington Department of Fish and Wildlife*, *Marine Mammal Investigations*; *dyanna.lambourn@dfw.wa.gov*; STEPHEN RAVERTY, *Animal Health Center*; *stephen.raverty@gov.bc.ca*; BRAD HANSON, *Northwest Marine Fisheries Service; brad.hanson@noaa.gov*; LINDA RHODES, *Northwest Marine Fisheries Service*; *linda.rhodes@noaa.gov*; STEPHANIE NORMAN, *Marine-Med: Marine Research*, *Epidemiology and Veterinary Medicine*; s*tephanie@marine-med.com*; JOSEPH GAYDOS, *SeaDoc Society*, *UC*

Davis Wildlife Health Center; *jkgaydos@ucdavis.edu*; JENNIFER OLSON, *The Whale Museum*; *Jennifer@whalemuseum.org*; MICHAEL GARNER, *Northwest Zoopath*; *zoopath1@gmail.com*.

Infections caused by fungi of the order Mucorales have been reported in a variety of marine mammal species. In cetaceans, mucormycosis (zygomycosis) is rare but has been documented in captive animals and occasional isolated infections in the wild. In the Salish Sea, which includes inland waters of Washington State and southwestern waters of British Columbia, fatal fungal infections in cetaceans have been infrequent, but when detected have been largely caused by *Cryptococcus gattii*. In 2012, the first case of mucormycosis in the region was documented in a dead stranded harbor porpoise (Phocoena phocoena) in Washington State. Since then, mucormycosis has been confirmed as the cause of mortality in five other harbor porpoises and a Southern Resident Killer Whale (SRKW) (*Orcinus orca*), and suspected in two additional harbor porpoises. The fungi have been detected histologically in several tissues including brain, lung, spleen, pancreas, kidney, lymph nodes and skin. The species involved are still under investigation; however, *Lichtheimia corymbifera* and *Rhizomucor pusillus* were identified via PCR in two porpoises. In humans, mucormycosis mainly affects immunocompromised individuals. Underlying conditions were found in several affected cetaceans such as recent pregnancy/loss of fetus, emaciation, and protozoal infection, suggesting mucormycosis may target immunocompromised marine mammals. The emergence of these fungi as a source of mortality in the Salish Sea is of particular concern for the endangered SRKWs that spend part of their lives in this region. Current SRKW population-level stressors, including insufficient prey, high levels of contaminants, and noise pollution, could predispose them to mucormycetes infections.

GOLDEN EAGLES NESTING IN OREGON, 2011–2016. FRANK B. ISAACS*, *Oregon Eagle Foundation*, *Inc.*, *24178 Cardwell Hill Dr.*, *Philomath*, *OR 97370*; *fbisaacs@peak.org*.

Golden Eagle (*Aquila chrysaetos*) nest locations reported for Oregon through 2010 were grouped into 743 historical potential nesting areas (HPNAs). Through 2016, 676 HPNAs (91%, n = 743) were surveyed and 552 (82%, n = 676) were confirmed as Golden Eagle nesting areas (NAs). Four-hundred-three additional NAs were discovered during 2011 to 2016, resulting in 955 NAs listed for the state. Mean annual nesting results were 59% occupied (range 55–63), 59% successful (range 45–71), 0.82 young per occupied nesting area with known outcome (range 0.63–1.04), and 1.39 young per successful nesting attempt (range 1.35–1.46). Mean estimated minimum statewide (MEMS) nesting population was 496 nesting pairs (range 394–574), and MEMS production was 409 eaglets per year (range 302–481). Occupation rate, based on a NA being occupied at least 1 year, increased from 40% when surveyed 1 year (n = 102) to 92% when surveyed for 6 consecutive years (n = 256). Fifty-one percent of nests (n = 2,522) were on Bureau of Land Management land, 32% on private property, 9% on National Forests, 3% on U.S. Fish and Wildlife Service land, and 5% divided among 5 other agencies. Nests (n = 931) were built on cliffs (76%), in trees (22%), and on electricity pylons (2%). Egg-laying and initiation of incubation began during the week of 29 January to 4 February, peaked during 26 February to 3 March and ended the week of 1 to7 April (n = 478 estimated nesting chronologies). Continued inventory, expanded survey of likely habitat, and additional monitoring are recommended.

VALIDATING AMERICAN MARTEN MODELED HABITAT USING MAXENT. PATRICIA L. JOHNSON*, *USFS, 1010 Y Ave., La Grande, OR 97850; trilyn4new@yahoo.com.*

The American Marten (*Martes americana*) (hereafter marten), are vulnerable to predation and prefer structurally complex mature forests with a high density of large-diameter trees and snags and with enough downed wood material to provide habitat for prey species, protection from predators, and secure runways, dens, or subnivean spaces during winter. Forest management effects on martens may include fragmentation, habitat destruction from logging, thinning and prescribed burns, loss of down wood, loss of hollow logs, loss of shrubs on forest floors, low density of snags, decrease in canopy closure, and loss of potential rest and denning sites. Marten habitat proxy modeling done previously for the Wallowa-Whitman National Forest was used to compare with verified marten location data, baited stations without marten data, and historic marten location data from collared martens using the maximum entropy (MaxEnt) least biased estimates. Implications of MaxEnt findings may be used to inform managers during conservation and management activities in preferred marten habitat.

CIRCUIT THEORY-BASED CONNECTIVITY MODELING IN THE PACIFIC NORTHWEST: FROM GREATER SAGE-GROUSE TO REGIONAL ECOLOGICAL FLOW. AARON JONES*, *The Nature Conservancy – Oregon, Portland, OR 97214*; KEN POPPER, *The Nature Conservancy – Oregon, Portland, OR 97214*; MICHAEL SCHINDEL, *The Nature Conservancy – Oregon, Portland, OR 97214*; BRAD MCRAE, *The Nature Conservancy – North America Region, Fort Collins, CO 80523.*

Preserving and increasing connectivity is imperative for the long-term persistence of many species' metapopulations and the facilitation of climate-driven range shifts across multiple taxa. Widely-used in conservation planning, tools developed under the Circuitscape Project adapt algorithms from electrical circuit theory to predict terrestrial species movements and other ecological flows through diverse landscape mosaics. First, we demonstrate the use of Circuitscape software in the characterization of areas in southeastern Oregon important as linkages for Greater Sage-grouse (*Centrocercus urophasianus*) movement between core areas and leks. After defining these linkage zones using least-cost corridor modeling, we identify (1) areas where Sage-grouse movement may be most constricted and which may warrant greater habitat protection priority, and (2) areas which may function as barriers in fragmenting structural connectivity and which may represent important habitat restoration opportunities. Second, we describe a regional modeling project – part of a larger study of climate change resilience across the Pacific Northwest – in which the Circuitscape algorithm was modified (as "Omniscape") to use a circular moving window to produce a continuous, "omnidirectional" view of landscape connectivity. Whereas Circuitscape is particularly well-suited for predicting species-level movement within a patch-corridor-matrix framework, Omniscape is more appropriate for modeling of multiple taxa or ecological processes by which (1) no *a priori* designation of discrete source and destination patches is required, (2) "source strengths" can be scaled at the resolution of landscape mosaic data, and (3) wall-to-wall results are desired.

ZUMWALT PRESERVE NON-LEAD AMMUNITION PROJECT. JUSTIN F. JONES*, *The Nature Conservancy, 906 S. River St., Enterprise, OR 97828; jjones@TNC.org*; CHAD DOTSON, *The Nature Conservancy; chad.dotson@tnc.org.*

The Oregon Department of Fish and Wildlife (ODFW), Oregon Zoo, The Nature Conservancy (TNC), and Oregon Hunters Association (OHA) support education and incentive programs aimed at encouraging hunters to use non-lead ammunition. TNC provided access on the Zumwalt Prairie Preserve during the 2016 hunting season to 250 cow Elk (*Cervus canadensis*) hunters resulting in an estimated harvest of 101 Elk. Of those hunters, 45% used non-lead ammunition for their hunt, a 16% increase from the year before. In 2017, TNC will offer access via a drawing to 380 cow elk rifle hunters, and anticipates approximately 250 hunters will hunt on the Zumwalt Prairie Preserve. As part of the access program for 2017, TNC, Oregon Zoo, ODFW and OHA will continue a cooperative project to implement voluntary incentives to encourage Elk hunters on TNC's Zumwalt Prairie Preserve to use non-lead ammunition. The voluntary incentives will be based on successful programs that have been implemented in Arizona. Lessons learned from this project will help inform ODFW and partners on the feasibility of implementing this program on a larger scale in other portions of the state. The partners involved in this project hope that our results will be used to support a continued education and incentive effort that encourages hunters to use non-lead ammunition and will further the conservation of raptors and other scavenging native wildlife in Oregon.

WASHINGTON STATE WILDLIFE LEADERS FORUM: STAKEHOLDER RECOMMENDATIONS FOR WILDLIFE AGENCY IMPROVEMENT. FRED KOONTZ*; *fwkoontz@gmail.com*.

This is the third presentation in the session: Facing the Sixth Extinction Crisis: Finding Broader Relevancy and Greater Funding for Fish and Wildlife Conservation. The Washington Wildlife Leaders Forum, held November 16-17, 2016 brought together 50 invitees representing environmental, wildlife and recreation groups, public agencies, tribes and the Governor's office to discuss improving state wildlife conservation. Forum members agreed there were 4 priorities: raising public awareness of the importance of conserving wildlife and habitat; funding wildlife programs more fully; building a much broader wildlife coalition of stakeholders; and addressing the limited trust observed toward the Department of Fish and Wildlife. It was agreed that raising public appreciation for wildlife, including state legislators and civic leaders, requires better connecting biodiversity conservation to preserving our high quality of life in Washington. This prerequisite trust building, communications effort and coalition building is necessary to gain the political support needed to allocate greater funds toward conserving "all species for all constituents."

STAND-LEVEL TRADEOFFS BETWEEN TIMBER PRODUCTION, BIODIVERSITY AND ECOSYSTEM FUNCTIONS IN THE OREGON COAST RANGE. Urs Kormann*****, Thomas Stokely, AJ Kroll, Jake Verschuyl, Scott Harris, Doug Mainwaring, Jim Rivers, Matthew Betts.

Global demand for wood resources is expected to increase by up to 40% over the next 15 years. Intensive forest management (IFM) targets competing vegetation with herbicides, aiming to increase crop tree growth. However, this reduction in vegetation complexity may negatively impact stand-level biodiversity and associated ecosystem services (tradeoffs). Here, we report results of the first replicated, large-scale experiment to examine stand-level tradeoffs between timber production, biodiversity and ecosystem functions across a gradient in IFM intensity (herbicide application) in the Oregon Coast Range. IFM induced community shifts, decreases in

species richness and abundance in some taxa, but effects were weaker than expected. Further, although pollinator species richness decreased with herbicide intensity and timber production, fruit set of potted phytometer plants (Northern Highbush Blueberries) was largely resilient to IFM intensity. In parallel, the most common and agriculturally important pollinators were equally often observed across the entire herbicide gradient. Overall, weak stand-level tradeoffs between timber production, biodiversity and ecosystem functions in the Oregon Coast Range seem to exist, but variation is high across herbicide treatments, and tradeoffs appear to dampen over time.

EARLY SERAL FOREST ALTERNATIVES IN THE PACIFIC NORTHWEST. ANDREW J. KROLL*, *Weyerhaeuser*, *785 N 72nd St.*, *Springfield*, *OR 97477*; *aj.kroll@weyerhaeuser.com*.

The debate about the quantity, quality, and spatial and temporal allocations of early seral forest in the Pacific Northwest is one aspect of a pernicious problem: how to plan for production and conservation of natural resources in a fractured ownership environment while engaging with conflicting public demands. Forested landscapes in the Pacific Northwest have changed dramatically since 1991 (Judge Dwyer's rulings on Northern Spotted Owl [*Strix occidentalis caurina*] lawsuits) in response to evolving legal, societal, economic, and natural forces. Significant factors include management intensification on private lands as Federal agencies focus on forest conservation; globalization of economic markets; rising consumption of wood products; urbanization; and altered frequency, severity and size of fires. The scientific infrastructure, which had previously provided robust support to forest policy decisions, has been overwhelmed, in part due to reduced funding but also because of the complex dynamics of the underlying problem and institutional barriers that pose a challenge to effective collaboration. Results from the Intensive Forest Management (IFM) project provide an enormous amount of high-quality technical information but address only one component of the larger problem. I discuss emerging concerns about early seral ecosystems with reference to IFM results. Finally, I propose how wildlife professionals might advance solutions for forest planning to benefit wildlife populations and meet societal demands.

ENTANGLEMENTS OF LARGE WHALES ALONG THE U.S. WEST COAST. DANIEL D. LAWSON*, *NOAA Fisheries West Coast Region*, *501 West Ocean Blvd Suite 4200*, *Long Beach*, *CA 90802*; *Dan.Lawson@noaa.gov*.

The Federal authority charged with the management and conservation of marine species protected by the Endangered Species and Marine Mammal Protection Act, NOAA Fisheries has been collecting reports and documentation of entangled whales and other marine species along the U.S. west coast and nationally since the early 1980s. In recent years there has been a dramatic increase in the reporting of entangled whales along the U.S. west coast, prompting significant concern by numerous interested stakeholders that include the fishing industry and fishery managers, scientists, non-governmental organizations, and the public at large. This has generated serious discussion about what may be contributing to these recent results and how U.S. west coast fisheries can respond to this issue. This presentation as part of the special marine mammal session will outline key information about what is known about whale entanglements on the U.S. west coast, as well as highlight key questions that remain unresolved and warrant

ongoing investigation. The presentation will also discuss some relevant current initiatives to address this issue on the coast and promising avenues for future consideration.

REINTRODUCING FISHERS TO THEIR HISTORICAL RANGE IN WASHINGTON: PROGRESS IN THE SOUTHERN CASCADES. JEFF LEWIS*, *Washington Department of Fish and Wildlife*, *1111 Washington St. SE*, *Olympia*, *WA 98501*; *Jeffrey.Lewis@dfw.wa.gov*; TARA CHESTNUT, *Mount Rainier National Park*; *Tara_chestnut@nps.gov*; JASON RANSOM, *North Cascades National Park; Jason_i_Ransom@nps.gov;* DAVE WERNTZ, *Conservation Northwest*; *dwerntz@conservationnw.org*.

Fishers (Pekania pennanti) once occupied the dense coniferous forests of western Washington, but disappeared from the state by the mid-1900s as a result of over-trapping, incidental mortality, and habitat loss. Our multi-agency team is tasked with reestablishing self-sustaining Fisher populations in three large areas of the Fisher's historical range in western Washington: the Olympic Peninsula, southern Cascades Range, and northern Cascades Range. Progress toward Fisher recovery includes a 2008 to 2010 reintroduction of 90 Fishers to Olympic National Park and an ongoing reintroduction of Fishers to the southern Cascades. Since December of 2015, we have released 69 Fishers (38F, 31M; each has a radio-transmitter) at two locations within the southern Cascades: 53 (30F, 23M) in Gifford Pinchot National Forest and 16 (8F, 8M) in Mount Rainier National Park; 23 were released in Year 1 (fall/winter 2015-16) and 46 in Year 2 (fall/winter 2016-17). To measure initial success, we are monitoring Fisher movements, survival, home range establishment, and reproduction. For Fishers released in year 1, we observed relatively short-distance movements from release sites, high survival rates (0.77), >60% home rangeestablishment by females, and no reproduction. We will present preliminary results from our monitoring efforts for years 1 and 2 of the project and new information on Fisher reproduction in the southern Cascades. Lastly, we will share information on anticipated year-3 efforts in the southern Washington Cascades as well as anticipated long-term monitoring efforts of reintroduction success and our planning efforts for a future Fisher reintroduction in the North Cascades.

RENEWABLE ENERGY AND WILDLIFE: A PATH FORWARD IN UNCERTAIN TIMES. ERIN LIEBERMA*, *Environmental & Wildlife Permitting*, *Invenergy*, *One South Wacker Dr.*, *Suite 1800*, *Chicago*, *IL 60606*; *elieberman@invenergyllc.com*.

The Trump Administration walked away from the Paris Climate Agreement, and is looking to unwind President Obama's Clean Power Plan. In this time of uncertainty, will the renewable energy industry succeed? This presentation will explore the opportunities and challenges—whether they be political, financial, or regulatory—influencing the future of renewable energy development across the US. As the industry navigates the uncertainties, critical to the success of the industry will be ensuring environmentally responsible development and operations; time will be spent discussing approaches, lessons learned, and pathways to collaboration.

POPULATION STATUS AND VIABILITY ANALYSIS OF PACIFIC MARTENS IN COASTAL OREGON. MARK A. LINNELL*, *Pacific Northwest Research Station, 3200 Jefferson Way, Corvallis, OR 97331; marcolinnell@yahoo.com*; KATIE MORIARTY, *USFS Pacific Northwest Research Station*;

kmoriarty02@fs.fed.us; DAVID GREEN, *Oregon State University*; *greendav@oregonstate.edu*; TAAL LEVI, *Oregon State University*; *Taal.Levi@oregonstate.edu*.

Pacific Martens (*Martes caurina humboldtensis*) in near-coast forests of Oregon and northern California are rare and geographically isolated to 3 potential sub-populations, prompting a petition for listing under the U.S. Endangered Species Act. Yet no estimates of population size, density, and viability of remnant sub-populations are available for evaluating conservation status. We used GPS telemetry, artificial marks, remote cameras, and spatial mark-resight to estimate home range sizes, density, and population size of martens within the current extent of the central coast Oregon population in the Oregon Dunes National Recreation Area. We then used population viability analysis to estimate viability over a 40-year period assuming differing levels of human-caused mortalities (e.g. roadkills, trapping). Marten density was estimated as 1.02 per 1 km2 (95% credible interval: 0.92, 1.16), the highest in North America. We estimated 63 adult martens (95% credible interval: 58, 73) across 2 subpopulations separated by a 500 m wide river mouth (Umpqua River). Extinction risk of a subpopulation of 30 martens ranged from 34% to 100% with 2 or more annual human-caused mortalities over a 40-year period. Even a few annual mortalities (1 –2) increased risk of local extirpation. Absent an increase in population extent, limiting human-caused mortalities is likely to have the greatest conservation impact.

USING THE ENDANGERED SPECIES ACT TO PROTECT RARE AMPHIBIANS AND REPTILES IN THE NORTHWEST. JENNY LODA*, *Center for Biological Diversity*, *1212 Broadway*, *Suite 800*, *Oakland*, *CA 94612*; *jloda@biologicaldiversity.org*.

The Center for Biological Diversity works to secure a future for all species, great and small, especially those hovering on the brink of extinction. By petitioning the U.S. Fish and Wildlife Service to provide Endangered Species Act (ESA) protection for imperiled amphibians and reptiles - and following up with lawsuits when necessary - the Center is working to obtain federal safeguards and protected habitat for herps in the Northwest and across the country. The Center works to insure compliance with the ESA for species that are already listed under the ESA and uses advocacy at the local, state, and federal levels in its campaign to address the amphibian and reptile extinction crisis. In this presentation, I will discuss the Center's work to protect frogs, salamanders and turtles in the Northwest. These efforts include filing the largest-ever ESA petition focused on amphibians and reptiles, securing habitat protections and recovery plans for listed species, filing petitions to gain state-level protections for amphibians in California, and litigating to insure public agencies are fulfilling their duties under the ESA.

A VERTEBRATE BIOLOGIST'S FORAY INTO THE SPINELESS WORLD: WESTERN BUMBLE BEE SURVEYS IN NE WASHINGTON STATE. CHRIS LOGGERS*, *Retired U.S. Forest Service*, *Colville NF*, *405 East 1st Ave.*, *Colville*, *WA 99114*; *ckeloggers@gmail.com.*

Western Bumble Bees (*Bombus occidentalis*) were the most widespread bumble bee in western North America but have severely declined. The cause is unknown, but several factors probably contribute. As a wildlife biologist, I was trained to think about the ways of vertebrates. In this talk I will describe surveys for Western Bumble Bees in northeastern Washington, present the findings, and discuss some of the challenges of surveying for insects.

DEVELOPMENT AND TESTING OF A NOVEL CAMERA-TRAPPING PROTOCOL FOR LONG-DURATION, OVER-WINTER SURVEYS OF CARNIVORES. ROBERT A. LONG*, *Woodland Park Zoo*, *5500 Phinney Ave. N*, *Seattle*, *WA 98103*; *robert.long@zoo.org*; PAULA MACKAY, *Independent Researcher*; *paulamackay2@gmail.com*; CATHY RALEY, *USDA Forest Service Pacific NW Research Station*; *craley@fs.fed.us*; KEITH AUBRY, *USDA Forest Service Pacific NW Research Station*; *kaubry@fs.fed.us*.

We developed a remote camera and scent lure protocol for surveying Wolverines (*Gulo gulo*) and other low-density and elusive carnivores that enables the deployment of scented survey stations for many months to over a year in locations with deep and varying snow accumulation, and with no revisits by researchers. The method relies on a novel camera deployment protocol paired with a newly-developed, ultra-low power scent lure dispenser. We successfully tested the protocol in Washington's North Cascades range over two winters from 2015-2017.

RENEWABLE ENERGY DEVELOPMENT: AN OVERVIEW OF PROJECTED LEVELS OF DEVELOPMENT AT REGIONAL, NATIONAL, AND GLOBAL SCALES AND HOW WILDLIFE CONCERNS ARE ADDRESSED IN THE DEVELOPMENT PROCESS. TODD J. MABEE.

Global climate change is a growing challenge for wildlife and their habitat throughout the world. The rapid increase in renewable energy development in the Pacific Northwest, the U.S., North America, and the world may begin to counter some of the risks that wildlife face from global climate change but renewable energy development also creates new concerns and challenges for wildlife. How much energy will we need in the future and where will it come from? Will our energy needs continue to grow in parallel with population and/or economic growth? What wildlife studies are conducted during the development process? How does wildlife fare with the current level of development and how might this change with future projected levels of development? This presentation will provide an overview of renewable energy development focused on the Pacific Northwest, the U.S., and North America, but will also describe this development in the context of the global renewable energy industry. An accompanying high-level review of wildlife study protocols from these regions will also be provided.

LOGGING IMPACTS ON HEADWATER AMPHIBIAN COMMUNITIES PERSIST IN REDWOOD NATIONAL AND STATE PARKS 60 YEARS POST LOGGING. ALYSSA MARQUEZ*, *Humboldt State University*, *3544 1/2 Dows Prairie Rd.*, *McKinleyville*, *CA 95519*; *amm1700@humboldt.edu*; DANIEL BARTON, *Humboldt State University*; *Daniel.Barton@humboldt.edu*.

The timescale of community response to disturbance varies drastically, and slow-recovering ecosystems such as coastal redwood forests may take hundreds of years to return to old-growth conditions post logging. Few studies have quantified long-term (>50 years) impacts of disturbance on ecosystems, specifically aquatic ecosystems. We provide evidence of the persistence of historical logging impacts 60 years post-logging through the comparison of headwater amphibian populations (occupancy and abundance) and stream characteristics using a control-treatment study with a logged watershed, Streelow Creek, as the treatment and a pristine old-growth watershed, Godwood Creek, as the control. The immediately adjacent old-growth watershed acts as a reference site because it is strikingly similar to the logged watershed

including geology, orientation, topography, and forest species composition, differing only in logging history. Thus, these results provide restoration efforts with a clear target which is often lacking in restoration designs. We surveyed for the 3 obligate headwater amphibians in this system, which are often used as indicators for watershed quality: the Coastal Tailed Frog (*Ascaphus truei*), Coastal Giant Salamander (*Dicamptodon tenebrosus*), and Southern Torrent Salamander (*Rhyacotriton variegatus*). These data will provide baseline information for a Redwood National and State Parks project aimed at ultimately restoring the logged-watershed where natural recovery has been prevented due to a combination of highly-erodible geology, low-gradient streams, and excess woody-debris from logging slash disrupt fluvial processes.

IS CLIMATE CHANGE RESPONSIBLE FOR THE SHIFT IN GIANT PANDA BREEDING SEASONS? MEGHAN MARTIN-WINTLE, *PDXWildlife*, *9233 SW Brier Pl.*, *Portland*, *OR 97219*; *meg@pdxwildlife.com*; NATHAN WINTLE, *PDXWildlife*; *nate@pdxwildlife.com*.

There is growing evidence that climate change has altered the distribution, reproduction and life history patterns of plants and animals. Specialist species that rely on one food source may be particularly susceptible to changes in phenology associated with increased temperatures. The relative importance of these relationships can be hard to uncouple in the wild, and, thus, studying captive endangered species with ad libitum food sources can help determine the specific effect from climate change. We collected climate and reproductive behavioral data on captive giant pandas in Sichuan, China over a seven year period to evaluate the effect of temperature on various breeding and cubbing season parameters. We found evidence that increased temperatures are causing shifts in the breeding season that: 1) alter the duration of the breeding season, 2) extend the first breeding date, and 3) change the mean peak breeding date. We discuss the implications for wild pandas in both timing of estrus, sperm production, mate searching behaviors, and potential asynchrony between offspring needs and bamboo biomass which all may be disrupted as giant panda reproductive phenology alters in response to global temperature rises.

GAINING VALUABLE INSIGHTS OVER THE HORIZON AT SEA. BRUCE MATE*, *Marine Mammal Institute*, *Fisheries and Wildlife*, *Oregon State University*, *Hatfield Marine Science Center*, *Newport*, *OR 97365*; *bruce.mate@oregonstate.edu*

The development of satellite-monitored radio tags for large whales has resulted in enormous changes and several surprises in our understanding the "how, where, when, and why" endangered whales migrate, forage, and reproduce throughout the world. This presentation will provide an update on some of the latest findings for North Pacific Gray (*Eschrichtius robustus*), Blue (*Balaenoptera musculus*) and Fin whales (*B. physalus*).

EARLY DEVELOPMENT AND REPRODUCTIVE DEN CHARACTERISTICS OF A SECONDARY-CAVITY-OBLIGATE MUSTELID. SEAN M. MATTHEWS*, *Oregon State University*, *Institute for Natural Resources, Oregon State University*, *Corvallis*, *OR 97331*; *sean.matthews@oregonstate.edu*; DAVID GREEN, *Oregon State University*; *greendav@oregonstate.edu*; MARK HIGLEY, *Hoopa Tribal Forestry*; *mhigley@hoopa-nsn.gov*; KERRY RENNIE, *Hoopa Tribal Forestry; 19kerry73@gmail.com;* CAYLEN CUMMINS, *USDA Forest Service Pacific Northwest Research Station*; *caylen.cummins@gmail.com*; REBECCA GREEN, *USDA Forest Service Pacific Northwest Research Station*; *regreen@ucdavis.edu*.

Maternal effects during neonate development can mediate the influence of adverse environmental conditions on the fitness of offspring. Previous research has suggested cavities and burrows used for reproduction by cavity-obligate species offer thermoregulatory benefits, access to prey, and can limit predation pressure. Fishers (*Pekania pennanti*) are secondary-cavity-obligate breeders we hypothesized to select particular characteristics of den cavities at discrete stages of offspring development to mediate adverse biotic and environmental effects on their neonates. We located 406 reproductive dens and 154 cavity rest sites used by 65 individual adult female Fishers over 11 reproductive seasons (2005 to 2016) in northwestern California. We counted 53 (27F, 26M) kits in 31 litters born to 19 females during 6 den seasons. The weight of kits varied significantly by sex and by age, whereas the length of kits varied only by age, suggesting that adult females were preferentially investing in male kits in this population. We found that natal and early-maternal dens buffered minimum temperatures significantly more than late-maternal dens and cavities used during the non-reproductive season. A male Fisher skull was also less likely to fit through the cavity openings of natal dens than through the openings of cavities used by adult females during the non-reproductive season. Litter survival was significantly lower at natal dens than at late-maternal dens. The age of adult female Fishers did not affect the probability of litter survival. Our results emphasize the vulnerability of vertebrate offspring during early-developmental periods, and how cavity-obligate species select cavities to mediate environmental conditions during reproduction.

NEZ PERCE TRIBE CALIFORNIA CONDOR PROJECT. DAVID MOEN*, *Nez Perce Tribe Wildlife Division*, *3510 10th street*, *Lewiston*, *ID 83501*; *dmoen@nezperce.org*; ANGELA SONDENAA, *NPT Wildlife Division*; *angelas@nezperce.org*.

Tribes in the Pacific Northwest are proven leaders in many modern conservation efforts. We have been instrumental in fighting for salmon recovery in the Columbia basin, protecting bighorn sheep in Idaho, providing refuge for marbled murrelets in the coast range, and returning gray wolves to the entire region. California Condors (*Gymnogyps californianus*) are a missing member of Pacific Northwest ecosystems. Currently, the Yurok and the Nez Perce Tribes are working in partnership with the Oregon Zoo, and others, to bring condors back to Oregon -- something we haven't seen in 100 years. It is this shared vision of restoring our common ecology to contribute to a more diverse and resilient world that makes partnerships between local tribes, concerned citizens, and regional organizations such a natural development. Diverse partnerships working toward a common conservation goal are especially needed now that a growing human population together with global climate disruption threatens to, quite literally, consume the biological riches of our planet. In this presentation, We will discuss the Tribe's latest efforts to return condors to the Hells Canyon Eco-region, with particular emphasis on:1.) historical presence of condors in the Pacific Northwest; 2.) habitat evaluation and the implications of climate change for condor recovery and 3.) lead poisoning in scavenging raptors and how the use of non-lead ammunition makes hunting a vital conservation tool.

A STRATEGIC APPROACH AT EVALUATING THE "DON'T PACK A PEST!" CAMPAIGN WITH A FOCUS ON INTERNATIONAL STUDENT TRAVELERS. NOELLE A. MOEN*, *Oregon Sea Grant and Oregon State University*, *1600 SW Western Blvd.*, *Corvallis*, *OR 97333*; *moenn@oregonstate.edu*; SAM CHAN, *Oregon Sea Grant and Oregon State University*; TANIA SIEMENS, *Oregon Sea Grant and Oregon State University*; KAYLA MARTIN, *Oregon Sea Grant and Oregon State University*; DULGUUN BAASANSUREN, *Oregon Sea Grant and Oregon State University*; CLINT BURFITT, *Oregon Department of Agriculture*; HELMUTH ROGG, *Oregon Department of Agriculture*; NICOLE BROOKS, *U.S. Customs and Border Protection*; CHRIS DEEGAN, *USDA-APHIS*; MARK HITCHCOX, *USDA-APHIS*.

"Don't Pack a Pest!"(DPAP) campaign was launched by U.S. Department of Agriculture and U.S. Customs and Border Protection (CPB) to educate travelers about the risks associated with carrying prohibited agricultural products in passenger luggage. We conducted an Institutional Review Board survey reaching 700 international students from Oregon universities and colleges with high international student enrollment. A highly-educated group of international students (>50% graduate students) completed the survey. Most students were from China, India, Saudi Arabia, Iran and Japan and survey participation aligned with current international student enrollment trends. Students were asked about their traveling and packing behaviors, their understanding of current prohibited agricultural product policies, and how to improve the campaign. We found that 83% of participants had not heard of the DPAP campaign. On average, 23% of a student's luggage is filled with food from their country. Students reasons for bringing in prohibited items ranged from not being able to find it in the U.S., cultural causes, and medicinal reasons. 32% of survey takers that have had products confiscated chose the CPB website to check for prohibited product information. We found from these results critical points

of intervention and how best to deliver information to international students. Using these results, we created new outreach materials with our partners and are being tested on their effectiveness.

MULTI-REGION, MULTI-SCALE, MESCOCARNIVORE MONITORING - DEVELOPING A SCIENTIFICALLY DEFENSIBLE BROAD-SCALE MONITORING FRAMEWORK. KATIE M. MORIARTY*, *USDA Forest Service*, *Pacific Northwest Research Station*, *3625 93rd Ave. SW*, *Olympia*, *WA 98512*; *ktmoriarty22@gmail.com*; JODY TUCKER,*USDA Forest Service*, *Pacific Southwest Region*; *jtucker@fs.fed.us*; JESSIE GOLDING,*USDA Forest Service*, *Rocky Mountain Research Station*; *jgolding@fs.fed.us*; MICHAEL SCHWARTZ, *USDA Forest Service*, *Rocky Mountain Research Station*; *mkschwartz@fs.fed.us*; KEVIN MCKELVEY, *USDA Forest Service*, *Rocky Mountain Research Station*; *kmckelvey@fs.fed.us*.

Over the past decade, there have been many local and regional monitoring efforts for rare carnivores. Yet, these species persist in populations or meta-populations which extend to scales well beyond individual management units (e.g., project area, hunting district, National Forest, state). Although local efforts provide valuable information about presence of individuals, such efforts incorporated within a biologically-driven and statistically-robust monitoring plan would allow increased capacity to understand population trends. Prior technology restricted efficient large-scale monitoring of mesocarnivores, as is can be incredibly difficult to detect such species that often persist at low densities and that move extensively within large home ranges. We will describe the development a collaborative, multi-partner effort to create a comprehensive, scientifically defensible, broad scale, multi-species mesocarnivore monitoring plan. Our vision is based on flexible survey methods, executed purposely at multiple scales, with a state-space occupancy modeling framework which can describe the status and trend of rare carnivores across states and regions. Our plan will provide managers with broader-scale context in order to make better informed conservation strategies and decisions, help fulfill legal requirements (e.g., the Forest Service's 2012 Planning Rule), and help ensure the persistence of these rare species by providing predictive spatially-explicit information to alert biologists to species-level trends.

NEW EXOTIC PESTS OF PACIFIC NORTHWEST FORESTS. TODD MURRAY*, *Washington State University Extension*, *Hulbert Hall*, *Room 411*, *Pullman*, *WA 99164*; *tmurray@wsu.edu*; JUSTIN BUSH, *Washington Invasive Species Council*; *justin.bush@rco.wa.gov*.

In a time of world trade and global movement of people and products, hitchhiking pests are becoming more and more common. There is an estimated 32% risk that a wood-boring insect more damaging than the Emerald Ash Borer (*Agrilus planipennis*) will be introduced into the U.S. in the next 10 years. Washington is ranked the fourth-highest risk for exotic pest introductions nationally. As a result, newly introduced insect pests have been introduced that threaten Pacific Northwest forest and forest understory ecosystems. Some pests such as the Spotted Wing Drosophila (*Drosophila suzukii*) and Brown Marmorated Stink Bug (*Halyomorpha halys*) are now widely researched and known in agriculture systems but impacts to ecosystems are only beginning to be realized. For example, in 2013 the Spotted Wing Drosophila was found in culturally significant *Vaccinium* species in high elevations in the Gifford Pinchot National Forest. Other pests such as the Red Lily Leaf Beetle (*Lilioceris lilii*) and Viburnum Leaf Beetle (*Pyrrhalta viburni*) are little known about while impacts to the ecosystem are also likely substantial. Developing awareness and skills to recognize newly introduced pests will aid

conservationists to target and prioritize management strategies. The Washington State Invasive Species Council is a collaboration of agencies, institutes and stakeholders that is increasing awareness of key invasive species issues across the region.

IDENTIFICATION AND CHARACTERIZATION OF SNP MARKERS FOR THE COLUMBIA BASIN PYGMY RABBIT (*BRACHYLAGUS IDAHOENSIS*). STACEY A. NERKOWSKI*, *Department of Fish and Wildlife Sciences*, *University of Idaho*, *875 Perimeter Dr.*, *MS 1136*, *Moscow*, *ID 83844*; *staceyn@uidaho.edu*; PAUL HOHENLOHE, *Department of Biological Sciences*, *University of Idaho*; *hohenlohe@uidaho.edu*; KENNETH WARHEIT, *Washington Department of Fish and Wildlife*, *Olympia*, *WA*; *kenneth.warheit@dfw.wa.gov*; LISETTE WAITS, *Department of Fish and Wildlife Sciences*, *University of Idaho*; *lwaits@uidaho.edu*.

Pygmy Rabbits (*Brachylagus idahoensis*) are the smallest rabbits in North America and are unique among rabbits due to their ability to consume sagebrush. Loss and fragmentation of habitat due to agricultural conversion has led to the near extirpation of the disjunct Pygmy Rabbit population in the Columbia Basin (CB), Washington (WA) State. In 2001, the CB Pygmy Rabbit was listed as a distinct population segment under the U.S. Endangered Species Act. Sixteen CB rabbits were taken from the last remaining population in Sagebrush Flats (SBF), WA to start a captive breeding program, and 111 rabbits from other states were added (2011) for numbers and genetic diversity needed to establish a wild population. Rabbits were moved to semi-wild breeding enclosures at SBF in 2001, and since 2012 ~1947 mixed ancestry rabbits have been released into the wild. Currently, 19 nuclear DNA microsatellite loci are used to examine genetic diversity and estimate CB ancestry in captive and wild populations. To provide insight into genomic diversity and ancestry, we used a single digest restriction site associated DNA sequencing (RADseq) protocol on 114 Pygmy Rabbit samples from source populations to generate the first genome-wide set of single nucleotide polymorphism (SNP) markers. SNPs were aligned to the European Rabbit (*Oryctolagus cuniculus*) genome with an average of 62% alignment. Diagnostic SNPs were identified for regional populations. These markers will allow us to assess ancestry, test for adaptive variation, and genetically monitor captive and wild populations of CB Pygmy Rabbits to guide strategies for conservation and management.

A GLIMPSE UNDER THE SNOW: NEW TECHNIQUES TO OSERVE SMALL MAMMAL SUBNIVEAN BEHAVIOR. KENDALL NORCOTT*, *University of Montana*, *1815 E. Lison Ln Missoula MT 59802; kendall.norcott@mso.umt.edu.*

Temperatures in the Intermountain West often reach well below freezing in the winter. Habitats that are normally warm and dry are covered in snow for the duration of these months. While some species hibernate, most small mammals in this region are active year round, and are well adapted to the harsh conditions. Through the winter they remain active in tunnels under the snow in a region between the ground and ice known as the subnivean space. Remnants of the tunnels and cavities they create areobservable only when the snow melts. Recently, with advances in camera technology, researchers been able to begin to study the movement and behavior of subnivean dwelling small mammals when snow is present. At MPG Ranch in Florence, MT we have developed new camera techniques that allow us to monitor small mammal

behavior in the subnivean zone. In this presentation I will discuss our progress developing this tool, its applications, as well as show some results from our first year deploying cameras.

HABITAT USE AND PERFORMANCE OF OREGON SPOTTED FROG (*RANA PRETIOSA*) LARVAE AT PONDS AND EMERGENT WETLANDS OF THE SAMISH RIVER PRESERVE, WHATCOM COUNTY, WASHINGTON, AND RESPONSE TO A HABITAT ENHANCEMENT PROJECT. STEPHEN NYMAN*, *Whatcom County Amphibian Monitoring Program*, *1058 West Smith Road, Bellingham*, *Washington 98226*; *stephen@whatfrogs.org*.

The threatened Oregon Spotted Frog (OSF) (*Rana pretiosa*) occurs at five separate sites at the Samish River Preserve. The primary focus of my research is relating OSF larval habitat use and performance to conditions at each of these sites, which are two permanent ponds and three emergent wetlands. Methods included periodic non-lethal sampling of larvae in 2014, 2016, and 2017; and electronic water level and water temperature monitoring in 2016 and 2017. OSF larvae grew and developed more rapidly at the ponds, which also exhibited warmer water conditions than the wetlands; however, few larvae were found at the ponds in 2016 and 2017. In 2016 at Southeast Meadow, the wetland where 49 percent of all egg masses were recorded in that year, the number of larvae was alarmingly low, a result associated with premature drying of habitat dominated by dense Reed Canarygrass (*Phalaris arundinacea*). After the 2016 season, we implemented habitat enhancements at Southeast Meadow focused on improving conditions for larvae, with measures to facilitate dispersal, and removal of a section of Reed Canarygrass to expose a new, more persistent pool. In 2017, OSF larvae at Southeast Meadow grew and developed more rapidly and occurred in greater numbers. The new pool also held water while other areas dried, providing habitat after metamorphosis. Based on these encouraging results, we have created a second pool. I suggest that future habitat projects for OSF should include provisions for larval habitat, and that planning be informed by ample baseline data collection and post-project monitoring.

ECTOTHERMOCLINES: REPTILE CLIMATE SENSITIVITY FROM A RARITY- AND TRAITS-BASED ANALYSIS EXAMINING INTRINSIC RISK TO CLIMATE CHANGE. DEANNA H. OLSON*, *U.S. Forest Service*, *Pacific Northwest Research Station*, *3200 SW Jefferson Way*, *Corvallis*, *OR 97331*; *dedeolson@fs.fed.us*; MERYL MIMS, *Virginia Tech*; *mims@vt.edu*; DAVID PILLIOD, *USGS; dpilliod@usgs.gov*; JASON DUNHAM, *USGS*; *jdunham@usgs.gov*.

Climate-smart management for species persistence includes consideration of species' climate sensitivity, exposure to changing conditions, and adaptive capacity. With all species potentially exposed to changing conditions, rapid systematic assessments are needed. The northwest is particularly important for ectotherms relative to climate change because many species reach their northward extents here, and climate variation can easily affect habitat suitability and physiological ecology. We evaluated the intrinsic risk to climate change for 114 reptiles, amphibians, and freshwater fishes in the Pacific Northwest by combining geographic rarity and traits-based approaches, and assessed efficacy of analyses across 3 geographic extents, 4 grain sizes for area of occupancy, and 2 known-site data types. We found considerable variation in climate sensitivity (metric of climate breadth at area of occupancy) for species with smaller range sizes; further species-specific climate-niche analyses are needed to differentiate degree of risk for taxa with small ranges. Rarity and life history data provided complementary

information on risk to climate change. Among the three vertebrate classes studied, an association between rarity and life history (i.e., age at maturity) was detected only for amphibians, but a trend was seen for this association in reptiles. For 29 reptile species, 41% had moderately high climate sensitivity. Trade-offs were evident among reptile life history traits, especially between later-maturing, longer-lived species and highly fecund species with shorter generation times. Rare reptiles with "K-selected" life history traits may be especially sensitive to climate change, warranting further examination. Geographic extent, grain size, or data type did not affect results.

MEASURING HABITAT QUALITY ACROSS MULTIPLE SCALES WITH UNMANNED AERIAL SYSTEMS. PETER J. OLSOY*, *School of the Environment*, *Washington State University*, *100 Dairy Road/1228 Webster*, *Pullman*, *WA 99164-2812*; *peter.olsoy@wsu.edu*; LISA SHIPLEY, *School of the Environment*, *Washington State University*; *shipley@wsu.edu*; JANET RACHLOW, *Department of Fish and Wildlife Sciences*, *University of Idaho*; *jrachlow@uidaho.edu*; JENNIFER FORBEY, *Department of Geosciences*, *Boise State University*; *jenniferforbey@boisestate.edu*; NANCY GLENN, *Department of Geosciences*, *Boise State University*; *nancyglenn@boisestate.edu*; MATTHEW BURGESS, *Department of Wildlife Ecology and Conservation*, *University of Florida*; *mburgess@ufl.edu*; DANIEL THORNTON, *School of Environment*, *Washington State University*; *daniel.thornton@wsu.edu*.

Assessing habitat quality is a primary goal of ecologists, however, evaluating habitat features that relate strongly to habitat quality at fine-scale resolutions across broad-scale extents is challenging. Unmanned aerial systems (UAS) provide an avenue for bridging the gap between field-based habitat measurements and satellite-based remote sensing. Our goal in this study was to evaluate the potential for UAS technology to estimate several dimensions of habitat quality that provide security from predators and forage for Pygmy Rabbits (*Brachylagus idahoensis*) in a sagebrush (*Artemisia spp*.)-steppe environment. At the plant and patch scales, we compared UAS-derived estimates of vegetation height, volume, and concealment from aerial predators to field-based measurements and estimates from terrestrial laser scanning (TLS), another remote sensing technique. Then, we mapped habitat structure across 2 sagebrush landscapes in Idaho, USA. UAS-derived estimates of structural quality were highly correlated to field-based measurements of height (R^2 = 0.67-0.85), volume (R^2 = 0.31-0.94), and concealment (R^2 = 0.29-0.68). Finally, we classified the vegetation at both study sites with UAS, and performed regression kriging to interpolate point measurements of crude protein and several plant secondary metabolites (PSMs) present in sagebrush across the landscape. This work illustrates an approach for garnering fine-resolution habitat data across broad landscapes for use in studies of animal ecology, conservation, and land management.

SPATIAL PATTERNS OF KILL SITE DISTRIBUTION FOR WOLVES AND COUGARS IN AN AREA OF SYMPATRY. ELIZABETH K. ORNING*, *Oregon Cooperative Fish and Wildlife Research Unit*, *Department of Fisheries and Wildlife*, *Oregon State University*, *104 Nash Hall*, *Corvallis*, *OR 97331*; KATIE M. DUGGER, *U.S. Geological Survey*, *Oregon Cooperative Fish and Wildlife Research Unit*, *Department of Fisheries and Wildlife*, *Oregon State University*, *104 Nash Hall*, *Corvallis*, *OR 97331*; DARREN A. CLARK, *Oregon Department of Fish and Wildlife*, *1401 Gekeler Ln.*, *La Grande*, *OR 97850*.

Expanding populations of Gray Wolves (*Canis lupus*) could increase interspecific competition with populations of sympatric large carnivores, like Cougar (*Puma concolor*), and alter predation effects on ungulate populations (e.g., Elk [*Cervus elephus*], Mule Deer [*Odocoileus hemionus*]). Interspecific competition can affect the spatial distribution, demography, and population dynamics of the subordinate predator, but the frequency and strength of agonistic interactions can be system specific. We evaluated spatial overlap and shifts in distribution of kernel density estimates (KDE) generated for cougar kill sites before (2009-2012) and for wolves and Cougar after (2014-2016) wolves recolonized the Mt. Emily Wildlife Management Unit. We compared isopleth contour probabilities (core 25%, 50%, 95%) based on 1,214 and 485 Cougar kill sites from pre- and post-wolf periods, respectively. We also compared the seasonal overlap of post-wolf Cougar kills with density estimates from 107 wolf kill sites. Distribution of Cougar kills differed from pre- to post-wolf time periods and relative to areas where wolves frequently made kills. Based on total kill distributions, 8% of core summer range where Cougars made kills overlapped core wolf use areas, whereas 20% of the core summer range where wolves made kills overlapped core Cougar kill use areas. Coupled with little change in Cougar diet composition, distributional shifts in areas Cougar frequently kill prey could signal relatively unchanged effects to prey populations in this multi-predator system. As wolf populations continue to expand, additional research is needed to clarify the effect of wolves and Cougars on prey behavioral response and ungulate population dynamics.

CONSERVATION AND MANAGEMENT OF THE MIDGET FADED RATTLESNAKE (*CROTALUS CONCOLOR*) IN WYOMING AND COLORADO. JOSHUA M. PARKER*, *Fresno City College*, *2226 E. Skyview Ave.*, *Fresno*, *CA 93720*; *joshua.parker@fresnocitycollege.edu*; STEPHEN SPEAR, *The Wilds*; *sspear@thewilds.org*; CHARLES PETERSON, *Idaho State University*; *petechar@isu.edu*.

The Midget faded Rattlesnake (*Crotalus concolor*) is protected as a species of special concern across their range in Utah, Wyoming, and Colorado. This means that take is prohibited and management agencies must include them in any land development plans. Energy development is the single greatest threat to populations across their range and their most critical and sensitive habitat is their overwintering habitat. Due to their extremely cryptic nature, finding the snakes and their overwintering habitat is extremely difficult. We used data collected from previous studies conducted by the authors to develop predictive habitat models based on known den locations. We also used hundreds of tissue samples from across their range in Wyoming to conduct landscape genetics to better understand the effects of the landscape on their populations which also includes features associated with development. Not only did we develop models based on the available data, but we also collected new data to validate those models. The final den model in Wyoming proved successful with an accuracy of 85% for its predictions. The den models developed for the Colorado portion of their range were slightly less accurate because the landscape was far more complicated in Colorado than in Wyoming. The landscape genetics revealed that some populations are genetically isolated, likely due to past urban development and an interstate highway, and that access roads are a major disturbance to gene flow. The latest GIS and landscape genetics techniques have proven to be invaluable in the conservation and management of the species.

THE SLOW DECLINE OF A HISTORIC FROG POPULATION IN YELLOWSTONE NATIONAL PARK.
DEBRA A. PATLA*, *Northern Rockies Conservation Cooperative*, *PO Box 420*, *Moran*, *WY 83013*; *dpatla@hughes.net*; CHARLES PETERSON, *Idaho State University*; *petechar@isu.edu*.

In the 1950s, Frederick B. Turner conducted his classic study on the demographics and activity patterns of a robust Columbia Spotted Frog (*Rana luteiventris*) population in Yellowstone National Park. In the 1990s, Turner assisted us in confirming the habitat features of his Lodge Creek study area, and we then attempted to replicate his 3-year mark-recapture study. We found a 78% decline in estimated population size. Changes in spatial characteristics of the remnant population reflected both habitat loss and fragmentation in the increasingly-developed area. Subsequent monitoring through 2017 revealed the demise of the breeding population in Turner's main study area. The species persisted in an adjacent downstream area, but egg mass numbers have declined sharply, from over 70 masses in 2005 to only 6 or 7 in recent years. Repeated disease and parasite outbreaks have afflicted juvenile and adult frogs. The story of Columbia Spotted Frogs at Lodge Creek may typify the 'death by a thousand cuts' that can affect amphibian populations in developed areas, even in protected parks. In this case, the most obvious human impacts involve road construction bisecting migration routes, water extraction for the growing human population, sewage spills, and alteration of forest and stream habitats. Lessons on amphibian conservation include the importance of a maintaining a network of habitat features (for breeding, foraging, migrating, and overwintering), the long time periods over which declines may unfold, and the utility of archiving information for future researchers and land managers.

COLONIZATION OF RESTORED HABITAT BY OREGON SPOTTED FROGS (*RANA PRETIOSA*) AND AMERICAN BULLFROGS (*LITHOBATES CATESBEIANUS*): IMPLICATIONS FOR MANAGEMENT OF BOTH SPECIES.
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Restoration of habitats and populations plays a central role in conservation and management of threatened species. Information is needed to improve efficiency of these projects, not just on benefits for native species, but also on their potential to resist harmful invasive species. As part of a collaborative restoration project in the Klamath Basin, Oregon, we monitored reintroduced Oregon Spotted Frog (*Rana pretiosa*; OSF) for 7 years after habitat construction. OSF expanded across the site and increased in numbers. American Bullfrogs (*Lithobates catesbeianus*) invaded the site midway through our monitoring period, providing a rare opportunity to observe and manage an invasion front by this prolific invader. We describe aspects of the invasion and the approach to and results of managing it. We discuss implications of this case study for restoration of OSF habitat and populations and considerations related to OSF confronted by bullfrogs.

REPTILE DATA NEEDS: THE INCREASING ROLE OF CROWDSOURCED DATA. CHARLES R. PETERSON* AND PATRICK GILTZ. *Herpetology Laboratory*, *Department of Biological Sciences*, *Idaho State University*, *Pocatello*, *ID 83209-8007*.

One of the top priorities for conserving reptiles is determining the status and trends of their populations. We need more up to date information on the occurrence and distribution of many (if not most) species of reptiles in the Pacific Northwest to identify and address their conservation problems. The required data can come from a variety of sources, including museum records, surveys, monitoring programs, and contributed observations. Each of these data types have their strengths and weaknesses. Museum specimen records have provided the most important historical data but less so recently. Surveys conducted by government organizations and industry have provided important information since the later 20th century. With the advent of the internet, contributed observations have increased since the 1990s. However, confirming species identifications and obtaining accurate location data have been problematic. The advent of smartphones with cameras and GPS receivers has largely solved these problems. Crowd sourced observations from applications like iNaturalist are becoming increasingly important and may be the primary source of new natural history data in the future. We not only can use these data to determine species occurrence but also to obtain information on habitat associations, activity patterns, behavior, and mortality. Problems with crowd sourced data include evaluating the accuracy of spatial coordinates and protecting the locations of sensitive species and sites. Solving these problems requires proper training of users and careful curation of the data. We illustrate these ideas with results from the Idaho Amphibian and Reptile iNaturalist Project.

UNDERSTANDING AMERICAN BLACK BEAR DENNING ECOLOGY IN INTENSIVELY MANAGED FORESTS. VANESSA M. PETRO*, *Oregon State University*, *321 Richardson Hall*, *Corvallis*, *OR 97331*; *vanessa.petro@oregonstate.edu*; JIMMY TAYLOR, *National Wildlife Research Center*; *jimmy.d.taylor@aphis.usda.gov*.

American Black Bear (*Ursus americanus*) damage to conifers in the Pacific Northwest is well documented and the magnitude of economic damage to timber is estimated in the millions annually. Black Bears forage on the healthiest conifers in intensively managed stands and often damage the same stands for multiple years. Methods to reduce bear damage are few, are often reactionary (i.e., after damage has occurred), but peeling continues. Recent anecdotal observations suggest bears wintering on public land may peel at higher rates on adjacent industrial forestland in spring. Therefore, we are conducting a multi-year study in western Oregon and Washington, to better understand where and when bears will cause damage to trees. We are live-capturing bears with Aldrich foot snares where fresh tree peeling occurs in intensively managed timber adjacent to public lands, and fitting them with global positioning system (GPS) collars. In addition to assessing peeling damage, we are also examining collared individuals denning ecology to determine if den site selection differs between public and private industrial ownership. Bears are tracked to their winter dens to verify the den site, which is later surveyed post-emergence for structural characteristics and habitat associations. Denning chronology is documented as well. This is an ongoing multi-year study, therefore we will not report final results here. However, we will describe our methodology in detail and discuss our initial findings. Ultimately, our results will help land managers to understand landscape-scale drivers of Black Bear damage and use proactive management to reduce bear conflict.

CONSERVATION AND RESEARCH PRIORITIES FOR REPTILES IN THE GREATER NORTHWEST.
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Reptiles tend to be one of the least studied vertebrate groups in the Northwest and yet, much like other wildlife, they face multiple threats to habitats and populations. We first provide an overview of the reptile diversity of the region and briefly describe the status, trends, and data deficiencies of individual species. The conservation issues facing reptiles in the region are similar to those for reptiles globally: habitat loss and degradation, disease, introduced species, collection and exploitation, and climate change. A lack of research studies examining these issues could hamper conservation and management decisions for some species. The western pond turtle is one example of a Northwest reptile that has been studied and monitored fairly well, which has aided in listing decisions. We encourage more research interest from graduate students and a growing citizen science effort to meet the research priorities and reduce the data deficiencies of reptiles in the greater Northwest.

CONSERVATION OF LIZARDS AND SNAKES UNDER THE UMBRELLA OF SINGLE-SPECIES MANAGEMENT.
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The umbrella species is an attractive wildlife management concept whereby the habitat protection implemented for one species encompasses many others. We examined this management strategy for the Greater Sage-grouse (*Centrocercus urophasiasnus*) and the assemblage of lizards and snakes (Order Squamata) occupying sagebrush (*Artemisia spp*.) ecosystems in the western U.S. Squamate diversity is particularly high in the sagebrush shrublands of western North America and yet we know little about how lizard and snake species will respond to management actions aimed at conserving Sage-grouse and the sagebrush ecosystems upon which they depend. We examined occurrence records and habitat associations of about 60 squamate species that occur within the range of the Sage-grouse. Preliminary results suggest that habitat management for Sage-grouse will have mixed effects (some winners, some losers) on lizards and snakes, with the majority likely to experience little benefit because of different physical habitat preferences. However, using existing Sage-grouse management plans as a foundation, additional habitat management for at-risk reptiles and other wildlife species in selected locations may supplement the umbrella-species management strategy. Proactive multi-taxa layering of habitat conservation actions warrants careful consideration given limited resources for wildlife conservation in the age of rapidly changing climate, shifts in disturbance regimes, and altered biophysical habitats.

BSAL: AN EMERGING THREAT TO AMPHIBIANS IN THE PACIFIC NORTHWEST? JONAH PIOVIA-SCOTT*, *Washington State University-Vancouver*, *School of Biological Sciences*, *Vancouver*, *WA 98685*; *jonah.piovia-scott@wsu.edu*; DEANNA OLSON, *United States Forest Service*; *dedeolson@fs.fed.us*; MATT GRAY, *University of Tennessee*; *mgray11@utk.edu;* MICHAEL ADAMS, *Association of Fish and Wildlife Agencies*; *mjadams@usgs.gov;* PRIYA NANJAPPA, *Association of Fish and Wildlife Agencies*; *pnanjappa@fishwildlife.org*; REID HARRIS, *James Madison University*; *harrisrn@gmail.com.*

Amphibians are the most threatened class of vertebrates, and diseases caused by introduced pathogens have played a key role in driving global amphibian declines. Chytrid fungal pathogens, particularly *Batrachochytrium dendrobatidis* (Bd), have had particularly devastating impacts on amphibians. While Bd became established in North America more than a century ago, another recently described pathogen in the same genus, *Batrachochytrium salamandrivorans* (Bsal) does not appear to have established a foothold in North America yet. Bsal is thought to have originated in Asia and spread to Europe through the pet trade. It is currently causing dramatic declines in European salamander species. If the effects of Bsal on European salamanders and the effects of Bd on North American anurans are any indication, Bsal could pose a serious threat to native amphibians in the Pacific Northwest. This presentation will describe ongoing research on Bsal, current efforts to establish surveillance, and strategies to prevent Bsal's introduction to North America. In addition, we will initiate a discussion about how researchers, managers, and conservationists in the Pacific Northwest can be prepared to deal with Bsal if it arrives in our region.

ASSESSING NORTHERN SPOTTED OWL NEST-SITE SELECTION WITH A LIDAR-BASED CANOPY COVER MODEL. M. SHANE PRUETT*, *Oregon Cooperative Fish and Wildlife Research Unit*, *Department of Fisheries and Wildlife*, *Oregon State University*, *Pacific NW Research Station*, *Forestry Sciences Laboratory*, *Corvallis*, *OR 97331*; *pruettmi@oregonstate.edu*; RAY DAVIS, *USDA Forest Service*, *Pacific Northwest Region*; *rjdavis@fs.fed.us*; KATIE DUGGER, *U.S. Geological Survey*, *Oregon Cooperative Fish and Wildlife Research Unit*, *Department of Fisheries and Wildlife*, *Oregon State University*; *katie.dugger@oregonstate.edu*; JULIANNA JENKINS, *USDA Forest Service*, *Pacific Northwest Research Station*; *juliannajenkins@fs.fed.us*; DAMON LESMEISTER, *USDA Forest Service*, *Pacific Northwest Research Station*; *dlesmeister@fs.fed.us*; STAN SOVERN, *Department of Fisheries and Wildlife*, *Oregon State University*; *ssovern@fs.fed.us*.

Northern Spotted Owls (NSO; *Strix occidentalis caurina*) select late-successional forest types for nesting and roosting, and use a range of forest types within their territories. However, the range expansion of Barred Owls (BO; Strix varia) into the Pacific Northwest has resulted in displacement of NSOs from historical nest sites. It is unknown if displaced NSOs are selecting similar forest types for nesting and roosting relative to pre-BO conditions. Field-based quantification of NSO habitat selection is extremely costly, but newly-acquired Light Detection and Ranging (LiDAR) data provide opportunities to evaluate current nest site selection by NSO. We used 1 m resolution LiDAR data to generate a canopy height model for 5 NSO demography study areas in Oregon, quantified various height and structural variables within buffers of 50, 100, and 200 meters around NSO nest sites, and used BO locations as variables in our models. We paired known, used nest and roost sites with two available but unused points within the same

territory, and used multinomial logit discrete choice models in a Bayesian framework to assess models at each scale. The amount of mature forest and the standard deviation of forest height were most supported effects at all scales with essentially no model selection uncertainty. The inclusion of BO presence did not improve our inferences, but our BO locations were not precise. Although displaced by an aggressive congeneric competitor, NSOs continue to demonstrate strong selection for mature, structurally diverse forest types.

WHY (AND HOW) SHOULD I TEACH ENVIRONMENTAL ETHICS? ALETA QUINN*, *University of Idaho, 1424 Northwood Dr. # 3, Moscow, ID 83843; aletaquinn@gmail.com*.

I'm a philosopher of science who teaches environmental ethics to undergraduate students. In this talk I reflect on what is/are the purpose(s) of teaching the course, and in turn how I should teach the course. My goal is to collect feedback from individuals active in conservation work, both to improve my own class and to contribute to pedagogical literature.

RENEWABLE ENERGY DEVELOPMENT IMPACTS ON WILDLIFE HABITAT CONNECTIVITY– HOW SMART PLANNING AND INNOVATIVE APPROACHES TO MITIGATION CAN HELP STREAMLINE OREGON'S TRANSITION OFF OF FOSSIL FUELS. SARAH REIF*, *ODFW Headquarters*, *4034 Fairview Industrial Ave. SE*, *Salem*, *OR 97302*; *Sarah.j.reif@state.or.us*; SARA GREGORY, *Deschutes and Klamath Wildlife Districts*, *61374 Parrell Rd.*, *Bend*, *OR* 97702; *Sara.c.gregory@state.or.us*; GREG JACKLE, *Prineville Field Office, 2042 SE Paulina Hwy*, *Prineville*, *OR 97754*; *Greg.s.jackle@state.or.us*.

To address the significant threat of climate change to Oregon's economy, environment, and way of life, the state has committed to pro-actively transitioning away from fossil fuels in its energy consumption. In 2016, Oregon adopted a renewable portfolio standard (RPS) of sourcing its energy from 50% renewables by 2040. To meet this ambitious RPS, additional renewable energy facilities are needed in Oregon. However, these developments are not without cost; there are local impacts to wildlife habitat that must be considered according to state statute and rule. While birds and bats often get the most attention on wind energy projects, the recent expansion of large solar energy developments in eastern Oregon is having the cumulative effect of habitat fragmentation for wide-ranging ungulates. From Oregon Department of Fish and Wildlife's (ODFW) south-central Mule Deer (*Odocoileus hemonius*) study (2005 to 2012) we know that Mule Deer show high site-fidelity to their movement corridors, and solar energy developments would be best designed to avoid those crucial corridors. ODFW addresses these impacts through other state and local government permitting processes, and uses the Oregon Fish and Wildlife Habitat Mitigation Policy to guide its recommendations. According to this policy, impacts to big game winter range must be offset with a goal of 'no net loss plus a net benefit in habitat quantity and quality. This presentation will highlight a recent case study in Crook County where a solar energy development's impacts were offset in a way that conserved big game habitat at a landscape scale.

AN UPDATE ON THE OREGON MARBLED MURRELET PROJECT: UNEXPECTED RESULTS CHARACTERIZE THE 2017 BREEDING SEASON. JAMES RIVERS*, *Oregon State University*, *Dept. Forest Ecosystems and Society*, *Corvallis*, *OR 97331*; *jim.rivers@oregonstate.edu*; KIM NELSON, *Oregon State University*; *kim.nelson@oregonstate.edu*; LINDSAY ADREAN, *Oregon State University*; *lindsay.adrean@oregonstate.edu*; CHERYL HORTON, *U.S. Geological Survey-Oregon Cooperative Fish and Wildlife Research Unit*, *Oregon State University*; *cheryl.horton@oregonstate.edu*; DANIEL ROBY, *U.S. Geological Survey-Oregon Cooperative Fish and Wildlife Research Unit*, *Oregon State University*; *daniel.roby@oregonstate.edu*; MATTHEW BETTS, *Oregon State University*; *matt.betts@oregonstate.edu*.

The Marbled Murrelet (*Brachyramphus marmoratus*) is an endangered seabird that that occurs along the Pacific Coast of North America and whose population has undergone long-term declines in recent decades. Unlike most auks, this species exhibits the highly unusual behavior of nesting inland within older coastal forests, making it imperative to understand murrelet habitat selection and space use in these areas to balance recovery efforts with forest management actions. Nevertheless, data on nest sites and the factors that influence nest success are limited in Oregon. To fill these critical knowledge gaps, our group initiated the Oregon Marbled Murrelet Project, a long-term, large-scale study assessing space use and nesting success of murrelets within Oregon's coastal forests. We formally launched this project in spring 2017 by undertaking operations to capture, tag, and monitor marine and terrestrial murrelet space use. Of 61 birds fitted with VHF radio-telemetry tags, none were detected undertaking inland movement behaviors that were consistent with nesting activity during May to July. In contrast, a majority of tagged murrelets left our core study area (coastal Oregon from Pacific City to Florence), and 34% of all tagged birds were detected outside of Oregon's waters in both Washington (n = 8 individuals) and California (n = 13 individuals). Thus, tagged birds dispersed over an area that covered >1200 km during the breeding season. These unprecedented movements coincided with anomalous ocean conditions that appears to have reduced available forage fish, so we hypothesize that murrelet movements and the absence of nesting behavior were driven by limited food resources.

BAT HIBERNACULA IN THE WESTERN UNITED STATES: IMPLICATIONS FOR POPULATION MONITORING AND WHITE-NOSE SYNDROME SURVEILLANCE. THOMAS J. RODHOUSE*, *National Park Service*, *Oregon State University-Cascades*, *Bend*, *OR 97702*; *Tom_Rodhouse@nps.gov*; THEODORE WELLER,*U.S. Forest Service*; *tweller@fs.fed.us*.

Detection of white-nose syndrome and its causative agent in bats has primarily been documented via surveillance of caves and mines, where bats tend to form large winter aggregations across eastern North America. This monitoring paradigm will be challenging in the western United States because the whereabouts and behaviors of most western bat species during winter are largely unknown. We provide the first comprehensive synthesis of western bat hibernacula surveys, drawing on best-available winter survey information from state and federal land and wildlife management agencies. We compiled 4574 winter bat survey records from 2906 unique structures across 11 western states reported between the winters of 1916 through 2017. *Myotis* were reported to be found in 18.5% of the structures searched while *Corynorhinus townsendii* was found in 38%. Group sizes of *Myotis* were smaller than for *C. townsendii* and counts of ≥ 50 *Myotis* were reported from only 13 caves in 4 widely-separated states. We used

regression models to explore patterns among winter counts of bats, geography and environmental conditions. Predictions from these models to a set of un-surveyed locations underscored the rarity of large colonies of *Myotis* available for discovery in the West. The winter survey results we compiled do not match the much larger numbers of bats evident across western landscapes during summer, strongly suggesting that most bats are wintering in highly over-dispersed, unobserved locations. We recommend that alternative methodologies be employed to discover the winter locations of bats and conduct disease surveillance and monitoring.

BAT GRID 2.0: COLLABORATIVE MONITORING TO ASSESS DECLINES IN OREGON BAT POPULATIONS FROM 2003-2017 VIA BAT GRID AND NORTH AMERICAN BAT MONITORING PROGRAMS. ROGER RODRIGUEZ*, *Oregon State University-Cascades, Human and Ecosystem Resiliency and Sustainability Lab, Northwestern Bat Hub, Bend, OR*; *roger@zotzeco.com*; THOMAS RODHOUSE, *National Park Service*; *tom_rodhouse@nps.gov*; PAT ORMSBEE, *ODFW Consultant*; *pcormsbee@gmail.com*; KATHRYN IRVINE, *Oregon Department of Fish and Wildlife*; *kirvine@usgs.gov*; SARAH REIF, *Oregon Department of Fish and Wildlife*, *Sarah.J.Reif@state.or.us*.

The original interagency Bat Grid, led by the U.S. Forest Service and with participation by many partners across Oregon and Washington from 2003-2010, established baseline distributional data for bats throughout Oregon and Washington and provided the foundation for the North American Bat Monitoring Program (NABat). In 2016-2017, collaborative acoustic bat monitoring was continued across Oregon at original Bat Grid survey locations and at new locations selected via the NABat master sample. This initiative, referred to locally as "Bat Grid 2.0", was led by Oregon Department of Fish and Wildlife (ODFW) with assistance from federal agencies and other partners. One primary objective was to enable comparisons between 2003-2010 Bat Grid 1.0 baseline and current probabilities of occurrence to evaluate potential population declines in light of the regional expansion of wind energy developments during the intervening years and the recent arrival of white-nose syndrome to Washington. In 2016 and 2017, ODFW and partners successfully surveyed for bats in >90 grid-cell sample units during this two-year pilot effort. All 15 species with established ranges in Oregon were detected in at least 1 grid cell. We updated the dynamic distribution models of Rodhouse et al. (2015) to evaluate the evidence for contemporary declines in occurrence probabilities with the new Bat Grid 2.0 data. We discuss the implications of our findings and outline how our approach, relying on interagency collaboration coordinated by the newly-established Oregon State University-Cascades Northwestern Bat Hub, provides a sustainable, long-term source of information for guiding evidence-based bat conservation decision-making.

BIOMASS AND TROPHIC POSITION OF BULLFROG (*LITHOBATES CATESBEIANUS*) LARVAE IN A FLOODPLAIN WETLAND. CHRIS ROMBOUGH*, *Team Rocket*, *PO Box 365*, *Aurora*, *OR 97002*; *rambo2718@yahoo.com*; LAURA TRUNK, *Jackson Bottom Wetlands Preserve*; *laura_trunk@hillsboro-oregon.gov*.

From 2014-2017, we studied the biomass and trophic position of Bullfrog (*Lithobates catesbeianus*) larvae produced in a series of wetlands within an active floodplain of the Tualatin River. We used several methods, including transect sampling and total capture, to estimate the biomass of larval bullfrogs in a given wetland. We simultaneously collected data on a series of

abiotic and biotic variables in an attempt to identify what factors influence production of larval biomass. We found that wetland topography, hydrology, and vegetation strongly influenced annual production and retention of larval biomass. Extensive observation conducted during all seasons documented consumption of Bullfrog larvae by 35 other species of animals (5 invertebrates and 30 vertebrates). In some of these species, Bullfrogs made up a seasonally large proportion of their total diet. We discuss our findings in the context of the floodplain's ecology and management; we also make comparisons to data collected in other Pacific Northwest floodplain wetlands.

GROWTH AND PHENOLOGY OF BULLFROG (LITHOBATES CATESBEIANUS) LARVAE IN A FLOODPLAIN WETLAND. CHRIS ROMBOUGH*, *Legion of Rombough*, *PO Box 365*, *Aurora*, *OR 97002*; *rambo2718@yahoo.com*; LAURA TRUNK, *Jackson Bottom Wetlands Preserve*; *laura_trunk@hillsboro-oregon.gov*.

In 2016 and 2017, we studied the seasonal growth and development of Bullfrog (*Lithobates catesbeianus*) larvae produced in a series of wetlands within an active floodplain of the Tualatin River. Our methods centered on examination of the size and development stage of larval samples taken in study wetlands throughout all seasons. We simultaneously collected data on a series of abiotic and biotic variables in an attempt to identify what factors influence larval growth and development. Spawning and growth periods across the floodplain as a whole were relatively long.

ASSOCIATION OF POND-BREEDING AMPHIBIANS WITH BEAVER DAMS IN THE WASHINGTON CASCADES. JOHN ROMANSIC*, *School of Biological Sciences*, *Washington State University*, *Vancouver*, *230 VSCI, Vancouver*, *WA 98686*; *john.romansic@wsu.edu*; NICOLETTE NELSON, *School of Biological Sciences*, *Washington State University*, *Vancouver*; *nicolette.nelson@wsu.edu*; KEVAN MOFFETT, *School of Biological Sciences*, *Washington State University*, *Vancouver*; *kevan.moffett@wsu.edu*; JONAH PIOVIA-SCOTT, *School of Biological Sciences*, *Washington State University*, *Vancouver*; *jonah.piovia-scott@wsu.edu*.

Land managers are increasingly using Beavers (*Castor canadensis*) to mitigate the effects of climate extremes on water balances and ecosystems. Beaver dams provide habitat for some amphibian species by creating large, deep ponds with long hydroperiods, which could benefit amphibian conservation. We studied pond-breeding amphibians in the southern Washington Cascade Range to investigate whether the relationship between Beavers and pond-breeding amphibians depends on species-specific rates of development. We surveyed Cascades Frogs (*Rana cascadae*), Northern Red-legged Frogs (*R. aurora*), Northwestern Salamanders (*Ambystoma gracile*), and Rough-skinned Newts (*Taricha granulosa*) in 30 Beaver-dammed and 20 undammed wetlands across 3 spatial blocks. Cascades Frogs, which develop relatively fast, require only 8 weeks to reach metamorphosis after egg deposition. This development requires 15 weeks in Red-legged Frogs and Northwestern Salamanders and varies in duration from 6 weeks to more than a year in Rough-skinned Newts. In slow-developing species (Red-legged Frogs and Northwestern Salamanders), relative abundance of embryo masses was far greater in Beaver-dammed compared to undammed wetlands. In our study areas, these slow-developers appeared to breed almost exclusively in Beaver-dammed sites. Relative abundance of Rough-skinned Newt mating events was also correlated with dams, but only in 1 block. In contrast, relative

abundance of Cascade frog embryo masses was not associated with dams. We suggest that slow developers in our study areas might depend heavily on Beaver dams, especially under the long-term drying that is projected for Cascade Range watersheds. Species highly variable in developmental rate, such as Rough-skinned Newts, may also benefit from dams in some areas.

ROAD MORTALITY IN A GREAT BASIN SNAKE COMMUNITY. CHRIS ROMBOUGH*, *Rombough Biological*, *PO Box 365*, *Aurora*, *OR 97002*; *rambo2718@yahoo.com*.

From 2012 to 2014, I conducted a study of road mortality in a Great Basin snake community in southeastern Oregon (elevation 1,250 m). I surveyed a 64 km stretch of paved road which ran through sagebrush (*Artemisia spp*.) habitat containing various features (hills, rock outcrops, freshwater marshes). During survey intervals, I drove this road up to 6 times a day. I collected a series of data on dead snakes and other variables such as weather, scavengers, and traffic patterns. I also monitored carcasses to determine their fate. I observed significant mortality in 5 of the 7 species present (*Coluber constrictor*, *Crotalus oreganus*, *Pituophis catenifer*, *Thamnophis elegans*, and *T. sirtalis*). For each species, mortality varied as a function of habitat features, time of year, weather, age, sex, and other factors. Fate of carcasses was not uniform, but also varied as a function of several factors. I discuss the implications of my findings to other studies of road mortality, as well as to the conservation of snakes in general.

DISEASE DYNAMICS IN A TRANSLOCATED POPULATION OF OREGON SPOTTED FROGS (*RANA PRETIOSA*). JENNIFER C. ROWE*, *U.S. Geological Survey*, *USGS Forest and Rangeland Ecosystem Science Center*, *Corvallis*, *OR 97331*; *jrowe@usgs.gov*; CHRISTOPHER PEARL, *U.S. Geological Survey*; *christopher_pearl@usgs.gov*; JAY BOWERMAN, *Sunriver Nature Center & Observatory; frogs1@sunrivernaturecenter.org;* MICHAEL ADAMS; *U.S. Geological Survey*; *mjadams@usgs.gov*.

The emerging infectious disease chytridiomycosis caused by *Batrachochytrium dendrobatidis* (Bd) is related to declining amphibian populations in some regions. Considering the large number of laboratory studies focusing on Bd-induced morbidity and mortality in Pacific Northwest amphibians, there's surprisingly little research connecting population data to disease status. Furthermore, our understanding of the threat Bd poses to the federally-listed Oregon Spotted Frog (*Rana pretiosa*) is lacking. We have conducted mark-recapture sampling over 17 years at a Spotted Frog relocation site in the Deschutes Basin, Oregon in a complex of excavated and blasted ponds. As part of this study, we investigated the interplay between Bd dynamics and pond succession. We processed 162 DNA swabs (mean 2.9, range 1 to 7 swabs per frog) from 56 adult and subadult *R. pretiosa* over 5 years. After ranking zero-inflated mixed-effects models, the best predictor of individual Bd zoospore load was method of pond creation. We will continue to monitor this translocated population in order to evaluate how the interaction between habitat and disease translates to demographic processes – information that is important for the success of conservation efforts.

DYNAMIC DEMOGRAPHIC RESPONSE TO EXPERIMENTAL FOREST HERBICIDE TREATMENTS BY AN EARLY SUCCESSIONAL SONGBIRD. JAMES RIVERS*, *Oregon State University*, *Dept. Forest Ecosystems and Society*, *Corvallis*, *OR 97331*; *jim.rivers@oregonstate.edu*; JAKE VERSCHUYL, *National Council for Air and Stream Improvement*; *jverschuyl@ncasi.org*; CARL SCHWARZ, *Simon Fraser University; cschwarzstatsfuca@gmail.com;* ANDREW. J. KROLL, Weyerhaeuser; *AJ.Kroll@weyerhaeuser.com;* MATTHEW BETTS, *Oregon State University*; *matt.betts@oregonstate.edu*.

Herbicides are used globally to control competing vegetation, yet a thorough understanding of how herbicide application intensity influences forest biodiversity is lacking. In particular, information is missing that evaluates how the critical demographic rates that structure populations are impacted by forest herbicide use. In this study we used a large-scale experiment to test how forest herbicides influenced demographic rates of the White-crowned Sparrow (*Zonotrichia leucophrys*), a declining songbird that breeds in early successional forests. We evaluated daily nest survival rate along a gradient of management intensity by applying four experimental treatments (i.e., light, moderate, and intensive herbicide application, and no-spray control) to recently harvested conifer stands; on a subset of treatments, we also assessed herbicide application intensity on post-fledging survival. Counter to our initial predictions, we found no evidence that either nest or post-fledging survival was influenced by herbicide intensity. Instead, we documented an unexpected and complete reversal in area-specific reproductive output (i.e., fledglings ha^{-1}) across the treatment gradient between successive breeding seasons. Increasing management intensity strongly reduced reproduction in the first season; in contrast, reproductive output increased by 217% the following year in the most intensive treatment. Thus, traditional demographic rates were minimally influenced, if at all, by herbicide intensity, whereas area-specific reproductive output was highly dynamic across time and treatments. Given our results, we suggest that management effects be considered together with the time since harvest to detect treatment x time interaction that may be critical for understanding demographic processes in dynamic early successional habitats.

INCORPORATING WOODPECKER HABITAT INTO DESIGN OF POST-FIRE SALVAGE LOGGING. VICTORIA A. SAAB*, *U.S. Forest Service*, *Rocky Mountain Research Station*, *1648 S. 7th Ave.*, *Bozeman*, *MT 59717*; *vsaab@fs.fed.us*; QURESH LATIF, *U.S. Forest Service*, *Rocky Mountain Research Station*; *qlatif@fs.fed.us*; JONATHAN DUDLEY, *U.S. Forest Service*, *Rocky Mountain Research Station*; *jdudley@fs.fed.us*; LORI STOKES, *U.S. Forest Service*, *Malheur National Forest*; *lstokes@fs.fed.us*.

Forests recently burned by wildfires contain increased snag densities, which provide habitat for disturbance-associated wildlife (e.g., woodpeckers) but also present economic opportunities for local communities. We implemented an experimental study to determine levels of post-fire salvage logging associated with specified woodpecker nesting densities. We are monitoring nests of 3 woodpecker species of conservation concern: Black-backed (*Picoides arcticus*), White-headed (*P. albolarvatus*), and Lewis's Woodpeckers (*Melanerpes lewis*) following the 2015 Canyon Creek Complex wildfire near John Day, Oregon. Working with silviculturists, we designed a replicated study with three salvage treatments and untreated controls based on habitat suitability of the nesting woodpeckers. During the 2016 to 2017, we monitored nests of 93 Black-backed, 47 White-headed, and 8 Lewis's Woodpeckers in both

treated and untreated units. This project is intended to provide guidelines for post-fire salvage logging that will minimize negative consequences to woodpecker species.

FRUGIVOROUS BIRDS IN RECOVERING SAGEBRUSH STEPPE HABITAT: FRENEMIES OF RESTORATION? GABRIEL L. SANDOVAL*, *Oregon State University*, *Department of Fisheries and Wildlife*, *104 Nash Hall*, *Corvallis*, *OR 97330*; *sandovga@oregonstate.edu*; DANA SANCHEZ, *Oregon State University*; *Dana.Sanchez@oregonstate.edu*; JACOB DITTEL, *Oregon State University*; *jacob.dittel@oregonstate.edu*.

Sagebrush (*Artemisia spp*.) steppe is an imperiled ecosystem due to numerous interacting pressures such as expansion of Western Juniper (*Juniperus occidentalis*). Juniper exerts strong negative effects on native plants and wildlife. The Phillip W. Schneider Wildlife Area is an example of a degraded sagebrush steppe undergoing management to restore wildlife habitat through reduction (cutting) of juniper. Interestingly, junipers benefit from bird-dispersal of their seeds. Ironically, through eating and dispersing juniper berries into restoration treatment patches, birds may be counteracting habitat restoration efforts. Species composition of the area's breeding season bird community had not previously been documented. Furthermore, the relationship among birds, fruits of junipers bordering restoration patches, and potential perching (and seed deposit) structures within the restoration patches is yet unexplored. Our objective is to understand the role that frugivorous birds might play in this complex restoration landscape. We conducted bi-weekly point-count surveys during the 2017 breeding season to document the composition of the bird community, and took care to note which frugivorous species were present. We then employed scan- and focal-animal sampling during fall 2017 to document which species were consuming the juniper berries, to determine the intensity of use, whether post-feeding perches tended to be inside or outside restoration patches, and to measure distance to perch sites within those patches. These observations will enable us to assess the potential effectiveness of frugivorous birds in juniper dispersal and potential re-encroachment. Preliminary analysis suggests that after feeding on juniper berries, frugivorous birds tend to select post-feeding perches within restoration patches.

ALLIANCE FOR AMERICA'S FISH AND WILDLIFE CAMPAIGN AND RECOVERING AMERICA'S WILDLIFE ACT. SEAN SAVILLE*, *Association of Fish & Wildlife Agencies*; *Alliance for America's Fish & Wildlife*; *ssaville@fishwildlife.org*.

This is 5th presentation in the session: Facing the Sixth Extinction Crisis: Finding Broader Relevancy and Greater Funding for Fish and Wildlife Conservation. For over 100 years, state fish and wildlife agencies have successfully shouldered the primary responsibility of managing America's fish and wildlife. While state fish and wildlife agencies and their partners have celebrated major conservation victories, many species of birds, mammals, reptiles and even the iconic Monarch Butterfly (*Danaus plexippus*) are in decline. Hunters and anglers have been some of America's best conservationists, and conservation of species that are widely hunted has been historically well funded. But there is a $1.3 billion funding shortfall for states to execute their State Wildlife Action Plans to do proactive conservation to keep more species from becoming endangered. In an unprecedented showing of unity from the energy sector, outdoor recreation and retail companies, automotive industry, science and academic institutions, conservation organizations, state and federal wildlife agencies have come together to form the

Alliance for America's Fish & Wildlife. The campaign is advocating for the passage of the bi-partisan Recovering America's Wildlife Act to provide adequate and sustainable funding for all 50 states, DC and the territories to implement their congressionally mandated wildlife action plans. It will be important to build a national coalition of stakeholders that are coordinated in advocacy, and the Pacific Northwest will play an important role in this overall strategy. The presentation will focus on elements of the campaign strategy, and engagement of various partners to leverage public support for the legislation.

SQUEAL ON PIGS! HOW FERAL SWINE CAN IMPACT OREGON AND WASHINGTON. LAURENCE SCHAFER*, *U.S. Department of Agriculture Wildlife Services*; DAVID WILLIAMS, *U.S. Department of Agriculture Wildlife Services*.

Feral Pigs (*Sus scrofa*) are highly destructive and potentially dangerous animals. Biologists generally describe feral Pigs as any swine not inside a secure facility. Their spread is blamed for an estimated $1.5 billion worth of damage to crops, wildlife, and the environment within the United States. These Pigs are known to carry diseases that pose a threat to livestock and humans, including swine brucellosis and pseudorabies. How can the establishment of feral swine negatively impact Oregon and Washington? Join subject matter experts from USDA Animal and Plant Health Inspection Service, Wildlife Services who will outline feral swine impacts, provide an update on locations feral swine have been detected and managed, and provide an overview of available tools to streamline the reporting of feral swine by professionals and the public.

DISPERSAL PATTERNS AND CONNECTIVITY OF WESTERN PURPLE MARTIN COLONIES IN WESTERN OREGON. LORELLE SHERMAN*, *Oregon State University*, *2620 SE Thompson St.*, *Corvallis*, *OR 97333*; *lorelle.sherman@oregonstate.edu*; JOAN HAGAR, *USGS*; *joan_hagar@usgs.gov*.

The Western Purple Martin (*Progne subis arboricola*) is a species of conservation concern throughout the Pacific Northwest. Unlike the eastern subspecies that is almost entirely dependent on artificial housing, many pairs of the western subspecies still nest in natural cavities in the wild. Although large colonies nest in artificial housing located at lowland, wetland sites, smaller colonies nesting in natural snags are scattered throughout upland forest habitat in western Oregon. However, the level of connectivity between colonies is uncertain. The goal of this study is to better understand the dispersal patterns and interactions among colonies of Purple Martins in the Pacific Northwest. We addressed 2 research questions in this study: 1) Are Purple Martins capable of transferring from artificial housing to natural cavities; and 2) do birds banded as nestlings at low elevation, wetland sites disperse to upland forest sites as adults? We added a band-resighting component to an ongoing project that has color-banded more than 1000 birds, primarily at lowland colonies. Preliminary results confirm birds born in artificial housing are capable of nesting in natural snag cavities as adults. We observed birds banded as nestlings at low elevation, wetland sites dispersing to use upland forest sites in subsequent breeding seasons. In addition, we documented interactions between regional colonies, including dispersal distances of over 100 miles from banding sites to new colony sites. The final results of this project will be useful for informing forest management strategies aimed at maintaining self-sustaining, snag-nesting populations of Purple Martin in the Pacific Northwest.

AN AGGRESSIVE APPROACH TO BULLFROG CONTROL AND ERADICATION IN SUNRIVER, OREGON. JESSE SHORT*, JODI WILMOTH; *jodiwilmoth@icloud.com*

Control of invasive Bullfrog (*Lithobates catesbeianus*) populations is often conducted using methods like electro-frogging, poisoning, and water level control. Unfortunately, these methods may have a significant impact on co-occurring native amphibians, such as the federally threatened Oregon Spotted Frog (*Rana pretiosa*), and thus may not be practical for use at a given site. In 2017, we manually removed bullfrogs from a site inhabited by Oregon Spotted Frogs in Deschutes County, Oregon. To do this, we used live traps, nets, and hand capture. These methods were quite effective: Between May and October, we removed 5,237 Bullfrogs with crews of one to three people. The record removed in a single night was 374. The majority of the frogs captured were metamorphs and juveniles, which reflects both the stage of colonization and the effect of previous years' efforts. Manually controlling invasive species is by no means a new idea, nor is it effective everywhere. However, our results suggest that manual control could be a viable solution in sensitive habitats where every native frog counts.

CONNECTING PEOPLE TO CONNECT PLACES: LESSONS LEARNED FROM THE WASHINGTON WILDLIFE HABITAT CONNECTIVITY WORKING GROUP. PETER H. SINGLETON*, *USFS PNW Research Station*, *1133 N Western Ave.*, *Wenatchee*, *WA 98801*; *psingleton@fs.fed.us*; SONIA HALL, *SAH Ecologia LLC*; *hallsoniawild@gmail.com.*

Providing an assessment of terrestrial wildlife habitat connectivity patterns that is informative across multiple scales and that gets used to support land management decisions is a challenging process. The Washington Wildlife Habitat Connectivity Working Group was formed in 2007 to promote the long-term viability of wildlife populations in Washington State through a science-based, collaborative approach that identifies opportunities and priorities to conserve and restore habitat connectivity for terrestrial wildlife (waconnected.org). Our experience with the working group highlighted 5 key challenges: 1) communicating the biological meaning of complicated connectivity assessment products, 2) conveying how that information can be used to support land management decisions, 3) establishing the credibility of complicated assessment products, 4) land manager's willingness to "own" products they did not develop, and 5) meeting the needs of multiple entities. We propose 6 principles for addressing these challenges: 1) shared vision and leadership, 2) engage users from the beginning to the end, 3) simplify, but don't oversimplify assessment products, 4) invest in communication and interpretation, 5) make all tools and products freely available online, and 6) facilitate development of additional products tailored to users' needs.

WHERE DID THE GOSHAWK GO: DESIGN AND ANALYSIS CONSIDERATIONS FOR GPS TELEMETRY STUDIES? PETER H. SINGLETON*, *USFS PNW Research Station*, *1133 N Western Ave.*, *Wenatchee*, *WA 98801*; *psingleton@fs.fed.us*; CHRIS LOGGERS, *Colville National Forest*; *cloggers@fs.fed.us*; JAMES WATSON, *Washington Dept. of Fish and Wildlife*; *James.Watson@dfw.wa.gov*.

Recent developments in GPS telemetry technology have created new opportunities for learning about animal space-use, movement behavior, and habitat selection. However, taking advantage of this technology requires unique considerations for study design and data analysis.

Since June 2016, we have deployed 12 solar-powered GPS tags on northern goshawks in the Colville National Forest in northeastern Washington. These data collection efforts are part of an ongoing study investigating the effects of wildfire and forest restoration on Northern Goshawk (*Accipiter gentilis*) distribution and habitat selection. The GPS tags were programmed to record 22 locations per day (1 an hour from 0500 to 2200) during breeding season (Mar 1 to Aug 31), and 4 locations per day (1 every 6 hours) during non-breeding season (Sept 1 – Feb 28). During a 2-week period in June and July 2017, we tested the feasibility of collecting higher-resolution movement data by programming one tag to record locations at 5-minute intervals. As of October 2017, we have recorded 12384 GPS locations from 11 individual goshawks at 10 breeding territories. In this presentation, we will discuss trade-offs between tag performance and frequency of recorded locations that are important to consider in the design of a GPS telemetry study. We will also discuss new analysis approaches for investigating movement behavior and habitat selection with high-resolution data from GPS tags.

AN ASSESSMENT OF GRASSLAND RESTORATION ON NATIVE BEE COMMUNITIES IN EASTERN OREGON. LAUREN A SMITH DICARLO*, *Oregon State University*, *2121 S 1st St.*, *Hermiston*, *OR 97838*; *lauren.smith@oregonstate.edu*; SANDRA DEBANO, *Oregon State University*; *sandy.debano@oregonstate.edu*.

Since pre-settlement times over 90% of native North American grasslands have declined, primarily due to agricultural conversion. Thus, much of grassland restoration efforts occur in the context of agroecosystems. Today, grasslands provide essential habitat for many rare and endangered plant and animal species; including native bees. Grassland bees increase pollination of native plants and neighboring crops yet it is unclear whether much of grassland restoration has resulted in restoration of native bee diversity and function. A recent realization of the importance of grassland habitats has led to an increased number of restoration projects in eastern Oregon such as The Nature Conservancy Boardman Grasslands and Zumwalt Prairie and The Umatilla National Wildlife Refuge, all sites that were previously grazed and invaded by annual grasses. The primary goal of this study was to use three years of observational data to understand how grassland restoration impacts native bee diversity and determine if restoration returns diversity and richness to native levels. Results indicate strong temporal patterns for both native bees and floral resources—with significantly less native bees but higher abundances and diversity of available floral resources seen later in the field season. Approximately 75% of the native bees collected were Sweat Bees (*Agapostemon spp*. and *Lasioglossum spp*.) followed by Long-horned Bees (*Melissodes spp*.); the only genus that increased in abundance throughout the season. Ultimately, this research will result in management recommendations that can increase the number and diversity of native bees and pollination in Pacific Northwest agroecosystems.

BUILDING SHARED SOLUTIONS: ANALYZING ANIMAL MOVEMENT AND MIGRATION WITH "MIGRATER". DEREK B. SPITZ*, *Oregon State University, 512 W 13th Ave.*, *Kennewick*, *WA 99337*; *spitzderek@gmail.com*; MARK HEBBLEWHITE, *University of Montana*; *mark.Hebblewhite@umontana.edu*; THOMAS R. STEPHENSON, *California Department of Fish and Wildlife*; *tom.Stephenson@wildlife.ca.gov*

In many areas of ecology, data collection has outpaced the development of analytical tools. The resulting research bottleneck ensures much time is spent reinventing the wheel.

Nowhere is this more apparent than in the study of animal-location data. We illustrate an alternative approach:
"migrateR", an open-source software package designed to distribute, standardize, and further develop methods for the analysis of animal movement, with a particular emphasis on migration.

QUANTIFYING THE COST OF HUMAN HUNTING ON NON-TARGET INDIVIDUALS. DEREK B. SPITZ*, *Oregon State University*, *512 W 13th Ave*, *Kennewick*, *WA 99337*; *spitzderek@gmail.com*; TAAL LEVI, *Oregon State University*; *taal.levi@oregonstate.edu*; MARY ROWLAND, *U.S. Forest Service*, *Pacific Northwest Research Station*; *mrowland@fs.fed.us*; DARREN CLARK,*Oregon Department of Fish and Wildlife*; *darren.a.clark@state.or.us*; MICHAEL WISDOM, *U.S. Forest Service*, *Pacific Northwest Research Station*; *mwisdom@fs.fed.us*.

The life-and-death stakes of predator-prey encounters justify the high cost of many anti-predator behaviors. In adopting these behaviors, prey incur substantial non-consumptive costs that can have population-level consequences. Because prey knowledge of risk is imperfect, individuals may even adopt these costly behaviors in the absence of a real threat. For example, many species categorically avoid anthropogenic activity rather than, e.g., only avoiding hunters. Although hunting seasons only increase risk for specific individuals (e.g., males), non-target individuals may still perceive human hunters as a source of risk and may respond by: 1) ignoring hunter activity, 2) gradually habituating to hunter activity through time, or 3) altering behavior to avoid perceived risk. We test these competing hypotheses using telemetry data from non-target cow Elk (*Cervus canadensis*) in Starkey Experimental Forest and Range (n = 148 animal-years). From 2008 to 2013, annual hunts were held for male Mule Deer (*Odocoileus hemionus*) and Elk, but female Elk were not hunted. Human hunters were restricted to one portion of the study area, while no hunting activity was allowed in an adjacent population of elk. Using the un-hunted Elk population as a baseline, we created 3 a priori models of Elk movement, each representing 1 of our 3 hypotheses, and compared the results using AIC. Non-target cow Elk showed strong responses to human hunters, but the strength and direction of this response depended on hunt type, suggesting a hierarchy of predator-avoidance strategies. We translate these changes in movement to energetic costs and discuss implications for population-level demography.

SO MANY WEEDS, SO LITTLE TIME: PRIORITIZING USE OF LIMITED RESOURCES. ELAINE M. STEWART*, *Metro-Conservation Program*, *Metro-Parks+Nature*, *Portland*, *OR 97232*; *elaine.stewart@oregonmetro.gov*.

Invasive species have many impacts, including reduced crop production, toxicity to livestock, native plant community disturbance, and water quality degradation. There are many resources for invasiveness and impacts, ranging from web sites (e.g., invasives.org, NatureServe), jurisdictional weed lists developed by state and local governments, published literature and professional expertise. However, practitioners have little time for research and must decide where and how to allocate limited resources. At Metro, the Parks + Nature program maintains and restores more than 6880 ha of parks and natural areas in a region with more than 500 exotic plant species. We manage upland forests, wetlands, oak and prairie habitats, riparian forests and nature parks. I will present a decision support tool developed to distill hundreds of plants into a framework that guides Metro scientists and technicians in assessing treatment needs. A 2-way table places species in treatment contexts such as public areas where toxic plants cannot

be tolerated. A number of species are targeted for treatment in prairie and oak (*Quercus spp*.) habitats that would not be controlled in other settings such as riparian plantings. This framework helps staff focus resources where they are needed most. It provides consistent guidance across the natural areas program and saves time in planning treatments among areas. A discretionary tool, it is designed to be flexible and adaptable as new weeds arrive and new tools and knowledge emerge.

EFFECTS OF INTENSIVE FOREST MANAGEMENT ON DEER AND ELK FORAGING DYNAMICS IN THE OREGON COAST RANGE. THOMAS D. STOKELY*, *Graduate Research Assistant, Oregon State University College of Forestry, Department of Forest Ecosystems and Society,* MATTHEW G. BETTS, *Professor, Oregon State University College of Forestry, Department of Forest Ecosystems and Society.*

In the face increasing demands for wood, industrial forestlands of Pacific Northwest will continue to be a major source of timber in global markets. Silvicultural herbicides are used to control early-seral vegetation and promote uniform regeneration of crop-trees, with potential consequences for wildlife such as deer and elk. We hypothesized that by altering forage composition, herbicide treatments alter foraging behavior of deer and elk, with herbicide and herbivory interacting to alter the development of plant communities and crop-trees. To test this hypothesis, we implemented an experiment in the Oregon Coast Range that manipulated both herbicide treatment intensity and deer and elk access to vegetation in young conifer plantations. We also monitored wildlife stand use via camera traps. The effect of herbivory on vegetation was consistent among herbicide treatments, but had a compounding effect on native-forage species where herbicides reduced the abundance of hardwoods and promoted non-native herbaceous species. Crop-tree regeneration was improved such that herbicides and herbivory controlled vegetation, but the "ecosystem services" provided by deer and elk to plantations came at the cost of native forage regeneration. Foraging behavior differed between deer and elk among treatments, but was consistently lower in intensive herbicide treatments which substantially reduced the availability of forage; other stand and landscape-scale factors seemed to be more important determinants of stand use than herbicide treatment per se. Our results demonstrate that the effects of intensive forest management are mediated by deer and elk herbivory in the Oregon Coast Range. Via selective foraging, deer and elk may assist in promoting conifer regeneration, but the compounding effects of herbicides and herbivory has consequences for native-forage composition.

A CONNECTIVITY PLANNING FRAMEWORK FOR OREGON. JAMES R. STRITTHOLT*, *Conservation Biology Institute*, *136 SW Washington Ave.*, *Corvallis*, *OR 97333*; *stritt@consbio.org*; KATIE O'CONNOR, *Conservation Biology Institute*; *katie.oconnor@consbio.org*; JOHN GALLO, *Conservation Biology Institute*; *john.gallo@consbio.org;* ANNIE PRISBREY, *Conservation Biology Institute*; *annie.prisbrey@consbio.org*; JOSEPH GLADWIN, *Conservation Biology Institute*; *gladwin.joseph@consbio.org*.

A recent update to the Oregon Conservation Strategy (2016) listed "barriers to animal movement" as one of seven key conservation issues for the state. That same year, a working

group formed to begin to advance wildlife connectivity planning in Oregon. The vision is to develop the social and analytical foundation to advance wildlife connectivity planning in the state that builds on existing regional efforts while employing the most recent advances in connectivity science and analysis methods. With user needs as a major guiding principle, the framework proposes to create a set of scientifically defensible products and online visualization tools that support various decision makers who operate at different spatial scales. A review of the main components of the framework, how it is being applied in the first region of the state, and other next steps will be presented.

ENHANCING WILDLIFE HABITAT ELEMENTS IN FUELS REDUCTION PROJECTS IN DRY FORESTS OF WASHINGTON AND OREGON. NICOLE A. STRONG*, *Oregon State University*, *3893 SW Airport Way*, *Redmond*, *OR 97756*; *nicole.strong@oregonstate.edu*; KEN BEVIS, *Washington Department of Natural Resources*; *Ken.Bevis@dnr.wa.gov*.

A century of past land management practices, including grazing, removal of large trees, and fire suppression, have resulted in the degradation of forest health, resilience, wildlife habitat, and increased the risk of high severity fire for many dry forest ecosystems throughout Washington and Oregon. In light of the need to protect an increasing number of homes and lives, and reduce fire risk in dry forest ecosystems, state and federal agencies are supporting subsidized fuels reduction projects for private landowners. In many of these treatments, contractors and technical assistance are so focused on fuels that other values, such as wildlife habitat, aesthetics, and forest health are overlooked. Homogenous silvicultural prescriptions and excessive removal of live and dead wood and understory species result in forest habitats that are greatly simplified. Unfortunately, this can significantly degrade habitat quality for many dry forest species, such as hiding cover for small mammals and birds, and winter forage for deer and Elk (*Cervus canadensis*). This also results in a very "unnatural" looking forest. In this presentation, we will identify specific methods of communicating how to maintain habitat diversity while accomplishing the primary objectives of reducing the risk of high severity fire. By focusing on reducing fuel continuity rather than eradicating fuels, as well as managing to include specific habitat components such as snags, logs, legacy, openings and patches, piles, and shrubs, projects yield results that meet a landowner's multiple objectives. Reference will be made to a recent publication of the Woodland Fish and Wildlife series.

RED TREE VOLE OCCUPANCY IN YOUNG FORESTS IN THE OREGON COAST RANGE. JAMES K. SWINGLE*, *USDA Forest Service*, *Pacific Northwest Research Station*, *Corvallis Forestry Sciences Lab*, *Corvallis*, *OR 97331*; *jswingle@fs.fed.us*; DAMON LESMEISTER, *USDA Forest Service*, *Pacific Northwest Research Station*; *dlesmeister@fs.fed.us*; MARK LINNELL, *USDA Forest Service*, *Pacific Northwest Research Station*; *marcolinnell@yahoo.com*; ARAYA JENSEN, *Oregon State University*; *ajensen6@student.umpqua.edu*.

Red Tree Voles (*Arborimus longicaudus*) are endemic to western Oregon and northwestern California and primarily occur in old coniferous forests (≥80 years old). In the northern half of Oregon's Coast Range, the tree vole is a candidate species for listing as a distinct population segment under the Endangered Species Act because of the historical contraction of old forest resulted in dispersed, small patches of old forest in a matrix of young forest. Young forests (20 to 80 years old) may function as low-contrast matrix for vole populations in old forest

patches but this effect may be limited by distance from old forest. We randomly selected young forest sites, subdivided into 2 distance classes from old forest: 0 to 1 km and 1 to 2 km. During 2016 to 2017, we conducted ground-based surveys for tree vole nests along 4 112-m independent transects and climbed to examine potential nests for unique tree vole nest material to estimate stand occupancy (ψ). In 2016, we found a moderate level of occupancy ($\psi = 0.426 \pm 0.075$) with no relationship with distance to old forest ($\beta = -0.295 \pm 0.324$). Our 2016 results of tree vole occupancy suggests that young forests may serve as low-matrix linkages 1 km.

THE CHANGING LANDSCAPE OF PREDATOR INTERACTIONS: DIET SHIFTS AND MESOPREDATOR RELEASE AT A CONTINENTAL SCALE. BRIAN P. TANIS*, *Oregon State University*, *OSU Department of Integrative Biology*, *Crovallis*, *OR 97330*; *tanisb@oregonstate.edu*; REBECCA TERRY, *Oregon State University*, *Department of Integrative Biology*; *rebecca.terry@science.oregonstate.edu*.

The loss of apex predators from the landscape frequently releases medium-sized mesopredators from competition, resulting in trophic cascades with widespread ecological impacts. For example, within the Pacific Northwest, historical extirpation and modern re-wilding of the Gray Wolf (*Canis lupus*) has potentially triggered the release of Coyotes (*Canis latrans*), causing complex cascading effects in the interactions between wolves, coyotes, and Red Foxes (*Vulpes vulpes*). Although mesopredator release has been studied at local and regional scales via population abundances, challenges persist when dealing with less discrete populations covering wide geographic extents. Here, we demonstrate that dietary niche space can reveal the dynamic interactions between apex and mesopredators over continental and century-scale spatial and temporal gradients. To assess the impacts of these interactions we quantified the dietary niche space for the above-listed canids using Dental Microwear Texture Analysis (DMTA) and the analysis of stable isotopes (δ13C and δ15N; SIA). Enamel surface casts and hairs were sampled from museum specimens for DMTA and SIA respectively. Individuals were categorized by spatial and temporal proximity along a north-south transect of western North America and dietary niche was quantified via the analysis of standard and Bayesian ellipses. Dietary niche space was found to shift in mean position and change in breadth within regions where canids have undergone competitive release. These findings demonstrate the potential for mesopredator release to have impacted trophic webs across the west coast, including the Pacific Northwest. Furthermore, this suggests that quantifying dietary niche space can document released populations of mesopredators without measuring population abundances.

ASSESSMENT OF THE STATUS AND DISTRIBUTION OF CANADA LYNX IN WASHINGTON USING BROAD-SCALE REMOTE CAMERA SURVEYS. DANIEL THORNTON*, *Washington State University*, *1228 Webster Hall*, *Pullman*, *WA 99164*; *daniel.thornton@wsu.edu*; TRAVIS KING, *Washington State University*; *travis.w.king@wsu.edu*.

Development of management strategies for many threatened species requires an understanding of species response to disturbance at broad spatial scales. Spatially extensive surveys can be used to study key environmental drivers of species distribution, inform the development of better predictive models of response to anthropogenic threats, and aid in adaptive management decisions. Camera-trapping has emerged as a powerful non-invasive method for the generation of broad-scale datasets of carnivore distribution. We applied camera-trapping to better

understand the distribution of threatened Canada Lynx (*Lynx canadensis*) in Washington State. Lynx in Washington persist in low numbers and are threatened by a variety of factors such as forest fires, habitat loss, and climate change. Despite these threats and the precarious status of Lynx in Washington, we currently have an incomplete understanding of lynx distribution in the state, and how Lynx large-scale occupancy patterns are influenced by environmental drivers. To address this gap in knowledge, we placed ~ 700 cameras across an area of 7000 km^2 in north-central Washington during summer of 2016 and 2017, using a simple design with unbaited cameras placed along roads and trails. Preliminary results suggest relatively low occupancy for Lynx, with spatially clustered hotspots of detection. Occupancy models reveal that our simple design is efficient at detecting Lynx, along with numerous other carnivores, suggesting that our methodology could provide a platform for broad-scale and long-term monitoring of multiple carnivore species.

AGE-SPECIFIC RISK TO THE THREATENED ANURAN (*RANA PRETIOSA*) THAT MANIFESTS AN AGE-LINKED RESPONSE TO THE PREDATORY STRIKE DISTANCE OF THE AMERICAN BULLFROG (*RANA CATESBEIANA*). KYLE S. TIDWELL*, *Portland State University*, *Department of Biology*, *Portland*, *OR 97207*; *kylescotttidwell@gmail.com*; PAUL YARNOLD, *Optimal Data Analysis*; *Optimal.Data.Analysis@gmail.com*; MARC HAYES, *Washington Dept. of Fish and Wildlife*; *Marc.Hayes@dfw.wa.gov*.

Anti-predator behavior studies often use the distance at which prey first evade an approaching predator (Flight Initiation Distance [FID]) as a focal metric, but only rarely explore age-specific changes in this metric. Previous study of Oregon Spotted Frog (OSF; *Rana pretiosa*) FID revealed an increase with OSF age for a population exposed to American Bullfrogs (bullfrog; *Rana catesbeiana*). We explored the risk this poses to different age groups with a combination of laboratory and field-based experiments of sympatric and allopatric populations of OSFs and bullfrogs. In laboratory experiments at a site of bullfrog co-occurrence we found that 100% of young, but only 20.75% of older OSFs had FIDs less than the upper limit of the bullfrog strike distance. Field trials at the site of co-occurrence validated these findings, wherein, 75% of young, 46% of second-year, and only 30% of adult OSFs had FIDs less than the bullfrog strike distance. In contrast we found, OSFs not impacted by bullfrogs, had substantially more frogs within the strike distance across all age groups over that in the bullfrog-impacted site (i.e. 50.5% vs. 73.3%). This pattern reinforces our previous suggestion that bullfrogs are the basis for the increased FID in older OSFs at the bullfrog-occupied site.

EVALUATION OF PINNIPED PREDATION ON ADULT SALMONIDS AND OTHER FISH IN THE BONNEVILLE DAM TAILRACE, 2017. KYLE S. TIDWELL*, *U.S. Army Corps of Engineers*, *Fisheries Field Unit*, *U.S. Army Corps of Engineers*, *Cascade Locks*, *OR 97014*; *kyle.s.tidwell@usace.army.mil*; BJORN VAN DER LEEUW, *U.S. Army Corps of Engineers*; *Bjorn.k.vanderleeuw@usace.army.mil*; LINDSAY MAGILL, *U.S. Army Corps of Engineers*; *Lindsay.N.Magill@usace.army.mil*; BRETT CARROTHERS, *U.S. Army Corps of Engineers*; *Brett.Carrothers@usace.army.mil.*

California Sea Lions (CSL; *Zalophus californianus*) and Steller Sea Lions (SSL; *Eumetopias jubatus*) aggregate seasonally at the base of Bonneville Dam, where they feed on fish including endangered stocks of Pacific Salmon and Steelhead (*Oncorhynchus spp*.). In

response to concerns of stock impact by predatory sea lions and as directed by a Biological Opinion, the U.S. Army Corps of Engineers has been monitoring the seasonal presence, abundance, and predation activities of pinnipeds at the dam since 2002. Here we present the findings of the current season and contrast to previous years. Using visual observations from the dams tailrace, abundance was evaluated with point counts of each pinniped species and documentation of uniquely identifiable (i.e., branded) individuals. Estimates of the total number of fish killed were calculated using a probability sampling technique with bootstrap validation of confidence intervals. An estimated 5,384 (CI 4,671 – 6,042) adult salmonids were consumed by both species of pinnipeds in 2017, which equates to 5.0% of the run. Of these, SSLs consumed 3,242 (CI 2,841 – 3,624) which equates to 3.0% of the run, and CSLs consumed 2,142 (1,831 – 2,419) – 2% of all adult salmonids. We documented record high levels of SSL abundance (i.e. daily max $n = 64$) and reduced CSL abundance (i.e. daily max $n = 28$). A total of 92 individual CSLs, 63 SSLs, and one Harbor Seal (*Phoca vitulina richardii*) were recorded. The current trajectory indicates that CSL abundance and predation of salmonids is declining while SSL metrics are increasing.

WASHINGTON DEPARTMENT OF FISH AND WILDLIFE'S WHITE-NOSE SYNDROME RESPONSE - OVERVIEW. ABIGAIL TOBIN*, *Washington Department of Fish and Wildlife*, *1111 Washington St. SE*, *Olympia*, *WA 98501*; *Abigail.Tobin@dfw.wa.gov*.

Washington Department of Fish and Wildlife (WDFW), other state and federal agencies, tribal nations, and non-governmental organizations are in ongoing collaborative efforts to understand how detrimental white-nose syndrome (WNS) will be on bat populations after its arrival in Washington in March 2016. Little is known about the winter roosting ecology of many Washington bat species, (e.g., use of hibernation, roost locations). Due to this, making inferences of WNS impacts on Washington's bat population proves difficult. WDFW along with partners has implemented a WNS response this past year that includes (1) conducting outreach about WNS and bats, (2) understanding the ecology and distribution of WNS in Washington, (3) elucidating the natural life history of bats, and (4) limiting the risk of human assisted spread of WNS. WDFW has developed several outreach materials to raise awareness about WNS and created an online reporting system for the public to report bat observations. WNS surveillance was conducted during the winter and spring of 2016 to 2017 to determine geographic distribution of WNS, identify environmental reservoirs, and determine species susceptible to WNS. Thirty-five roosts in 17 counties were included in surveillance. WDFW is in its second season of a winter acoustic monitoring project to characterize winter activity (e.g., use of hibernation) and identify areas with bat activity to guide future management activities such as WNS surveillance. Lastly, WDFW has developed WNS decontamination guidelines using the National WNS protocol as guidance to facilitate participation. With partnership, WDFW will continue a comprehensive WNS response.

TERRESTRIAL FOOD WEBS OF THE PACIFIC NORTHWEST FORESTS AND THE IMPORTANCE OF SPOTTED SKUNKS. MARIE I. TOSA*, *Oregon State University*, *1959 Onyx St.*, *Eugene*, *OR 97403*; *tosam@oregonstate.edu*; DAMON LESMEISTER, *Pacific Northwest Research Station, U.S. Forest Service and Department of Fisheries and Wildlife*, *Oregon State University*; *dlesmeister@fs.fed.us*; TAAL LEVI, *Department of Fisheries and Wildlife*, *Oregon State University*; *taal.levi@oregonstate.edu*.

Improved understanding of the natural history and spatial ecology of carnivores in the Pacific Northwest forests can aid in our ability to respond to perturbations such as climate change, land use change, and novel species invasions. Using baited trail cameras, we described the distribution of carnivores from May through December 2017 across a gradient of elevation and stand age. Additionally, we conduced more focused research on Western Spotted Skunks (*Spilogale gracilis*), which are poorly studied despite being one of the most abundant mammalian carnivores in the Pacific Northwest forests. We deployed 7 VHF radio-collars on western spotted skunks to describe their spatial ecology from October through December 2017 at the H. J. Andrews Experimental Forest, a National Science Foundation Long-Term Ecological Research site. We calculated home range sizes and characterized daytime rest sites of male spotted skunks in an area with a gradient of logged to old-growth forest. Preliminary results suggest that Spotted Skunks occurred at lower elevations, primarily used underground burrows for rest sites, and had enhanced use of old-growth forest compared to younger forest types.

DUSKY CANADA GOOSE MANAGEMENT IN THE PACIFIC FLYWAY. NICHOLAS TREJO*, *Washington Department of Fish and Wildlife*, *5525 S. 11th St.*, *Ridgefield*, *WA 98642*; *Nicholas.Trejo@dfw.wa.gov*; NICHOLLE STEPHENS, *Washington Department of Fish and Wildlife*; *Nicholle.Stephens@dfw.wa.gov*.

The Dusky Canada Goose (*Branta canadensis occidentalis*, hereafter Dusky Goose) population dropped to a low of 6700 in 2009. The cause of this population decrease was the result of an 8.5 magnitude earthquake that lifted Dusky Goose breeding grounds by 2 m. This abrupt change to the Copper River Delta made breeding grounds more accessible to predators. Dryer soils contributed the drastic alteration of Dusky Goose nesting habitat causing state and federal agencies to take action to conserve Dusky Geese throughout the Pacific Flyway. State and federal wildlife agencies are tasked with monitoring Dusky Geese throughout the flyway. These agencies have taken multiple approaches to increase breeding success and winter survival to meet a target population of 20,000 birds. Artificial nesting platforms have been built for nesting Dusky Canada Geese to use to increase breeding success. On the wintering grounds states have implemented goose identification testing to reduce harvest by hunters. Goose hunting regulations have become increasingly complicated in Washington. To add the confusion, Washington and Oregon host a resident goose called a Resident Dark Goose or a Wusky Goose that further confuses hunters and wildlife managers. The history of the Dusky Goose and goose management practices in Washington State are the focal points of this presentation.

RECREATION AND WILDLIFE IMPACTS: A BALANCING ACT. LAURI TURNER*, *Deschutes National Forest*, *63095 Deschutes Market Rd.*, *Bend*, *OR 97701*; *lturner@fs.fed.us*; BROCK MCCORMICK, *Deschutes National Forest*; *bmccormick@fs.fed.us*.

Recreation use on the Deschutes National Forest has increased dramatically over the past 10 to 15 years. Central Oregon has become a major destination for non-motorized use, currently providing well over 1,145 miles of non-motorized system trails. Growing impacts to natural and cultural resources continue to occur for several reasons: 1) A diversity of trail user groups continue to pressure the Deschutes National Forest to build more trails to meet their recreational desires; (2) User-created trails are increasing; and (3) The public generally does not connect the

impact of their recreational use, on or off trails, to the degraded ecological health of Deschutes National Forest. There is a need to look at new ways to accommodate recreation development while still protecting wildlife and other valuable resources. Our efforts to address these issues have built momentum in recent years, resulting in the development of innovative and effective approaches to sustainable recreation management. This has included the development of a Trails Analysis Process and toolkit which allows a consistent approach to analyzing trail development at a landscape scale using the best available science and a Communication and Action Plan to increase a broad community and stakeholder understanding of the need to balance the interests and benefits of recreational users with other resource needs and land uses. These efforts may be applicable and insightful to many land and wildlife managers that also perform a balancing act to provide for both recreation needs and wildlife resources.

USING LIDAR TO DESCRIBE PACIFIC MARTEN RESTING HABITAT AT MULTIPLE SPATIAL SCALES. PATRICK J. TWEEDY*, *Oregon State University*, *619 NW 33rd Street*, *Corvallis*, *OR 97330*; *patrick.tweedy@oregonstate.edu*; KATIE MORIARTY, *USDA Forest Service*, *Pacific Northwest Research Station*; *kmoriarty02@fs.fed.us*; JOHN BAILEY, *Oregon State University*; *john.bailey@oregonstate.edu*; CLINTON EPPS, *Oregon State University*; *clinton.epps@oregonstate.edu*; BRIAN WING, *USDA Forest Service*, *Pacific Southwest Research Station*; *brianwing@fs.fed.us*.

Conservation of wildlife populations on managed landscapes requires planning at the appropriate spatial scale, since scale dramatically affect results and thus interpretation. We examined multiscale habitat relationships at Pacific Marten (*Martes caurina*) rest structures in Lassen National Forest using fine-resolution vegetation data (30 m airborne LiDAR). Using a moving-window framework to compare selection, we optimized 14 covariates at 12 spatial scales (30 m to 990 m) centered on each rest structure. We monitored Martens from 2009 to 2012 and 2015 to 2017 (n = 312 resting structures, 31 Martens), and then compared used vs. randomly sampled locations (n = 624) in order to develop multivariate habitat selection models. Our top model included trees per acre (990 m scale) and elevation (900 m), suggesting that Martens select for increased tree cover at higher elevations at the home range scale. Increased structural complexity and canopy cover surrounding rest structures (270 and 30 m, respectively) increased probability of selection. Because Martens selected locations with vegetation characteristics optimized at 30 to 270 m, 270 m may be an appropriate scale to consider for establishing leave islands or focal areas for restoration. We provide the first evaluation of Marten habitat using LiDAR, which can be broadly and accurately extrapolated for management planning and restoration prioritization.

USING ASSISTED MIGRATION OF BEAVERS TO QUANTIFY THE IMPORTANCE OF HABITAT AND BEHAVIOURAL PATTERNS FOR ESTABLISHMENT. IZZIE TWEEN*, *Washington State University*, *735 SW State St.*, *Pullman*, *WA 99163*; *izott.tween@wsu.edu*; ALEX FREMIER, *Washington State University*; *alex.fremier@wsu.edu*.

Increasingly land managers use Beavers (*Castor canadensis*) to restore stream function. Through the impacts of dam building Beavers increase water storage and aquifer recharge resulting in improved stream conditions for fish. Restoration projects that translocate nuisance Beavers provide an opportunity to improve our understanding of habitat selection and assisted

migration effectiveness. Much research has been carried out on Beaver habitat preferences, with translocation projects using this knowledge to select suitable release sites. We analysed the success rate of Beaver establishments at release sites in the Methow Valley, Washington and found that despite informed selection for suitable habitat, only 50% (n = 33) of 67 release sites benefitted from dam building. This experimental setup gave us the opportunity to test the importance of habitat and behavioural variables on release success. We collected remotely-sensed and in-situ field data by measuring channel incision, gradient, substrate, and vegetation. We also analysed behavioural characteristics by testing for differences in how Beavers were paired up, time spent in the holding facility and time of year released. Initial findings indicate that sites with lower stream powers were significantly more likely to be successful (P = 0.01). Additionally no lone Beavers established to build dams compared to translocated families and Beavers paired up artificially in the holding facility (P = 0.01). These findings justify the use of holding facilities to pair animals before release, and underline the importance of quantifying suitable habitat. Incorporating these parameters may better inform predictive models, therefore improving translocation success rates and habitat restoration efforts.

REPTILES AID SCIENCE EDUCATION. BRAD TYLMAN*, *Brad's World Reptiles*, *6700 NW Hwy 99W*, *Corvallis*, *OR 97330*; *service@bradsworldreptiles.com*.

Today, many species of reptiles are successfully being reproduced in captivity and are quite acclimated to captive conditions, even direct handling. Exothermic species, which tend to live in smaller microhabitats in the wild, are much easier to maintain and to travel with than endothermic species. At Brad's World Reptiles we maintain a large number of captive produced reptiles, amphibians, and arthropods. The ability to travel with these animals allows us to take them to more rural areas of our country. They are excellent vehicles of science education due to their behavior, physiology, morphology, and cultural significance. Providing direct exposure with some of these animals and the general public, allows an opportunity to teach science concepts, and creates a greater compassion about life and biodiversity, including its conservation and sustainable use.

SEEING BEYOND WHITE-NOSE SYNDROME: AN UPDATE FROM REGION 6 USFS AND OR/WA BLM. KELLI VAN NORMAN*, *OR/WA BLM & Region 6 USFS*, *1220 SW 3rd Ave.*, *Portland*, *OR 97204*; *kvannorm@blm.gov*.

Both prior to and after white-nose syndrome (WNS) was discovered in a Little Brown Bat (*Myotis lucifugus*) in King County, Washington in March 2017, the Region 6 U.S. Forest Service and Oregon/Washington BLM have been involved with other partners in preparing for the eventual arrival of WNS in the Pacific Northwest. An update on USFS and BLM activities to conduct surveillance for the fungus *Pseudogymnoascus destructans* (Pd) and the presence of WNS on bats will be given along with updates on other recent USFS and BLM activities to manage caves, work with partners, and create habitat to sustain healthy bat populations.

GUILD-SPECIFIC EFFECTS OF INTENSIVE FOREST MANAGEMENT ON AVIAN ABUNDANCE. JAKE VERSCHUYL*, *National Council for Air and Stream Improvement*, *PO Box 1259*, *Anacortes*, *WA 98221*; *jverschuyl@ncasi.org*; MATTHEW BETTS, *Oregon State University*; *matt.betts@oregonstate.edu*; JAY JONES, *Weyerhaeuser*; *jay.jones@weyerhaeuser.com*; ANDREW KROLL, *Weyerhaeuser*; *aj.kroll@weyerhaeuser.com*.

Intensively managed tree plantations have the potential to supply wood products for an expanding human population while reducing pressure on natural forests. Herbicides are used to accelerate growth of crop trees by suppressing competing vegetation but early-seral communities may be negatively affected by reduced vegetation abundance and richness. We used a large-scale randomized complete block experiment to test avian population responses to variation in stand management intensity post-harvest in the Pacific Northwest, USA, 2011-2017. We evaluated how abundance changed for 59 species in response to 3 levels of plant cover reduction (Light, Moderate, and Intensive herbicide applications) in relation to a control without herbicide. By 2015, we found no evidence of differences in total abundance of non-leaf-gleaning species on any of the treatments compared to the control. By 2017, we did not find evidence of on-going reductions for any leaf-gleaning species, except Wilson's Warbler (*Wilsonia pusilla*), between treatment and control stands. Substantial block-specific variation suggests that other factors may mediate treatment effects on individual stands. Our results suggest trade-offs between avian abundance and wood production may be less severe than previously recognized; breeding populations of the 59 species occurred on all treatments, and all but one of the leaf gleaning species had no evidence of abundance differences between treatment and control stands. However, demographic information is required to compare the relative contribution of both treatment and control stands to stands originating from natural disturbance, and to determine how these contribute to the maintenance of regional bird populations across the Pacific Northwest.

ASSESSING EFFECTS ON BIRD POPULATIONS FOLLOWING TIDAL RESTORATION AT FIR ISLAND FARM. TOM VIRZI*, *Conservation InSight*, *13203 SE 172nd Ave.*, *Happy Valley*, *OR 97086*; *tvirzi@conservationinsight.org*; RUTH MILNER, *WA Dept of Fish and Wildlife*; *Ruth.Milner@dfw.wa.gov*; GARY SLATER, *Ecostudies Institute*; *glslater@ecoinst.org*; LEAH RENSEL, *Ecostudies Institute*; *leahrensel@att.net*.

We studied the effects on bird populations after tidal restoration at Fir Island Farm and other sites in the Skagit-Stillaguamish river deltas. Surveys were conducted pre- and post-restoration using methods to estimate and compare changes in avian diversity and abundance. Our results are preliminary as long-term monitoring data is needed to fully understand the effects of estuary restoration projects on bird populations.

DESPERATELY SEEKING SKEETERS: WEST NILE VIRUS SURVEILLANCE IN RESPONSE TO GREATER SAGE-GROUSE POPULATION DECLINES. EMILY C. WEIDNER*, *U.S. Fish and Wildlife Service*, *63095 Deschutes Market Rd.*, *Bend*, *OR 97701*; *emily_weidner@fws.gov*; STU GARRETT, *East Cascades Audubon Society*; *garrett@bendcable.com*; LEE FOSTER, *Oregon Department of Fish and Wildlife*; *Lee.J.Foster@state.or.us*; BROCK MCCORMICK, *U.S. Forest Service*; *bmccormick@fs.fed.us*; LARRY ASHTON, *Bureau of Land Management*; *lashton@blm.gov*.

In August 2006, the United States Geological Survey National Wildlife Health Center confirmed West Nile virus (WNv) infection in Greater Sage-grouse (*Centrocercus urophasianus*)

mortalities in Malheur County, Oregon. Despite the fact that Greater Sage-grouse (Sage-grouse) exhibit a measure of WNv resistance, current research suggests that WNv may serve as a persistent source of mortality and an enzootic stressor on Sage-grouse populations. In response to lek attendance declines in the Brothers/North Wagontire Priority Area for Conservation (PAC), the Bureau of Land Management, East Cascades Audubon Society, Oregon Department of Fish and Wildlife, U.S. Fish and Wildlife Service, and U.S. Forest Service cooperatively monitored WNv presence in mosquitoes (Culicidae) from July through September 2017. During the 7-week pilot season, agency staff and volunteers collected mosquito pools (n = 63) from 16 sites within and around the PAC. Oregon Veterinary Diagnostic Laboratory used real-time reverse transcription polymerase chain reaction (rRT-PCR) to test each individual pool. All mosquito pools tested negative for WNv. Despite these results, project collaborators elected to continue trapping efforts during 2018 to establish a more robust assessment of WNv and its vector (Culex spp.) presence within the PAC. WNv presence in these locations does not imply causation in Sage-grouse declines. However, detection or lack thereof may help direct future Sage-grouse monitoring or potentially more active surveillance. Appropriate and timely response to surveillance data is crucial for predicting impacts of WNv on Sage-grouse populations.

STATUS OF SPOTTED OWLS, BARRED OWLS, AND REMOVAL EXPERIMENTS IN OREGON AND WASHINGTON. J. DAVID WIENS*, *USGS Forest and Rangeland Ecosystem Science Center*, *3200 SW Jefferson Way*, *Corvallis*, *OR 97331*; *jwiens@usgs.gov*; KATIE DUGGER, *U.S. Geological Survey Oregon Cooperative Fish and Wildlife Research Unit*; DAMON LESMWISTER, *USDA Forest Service, Pacific Northwest Research Station*; KRISTA DILIONE, *USGS Forest and Rangeland Ecosystem Science Center*; DAVID SIMON, *USGS Forest and Rangeland Ecosystem Science Center*; ROBIN BOWN, *U.S. Fish and Wildlife Service*;

Competition with Barred Owls (*Strix varia*) is a major contributor to population declines of the Federally threatened Northern Spotted Owl (*S. occidentalis caurina*). A pilot study in California demonstrated that removal of Barred Owls in combination with habitat conservation may be able to slow or even reverse population declines of Spotted Owls. It remains unknown, however, whether similar results can be obtained in areas with different forest conditions, greater densities of Barred Owls, and fewer remaining Spotted Owls. Here, we report initial results from a before-after-control-impact (BACI) experiment implemented on 3 study areas in Oregon and Washington to determine the demographic response of Northern Spotted Owls to the removal of Barred Owls. During 2015 to 2017 we removed >1,200 Barred Owls from treatment areas (257 – 607 km^2 in size), and used standardized field methods to track population responses of both owl species relative to control areas without Barred Owl removal. Preliminary results suggest that recolonization rates of post-removal landscapes by each owl species can vary considerably among and within study areas depending on the regional availability of surplus individuals (i.e. floaters) and site-specific environmental conditions that promote habitat use and territory establishment. We observed little response from Spotted Owls to initial removal efforts, but additional years of study are needed to determine if removal of Barred Owls can ultimately benefit Spotted Owls.

EXOTIC FOREST INSECTS, DISEASES AND WEEDS IN OREGON. WYATT WILLIAMS*, *Oregon Department of Forestry*, *2600 State St.*, *Salem*, *OR 97310*; *wyatt.williams@oregon.gov*.

For over 100 years, forests in the Pacific Northwest have been pressured by exotic pests – insects, disease and weeds – that have altered the region's endemic forest communities as well as timber-harvesting practices. Forest invasive species that have established in Oregon and Washington include White Pine Blister Rust (*Cronartium ribicola*), Scotch Broom (*Cytisus scoparius*), and Sudden Oak Death (*Phytophthora ramorum*). Oregon Department of Forestry (ODF) has identified over 50 additional pests, diseases and plants – and more importantly the pathways of introduction – that further threaten the sustainability of the state's forest environment and economy. Species that have yet to arrive to the region but appear likely in the future include Emerald Ash Borer (*Agrilus planipennis*), several species of exotic wood borers and plant diseases such as Oak Wilt (*Ceratocystis fagacearum*) and Laurel Wilt (*Raffaelea lauricola*). Along with several partner institutions, ODF has initiated forest health projects that aim to prevent or detect early the introduction of new forest pests. Early detection and rapid response programs, combined with creative outreach and education and other preventative programs will ensure that Oregon's forests are healthy and productive in the coming decades. The recent success of detecting, eradicating and providing education and outreach for Asian Gypsy Moth (*Lymantria dispar asiatica*) in the Pacific Northwest will be discussed.

POTENTIAL EFFECTS AND IMPLICATIONS OF CLIMATE CHANGE ON ELK IN DRY FOREST ECOSYSTEMS. MICHAEL J. WISDOM*, *Forest Service Pacific Northwest Research Station*, *PNW Research Station*, *Forestry and Range Sciences Laboratory*, *La Grande*, *OR 97850*; *mwisdom@fs.fed.us*; BRIAN DICK, *U.S. Forest Service PNW Research Station*; BRIDGETT NAYLOR, *U.S. Forest Service PNW Research Station;* MARY ROWLAND, *U.S. Forest Service PNW Research Station*, PRISCILLA COE, *Oregon Dept. of Fish and Wildlife*.

Changes in climate have been occurring for a number of decades across the world. In the Blue Mountains of northeast Oregon, year-round temperatures have increased substantially during the past 30 years, with an associated decline in late-winter snow pack and an increased period of summer drought. Long-term trends in performance metrics of female Elk (*Cervus canadensis*) at Starkey Experimental Forest and Range in northeast Oregon appear to be declining in response to these changes. Altered climate affects the timing and duration of ungulate forage production and its sustainability during spring and summer, which appears to explain the trends of reduced body fat of female Elk at Starkey during years of higher temperatures and lower snow pack. We discuss plausible mechanisms and potential implications for wild ungulates in dry forest ecosystems of the interior western United States.

SPATIAL MOVEMENT OF COLUMBIAN WHITE-TAILED DEER IN RESPONSE TO CATTLE GRAZING. BRENT M. WOLF*, *Oregon Department of Fish and Wildlife*, *4192 N Umpqua Hwy.*, *Roseburg*, *OR 97470*; *brent.m.wolf@state.or.us*; DEWAINE JACKSON, *Oregon Department of Fish and Wildlife*; *dewaine.h.jackson@state.or.us*.

Limited data exist regarding movement of Columbian White-tailed Deer (CWTD, *Odocoileus virginianus leucurus*) in response to Cattle (*Bos taurus*) grazing. From 2014 to 2016 the Oregon Department of Fish and Wildlife conducted a study monitoring the movement of

CWTD on the 26.67 km^2 North Bank Habitat Management Area in Douglas County, OR. CWTD that were using active grazing pastures were fitted with GPS radio-collars and were monitored during three periods: 1.) prior to Cattle grazing the pasture, 2.) during Cattle grazing, and 3.) after removal of Cattle from the pasture. Ten CWTD were tracked and experienced a wide range of Cattle grazing, both in terms of intensity (number of Cattle on a pasture) and duration (number of days Cattle were on a pasture). Our presentation will address the response of deer to Cattle presence in terms of home range dynamics.

SUMMER PHENOLOGY AND HABITATS OF PNW RANID FROGS. AMY E.YAHNKE*, *Washington Department of Ecology, P.O. Box 47600, Olympia, WA 98504; Amy.Yahnke@ecy.wa.gov*; MARC HAYES, *Washington Department of Fish and Wildlife*; *Marc.Hayes@dfw.wa.gov*; JULIE TYSON, *Washington Department of Fish and Wildlife; Julie.Tyson@dfw.wa.gov*; CHRISTIAN GRUE, *University of Washington*; *cgrue@uw.edu*.

Habitat restoration can be pivotal to amphibian recovery. Breeding habitats are often the focus of restoration. However, recovery of amphibian populations will also depend on protecting and restoring habitats used outside of the breeding season. Oregon Spotted Frogs (*Rana pretiosa*; OSF) are an ESA-listed species sympatric with Northern Red-legged Frogs (*Rana aurora*; NRLF). Breeding habitats of both species are well known, but knowledge of non-breeding season habitats is sparse. To help fill this gap, we surveyed a site occupied by both species weekly during the non-breeding season in late spring and summer. We recorded species and life stages and found important life history differences during and after metamorphosis. Water depth was an important correlate of amphibian distribution. Overall, both species used water slightly deeper than available depths. Moreover, hydroperiod in seasonally inundated locations typically used for breeding was negatively correlated with abundance of the early life stages of both species and OSF adults. Abundance estimates showed that amphibians moved as the more ephemeral areas of the wetland dried out. All OSF remained in the wettest parts of the wetland through the summer, whereas post-metamorphic NRLF were rarely seen in the wetland over the same time interval. OSF require shallow emergent wetlands for breeding, but permanent waters appear to be a critical summer refuge. To recover OSF, it will be crucial to maintain sites with a duality of hydroperiods: shallow ephemeral wetlands during the breeding season connected to deeper permanent waters for summer refuge.

EFFECT OF SEASON AND HABITAT ON PREDATOR VISITATION RATES OF ENDANGERED COLUMBIA BASIN PYGMY RABBIT BURROWS. BRIAN ZINKE*, *Washington Department of Fish and Wildlife*, *1550 Alder St. NW*, *Ephrata*, *WA 98823*; *Brian.Zinke@dfw.wa.gov*; JON GALLIE, *Washington Department of Fish and Wildlife*; *Jon.Gallie@dfw.wa.gov*.

The Columbia Basin Pygmy Rabbit (*Brachylagus idahoensis*) is a federally endangered species, with less than 200 individuals known to persist. Reintroduction efforts have reestablished a wild population in eastern Washington, in an area characterized by high agricultural use and varying levels of habitat fragmentation. Recently, Pygmy Rabbits have started using Conservation Reserve Program (CRP) fields and fragmented agricultural areas at higher levels than the adjacent native shrubsteppe habitat in which they were reintroduced. To assess factors that might make these non-native habitats more appealing to Pygmy Rabbits, we began camera monitoring to determine predator visitation rates at burrows in native shrubsteppe,

CRP fields, and fragmented habitats. Predators detected, in order of frequency, were Long-tailed Weasel (*Mustela frenata*), American Badger (*Taxidea taxus*), and Coyote (*Canis latrans*). Predator visitation rates increased in all 3 habitat types in the fall compared to summer months. During both summer and fall, burrows in CRP fields had the lowest predator visitation rates, while native shrubsteppe had the highest. The most observed prey type varied between habitats, with rodents having higher visitation rates in CRP and native shrubsteppe, while lagomorphs had higher rates in fragmented areas. Interestingly, we documented Cottontails (*Sylvilagus spp*.) and Pygmy Rabbits using the same burrows, seemingly without detrimental effects. The lower predator visitation rates in the CRP could be a contributing factor as to why Pygmy Rabbits have higher burrow establishment and higher occurrence of wild-born rabbits than the nearby native shrubsteppe.

ENHANCING CONSERVATION OF NATIVE BEES IN FORESTS AND GRASSLANDS OF EASTERN OREGON: IDENTIFYING MAJOR FOOD SOURCES USING DNA METABARCODING TECHNIQUES.
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Invertebrates are one of the largest and most diverse groups of animals, and they provide many important ecological functions, including pollination. The importance of conserving invertebrate diversity is becoming increasingly appreciated, and with recent declines of some pollinators, including native bees, many land managers are looking to implement restoration and conservation plans that enhance native bee habitat. However, there is currently limited information on which plant species are major food sources for native bees in the Pacific Northwest. This presentation describes an ongoing project that uses recently developed molecular ecology techniques (DNA metabarcoding) on pollen collected from foraging bees at 30 sites in Pacific Northwest Bunchgrass Prairie and riparian areas in forests of the Blue Mountains to determine which plant species serve as significant food sources for native bees. In addition, we will compare this method with data from field observations to determine whether DNA metabarcoding provides a more complete record of bee foraging behavior.

THE RELATIONSHIP BETWEEN WILDFIRE AND THE CASCADING IMPACTS OF PREDATORS ON PLANTS.
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Predators may exhibit top-down effects on plant communities by altering the abundance and behavior of their herbivore prey. Disturbance regimes such as wildfire may impact the strength and nature of these interactions and their corresponding effects on plant communities. In 2015, wildfires burned through areas in eastern Washington impacted by the recolonization of Gray Wolves (*Canis lupus*) and inhabited by their two main prey species, Mule Deer (*Odocileus hemionus*) and White-tailed Deer (*O. virginianus*). We are using data collected in burned and unburned areas across wolf-impacted and wolf-free sites to explore the relationship between recent wildfires and the effects of predators on plants. Data on plant species presence, height, percent cover, and browsing extent within each plot and associated controls will provide an index of browsing intensity and plant species selection by deer. The amount of biomass removal by deer will be analyzed as a function of fire, wolf-presence, and measured landscape variables. Our findings will yield a better understanding of the top down effects of predators like wolves in areas like the American West that are predicted to be increasingly affected by wildfire.

APPLYING HABITAT CONSERVATION FOR LANDBIRDS IN THE CONIFEROUS FORESTS OF WESTERN OREGON AND WASHINGTON TO PLANING IN THE SOUTH FORK, STILLAGUAMISH VEGETATION PROJECT.
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A consortium of avian conservation partners are collaborating with the Mt. Baker Snoqualmie NF personnel to integrate the Partners in Flight (PIF) Bird Conservation Plans with forest planning efforts. The project will apply the PIF conservation planning framework to inform landscape level planning and stand level prescriptions. The PIF conservation planning process uses birds as indicators of habitat components to determine current and desired conditions, recommend prescriptions, and develop a monitoring strategy to measure treatment effectiveness. Birds are excellent indicators of ecosystem health because they respond quickly to habitat change. Avian focal species are sensitive to environmental variation at multiple trophic levels and spatial scales, and are relatively easy and cost-effective to monitor. The planning area includes commercially thinned trees.

AFFORDABLE TEMPERATURE CHAMBERS WITH REALISTIC DIEL FLUCTUATIONS. GWENDOLYNN W. BURY*, *Oregon State University, 104 Nash Hall, Corvallis, OR 97331; Gwendolynn.Bury@oregonstate.edu.*

Laboratory results can be misleading if the subjects are kept under conditions that are not representative. The equipment to accurately replicate field conditions is often prohibitively expensive. I built chambers that allow for realistic thermal cycling for aquatic and semi-aquatic organisms. All the components are available locally or inexpensively online. The tanks were able to replicate field observations of daily thermal fluctuations. I used this equipment to test the thermal tolerance of a sensitive stream salamander (Southern Torrent Salamander, Rhyacotriton variegatus). Adult R. variegatus experienced increased stress when exposed to elevated temperature regimes. R. variegatus larvae died when the daily maximum of the temperature treatment approached previously recorded CTM levels. Considering the rate of human alteration of landscapes, testing the response of organisms accurately is important to management and conservation. Many animal responses are different at steady versus cycling temperatures.

ADAPTIVE MANAGEMENT OF WESTERN POND TURTLES IN OREGON'S WILLAMETTE VALLEY. AARON J. CENCICH*, *U.S. Army Corps of Engineers*, *491 W 8th Ave.*, *Eugene*, *OR 97401*; *aaron.j.cencich@usace.army.mil*.

The Western Pond Turtle (*Actinemys marmorata*) is 1 of 2 native turtles found in the Pacific Northwest. It has suffered population declines throughout its range and its species status is currently under review by the U.S. Fish & Wildlife Service. A determination on listing under the Endangered Species Act is projected for 2020. There are 3 primary Western Pond Turtle populations managed by the U.S. Army Corps of Engineers located in the Southern Willamette Valley. We examine our current Western Pond Turtle Management Program implemented in 1993. Our primary management goal is to increase hatchling recruitment through decreasing nest depredation rates. This is achieved by clearing all nesting grounds of vegetation, enclosing this

area with an electric fence (primary predator exclosure), and by using wire nest exclosures (secondary). In 2013, we observed higher depredation rates of turtle nests within areas protected by electric fences and nests were predated within protected metal exclosures. This indicates that predators are figuring out how to infiltrate through our dual barrier system and our system design needs improvement. Here we discuss how we will decrease nest depredation by strengthening our barrier systems, shifting our nest survey timing, and increasing the area searched and area protected. We will achieve this by adding complexity to both primary and secondary barrier systems. We will use spatial nesting data to target clearing of small patches of high use nesting habitat which will increase vegetation composition and heterogeneity within nesting sites.

EVALUATION OF BLACK-TAILED DEER MOVEMENT, HABITAT USE AND SURVIVAL IN WESTERN OREGON. JESSICA CLARK*, *ODFW*, *863 NE Knoll Ave.*, *Roseburg*, *OR 97470*; *jessica.s.clark@state.or.us*; DEWAINE JACKSON, *ODFW*; *dewaine.h.jackson@state.or.us*.

Limited data exist for Black-tailed Deer (*Odocoileus hemionus columbianus*) home range, movement patterns and survival in association with the habitat conditions in which they exist. The range of Black-tailed Deer in Oregon extends from the Pacific coast to the Cascade Mountain crest across western Oregon and thus they occupy significantly different habitats, elevations, weather, and mortality risks. It is likely individuals in these differing circumstances exhibit behavior most beneficial to their conditions. During 2011-2016, the Oregon Department of Fish and Wildlife fitted 334 adult female Black-tailed Deer with GPS radio-collars in 4 Wildlife Management Units (WMU's). We hypothesize that deer initially captured in higher elevations of the Cascades will make seasonal migrations in response to changing environmental conditions; unlike Coastal deer. Mortality risk associated with migration (especially long-distance movements) may lower survival rates in Cascade vs. Coastal deer. We will discuss additional differences in habitat use, movement patterns, home range size and survival of radio-marked deer between the 2 coastal WMUs (Alsea and Trask) and the 2 Cascade Range WMU's (Indigo,Dixon).

EDNA AND TERRESTRIAL AMPHIBIANS: POTENTIAL APPLICATIONS FOR SURVEYING, MONITORING, AND RESEARCH. CHRISTOPHER D. COUSINS*, *Oregon State University*, *Nash Hall*, *2820 SW Campus Way*, *Corvallis*, *OR 97331*; *cousinsc@oregonstate.edu*.

Environmental DNA (eDNA) methods have been used for a variety of purposes: estimating occupancy and abundance of species, monitoring the biodiversity of endangered fauna, detecting species of concern, establishing the arrival of alien invasive species, testing for the presence amphibian chytrid fungus, and many others. The majority of work involving eDNA has focused on the collection of DNA from water to work with aquatic fauna, including fish and aquatic amphibians. In this poster, examples of successful results of using eDNA methods are discussed. In addition, the potential applications of eDNA in surveying for terrestrial amphibians are explored. As eDNA has proven useful for locating stream amphibians, the possibility of its use as a noninvasive survey technique arises. Here, candidate species for surveying are identified, as well as potential collection sources and methods. As suitability could depend on the life history of potential species, patterns are identified to determine if eDNA could prove useful for certain species. In addition to exploring possibilities for monitoring terrestrial amphibians with eDNA, other potential uses are also discussed.

HUNGER GAMES: DEER FORAGING AND VIGILANCE IN THE FACE OF WOLF PREDATION RISK.
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In weighing foraging options, animals trade-off food and safety. The costs associated with mitigating predation risk, such as decreased time spent foraging, can reduce prey fitness and lead to changes to prey populations as great or greater than the effects of direct consumption. In northeast Washington, deer may be trading food for safety because of increased risk of predation from naturally recolonizing Gray Wolves (*Canis lupus*). To test this hypothesis, we placed animal-borne video camera collars on Mule Deer (*Odocoileus hemionus*) and White-tailed Deer (*O. virginianus*) in 2 wolf-recolonized and 2 wolf-free areas. These collars allowed us to view habitat covariates from the perspective of the instrumented deer and assess behavior under conditions where direct observation would have been untenable. The results of this investigation will yield insight into the effects of wolf predation risk on deer behavior and ecosystem dynamics. Increased wolf predation risk, for example, could drive changes in plant communities as a result of vegetation being released from foraging pressure in high risk areas.

USING SOILS INFORMATION TO PREDICT THE OUTCOME OF WILDLIFE HABITAT MANAGEMENT DECISIONS.
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Wildlife biologist are continually adapting to the challenges of evolving knowledge and experience as it relates to habitat management. As a result many of today's land management decisions are not solely associated with habitat improvement, but are highly integrated and include other resource issues such as restoring resilient forest conditions, and improved hydrologic function. Knowledge of the soil resource can assist the process by matching specific habitat management objectives to soils that have the highest potential for supporting those objectives. The result is habitat management strategies that are both sustainable and better able to meet the intent of the planners because the management actions are occurring on soil types that have high potential for attaining habitat objectives. Here those concepts are applied to long-term habitat management objectives for the Flymon and Green Ridge Project Areas within the east cascades dry forest province of the Deschutes National Forest in central Oregon. Soil survey data was used to help refine an ecologically based treatment prescription that addresses specific wildlife habitat management objectives at the project level.

CHARACTERISTICS OF FISHER REST AND DEN SITES IN THE SOUTHERN CASCADES OF OREGON.
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Fishers (*Pekania pennanti*) are a forest carnivore of conservation concern in the western United States. Fishers often use structures with cavities and deformities for resting multiple times daily in areas that provide refuge from weather and predators, and for denning while raising young. We located rest and den sites for radio-collared sub-adult and adult Fishers (n = 12) in southern Oregon from October 2015-September 2017. Using VHF telemetry, we identified 119 unique rest structures and 22 den and maternal rest structures. Fishers used live trees, snags, logs, slash piles, stumps, subnivean spaces, and rock piles. The most frequently used microsites at rest structures were mistletoe brooms (n = 38) and cavities (n = 28). Sizes of live tree, snag, and log structures were variable, ranging from 21 to 211 cm in diameter. Den and maternal rest sites were located in the largest diameter structures (103 ± 26 cm), followed by female rest sites (96 ± 32 cm) and male rest sites (89 ± 47 cm). Den sites consisted of structures with cavities (primarily snags and live trees) until kits were weaned and semi-mobile at approximately 8-10 weeks of age, when females were documented using both slash piles and logs as maternal rest structures. These results are similar to the only other Fisher radio telemetry research in the Oregon Cascade Range, though we documented a higher occurrence of cavity rest microsites for both sexes. Cumulatively these data suggest a strong association with Fishers and larger structures, predominately those that have either cavities or mistletoe brooms.

INFLUENCE OF NATIVE UNGULATE GRAZING ON NATIVE BEE COMMUNITIES IN RIPARIAN AREAS OF A BLUE MOUNTAIN FOREST SYSTEM. SANDRA J. DEBANO*, *Oregon State University*, *2121 S. First St.*, *Hermiston*, *OR 97838*; *sandy.debano@oregonstate.edu*; MARY ROWLAND, *U.S. Forest Service*, *Pacific Northwest Research Station*, *Forestry and Range Sciences Laboratory*; *mrowland@fs.fed.us*; SAMANTHA ROOF, *Department of Fisheries and Wildlife*, *Oregon State University*, *Hermiston Agricultural Research and Extension Center*; *samroof5@gmail.com;* SKYLER BURROWS, *Bee Biology and Systematics Lab, Utah State University*; *skyler.burrows@aggiemail.usu.edu*; SCOTT MITCHELL, *Dept. of Fisheries and Wildlife*, *Oregon State University*, *Hermiston Agricultural Research and Extension Center*; *scott.mitchell@oregonstate.edu*.

Native bees are a diverse and functionally important group of invertebrates in riparian areas of the Pacific Northwest. As in much of the U.S., these riparian areas have been impacted by a variety of disturbances, including logging, stream channelization, exotic weed invasions, and livestock and native ungulate grazing. While some studies have examined livestock grazing effects on native bees, little attention has been directed at understanding how herbivory by native ungulates, such as deer and Elk (*Cervus canadensis*), influences native bees. To address this question, we conducted a three-year manipulative study at 12 riparian sites on Meadow Creek in the Starkey Experimental Forest and Range in eastern Oregon. Half of the sites were excluded from deer and Elk herbivory and half were open to grazing by deer and Elk. Native bees were sampled using pan traps and vane traps three to four times each year. Blooming forb and shrub availability was also estimated at each site. We found high variability in seasonal and spatial dynamics of the bee community in relation to grazing treatments. This research is part of a larger, multidisciplinary project evaluating the effectiveness of riparian restoration and ungulate management within Starkey. We present preliminary results of the project and discuss their implications for management of ungulate grazing in riparian areas of the Pacific Northwest.

QUANTIFYING OVERLAP AND FITNESS CONSEQUENCES OF MIGRATION STRATEGY WITH SEASONAL HABITAT USE AND A CONSERVATION POLICY. JONATHAN B. DINKINS*, *Oregon State University, 206 Withycombe Hall, Corvallis, OR 97331; jonathan.dinkins@oregonstate.edu;* KIRSTIE LAWSON, *University of Wyoming; klawson9@uwyo.edu;* KURT SMITH, *University of Wyoming; ksmith94@uwyo.edu;* JEFFREY BECK, *University of Wyoming; jlbeck@uwyo.edu;* CHRISTOPHER KIROL, *University of Wyoming; ckirol@uwyo.edu;* AARON PRATT, *University of Wyoming; apratt3@uwyo.edu;* MICHAEL CONOVER, *Utah State University; mike.conover@usu.edu;* FRANK BLOMQUIST, *Bureau of Land Mangement; fblomqui@blm.gov.*

Our study aimed to delineate seasonal habitats and assess differential fitness related to migration strategy and seasonal habitat use of Greater Sage-grouse (Centrocercus urophasianus: hereafter "Sage-grouse"). In addition, we evaluated benefits gained for Sage-grouse through the implementation of the Wyoming Core Area Strategy relative to protection of habitat and differences in nest, brood, and annual female survival. We compared the proportion of seasonal habitats within or outside Core Areas as delineated with 75% and 95% kernel density contours (KDE). The proportion of summer and winter habitats (95% KDE) overlapping Core Areas was 0.69 of summer and 0.50 of winter habitat. We found no differences in nest or brood survival among migration strategies or within and outside Core Areas. However, females that did not migrate out of their respective winter habitat had lower risk of death, which highlighted year-round benefits of winter habitat. Females had lower risk of death during winter with the lowest risk occurring during winter in Core Areas. Higher temperature and lower snow water equivalent during the breeding season and fall were detrimental to female survival; whereas, neither had an effect on winter survival. Although Core Areas encompassed a large proportion of winter habitat, our results indicate that Core Areas (as delineated) were not the most direct way to protect winter habitat for Sage-grouse. During winter, Sage-grouse gathered within habitat conducive to winter survival, indicating that disturbances within these winter habitats may have broad consequences for Sage-grouse populations.

CENTRAL WASHINGTON BROODING SAGE-GROUSE SHOW NO PREFERENCE FOR MESIC HABITAT. EMILY DONNEL*, *Whitworth University, Whitworth University*, *Spokane*, *WA 99251*; *edonnel20@my.whitworth.edu*; ASHLYNNE PRESTON, *Whitworth University*; *apreston19@my.whitworth.edu*.

The Greater Sage-grouse (*Centrocercus urophasianus*) is a sagebrush (*Artemisia spp*.) steppe obligate species that has experienced population decline recently, especially in Washington State. The Sage-grouse of Lincoln County, Washington went locally extinct in the 1980s and was re-introduced from southeast Oregon. Literature suggests that Sage-grouse use mesic sites during the critical brood-rearing time. Initial observations indicated that brooding Sage-grouse in Lincoln County do not rely on mesic habitat as much as expected. To verify this observation we collected location data for brooding Sage-grouse between 2008 and 2016 and compared the distance of those birds from mesic sites to distances of randomlocations across the same region. We found no statistical difference between actual and random locations. Further, we demonstrated that brooding Sage-grouse spend the predominant portion of their time in sparse shrub, sagebrush dominated habitats not associated with mesic sites. In order to assess potential reasons for this preference we collected vegetation cover and species richness data for 26 mesic sites with paired upland sites. We found that mesic habitat offers a lesser diversity of

Sage-grouse-preferred forbs and showed no difference in percent cover of Sage-grouse preferred forbs than adjacent upland habitat. A better understanding of areas that are used by brooding Sage-grouse will improve habitat restoration and preservation strategies.

BUILD IT AND THEY WILL COME: EXPANDING OREGON SPOTTED FROG HABITAT AT A WETLAND MITIGATION SITE. JEFF S. DREIER*, *Washington State Department of Transportation*, *310 Maple Park Ave. SE*, *Olympia*, *WA 98504*; *dreierj@wsdot.wa.gov*; KELLY MCALLISTER, *Washington State Department of Transportation*; *mcallke@wsdot.wa.gov*; MARION CAREY, *Washington State Department of Transportation*; *careym@wsdot.wa.gov*.

Transportation projects often result in effects to wetlands, requiring mitigation under state or federal law. In 2008, the Washington State Department of Transportation (WSDOT) constructed the Potter Road wetland mitigation site, excavating former hayfield to expose groundwater and create both perennial and seasonal wetland habitat. Initial planting was complete in March 2009. Follow-up plantings to fill in areas of high tree and shrub mortality occurred in 2011 and 2012. Within 6 years, a dense scrub-shrub plant community developed over much of the site, including areas that were formerly hayfield. Beaver (*Castor canadensis*) activity increased in 2012 and a pond leveler was installed at the northern dam in 2015 to prevent flooding of adjacent property. Oregon Spotted Frogs (*Rana pretiosa*) and their egg masses, previously unknown from the site, were found in March 2015 by a WSDOT biologist. In 2017, the first complete survey of the site found over 140 egg masses. These egg-laying sites were in relatively open areas within the scrub-shrub wetland community. After the species was discovered on the site, WSDOT met with agency representatives to ensure that management of the mitigation site was compatible with Oregon Spotted Frog habitat requirements and approved by the regulatory agencies that oversee wetland mitigation. Revegetation plans were shifted toward maintenance of a more open plant community with less woody vegetation and more submerged and emergent types. Proposed wetland mitigation within watersheds occupied or historically occupied by Oregon Spotted Frogs should consider designs that incorporate suitable seasonal habitats for this species.

TESTING A PASSIVE ACOUSTIC APPROACH TO DETECT NORTHERN SPOTTED OWLS AND BARRED OWLS. LEILA S. DUCHAC*, *Oregon Cooperative Fish and Wildlife Research Unit*, *Department of Fisheries and Wildlife*, *Oregon State University*, *2221 NW Mulkey Ave.*, *Corvallis*, *OR 97330*; *leila.duchac@oregonstate.edu*; DAMON B. LESMEISTER, *Pacific Northwest Research Station*, *U.S. Forest Service and Department of Fisheries and Wildlife*, *Oregon State University*; *dlesmeister@fs.fed.us*; KATIE M. DUGGER,*U.S. Geological Survey*, *Oregon Cooperative Fish and Wildlife Research Unit*, *Department of Fisheries and Wildlife*, *Oregon State University*; *katie.dugger@oregonstate.edu*.

Passive acoustic monitoring using autonomous recording units (ARUs) is a fast-growing area of wildlife research, especially for rare, cryptic species that vocalize. Recent advances in ARU technology allow for long-duration recordings and more efficient sound processing, and ARU monitoring increases spatial and temporal coverage, does not disturb animals, improves crew safety, records all vocalizing species within the listening radius, and provides a permanent record of vocalizations. Northern Spotted Owl (*Strix occidentalis caurina*, hereafter NSO) populations have been monitored since the mid-1980s using mark-recapture survey methods. We

investigated the use of ARUs to detect calls of NSO as well as Barred Owls (*S. varia*), recently arrived congeners that have expanded their range to now encompass the entire NSO range and appear to threaten NSO persistence. We deployed 150 ARUs in 3 NSO demographic study areas in Oregon and Washington from March-July 2017 and recorded continuously every night. Preliminary results suggest that ARUs may be an effective monitoring tool for determining at least presence/absence of NSO and other owl species. We are also investigating whether the ARU data can provide additional information for both species, such as abundance, or information on pair and/or reproductive status, as it has for other species. The results from this study will inform the development of a passive, occupancy-based study design for NSO monitoring, as population estimates decline and managers seek alternatives to current methods to monitor populations.

THE OBGP: GENOMIC DATA ASSEMBLY FOR THE DEVELOPMENT OF ENHANCED MOLECULAR MONITORING TOOLS. EMILY DZIEDZIC*, *Oregon State University, 7741 SE 17th Ave, Portland, OR 97202; emily.dziedzic@oregonstate.edu*; TAAL LEVI, *Oregon State University; taal.levi@oregonstate.edu.*

Rapid technological advancements and decreasing DNA sequencing costs have led to a genomics revolution enabling the development of molecular applications to monitor biodiversity and assess management policies. The Oregon Biodiversity Genome Project (OBGP) was established to develop novel genetic tools to quantify the distribution and ecology of fish, wildlife, and invertebrates to understand how ecosystems function and respond to management intervention. Such tools allow the rapid evaluation of policy impacts on fish and wildlife. Traditional methods to measure biodiversity are inefficient and strides have been made to enhance our ability to monitor wildlife using molecular detection tools with environmental DNA (eDNA). Assays can detect target taxa in eDNA at various levels. Species-general primers can identify a range of species while species-specific primers can be used to identify the presence of individual species. To develop these tools we need comprehensive genomic data, and data for these applications are generally collected piecemeal for individual genes and applications. This frustrates researchers' ability to fine-tune tools to discern single species or targeted groups of species from eDNA. The OBGP will create a comprehensive georeferenced reference sequence database including full mitogenomic data for Oregon's animal species. We will make these data publicly available to facilitate molecular tool development for wildlife monitoring and management. We are currently working with ODFW, OSU, and the USFS to develop these resources and are interested in forging collaborations to expand the taxonomic scope of the OBGB, which will require georeferenced animal tissues of species throughout Oregon.

CHANGES IN CARNIVORE DISTRIBUTION IN WESTERN OREGON. JORDAN L. ELLISON*, *Oakridge Institute for Science and Education*, *2404 SE Taylor*, *Portland*, *OR 97214*; *jordanellison91@gmail.com*; KATIE MORIARTY, *USDA Forest Service*, *Pacific Northwest Research Station*; *kmoriarty02@fs.fed.us*; BRENT BARRY, *Oregon State University*; *brent.barry@oregonstate.edu*.

Changes in the distributions of wildlife populations are one metric used by the IUCN to determine the conservation status of a species. One would hypothesize changes in wildlife distributions in Oregon have occurred, in part, because the human population has grown by more

than 570% between 1910 and 2010. We predicted decreases in the distribution of old-forest associated specialists (e.g., Pacific Marten [*Martes caurina*], Fisher ([*Pekania pennanti*]), and increases in distribution of habitat generalists (e.g., Bobcat [*Lynx rufus*], Coyote [*Canis latrans*], Raccoon [*Procyon lotor*]). We compiled and digitized available historical records (i.e., trapping records, detections from GeoBob and NRIS databases) to illustrate baseline carnivore distributions and compared location maps created from verified detections with remote cameras surveys (2015-2017). Our current survey efforts include 2147 survey locations within the Coast ranges, Oregon southern and northern Cascades, and Klamath-Siskiyou mountains. These surveys provide contemporary data to quantify carnivore distributions in our study areas. Historical data were not obtained consistently, but it appears that there has been a significant decrease in the distribution of Pacific Marten, and increases in the range of Coyotes, Mountain Lion (*Puma concolor*), and Gray Fox (*Urocyon cinereoargenteus*). Patterns appear generally similar in distribution for Spotted Skunk (*Spilogale gracilis*), Striped Skunk (*Mephitis mephitis*), Ringtail (*Bassariscus astutus*) and Bobcat. Better understanding the driving factors for species distribution (e.g., fecundity, survival) at specific study areas would improve our understanding whether distributions will change in the future.

OBSERVED TRENDS OF BIRDS IN POST-FIRE HABITAT IN SOUTHWESTERN OREGON: 1999-2017.
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The Canyon Mountain Fire occurred in 1987 on the Roseburg BLM District approximately 3.22 km south of Canyonville, Oregon and burned approximately 2,111 ha. The fire area was salvaged in 1988; however, the area was not replanted and has naturally revegetated. The Monitoring Avian Productivity and Survivorship (MAPS) station was established in 1998 and is located on a southeast aspect in T31S-R05W-Section 10 SW/NE at an average elevation of 521 meters within the Klamath Mountain Ecoregion. Over an 18-year period, a total of 2,624 individuals of 53 species of resident and migrant birds have been captured. Wrentit (*Chamaea fasciata*) was the most abundant capture of resident species. Macgillivray's Warbler (*Geothlypis tolmiei*), Nashville Warbler (*Oreothlypis ruficapilla*) and Orange-crowned Warbler (*O. celata*) were the most abundant migrant songbird species captured. Bewick's Wren (*Thryomanes bewickii*) was captured annually until 2010, irregularly for 4 years until 2013, and then no captures since 2014. The data shows that abundance, species diversity, and productivity have declined over the banding period. These changes may be linked to the change in early-seral vegetation type from an open shrub (*Ceanothus spp*. and *Arctostaphylos sp*.) and young hardwood (*Arbutus mensiesii*) dominated habitat to a closed canopy habitat dominated by tree species (primarily *Arbutus mensiesii*).

USING SPRING MIGRATION STOPOVER SITES TO PRIORITIZE CONSERVATION OF CHANNELED SCABLAND WETLANDS.
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Spring migration stopover sites play a critical role in the annual cycle of waterfowl. Identification of stopover sites can allow managers to develop conservation plans that target important wetlands. In spring 2016, Washington Department of Wildlife (WDFW), Ducks Unlimited (DU), U.S. Fish and Wildlife Service (USFWS), and volunteers initiated a 4-year survey to identify important wetlands in the Channeled Scablands of eastern Washington. We present 2 years of survey data results and outline a strategy to identify and rank potential conservation sites. In 2016, we observed 283,663 ducks, swans, and geese during 49 ground surveys between early February and late April. Swan and goose counts peaked in late March, dabblers were observed in 3 peaks between late February and late March, and diving ducks peaked in late April. In 2017, we observed 20,049 ducks, swans, and geese during 8 aerial survey flights along 11 transects between late February and late April. We have identified 32 important Northern Pintail (*Anas acuta*) stopover sites on private agricultural land south of Cheney, southwest of Davenport, and west of Medical Lake.

HABITAT SELECTION BY COLUMBIAN WHITE-TAILED DEER ALONG THE LOWER COLUMBIA RIVER. JON D. HEALE*, *Washington State University*, *1880 NE Terre View Dr.*, *Pullman*, *WA 99163; jonathon.heale@wsu.edu*; LISA SHIPLEY, *WSU School of the Environment*; *shipley@wsu.edu*; DAN THORNTON, *WSU School of the Environment*; *daniel.thornton@wsu.edu*; PAUL MEYERS; *U.S. Fish and Wildlife Service*; *paul_meyers@fws.gov*.

Columbian White-tailed Deer (*Odocoileus virginianus leucurus*) are a Federally threatened species inhabiting historic floodplains along the Columbia River in Washington and Oregon. From 2013 to 2015, 88 deer were translocated from the Julia Butler Hansen Refuge (JBH) and surrounding areas to Ridgefield National Wildlife Refuge (RNWR). A major component of habitat management at each refuge involves using Cattle (*Bos taurus*) grazing to manage grasslands. Grazing from April to October potentially creates habitat that is irregularly available, both spatially and temporally. We hypothesized that Cattle presence and grazing would alter the space use and movement of deer. Specifically, we predicted that a) Cattle presence would increase seasonal home range size, b) deer would avoid Cattle pastures year-round, and c) avoidance of Cattle pastures would be most pronounced when Cattle were present on the landscape. To test this, we examined GPS location data from resident (JBH) and translocated (RNWR) deer. Average home range size during Cattle-on and Cattle-off periods was not significantly different ($P = 0.47$). For deer with ≥500 relocations, the mean percent of locations in Cattle pastures was 8% at JBH ($n = 6$) and 2% at RNWR ($n = 12$), whereas pastures comprised 20% and 13% of the habitat at JBH and RNWR, respectively. Locations occurring in Cattle pastures when Cattle were present accounted for 3.8% ($n = 2501$) of total in-pasture locations. Our next step is to build models of habitat selection within each refuge. Results from our work may help to guide management decisions that will assist in the recovery of this threatened species.

LINKING HABITAT CONDITIONS TO WATERBIRD COUNTS: USING THE INTEGRATED WATERBIRD MANAGEMENT AND MONITORING PROGRAM (IWMM) ON COLD SPRINGS NATIONAL WILDLIFE REFUGE. FAYE L. HEALY*, *Mid-Columbia River National Wildlife Refuge Complex*, *U.S. Fish and Wildlife Service*, *64 Maple St.*, *Burbank*, *WA 99337*; *faye_healy@fws.gov*; JENNY BARNETT, *Inventory and Monitoring Program*, *U.S. Fish and Wildlife Service*; *Jenny_barnett@fws.gov*.

Wetlands on Memorial Marsh unit of Cold Springs National Wildlife Refuge are managed to produce moist-soil vegetation for wintering waterfowl. Although the Refuge has conducted weekly winter waterfowl counts since 2012, a tie to habitat conditions was lacking. Starting fall 2016, the Refuge implemented protocols from the Integrated Waterbird Management and Monitoring program (IWMM), a multi-scaled adaptive management process meant to inform local, regional/state, and flyway managers about supporting migrating and wintering waterbird populations. IWMM developed a set of standardized protocols for conducting waterbird counts, quantifying habitat structural condition, rapid assessment of plant community composition and seed production, and recording management actions. A database hosted on the Avian Knowledge Network (AKN) is available for entering and summarizing data. Reports showing migration curves, habitat conditions at time of survey, bird use days, and vegetation composition are easily created in the AKN interface. Results from winter 2016-17 will be provided including bird numbers, bird use days, migration curves, water depth (mean, max, min), habitat cover (mean, max, min), and vegetation data (ratio of annual and perennial plant cover, plant species richness and diversity, and seed production index of select species). The IWMM protocols can apply at local and regional scales, allowing biologists and managers to compare plant product, habitat cover, and bird use between individual wetlands at a local area, or compare bird use days and migration curves between wetlands across a large region.

COMPARISON OF CLASSIFICATION SCHEMES FOR CENTRAL WASHINGTON SAGE-GROUSE HABITAT. LINNEA HOWARD, *Whitworth University*, *300 W Hawthorne Rd.*, *Spokane*, *WA 99251*; *lhoward18@my.whitworth.edu*.

The Greater Sage-grouse (Centrocercus urophasianus) is a unique bird with particular needs when it comes to habitat. Especially during the brooding period, hens require habitat with both cover to hide from predators and plenty of forbs, or soft plants high in water content, for the chicks to eat. In states such as Nevada and Idaho, Sage-grouse have been shown to utilize mesic areas in late summer as a result of forb desiccation in the upland areas. In central Washington State, possibly due to a wetter climate, brooding hens do not seem to need these mesic areas, as the uplands contain both more cover from predators and plenty of forbs. In order to classify these mesic areas, National Agricultural Imagery Program (NAIP) imagery has previously been used in the Upper Crab Creek Sage-Grouse Management area, located in Lincoln County, WA. While this has been sufficient to survey the vegetation located in those areas, satellite imagery is spectrally characterized and can therefore be used to more accurately compare land cover between areas and over time. Providing a clear comparison between these two classification strategies is useful because it provides a clear measure of strengths and weaknesses of classification schemes for 2 different data sources. We obtained and classified Worldview 3 satellite data at 35 cm resolution for comparison against previously classified 1 foot NAIP data for the Upper Crab Creek Sage-Grouse Management area.

INFLUENCES OF FUEL REDUCTION LOGGING ON THE NUTRITIONAL ECOLOGY OF DEER IN NORTHEASTERN WASHINGTON. IVER HULL*, *Washington State University*, *100 Dairy Rd.*, *Pullman*, *WA 99164*; *iver.hull@wsu.edu*; LISA SHIPLEY, *Washington State University*; *shipley@wsu.edu*.

To restore historic conditions and alleviate chances of catastrophic wildfires, fuel reduction logging treatments have been implemented in inland northwest forests. Historic forests were structured to support light fuel loads and frequent low-severity fires, whereas fire suppression era forests typically have thick, continuous overstories, densely stocked trees, and heavy fuel loads, which limit light penetration to the forest floor. Therefore, fuel reduction treatments have the potential to improve forage resources for herbivores by increasing production of understory vegetation that is available as forage. To determine whether these treatments improve the quality and quantity of forage for deer, we measured plant species composition, biomass, and nutritional quality of understory vegetation in 78 stands over 4 seasons across the Colville National Forest. The sampled stands ranged from 3 to 100% canopy closure and 1 to 20 years post-treatment in addition to unharvested stands. We also measured diet quality and composition, nutrient intake, and nutritional carrying capacity of Mule Deer (*Odocoileus hemionus*) and White-tailed Deer (*O. virginianus*) using bite-count methods with tractable, hand-raised deer. Our results show that available, non-conifer forage biomass was highest between ~30 to 70% canopy cover and ~9 to 16 years following harvest. In addition, the rate at which deer could harvest food, and the daily intake of digestible protein in their diets increased with more abundant non-conifer biomass. The results of this project can help identify how deer use and cope with human-influenced habitats and aid in management decisions that better meet the nutritional needs of wild deer and promote sustainable landscapes.

USING LIDAR IMAGERY TO EXAMINE RESOURCE PARTITIONING BETWEEN NORTHERN SPOTTED OWLS AND BARRED OWLS IN THE OREGON COAST RANGE. JULIANNA M. A. JENKINS*, *USDA Forest Service*, *Pacific Northwest Research Station*, *Forestry Sciences Lab*, *Corvallis*, *OR 97331*; *juliannajenkins@fs.fed.us*; JONATHAN KANE, *University of Washington, College of the Environment*; *jontkane@uw.edu*; VAN KANE, *University of Washington, College of the Environment*; *vkane@uw.edu*; DAMON LESMEISTER, *USDA Forest Service, Pacific Northwest Research Station*; *dlesmeister@fs.fed.us*; JAKE VERSCHUYL, *National Council for Air and Stream Improvement*; *jverschuyl@ncasi.org*; J. DAVID WIENS, *Forest and Rangeland Ecosystem Science Center*; *jwiens@usgs.gov*.

Populations of the federally threatened, Northern Spotted Owl (*Strix occidentalis caurina*) have declined considerably since population monitoring began in 1985. Increased competitive interaction with Barred Owls (*S. varia*), historically absent from the Pacific Northwest, is increasingly considered a primary threat to Northern Spotted Owls. In areas of sympatry, both species utilize and benefit from resources associated with high cover of old conifer forest. However, there is uncertainty in their partitioning of forest areas at finer scales, particularly with regard to forest canopy structure and understory vegetation. Telemetry data on 41 Northern Spotted Owls (93 seasonal territories) and 38 sympatric Barred Owls (105 seasonal territories) were compiled for 2 sites in the southern Coast Ranges of Oregon from 2007 to 2009 and 2012 to 2014. We used discrete-choice models of resource selection to compare alternative hypotheses about the influence of topography, forest structural conditions, and forest cover on species-specific patterns of night-time resource selection in the breeding (March to August) and nonbreeding (September to April) seasons. We used a Bayesian hierarchical modelling framework that accounted for individual and temporal effects on selection coefficients. Metrics of forest structural conditions were generated using light detection and ranging (LiDAR) data acquired between 2007 and 2015. Identifying differences in these species' use of canopy

conditions or understory vegetation can help land managers recognize specific forest structural conditions that benefit Spotted Owls the most.

LANDSCAPE OF STRESS AMONG PACIFIC FISHER: DOES CLIMATE CHANGE TRUMP ANTHROPOGENIC MODIFICATIONS IN THEIR HOME RANGE? JENNIFER R. KORDOSKY*, *Utah State University*, *726 Governor Steven's Ave. SE*, *Olympia*, *WA 98501*; *jrkordosky@gmail.com*; ERIC GESE, *Utah State University*; *eric.gese@usu.edu*; Susannah French, *Utah State University*; *susannah.french@usu.edu*; CRAIG THOMPSON, *U.S. Forest Service*; *cthompson05@fs.fed.us*; Patricia Terletzky, *Utah State University*; *pat.terletzky@usu.edu*; LORI NEUMAN-LEE, *Arkansas State University*; *lorin215@gmail.com*; Jon Schneiderman, *U.S. Forest Service*; *jdschnei32@gmail.com*.

Cortisol is a glucocorticoid hormone released in response to stress and has been used as an indicator of an individual's physiological response to its environment. By collecting samples of Fisher (*Pekania pennanti*) hair and measuring an individual's cortisol level, we examined the physiological stress response of the animals to human disturbances and metrics of climate change in their home ranges in the central Sierra Nevada Mountains of California. We examined the influence of disturbance through anthropogenic modification to the landscape by determining housing density, road density, habitat fragmentation, and silvicultural treatments. We also examined climate change through measures of tree mortality and temperature within an individual Fisher's home range and a Fisher's cortisol level. Different aspects of fitness were also examined including survival rates and kit counts to determine the impact that high cortisol levels may have on vital rates of Fishers in this population.

GIS TOOLS FOR APPLYING HABITAT SUITABILITY MODELS TO INFORM FOREST MANAGEMENT. QURESH S. LATIF*, *Rocky Mountain Research Station*, *USFS, 1648 South 7th Ave.*, *Bozeman*, *MT 59717*; *qlatif@fs.fed.us*; VICTORIA SAAB, *Rocky Mountain Research Station*; *vsaab@fs.fed.us*; JESSICA HAAS, *Rocky Mountain Research Station*; *jhaas@fs.fed.us*; JONATHAN DUDLEY; *Rocky Mountain Research Station*; *jdudley@fs.fed.us*.

Habitat suitability models are used to guide habitat management for species of conservation concern. Models quantify relationships between known species locations and environmental attributes, which are used to identify and map areas most likely to support species of concern. Managers can then restrict human activities with negative impacts on habitat suitability in these areas. Application of habitat suitability models, however, typically requires technical expertise not available to most land managers. We developed a series of ArcGIS tools that facilitate application of habitat suitability models to inform forest management for disturbance-associated woodpeckers of conservation concern. By operating within an ArcGIS environment, the tools are well positioned to integrate with forest planning. Tools are currently developed for Black-backed (*Picoides arcticus*) and White-headed Woodpecker (*P. albolvartus*) in Inland Northwest burned forests; Black-backed, White-headed, and Hairy Woodpecker (*P. villosus*) in Northern Sierra burned forests; and White-headed Woodpecker in Inland Northwest unburned forests. The toolset automates both model application and preliminary data processing to minimize required technical expertise. An accompanying manual describes implementation and interpretation of resulting habitat suitability maps. Tool prototypes have been tested by U.S. Forest Service biologists, and their feedback has been incorporated. The suite of species

currently included makes this toolset best suited to inform management of recently burned forests and dry conifer forest restoration. In future, incorporation of additional species and forest conditions could broaden the scope of this toolset.

ARTIFICIAL HABITAT REFUGES WITHIN VINEYARDS MAY MITIGATE IMPACTS OF AGRICULTURE ON SNAKE POPULATIONS. VALERIE E. LAW*, *Thompson Rivers University*, *677*, *Kamloops*, *BC v2c2h1*; *valerie-law@hotmail.com*; KARL LARSEN, *Thompson Rivers University*; *klarsen@tru.ca*.

The Okanagan of BC has turned into an agricultural mecca drawing tourists worldwide. However, the conversion of native shrub-steppe vegetation directly impacts snake populations endemic to the area through removal of habitat. Finding ways to enable snakes to use vineyards for hunting has obvious benefits to both snakes and vineyard protection, though reduction of prey levels. However, for venomous rattlesnakes, this is a greater challenge, requiring ways to ensure the safety of both snakes and vineyard workers. This study is investigating a novel way to approach this situation, through the creation of artificial pockets of habitat ('refugia'). Eight refugia, consisting of subterranean chambers, artificial rock piles, and native flora were built within a vineyard in the Okanagan in an effort to provide separation between snakes and workers, particularly during the day. Chamber temperatures and external air temperatures have been monitored for 3 summers. Internal chambers now appear to be significantly cooler than ambient conditions, likely due to vegetation cover. Wildlife cameras within the chambers reveal relatively higher levels of visits by snakes in refugia near the periphery of the vineyard. Rodents (snake prey) also utilize the refugia quite extensively. Interestingly, an endangered and elusive lizard (*Plestiodon inexpectatus*) also appears in the refugia. Problematic snakes that are relocated into the refugia tend to occupy the chambers longer than transient snakes. With continued refinement, these refugia appear to offer one way to maintain threatened snake populations within agricultural property, while helping to maintain spatial separation between the animals and workers.

ARBOREAL RESTING AND DENNING BY MARTENS IN COASTAL FORESTS. MARK A. LINNELL*, *Pacific Northwest Research Station*, *3200 Jefferson Way*, *Corvallis*, *OR 97331*; *marcolinnell@yahoo.com*; MATTHEW DELHEIMER, *Pacific Northwest Research Station*; KATIE MORIARTY, *Pacific Northwest Research Station*.

North American martens (*Martes caurina* and *Martes americana*) typically inhabit mature montane and boreal forests where they use cavities in large, old trees and snags for resting and denning. Yet cavities are rare in young coastal forests dominated by Shore Pine (*Pinus contorta*) and Sitka Spruce (*Picea sitchensis*) where a small population of Pacific Martens (*Martes caurina humboldtensis*) resides. We used VHF telemetry to identify rest sites of Pacific Martens. We then experimentally added 19 arboreal rest boxes to trees at a height of > 4 m. We monitored trees both at their base and the rest box entrance with remote cameras, documenting visitation rates of martens and other carnivores (e.g., Gray Fox, *Urocyon cinereorgenteus*). Of 53 rest sites, martens used 24 terrestrial structures, and 22 arboreal structures, including 2 natural cavities. Martens visited 9 of 13 rest boxes that were monitored consecutively >4 months, including intensive use of 3 boxes where we collected 7 – 45 scats. Gray Foxes and Spotted Skunks (*Spilogale gracilis*) were detected at the base of trees but not at rest boxes, and the only other carnivore detected at rest boxes were Black Bears (*Ursus americana*). We concluded that

martens used the arboreal environment even where large trees were rare, potentially mediating competitive interactions with other small carnivores.

DRAGONFLY SPECIES RICHNESS ACROSS AN ELEVATIONAL GRADIENT IN NORTHEASTERN WASHINGTON STATE. ELISE A. LOGGERS*, *405 East 1st Ave.*, *Colville*, *WA 99114*; *ckeloggers@gmail.com*; CHRIS LOGGERS, *Colville NF (Retired)*; *ckeloggers@gmail.com*.

We used data from the first systematic survey of dragonflies (Odonata) on the Colville National Forest in northeastern Washington State to examine dragonfly distribution across an elevational gradient. From 2008 to 2013 surveyors sampled dragonflies at wetlands ranging from 760 to 1,980 meters in elevation and collected 41 species. Species richness peaked at mid-elevations, and 5 species occurred across the entire elevational gradient. We found a significant negative correlation between dragonfly species richness and elevation. Mid- and late-season sampling produced lower R-squared values than early season sampling suggesting that in mid- and late-seasons variables in addition to elevation restrict dragonfly range.

USING NEXT-GENERATION SEQUENCING TO IDENTIFY WOOD DECAY FUNGI AT WOODPECKER CAVITIES IN OREGON AND WASHINGTON. TERESA J. LORENZ*, *USFS Pacific Northwest Research Station*, *27291 US Hwy 12*, *Naches*, *WA 989397*; *teresajlorenz@gmail.com*; MICHELLE JUSINO, *University of Florida*, *Department of Plant Pathology*; MARK BANIK, *USFS NRS Center for Forest Mycology Research*; DANIEL LINDNER, *USFS NRS Center for Forest Mycology Research*; PHILIP FISCHER.

Woodpeckers are keystone species because of their cavity excavation behavior. Many woodpeckers require decayed snags for cavity excavation but the fungal taxa that cause such decay are largely unknown. In 2017, we sampled wood from nest cavities of White-headed Woodpecker (*Picoides albolarvatus*; $n = 31$), Black-backed Woodpecker (*P. arcticus*; $n = 22$), Northern Flicker (*Colaptes auratus*; $n = 21$), and Hairy Woodpecker (*P. villosus*; $n = 26$) on the Wenatchee and Deschutes National Forests in eastern Washington and Oregon. For comparison, we also collected samples from the bole of nest snags, just above each nest cavity opening and we sampled 80 non-excavated snags with characteristics similar to the excavated trees. We extracted DNA, samplified the fungal ITS2 region, and used high-throughput amplicon sequencing to identify the fungal taxa in present in these wood samples. The most commonly occurring fungal taxon in Washington nest snags was *Rhinocladiella atrovirens*, a fungus not known to be associated with decay, whereas the most commonly occurring taxon in Oregon nest snags was *Fomitopsis pinicola*, a known wood decay fungus. Eliminating single-read OTUs, we identified 554 fungal taxa in nest snags and 219 taxa in random snags. Fungal communities differed between samples taken from woodpecker cavities, the boles of the nest snags, and random snags ($r^2 = 0.35$, pseudo-F = 18.4, $P < 0.0001$). Our results indicate there is a high diversity of fungi in woodpecker cavities and snags in the northwest, and the dominant taxa associated with woodpecker snags may differ regionally.

THE WOLVERINE TRACKING PROJECT - USING CITIZEN SCIENCE TO STUDY RARE CARNIVORES. TERI LYSAK*, *Cascadia Wild*, *5431 NE 20th Ave*, *Portland*, *OR 97211*; *info@cascadiawild.org*; QUINN READ, *Defenders of Widlife*; *QREAD@defenders.org*.

Carnivores such as Wolverine (*Gulo gulo*), Gray Wolves (*Canis lupus*), and Montane Red Fox (*Vulpes vulpes*) are very elusive and difficult to study. This project trains volunteers to carry out snow tracking and camera surveys to collect data on these and other carnivores, to better inform research and management. Citizen science is a valuable, cost-effective way of collecting important data while at the same time raising awareness and support for conservation efforts. Both these survey methods are especially well suited to citizen science work. Tracking is a skill that takes years to learn well, and this project takes advantage of local people who are interested in tracking as a hobby. Cameras have broad appeal and provide pictures of animals that engage and inspire people. The Wolverine Tracking Project, started in 2004, had 152 volunteers last year, and includes a 2-year training program in wildlife tracking for trip leaders. We would like to share our experience to help others who might be interested in engaging citizen scientists.

TAKING THE ENVIRONMENTAL QUALITY INCENTIVES PROGRAM 'OUT-OF-THE-BOX' FOR WILDLIFE. RACHEL C. MAGGI*, *USDA NRCS WA State, 500 W. 12th St., Suite 135, Vancouver, WA 98660; rachel.maggi@wa.usda.gov.*

The 2014 Farm Bill retired the Wildlife Habitat Incentives Program, one of the long standing flagship financial assistance programs implemented on private agricultural and forestlands in Washington State. The new law transitioned wildlife habitat conservation into the existing Environmental Quality Incentives Program, setting a spending minimum of 5% for wildlife practices. Not to be deterred, NRCS staff in Western Washington strive to exceed the minimum funding threshold, assisting owners of working lands along with partner organizations to implement fish and wildlife conservation activities. Both traditional habitat enhancement projects continue, along with some out-of-the-ordinary habitat focused projects. This presentation will highlight some examples of 'out-of-the box' fish and wildlife habitat projects from native oyster restoration and prairie restoration in the Puget Sound to Elk (Cervus canadensis) habitat improvement on the Washington Coast.

IDENTIFYING CLIMATE CHANGE EFFECTS ON SALMONID HYBRIDIZATION RISK IN THE PACIFIC NORTHWEST. MICHAEL A. MANNING*, *Department of Fisheries & Wildlife*, *Oregon State University*, *950 SE Marion Ave.*, *Corvallis*, *OR 97333*; *manninmi@oregonstate.edu*; GWENDOLYNN W. BURY, *Department of Fisheries & Wildlife*, *Oregon State University*; *buryg@oregonstate.edu*.

There are many reproductive barriers to salmonid hybridization, and few studies have considered which environmental factor is most influential. Differences in temporal and spatial use of spawning habitat are a reproductive barrier, along with habitat characteristics such as water temperature, flow, and streambed composition. Higher incidence of hybridization in salmonids is found when at least one of the involved species is outside its natural range. Anthropogenic impacts on disturbance regimes, climate change, and land use may influence the risk of hybridization. The goal of this study is to identify which factors are most important to hybridization risk in salmonids. I will focus on populations in the Pacific Northwest. My initial model looks at changes in species distribution in response to climate change, and incorporates covariates such as stream characteristics.

THE BENEFITS OF UNMANNED AERIAL SYSTEMS IN PRESCRIBED FIRE SITUATIONS. SARA M. MCFALL*, *USFWS*, *100 Wildlife Refuge Rd.*, *Glenwood*, *WA 98619*; *sara_mcfall@fws.gov*.

Unmanned Aerial Systems (UAS) are becoming more common place in land management and wildlife survey work. Additionally, many new applications of this technology are still being considered and investigated. The Mid-Columbia National Wildlife Refuge Complex has 2 3DR Solo drones for use with aerial surveys. We explore the benefits of UAS in the management of prescribed fire for wildlife habitat management. UAS can have many uses in connection with prescribed fires. They can be used for planning and implementation at all levels of a prescribed fire; pre-burn surveys, burn surveys and post burn surveys. Aerial surveys using UAS can be conducted before prescribed fires are considered. They can map the proposed burn area, identify hazards and determine possible escape routes and help determine success of prescribed burns by providing a pre-burn view of the area. They can be used during the prescribed fires to assess wind direction and provide a live-feed, aerial view of the fire area. Post burn uses consist of use of infared (IR) cameras to detect hot spots on the fire as well as post analysis of burn success. These units can save valuable man hours of work time and can provide additional safety for fire crews. This paper presents benefits and challenges of using UAS for prescribed fire applications.

OBSERVED PATTERNS OF DEER, DOGS, & HUMAN USERS ON THE NORTH BANK HABITAT MANAGEMENT AREA ADMINISTERED BY THE ROSEBURG DISTRICT OF THE BUREAU OF LAND MANAGEMENT. REX L. MCGRAW*, *Bureau of Land Management*, *777 NW Garden Valley Blvd, Roseburg*, *OR 97471*; *rmcgraw@blm.gov*.

Observed detection rates of Columbian White-tailed Deer (*Odocoileus virginianus*), Black-tailed Deer (*O. hemionus columbianus*), domestic Dogs (*Canis familiaris*), and Human (*Homo sapiens*) users based on remote camera stations on the North Bank Habitat Management Area (NBHMA) administered by the Roseburg District, Bureau of Land Management (BLM). Remote camera stations were placed off-trail (n = 35 stations; 1,333 total camera-days) and at four primary entry/exit points (n = 4 stations; 585 total camera-days) from April to October 2017. Fewer Black-tailed Deer fawns were detected where Dogs were present (n = 8 stations; 0.007 fawn detections/day) than at stations where dogs were absent (n = 27 stations; 0.013 fawn detections/day). No White-tailed Deer fawns were detected where Dogs were present (n = 8 stations); but White-tailed Deer fawns were detected at stations where Dogs were absent (n = 27 stations; 0.008 fawn detections/day). Recreational users (non-hunting) were detected an average of 3.5 times per day (2,059 detections) and 48 percent (993 detections) of recreational users were accompanied by Dogs; 19% of which were leashed (190 detections). Additional Human users included: adjacent landowners (1.3 detections/day; 783 detections), administrative-use by BLM (0.9 detections/day; 517 detections), and hunters during the spring Turkey (*Meleagris gallopavo*) season (0.6 hunters/day; 361 detections). Overall, Human users were detected an average of 6.4 times per day (3,720 total detections) on NBHMA. Surveys are ongoing.

SMALL MAMMAL MICROHABITAT USE AND SPECIES COMPOSITION OF A WILDLIFE CROSSING STRUCTURE COMPARED WITH NEARBY HABITATS. LINDSAY S. MILLWARD*, *Central Washington University*, *1601 North Walnut*, *Ellensburg*, *WA 98926*; *lindsay.millward@cwu.edu*; KRISTINA ERNEST, *Central Washington University*; *kristina.ernest@cwu.edu*.

Expanding transportation corridors have fractured ecosystems in many areas of the world, with consequent restrictions on the movement of organisms. Wildlife crossing structures (WCS) can improve the permeability of roads, allowing animals to move through connectivity barriers. Small mammals are especially vulnerable to the effects of reduced connectivity because of their limited mobility; however, few studies have focused on their use of WCS. This study was conducted at a WCS under Interstate-90 in central Washington's Cascade Range. The WCS was intentionally designed to mimic natural habitat characteristics by installing features such as rock piles, large fallen logs, snags, and brush piles. Our objective was to use mark-recapture, track tubes, and wildlife cameras to evaluate whether small mammal use of these habitat features would help improve connectivity through the WCS. Preliminary results indicate higher abundance of generalist species and lower diversity near the crossing structure compared to the adjacent forest. Additionally, between the 4 habitat feature categories small mammals were more likely to be captured near fallen logs or rock piles. The results of this study will provide baseline data, offer a snapshot of small mammal crossing structure use, and suggest habitat improvements for upcoming connectivity projects.

WILD BEES AND SHRUBS IN EASTERN OREGON. SCOTT R. MITCHELL*, *Oregon State University*, *2048 NW Arthur Pl.*, *Corvallis*, *OR 97330*; *scott.mitchell@oregonstate.edu*; SANDRA DEBANO, *Oregon State University*; *sandy.debano@oregonstate.edu*; MARY ROWLAND, *U.S. Forest Service;mrowland@fs.fed.us*.

With evidence of widespread declines in pollinator populations and an increased focus on habitat restoration, there is growing interest in investigating floral resources available to native bees. While it is well recognized that woody shrubs can provide forage for native bees, little is known about the relative importance of shrubs versus forbs. Additionally, shrub species such as willow (*Salix spp*.) and currant (*Ribes spp*.) bloom earlier in the season than many forb species and, in some cases, have been found to be important springtime resources for bees. Shrubs are ommonly used in stream restorations to shade streams, moderating the impact of warm summers on water temperatures. Restoration plantings in the Pacific Northwest can be browsed by wild ungulates and livestock, sometimes resulting in reduced survival and recruitment rates of planted shrubs. To better understand the roles of woody shrubs in riparian zones, we are evaluating the importance of shrubs to early emerging bees and assessing the relative importance of shrubs and forbs to bee communities throughout the flowering season for a study system in the Starkey Experimental Forest and Range in Eastern Oregon. This study will complement ongoing research in this site on bee-flower associations, bee community dynamics, impacts of ungulate herbivory on planted shrubs, and improve our understanding of the effects ungulate browsing pressure may have across trophic levels. We will describe the Meadow Creek riparian system at Starkey, present background information on what is known about shrub-pollinator interactions, and our approaches to addressing questions about bees and shrubs.

VARYING REMOTE CAMERA METHODOLOGY TO ASSESS PACIFIC FISHER DETECTABILITY IN A MULTISPECIES FRAMEWORK. ALEXA MYERS*, *Oregon State University, 3550 SW Country Club Dr.*, *Corvallis*, *OR 97333*; *glennal@oregonstate.edu*; BRENT BARRY, *Oregon State University*, *Corvallis OR*; *brent.barry@oregonstate.edu*; KATIE MORIARTY, *USFS Pacific Northwest*

Research Station, *kmoriarty02@fs.fed.us*; TAAL LEVI, *Oregon State University, Corvallis OR; taal.levi@oregonstate.edu*;

Motion-activated remote cameras have emerged as a powerful tool for noninvasive research and an effective technique to document animals: however, methodological questions regarding the most effective placement and use attractants remain. To assess remote camera survey methodology, we deployed 66 cameras across 15 survey units within known Fisher (*Pekania pennanti*) occupied areas outside Ashland, OR fall of 2015. We varied attractants (e.g., bait, lure) and camera distance from the baited tree to examine Fisher detectability while parsimoniously exploring these effects on other species. Camera stations were randomly assigned 1 of 3 bait types (chicken, cat food, kitchen sink), 1 olfactory lure (gusto, mega musk), whether or not a visual lure was present (spinning aluminum pie pan), and were set at a distance approximately 2 m or 4 m from the camera to the bait (i.e., near, far). Fisher detections varied across all treatments but none significantly so. The effect of lures was negligible for most species. In general, species were detected more often at stations than unbaited stations and with near camera sets, especially for smaller bodied species like small mammals.

DOCUMENTING THE DECLINE OF THE UPLAND SANDPIPER (*BARTRAMIA LONGICAUDA*) IN EASTERN OREGON. LAURA NAVARRETE*, *U.S. Forest Service*, *1903 Foley St.*, *La Grande*, *OR 97850*; *lmnavarrete@fs.fed.us*; HOLLY AKENSON; *hollyakenson@gmail.com*.

A disjunct population of Upland Sandpipers (*Bartramia longicauda*) breeds and summers in large, high elevation mountain valleys and uplands of Washington, Idaho and Eastern Oregon. Intensive surveys across public and private lands in the 1980's established breeding populations in 7 basins and uplands in Eastern Oregon with an estimated 50 to 100 territorial pairs. Additional surveys in the 1990's started documenting a downward trend in population numbers. Loss and fragmentation of habitat due to increased urbanization, degradation due to over grazing, and natural forest succession are thought to pose the most serious threats to populations. Recent survey efforts, while limited, have failed to document Upland Sandpipers within Oregon in the past 7 years with no clear evidence as to the cause.

COMPARISON OF BEE OCCURRENCE BETWEEN THREE TYPES OF SAGE-BRUSH STEPPE HABITAT ON THE HANFORD REACH NATIONAL MONUMENT. HEIDI L. NEWSOME*, *U.S. Fish and Wildlife Service*, *National Wildlife Refuge System*, *Mid-Columbia River National Wildlife Refuge Complex*, *Burbank*, *WA 99323*; *Heidi_Newsome@fws.gov*; JASON ROMINE, *U.S.Fish and Wildlife Service*; *Jason_Romine@fws.gov*; JOSEPH ENGLER, *U.S. Fish and Wildlife Service (retired)*; *jdengler0259@gmail.com;* ERIN STOCKENBERG, *U.S. Fish and Wildlife Service*, *erin_stockenberg@fws.gov*; KELSEY LOTZ, *Mid-Columbia River NWR Complex*; *klotz91@gmail.com*; ALLISON HALL-MULLEN, *Mid-Columbia River NWR Complex*; *ahallmullen@hotmail.com*.

Native bees and other pollinators are becoming increasingly important species as biological indicators of environmental health. These organisms are susceptible to population declines from multiple factors including; habitat fragmentation, environmental toxins, and habitat alterations due to agricultural and urban developments, and invasive species. Little is known about the abundance or diversity of native bees and other pollinators on National Wildlife Refuges (NWR) across the country. The Hanford Reach National Monument, a unit of the NWR

system, is one of the last remnants of native shrub-steppe vegetation in Washington State. An inventory of native bees was desired to identify species frequenting native habitats and to examine differences in invertebrate diversity in various habitat types.We surveyed bee presence at the Arid Lands Ecology Reserve area in an effort to look at bee diversity among 3 different shrub-steppe plant community assemblages. We deployed 18 bee bowls of alternating colors along each of three selected transects that were located in different habitat types; cheatgrass (*Bromus tectorum*) dominated, native bunch grass dominated and sage brush (*Artemisia spp*.) dominated. Bee bowls were deployed once every 2 weeks from April to October during 2014 and 2015. We compared diversity between transects using Shannon-Weiner diversity index and the Rényi diversity index. Relative abundance was calculated as number of bees per daylight trap hour. All calculations were completed using the statistical software language R. Native bee diversity was highest within the native vegetation communities, however, species richness was high within cheat grass dominated areas.

WHO MOVED MY PENSTEMON? SYSTEMATIC DIRECT OBSERVATIONS PAIRED WITH CAMERA TRAPS QUERY HISTORICAL PERCEPTIONS OF AMERICAN PIKA BEHAVIOR. CORRINNE D. OEDEKERK*, *OSU-Cascades, Human and Ecosystem Resiliency and Sustainability Lab*, *2551 NE Ravenwood Dr.*, *Bend*, *OR 97701*; *oedekerc@oregonstate.edu*.

Wildlife ecologists have long utilized direct observation surveys to study the behavior of enigmatic mammals. Some wildlife observations are performed by citizen scientists, which can result in significant variability in data collection and quality. The use of camera traps in wildlife research has mitigated some issues associated with data collection from non-professionals, but while presenting their own data collection challenges. The American Pika (*Ochotona princeps*) is a noticeably cryptic species, particularly in low elevation lava landscapes in the western U.S. During Fall, 2017, citizen scientists and field research technicians performed behavioral observations of American Pika in Newberry National Volcanic Monument, Oregon. A subset of observations were paired with a camera trap in order to compare and contrast behavior captured by the 2 approaches. Data collected by the technicians and the camera trap provided varied results, which included distinct strengths and challenges presented by either collection method. This work supports the use of camera traps to document pika behavior, particularly if paired with systematic direct observations conducted by trained observers.

OLYMPIC TORRENT SALAMANDER (RHYACOTRITON OLYMPICUS) OVIPOSITION SITE WITH NOTES ON EARLY DEVELOPMENT. REED OJALA-BARBOUR*, *Washington State Department of Fish and Wildlife*, *1111 Washington St. SE*, *Olympia*, *WA 98501*; *reed.ojala-barbour@dfw.wa.gov*; CURTIS THOMPSON, *Washington State Department of Fish and Wildlife*; *curtisthompson2002@yahoo.com*; CHARLES FOXX, *Washington State Department of Fish and Wildlife*; *charleyefoxx@gmail.com*; AIMEE MCINTYRE, *Washington State Department of Fish and Wildlife*; *aimee.mcintyre@dfw.wa.gov*; MARC HAYES, *Washington State Department of Fish and Wildlife*; *Marc.Hayes@dfw.wa.gov*.

We describe the eggs, oviposition site, and pre-hatching development of the Olympic Torrent Salamander (*Rhyacotriton olympicus*) for the first time based on its discovery on 10 August 2016, and serial field and laboratory observations made through 4 January 2017. Oviposition is similar to the 3 other species of torrent salamanders in that unattached eggs are

deposited separately within the interstices of an unconsolidated coarse clast substrate through which some water flow exists. The number of eggs (n = 10) at this oviposition site falls within the variability described as entire clutches for the 3 other torrent salamander species (n = 5-11). However, haphazard dispersion of deposited eggs, likely typical, and sometimes communal oviposition sites, creates ambiguity in what comprises 1 clutch. Egg capsules averaged 9.5 mm ± 0.9 mm SD (range: 8.0-11.0 mm); their pale yellow-white ova, measured when still roughly round, averaged 4.5 mm ± 0.5 mm SD (range: 4.0-5.0 mm). The lack of attachment to a substrate and large capsular spaces distinguish torrent salamander eggs from those of other amphibians that lay unpigmented eggs in concealed sites. Lack of attachment may constrain torrent salamander egg deposition to low-flow habitats, which appear more frequent in the headwater landscapes. Colluvium, also frequent in headwater landscapes, may often provide the low-flow environment in its interstitial matrices ideal for torrent salamander oviposition.

EFFECTS OF WILDFIRE, INVASIVE GRASSES, AND AVIAN PREDATOR DENSITIES ON GREATER SAGE-GROUSE IN OREGON. TERRAH M. OWENS*, *Oregon State University*, *112 Withycombe Hall*, *Corvallis*, *OR 97331*; *terrah.owens@oregonstate.edu*; LINDSEY PERRY, *Oregon State University*; *lindsey.perry@oregonstate.edu*; JONATHAN DINKINS, *Oregon State University*; *jonathan.dinkins@oregonstate.edu*; LEE FOSTER, *Oregon Dept. of Fish and Wildlife*; *lee.j.foster@state.or.us*; JACQUELIN CUPPLES, *U.S. Fish and Wildlife*; *jacqueline_cupples@fws.gov*.

Wildfire is one of the primary threats to Greater Sage-grouse (*Centrocercus urophasianus*; hereafter, Sage-grouse) in Oregon, which is exacerbated by the positive feedback cycle created by invasive annual grasses (e.g., Cheatgrass; [*Bromus tectorum*]). Sage-grouse exhibit high site fidelity to seasonal habitats. When these habitats are lost or degraded by wildfire, there are lasting effects due to long sagebrush recovery intervals (35 to 100+ years). In addition, edge effects, such as reduced shrub cover, reduced forb cover, and increased predation, may negatively affect Sage-grouse within close proximity to a burn. Six Priority Areas of Conservation (PACs) for Sage-grouse were identified as study areas in Baker and Malheur counties, Oregon. We intend to maintain 120 radio-marked (satellite-PTT and VHF) hens each year among the 6 PACs. Sage-grouse demographics will be documented using a combination of ground and aerial telemetry. Burned areas will be identified through Monitoring Trends in Burn Severity, Bureau of Land Management, and Oregon State Lands databases. Proportion of invasive annual grasses will be quantified through a combination of satellite imagery and field data collection. Avian predator densities will be estimated at Sage-grouse use and random locations using point-count sampling. In 2017, we radio-marked 57 hens, initiated collection of breeding season and winter locations for Sage-grouse, and completed >500 point-count surveys in 3 PACs. We will investigate the individual and interactive effects of burn area, burn year, burn proximity to lek, proportion of invasive annual grasses, and density of avian predators on hen survival, reproductive success, and seasonal habitat use.

PRELIMINARY CHARACTERIZATION OF POPULATION GENETIC CONNECTIVITY IN TWO PACIFIC NORTHWEST AMPHIBIANS. SADIE PARKER*****, *PACIFIC UNIVERSITY, 2043 COLLEGE WAY, FOREST GROVE, OR 97116; PARK4490@PACIFICU.EDU;* KATY WEIL, *METRO PARKS AND NATURE; KATY.WEIL@OREGONMETRO.GOV;* LAUREN CHAN, *PACIFIC UNIVERSITY; LCHAN@PACIFICU.EDU.*

Habitat alteration is a leading cause of species declines in vertebrates. Amphibians are particularly vulnerable to environmental changes due to their physiology and life history and have been experiencing extensive global declines since the 1970s. Human activities such as logging, agriculture, and development modify and destroy suitable habitat. This may result in local declines and population extinctions, and can additionally lead to the isolation of populations when corridors for dispersal are altered. The Pacific Northwest is a heterogeneous landscape that includes forest, wetlands, agriculture, logging, suburban neighborhoods, and urban centers. We are interested in the impact of land use practices on population connectivity in two amphibians native to the Portland metropolitan area – the Northern Red-Legged Frog (*Rana aurora*) and the Rough-Skinned Newt (*Taricha granulosa*). Our research is guided by the following questions: How do land use practices affect patterns of genetic diversity within and among populations of each species? And, how do patterns of genetic connectivity compare between these two ecologically distinct amphibians? We present preliminary landscape genetic data for both *R. aurora* and *T. granulosa* sampled from the northwestern Willamette Valley. Initial results are based on multilocus microsatellite markers. This is an ongoing project and upcoming work will include greater population sampling as well as genome-wide SNP data.

ASSESSING AMERICAN BEAVER DAMMING ACTIVITIES IN WEST FORK COW CREEK, A SUB-BASIN TO THE UMPQUA WATERSHED. JOSIE R. PAYNE*, *Oregon State University*, *321 Richardson Hall*, *Corvallis*, *OR 97331*; *bergejos@oregonstate.edu*; VANESSA PETRO, *Oregon State University*; *vanessa.petro@oregonstate.edu*; JIMMY TAYLOR, *National Wildlife Research Center*; *jimmy.d.taylor@aphis.usda.gov*; JASON DUNHAM, *U.S. Geological Survey; jdunham@usgs.gov;* NATE CHELGREN, *U.S. Geological Survey*; *nchelgren@usgs.gov*; DAVID HOCKMAN-WERT, *Oregon State University*, *david.hockman-wert@oregonstate.edu*; ANAKA SMITH, *Oregon State University*, *smithana@oregonstate.edu*.

In the Pacific Northwest, American Beavers (*Castor canadensis*) are promoted as a management tool to augment in-stream complexity and influence fish productivity for Endangered Species Act listed species such as Coho Salmon (*Oncorhynchus kisutch*). Despite strong support to integrate an "ecosystem engineer" into stream restoration, limited information exists on Beaver ecology and their damming activities in the state of Oregon. A general consensus of the public believes both Beaver populations and their dams are declining in Oregon; however, recent research suggests Beaver populations are substantially distributed throughout the Oregon Coast Range. This project seeks to improve understanding of Beaver populations and their damming activities to better inform stream restoration projects in western Oregon. We verified observations of Beaver activity at model identified sites to document the presence of Beaver populations and dam structures in the West Fork Cow Creek sub-basin of the Umpqua Watershed. We surveyed 144 stream reaches that represented unsuitable or suitable damming sites based on habitat associations noted in previous research efforts. Of reaches surveyed, damming activity was documented at only 13 sites. We measured dam structure characteristics in addition to pond area and volume at 48 total dams. Interestingly, the distribution of field verified dams were limited to 2 tributaries in the study area. With this ongoing study, we will later use our observations of Beaver activity to construct a probability of use model that will identify both damming and non-damming Beaver habitat associations throughout the sub-basin, which may be later expanded to include the greater Umpqua Watershed.

TWO DECADES OF WILDLIFE HABITAT MANAGEMENT AT THE SUBWATERSHED SCALE: HOW TO QUANTIFY SUCCESS TOWARDS OBJECTIVES? SCOTT D. PECKHAM*, *Confederated Tribes of the Umatilla Indian Reservation*, *46411 Timine Way*, *Pendleton*, *OR 97801*; *scottpeckham@ctuir.org*; LINDSAY CHIONO, *CTUIR*; *lindsaychiono@ctuir.org*; GERALD MIDDEL, *CTUIR*; *geraldmiddel@ctuir.org*; Carl Scheeler, *CTUIR*; *carlscheeler@ctuir.org*.

The Confederated Tribes of the Umatilla Indian Reservation (CTUIR) manages 2 wildlife areas in the Blue Mountains of Oregon and Washington using a 'ridgetop to ridgetop' strategy. Both projects encompass large portions of an entire subwatershed and were established to protect and enhance wildlife habitat; on-the-ground habitat restoration work is supported by continued mitigation funding. However, neither project management plan established a robust long-term monitoring program to quantify progress toward watershed-level objectives. Here we present a synthesis of two decades of habitat management-related data used to draw inference about and quantify success (or failure) of some of the key strategies applied at this spatial scale. We also discuss how we might improve future data collection to more effectively address these questions about restoring ecosystem health and function at large scales with limited funding.

NEST-SITE SELECTION AND ABUNDANCE OF COMMON RAVENS (*CORVUS CORAX*) IN SAGEBRUSH HABITAT OF EASTERN OREGON. LINDSEY R. PERRY*, *Oregon State University*, *224 Withycombe Hall*, *Corvallis*, *OR 97331*; *lindsey.perry@oregonstate.edu*; TERRAH OWENS, *Oregon State University*; *terrah.owens@oregonstate.edu*; JONATHAN DINKINS, *Oregon State University; jonathan.dinkins@oregonstate.edu;* LEE FOSTER, *Oregon Dept. of Fish and Wildlife*; *lee.j.foster@state.or.us*; JACQUELIN CUPPLES, *U.S. Fish and Wildlife*; *jacqueline_cupples@fws.gov*.

Common Ravens (*Corvus corax*; hereafter, ravens) inhabit multiple habitat types throughout western North America. In sagebrush (*Artemisia spp*.) ecosystems, ravens utilize tall anthropogenic structures such as power lines, irrigation equipment, and buildings for perching, nesting, or roosting. Human activity in sagebrush ecosystems, such as agricultural expansion, road development, and urbanization, has facilitated or provided ravens with greater availability of foraging opportunities and water resources (e.g., dead livestock, garbage, road-kill, irrigation, water troughs, etc.). As a result, there may be negative effects on vulnerable sagebrush-obligate species. For example, ravens depredate Greater Sage-grouse (*Centrocercus urophasianus*; hereafter, Sage-grouse) nests and were connected to lower Sage-grouse lek counts in Wyoming. In eastern Oregon, the Sage-grouse population within the Baker Priority Area of Conservation (PAC) has sharply declined during the past decade, and high raven density has been recorded. Thus, we are evaluating raven ecology related to their use of sagebrush habitat. Preliminary data from our study includes raven nest-site selection and density estimates from 1 treatment and 2 reference sites (Baker PAC, and Crowley and Bully Creek PACs, respectively). Active raven nests were identified throughout the breeding and fledging season (May to July 2017). We estimated raven abundance from 103 point count locations within the three PACs. We also assessed the influence of habitat covariates on local raven density, including power line and road density, landcover type, and topographic ruggedness. An understanding of raven ecology in the sagebrush ecosystem will aide future Sage-grouse conservation efforts.

USDA WILDLIFE SERVICES WILDLIFE DISEASE PROGRAM OVERVIEW AND ACTIVITIES IN OREGON. IAN H. PLUMMER*, *USDA APHIS Wildlife Services*, *USDA APHIS Wildlife Services*, *Salem*, *OR 97301*; *ian.h.plummer@aphis.usda.gov*.

The United States Department of Agriculture Wildlife Services' National Wildlife Disease Program (NWDP) promotes safe agricultural trade by protecting the health of humans, animals, plants, and ecosystems to reduce the levels of incurred losses to agricultural and natural resources. The NWDP works closely with state, federal, tribal, and private land managers and land owners on wildlife disease monitoring and surveillance in all regions of the United States. In Oregon, Wildlife Services' wildlife disease surveillance includes feral swine diseases, avian diseases, leptospirosis, plague, and tularemia. We offer an overview of our recent surveillance efforts that includes pathogen or pathogen group, host species, collection year, collection county or watershed, and results, when available.

COMPARISON OF AVIAN AND MAMMALIAN PREDATORS IN SAGE-GROUSE CORE AND NON-CORE AREAS: ASSESSING PREDATOR ABUNDANCE AND RESPONSES TO ANTHROPOGENIC FEATURES. CLAIRE L. REVEKANT*, *Oregon State University*, *Department of Animal and Rangeland Science*, *Corvallis*, *OR 97331*; *claire.revekant@oregonstate.edu*; JONATHAN DINKINS, *Oregon State University*; *jonathan.dinkins@oregonstate.edu*.

Greater Sage-grouse (*Centrocercus urophasianus*: hereafter Sage-grouse) abundance and distribution in western North America has declined over the last century. Many factors have contributed to this decline, including habitat loss and fragmentation from human development with an associated potential for increased predation rates from avian and/or mammalian predators. In addition, Sage-grouse avoid areas with higher avian predator densities. While human development influences Sage-grouse demographic rates and habitat selection, development also provides an increased number of perch and nesting structures used by avian predators—including ravens that can negatively influence Sage-grouse nest success. Wyoming's Sage-grouse Core Areas were developed to add protections to important habitat for Sage-grouse by reducing human development within Core Areas. Core Areas have maintained higher Sage-grouse trends compared to Non-Core Areas, which could be explained by reduced predation rates. However, we lack a study comparing predator abundance within and outside Core Areas. We performed avian point counts along 5-mi transects throughout the Wyoming Basin during the 2017 summer. Transects were stratified between Sage-grouse Core and Non-Core Areas. Human structures were noted at each point count location. This information will be added to BBS data and human disturbance data previously calculated. We plan to survey coyotes and potentially other mammalian predators during the 2017 to 2018 winter and 2018 summer by performing line transect surveys with fixed-wing flights or other survey techniques. Our study will determine (1) what habitat or structural factors are associated with higher predator abundance and (2) if avian and mammalian predator abundance differs between Core and Non-Core Areas.

LANDSCAPE METRICS INDICATE DIFFERENCES IN MESIC HABITAT DISTRIBUTION FOR TRANSLOCATED SAGE-GROUSE IN CENTRAL WASHINGTON. JIAN RZESZEWICZ*, *Whitworth University, Spokane, WA; hrzeszewicz18@whitworth.edu.*

The greater sage-grouse *(Centrocerus urophasianus)*, resides in sage brush steppe ecosystems across North America. Research indicates that sage-grouse require areas of mesic habitat during the summer season. Mesic areas are plentiful in forbs, and brooding sage-grouse and their chicks rely heavily on these forbs as a food source. In the Swanson Lakes area in Washington, sage-grouse numbers have decreased in recent years. Preliminary research has indicated that brooding sage-grouse in this area do not use mesic sites as heavily as in other regions. In order to explore potential reasons for this, we evaluated National Agricultural Imagery Program (NAIP) aerial photography at one-foot resolution for the Swanson Lakes area as well as for Hart Mountain National Antelope Refuge (HMNAR) in Eastern Oregon, an area where many sage-grouse were captured for translocation to the Swanson Lakes area. The Normalized Difference Vegetation Index (NDVI) was calculated for both areas, and mesic sites were identified as areas with over 0.25 NDVI. Fragstats was used to calculate the mean mesic area, patch density, and contagion for each site. Results indicate that patches at HMNAR are larger, with a lower patch density and contagion than at Swanson Lakes. This may indicate that water resources are more evenly distributed at Swanson Lakes, which may result in a decreased dependency on mesic sites.

GRAZING SEASON OF USE EFFECTS ON SAGEBRUSH OBLIGATE AVIAN HABITAT. VANESSA SCHROEDER*, *Oregon State University, 67826A Hwy 205, Burns, OR 97720; vanessa.schroeder@oregonstate.edu*; JONATHAN DINKINS, *Oregon State University*; *jonathan.dinkins@oregonstate.edu*; DUSTIN JOHNSON, *Oregon State University;dustin.johnson@oregonstate.edu*; DAVID BOHNERT, *Oregon State University*, *david.bohnert@oregonstate.edu*; TRAVIS MILLER, *BLM*; *tmiller@blm.gov*; CHAD BOYD, *USDA-ARS*; *chad.boyd@oregonstate.edu*; KIRK DAVIES, *USDA-ARS*; *kirk.davies@oregonstate.edu*; FARA BRUMMER, *Oregon State University*; *fara.brummer@oregonstate.edu*; PETE SCHREDER, *Oregon State University*; *pete.schreder@oregonstate.edu*.

Extensive sagebrush (*Artemisia spp*.) habitat reduction throughout the Great Basin has led to declines in several sagebrush-obligate wildlife species and generated an intense focus on management of remaining sagebrush habitat. As the predominant land use in the sagebrush ecosystem, livestock grazing is a central factor considered in most sagebrush habitat conservation planning efforts. Surprisingly, a dearth of information is available for understanding the influence of common contemporary grazing practices on sagebrush habitats and associated sagebrush-obligate wildlife species over both short and long time scales. We are in the second year of implementing a replicated grazing experiment to assess the influence of two grazing regimes (winter and spring-defer rotation) at moderate utilization of native grasses (30-40% by weight) and grazing exclusion in 15-20 acre pastures of sagebrush habitat on (1) abundance, nest density, and nest success of sagebrush-obligate songbirds, including Brewer's Sparrows (*Spizella breweri*), Sagebrush Sparrows (*Artemisiospiza nevadensis*), and Sage Thrashers (*Oreoscoptes montanus*); (2) potential nesting habitat for sagebrush-obligate birds; and (3) plant community composition and structure. This research will fill important knowledge gaps that currently exist around the effects of grazing on plant community and habitat characteristics of sagebrush rangelands and the influence of grazing on sagebrush-obligate songbirds.

CELLULASE ACTIVITY IN WOODPECKER NEST AND CONTROL TREES. TYGH SCHUSTER*, *Yakima Valley College*, *P.O. Box 22520*, *Yakima*, *WA 98907-2520*; *kwihumlee@gmail.com*; SHANIA

CARLISLE, *Yakima Valley College*; KEVIN MANNIN, *Yakima Valley College*; TERESA LORENZ, *U.S. Forest Service Pacific Northwest Research Station*; *teresajlorenz@gmail.com*; PHILIP FISCHER.

Fungal cellulases soften trees by hydrolyzing cellulose.The final enzyme in cellulose degradation is cellulobiase. Because tree hardness influences woodpecker nest site selection, we predicted higher cellulobiase activity in woodpecker nest trees compared to random control trees. We used p-nitrophenyl glucopyranoside hydrolysis to determine cellulobiase activity in wood samples and found that samples from woodpecker nest trees had higher cellulobiase activity (mean = 0.025, $n = 80$) than those from control trees (mean = 0.003, $n = 80$, $P < 0.0001$). In addition, we compared cellulobiase activity of wood from nest trees of 4 woodpecker species: Hairy Woodpecker (HAWO; *Picoides villosus*), Black-backed Woodpecker (BBWO; *P. arcticus*), White-headed Woodpecker (WHWO; *P. albolarvatus*), and Northern Flicker (NOFL; *Colaptes auratus*). Cellulobiase activity of BBWO nests ($n = 19$) was significantly lower than nests of the other woodpecker species (HAWO $P = 0.0154$, $n = 18$; NOFL $P = 0.0049$, $n = 17$; WHWO $P = 0.0116$, n = 26). Furthermore, cellulobiase activity of nest sites of HAWO, WHWO, and NOFL were significantly higher than controls.

SPEAKING AS WHITE: LEARNING ABOUT EQUITY IN CONSERVATION PRACTICE. ELAINE M. STEWART*, Metro-Conservation Program, Metro-Parks + Nature, Portland, OR 97225; elaine.stewart@oregonmetro.gov.

I have seen a lot of changes during more than 30 years as a public servant managing natural resources, but our field continues to lack racial and ethnic diversity. My puzzlement has become impatience, spurring me to learn more about this persistent deficit and work to change it. This is a personal journey, but themes and tools gleaned from experts may help all of us in this important work. Part of the solution is a broader understanding of history and part is moving outside our comfort zones to actively disrupt institutionalized racism. In order to create welcoming environments and foster candid conversations, it is incumbent on Whites to become more literate in the history and systems that support inequity. I will discuss how institutionalized racism creates skepticism and suspicion of conservation in the U.S., ways to change our habits and welcome equity into our work, and roles and responsibilities of White people in this effort. It is critical for White people to educate ourselves and to not expect help from people of color. As beneficiaries of the status quo, it is our job to disrupt it. As a shrinking majority that will be outnumbered by people of color in the next 20 years, our legacy is tied to our ability to diversify our ranks and avoid the mistakes of the past. Useful strategies in advancing equity include seeking out voices of color and accessing available opportunities for training. A few of the many resources are provided.

MAPPING RISKS ACROSS URBAN-WILDLIFE CONNECTIVITY. AMANDA TEMPLE*, *PSU Department of Geography*, *1721 SW Broadway*, *Portland*, *OR 97201*; *amtemple@pdx.edu*; MARTIN LAFRENZ, *PSU Geography*; *lafrenz@pdx.edu*; LESLIE BLISS-KETCHUM, *PSU Environmental Science and Management*; *blissket@pdx.edu*.

Habitat connectivity enables wildlife to access resources for their survival in and around an urban landscape. The question of connectivity becomes especially important as urban growth

and development continue across Portland. Undeveloped areas within the city are expected to be most at risk. Vacant lots and private property are more likely to be developed than publicly owned spaces (i.e., parks) within the urban growth boundary. Site-specific effects of development vary across multiple scales and for many species. Wildlife moving within areas of concern will benefit from the connectivity of available habitat. The objective is to map locations at high risk of development within and surrounding the city, and to assess the effects of these risks. Land ownership, vegetation characteristics, and aerial photography will be used to identify hot spots with GIS analysis. Visualization of this data will be produced using multiple methods: weighted-average reclassification, neighborhood focal statistics tool, and statistical clustering by Getis-Ord Gi* 1) inside the urban growth boundary 2) within carefully selected connectivity zones at pilot sites 3) at currently undeveloped areas. A high risk area of development map would influence the site selection process for land managers and the public to identify areas of concern, and the needs of wildlife. The resulting maps can be overlaid with habitat quality and permeability assessment scoring for future research initiatives.This research will assist managers in working with partners to protect the values associated with urban wildlife habitat.

PRELIMINARY ACOUSTIC SURVEYS OF BATS IN PORTLAND'S URBAN PARKS. PAMELA G. THOMPSON*, *Portland State University*, *7225 N. Concord Ave.*, *Portland*, *OR 97217*; *thompson@pdx.edu*; OLYSSA STARRY, *Portland State University*; *ostarry@pdx.edu*; KEVINA VULINEC, *Delaware State University*; *vulinec@gmail.com*.

Bats are a diverse group of animals that serve important roles in the ecosystem; they contribute to pollination and seed dispersal, and are the principal predators of night-flying insects. Certain bat species are sensitive to habitat changes and are used as indicators of ecosystem integrity, but others are highly adaptable, and frequently observed in urban environments. Several bat species and populations in North America are under threat from White Nose Syndrome (WNS), which has been characterized as the largest wildlife epidemic in the past century. WNS was detected in Western states for the first time in 2016, highlighting the need for studies on bat populations in this region. We conducted preliminary acoustic surveys of bats in parks around Portland, OR during late summer 2017. We surveyed many of the sites described in a report by the City of Portland's Bureau of Environmental Services in 2008, which had the following parameters: within 0.4 km of water, with some forest structure, and easily accessible. We used a Pettersson's M500 microphone to detect ultrasonic bat calls, and then ran three of the surveys through Sonobat's automatic classification. Sonobat identified three bat species with high confidence: Big Brown Bats (*Eptesicus fuscus*) at Laurelhurst Park and Kelly Point Park, Silver-haired Bats (*Lasionycteris noctivigans*) at Kelly Point Park, and *Myotis sp*. at Pier Park. These represent significant differences in species found in the 2008 report. Future work will focus on surveying bats at more locations, to determine ecological constraints on species occurrences.

APPLYING THE POWER OF PARTNERSHIPS THROUGH THE SAGE GROUSE INITIATIVE TO CONSERVE WASHINGTON'S SAGEBRUSH STEPPE. JULIE K. UNFRIED*, *Pheasants Forever*, *103 N. Baker*, *Waterville*, *WA 98858*; *junfried@pheasantsforever.org*; LISA DOWLING, *Pheasats Forever*; *ldowling@pheasantsforever.org*; SCOTT SCROGGIE, *Natural Resource Conservation Service*; *scott.scroggie@wa.usda.gov*; DOMINIC BACHMAN, *Natural Resource Conservation Service; dominic.bachman@wa.usda.gov*.

Greater Sage-grouse (*Centrocercus urophasianus*) are a sage-steppe obligate species found across 11 western states and 2 Canadian provinces. Greater Sage-grouse (hereafter Sage-grouse) are considered an umbrella species for the sage-steppe ecosystem because they have complex life histories and require the full assemblage of habitat types found within healthy sage-brush (*Artemisia spp*.) ecosystems; however, the bird's range has decreased by nearly 50%. To address growing concerns associated with habitat loss across the American West, the Natural Resource Conservation Service (NRCS) partnered with several Federal, state, and NGOs to create the Sage Grouse Initiative (SGI) in 2010. SGI provides technical assistance and financial incentives to help producers apply sustainable management practices while benefitting wildlife. SGI efforts are prioritized in locations where each dollar spent optimizes the conservation impact. In Washington State, habitat loss is primarily associated with crop production and largescale wildfires followed by invasive annual grasses such as cheat grass. Since 2010, SGI in Washington State has strategically applied landscape scale conservation on more than 88,000 acres to address the aforementioned threats. As SGI continues to expand across Central Washington, we look forward to implementing projects that will benefit core Sage-grouse habitat. Future projects include, acquiring approximately 6,000 acres for a conservation easement; new partnerships with BLM and WDFW to develop comprehensive plans across multiple ownershipboundaries; and collaborating with partners and private landowners to restore wet meadows within the core area for Sage-grouse.

COYOTES: POSSIBILITIES FOR CITIZEN SCIENCE AND URBAN ECOLOGY. KEITH VANDER BROOKE*, *Portland State University*, *105 NE Beech St.*, *Portland*, *OR 97212*; *kvanderbrooke@gmail.com*.

Portland State University's Portland Urban Coyote Project (PUCP) is a city-wide citizen science initiative that studies residents' interactions with Coyotes (*Canis latrans*). Steadily increasing participation in the project has yielded a large amount of data to be interpreted. Qualitative data derived from comments reflect a wide range of emotions regarding Coyotes. Unfortunately, the citizen science collection method has limitations. All Coyote sightings require that (1) a person is present (2) a Coyote is present (3) the person knows about PUCP (4) the person makes the decision to report the sighting. Despite this prohibitive spatial bias, sighting data gathered so far reflects Coyote day-night activity changes consistent with human-avoidance. For density related information, preliminary camera trap data appears to be a promising complement to citizen sightings. By comparing static camera trap results across a gradient of urbanization, PUCP members hope to better reveal the realities of human-wildlife coexistence.

CORVID RESPONSE TO FOREST THINNING IN THE WILLAMETTE NATIONAL FOREST: IMPLICATIONS FOR THE CONSERVATION OF THE MARBLED MURRELET. LORRAINE K. WAIANUHEA*, *Oregon State University*, *PO Box 1291*, *Corvallis*, *OR 97339*; *waianuhl@oregonstate.edu*; JOAN HAGAR, *USGS Forest & Rangeland Ecosystem Science Center*, *Corvallis*, *OR*; *joan_hagar@usgs.gov*.

The Marbled Murrelet (*Brachyramphus marmoratus*) is federally listed as threatened under the Endangered Species Act in Washington, Oregon, and California. The loss and fragmentation of old-growth forest nesting habitat over the last two centuries has been the

greatest threat to the Marbled Murrelet. One consequence of forest fragmentation is an increase in nest predation rates, primarily by corvid predators. Thinning of young forest adjacent to murrelet habitat reserves may increase nest predation rates, but corvid response to thinning has not been well studied. For this project, we used bird survey data collected between 1992 and 2007 as a part of an experiment with treatments consisting of 3 levels of thinning intensity to investigate the response of corvids to thinning. Our research questions were: (1) Was there a difference in corvid detection rates before and after thinning treatments? and (2) Did the trends in corvid detection rates for each treatment change over time? Preliminary results indicate that corvid detection rates increased in response to thinning, and that the response of corvids over time varied by treatment. These preliminary findings add to recent studies which suggest that forest harvest may increase the abundance and activity of corvids. Overall, these results contribute to knowledge of corvid response to forest management in the Pacific Northwest and can inform decisions related to murrelet conservation.

VEGETATIVE ANALYSIS OF COLUMBIA BASIN PYGMY RABBIT (*BRACHYLAGUS IDAHOENSIS*) HABITAT. ASPEN WELKER*, *Department of Fish and Wildlife Sciences*, *University of Idaho*, *875 Perimeter Dr.*, *Moscow*, *ID 83844-1136*; *welk4238@vandals.uidaho.edu*; AUSTIN DUPUIS, *Department of Fish and Wildlife Sciences*, *University of Idaho*; *dupu9169@vandals.uidaho.edu*; STACEY NERKOWSKI, *Department of Fish and Wildlife Sciences, University of Idaho*; *staceyn@uidaho.edu*; JANET RACHLOW, *Department of Fish and Wildlife Sciences*, *University of Idaho*; *jrachlow@uidaho.edu*; LISA SHIPLEY, *School of the Environment, Washington State* University; s*hipley@wsu.edu*; LISETTE WAITS, *Department of Fish and Wildlife Sciences*, *University of Idaho*; *lwaits@uidaho.edu*.

Loss and fragmentation of native shrub-steppe habitat has led to the decline and extirpation of the Columbia Basin Pygmy Rabbit (*Brachylagus idahoensis*; CBPR) in Washington State. In 2001, the last remaining 16 CBPR were removed from the wild to begin a captive breeding program. In 2011, the program transitioned to an onsite breeding program with the goal of reestablishing wild populations within central Washington. Since 2011, 1947 rabbits have been released onto Sagebrush Flats Wildlife Area (SBF). Since 2015, ~75% of active burrows are no longer found on SBF, but have transitioned to Conservation Reserve Program (CRP) land. The objective of this study was to identify factors that have led to the transition of active burrows from SBF to CRP. We hypothesize that concealment, as well as canopy cover, are greater in CRP vs SBF. Line transects and 1 m plot boxes were used to determine canopy cover, plant diversity, and plant coverage. Surveys were performed to evaluate terrestrial and aerial concealment, and the quality of sagebrush (*Artemisia spp.*) and soil. ANOVA's and mixed effect modeling were used to characterize the relationship between concealment, canopy cover, and burrow location. This data will be used to help determine optimal habitat for future Pygmy Rabbit release sites. This is important, because in summer 2017, a fire destroyed 1 of the few plausible release sites, as well as one of the more productive breeding enclosures, with more than 100 rabbits. The managers of the CBPR hope to identify more suitable habitat, aside from SBF, for future releases.

NORTHERN PINTAIL SPRING MIGRATION STOPOVER AND RESIDENCE TIME IN THE CHANNELED SCABLANDS OF EASTERN WASHINGTON. MATTHEW WILSON*, *Washington Department of Fish*

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Spring migratory waterfowl distribution, habitat utilization, and timing, are often poorly understood aspects of the annual waterfowl life cycle. The Channeled Scablands (CS) Region of Eastern Washington has long been assumed to be an important stopover site for several species of waterfowl, including Northern Pintails (*Anus acuta*). As part of ongoing aerial waterfowl survey work, we radio-marked 12 adult female Northern Pintails in March 2017 with backpack VHF transmitters, during 3 capture periods, at two locations in the CS. Additionally, we marked 6 adult female Northern Pintails with Ecotone GPS-GSM transmitters, two during each capture period. We calculated residence time as the number of days between capture and departure from the CS using GPS locations, or the last recorded location of a VHF transmitter. The mean residence time of migratory Northern Pintails was 20.75 days (SE 2.59, $n = 16$). The observed residence time was a minimum of 4 days to a maximum of 39. Mean residence time was similar between GSM and VHF transmitters (24.20 and 19.18 days, respectively) and among birds captured during the 3 periods (22.80, 18.40, 34.00, respectively). Additional analysis using transmitter locations with GIS data layers will determine habitat preference for foraging and roosting Northern Pintails throughout the CS during this critical pre-nesting period. With this information we are developing decision criteria for habitat preservation and restoration.

MANAGING AND SHARING INVASIVE SPECIES DATA WITH IMAPINVASIVES. LINDSEY WISE*, *Institute for Natural Resources*, *Portland State University*, *2112 SW 5th Ave.*, *Portland*, *OR 97201*; *lwise@pdx.edu*.

iMapInvasives is an online, GIS-based data management system used to assist citizen scientists and natural resource professionals working to protect our natural resources from the threat of invasive species. iMapInvasives is a growing, collaborative partnership of participating states and provinces, creating a network of professionals and shared resources to help combat the threat of invasive species. Oregon iMapInvasives is the state's most comprehensive invasive species dataset, incorporating observations, surveys, and treatments for terrestrial and aquatic plants and animals, and comprising more than 335,000 observations of 371 species with data from over 90 organizations. Oregon iMapInvaisves consolidates data from many sources including the Oregon Invasive Species Hotline, ODA WeedMapper, herbarium records, and an active community on iNaturalist.org. Existing datasets can be submitted to imapinvasivesoregon@gmail.com for bulk upload, or users can create records online using mobile or desktop mapping tools. Anyone can sign up for a free iMap account to map their own invasive species locations, query the dataset, generate reports, and request data exports for use in their own analyses. Oregon iMapInvasives data has led to early detection and management of List A noxious weeds and has been used for planning, prioritization, and research in Oregon and beyond.

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