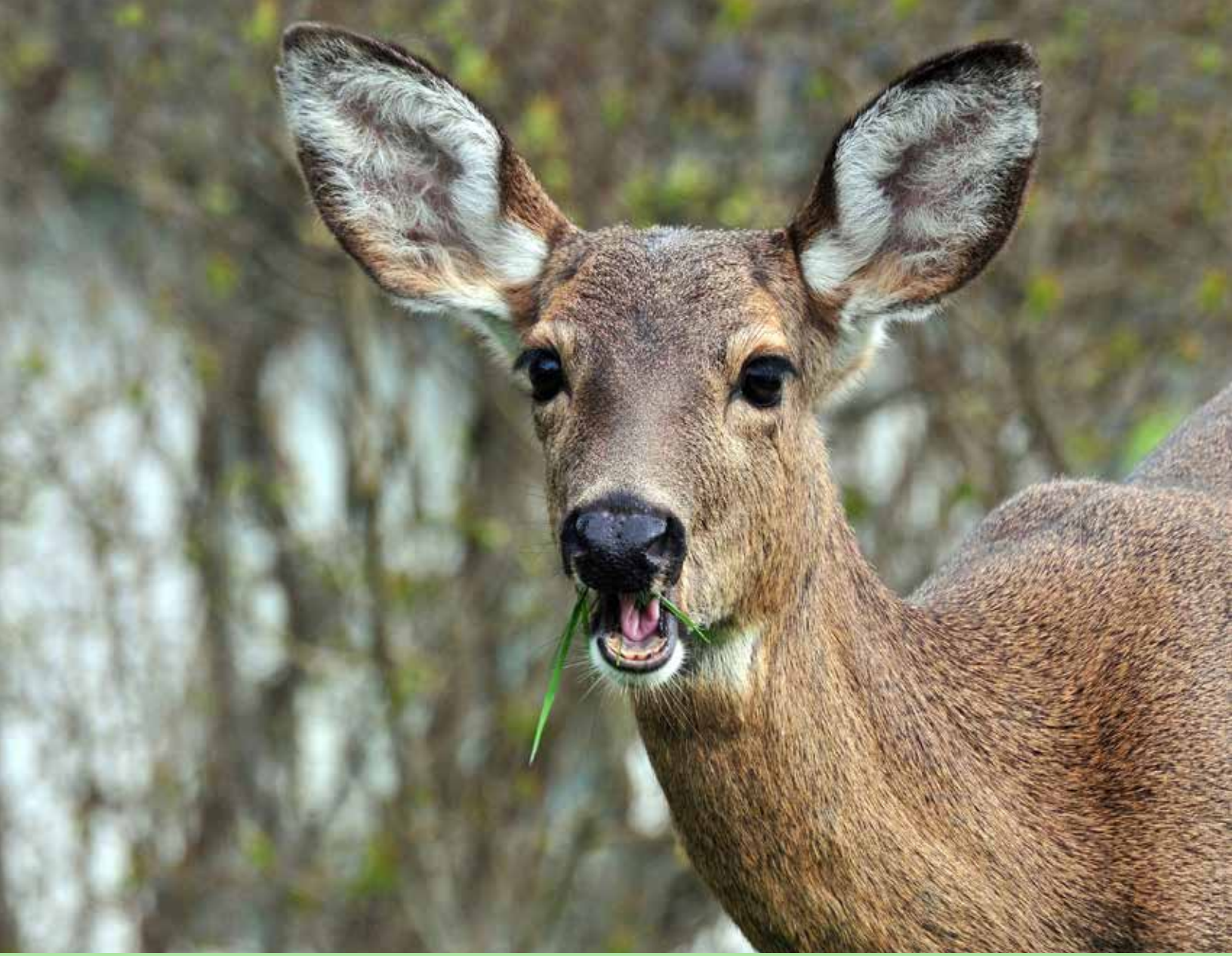

ANNUAL REPORT

July 1, 2022–June 30, 2023

Washington Cooperative Fish and Wildlife Research Unit

WACFWRU

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Cover photo: iStockphoto.com/Edward Palm; This page: iStockphoto.com/ksushsh

Sarah Converse

MESSAGE FROM
The Unit Leader

It's been another busy year at the WACFWRU and in my research lab. My group now includes 1 postdoc, 1 research scientist, 2 PhD students, and 5 MS students.

We've been busy planning and carrying out fieldwork at Protection Island in the Strait of Juan de Fuca (Pigeon Guillemots and Rhinocerous Auklets), in and around Mt. Rainier National Park (Cascade red fox), and at Tetiaroa Atoll in French Polynesia (Brown Boobies and other seabirds). As always, we were also busy with lots of modeling and decision-analysis projects. One PhD student finished this year: Abby Bratt is off to New Zealand to work for Proteus, a statistical consulting company. Lisanne Petracca, a former postdoc, left for a faculty position at Texas A&M Kingsville. Jamie Brusa, a former postdoc with me and my colleague Beth Gardner, has a contract position at the NOAA/NMFS Northeast Fisheries Science Center. It's always great to see folks getting jobs and doing good things.

The Sustainability of the Unit is my first priority as Unit Leader, and the number one determinant of the sustainability of our operations is the Unit administrator. This year, we said farewell to Verna Blackhurst, who was with the Unit for more than 20 years. She is living her best life with her husband in Spokane now, with a full menagerie installed on their beautiful property, including a couple of horses in their brand-new barn. We miss Verna tremendously, but love to see her so happy. Sarah Romero has been with us for just over a year, and is getting up to speed on all of the complexities of the WACFWRU and the UW Financial Transformation. I encourage folks to reach out to her with questions or just to say hello.

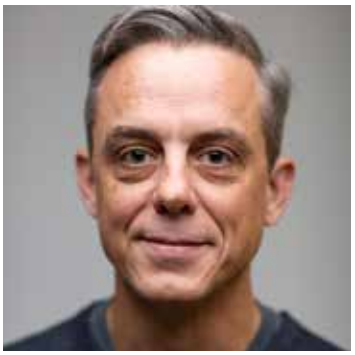
Connection with our state cooperators is another of my priorities as Unit Leader. On this front, Alex McInturff and I are looking forward to teaching our two-day Structured Decision Making (SDM) course at WDFW again in November. We'll be joined on the instruction team by Laura Keating, a conservation decision-analyst at the Wilder Institute/Calgary Zoo, and by several UW graduate students. A couple of these students took the Intro to SDM course that I taught to a combined class of UW and WSU graduate students last winter for the first time. We're looking forward to more interesting and productive conversations with WDFW this year. One of the case studies from the 2022 two-day course has now become a fully fledged SDM process and research project, with a new graduate student in my lab, Timothy Chen, joining that team, which is led by WDFW scientist and former Converse lab postdoc Staci Amburgey.

Serving the Washington fish and wildlife community is the third of my priorities as Unit Leader. On this front, the Fish and Wildlife Ecology Seminar Series is going strong, led by Alex. Check https://depts.washington.edu/wacfwru/category/seminar-series/ for more information.

We had several changes in the Cooperator's Committee (CC) this year. Chris Smith, our long-time CC member from the Wildlife Management Institute, retired. HIs position will be filled in the coming year. Annette Hoffmann, who was our rep from the Washington Department of Ecology, has passed the reins to Will Hobbs. We're looking forward to meeting Will in person at our annual meeting in October. And, our USFWS rep, Jim Unsworth, also retired. Scott Covington will be taking his place on the board as he steps into his new position as the Assistant Regional Director for Science Applications in our region. My sincerest thanks to Chris, Annette, and Jim. And welcome to our new members!

—Sarah Converse, *Seattle, September 21, 2023*

Photo: UW College of the Environment



Mark Scheuerell

MESSAGE FROM
Assistant Unit Leader–Fisheries

This past year, my lab group has experienced both continuity and change.

Karl Veggerby defended his master's thesis this summer, and although we were sad to see him go, it's not really goodbye because he accepted a position with a local consulting firm. Nicole Doran continues to collaborate with partners at US Fish and Wildlife Service (USFWS), the Washington Department of Fish and Wildlife (WDFW), and King County to study food web dynamics surrounding at-risk kokanee salmon in Lake Sammamish. Andrea Hennings continues to balance her duties with WDFW's groundfish assessment team while working towards her master's on rockfishes in Puget Sound. Markus Min was awarded a prestigious NSF predoctoral fellowship to study changing food web dynamics in the California Current as he continues his PhD research. Dara Farrell, our postdoc, is wrapping up her development of a machine learning program to detect fish in underwater video and will be leaving us at the end of October for a position with the National Oceanography Centre in the UK.

Brian McGreal, a PhD student in the Quantitative Ecology an*d* Resource Management program, joined our lab group this summer and will be working with the National Park Service to develop better harvest management goals for pink salmon in Sitka National Historic Park. Tessa Code, a master's student and current USGS employee, migrated over to our lab this summer as well. She is studying the effects of artificial light at night on the spatial distributions of pelagic planktivores and their predation risk in Lake Washington. We also just welcomed a new master's student, Amirah Casey, who will be studying the effects of persistent toxins on fish population dynamics in collaboration with colleagues from WDFW. I wrapped up the updated species status assessment for ESA-listed bull trout in OR, WA, ID, and MT this past fall, and we completed our project with the ecotoxicology group at WDFW to help them better understand patterns and trends in their Puget Sound monitoring data and use that information to develop a better monitoring program. We also collaborated with Andrea Richter-Sanchez, a graduate student in the School of Marine and Environmental Affairs (SMEA), and Kate Loy, a Hershman Fellow at the Puget Sound Partnership, to develop an outreach plan for engaging with traditionally underserved communities in south King County. In collaboration with scientists from SMEA, NOAA, and WDFW, we are in the final stages of rolling out a webtool to help landowners prioritize road culvert removals, as mandated by the 2018 U.S. Supreme Court decision.

I was the chair of the Diversity, Equity and Inclusion (DEI) committee in the School of Aquatic and Fishery Sciences this past year. Among our highlights, we published several informational guides on mentoring and safe and equitable field work, and we organized a college-wide workshop to better understand how DEI efforts underway in different schools and departments could be better aligned and leveraged with one another. I am excited to begin working with Alex on incorporating human dimensions into applied fisheries research in the region. I also look forward to working with my CRU colleagues from Oregon and Idaho to conduct a workshop with our state cooperators on approaches for better forecasting salmon returns to our rivers and streams.

I'm fortunate to serve our cooperators and the public in advancing our knowledge and improving the management of aquatic resources in Washington and beyond.

—Mark Scheuerell, *Seattle, September 15, 2023*

Photo: UW College of the Environment

Alex McInturff

MESSAGE FROM
Assistant Unit Leader–Wildlife

This past year has been an exciting one, as projects have moved forward, my research group has grown, and we officially landed on a name: The People and Wildlife (PAW) Lab.

This spring, current PhD student Lara Volski received a National Science Foundation GRFP Fellowship for her research studying the human dimensions of wolf recolonization in Klickitat County. Incoming PhD student Vivian Hawkinson also received this prestigious award to support work modeling human–wolf conflict. Incoming PhD student Nikol Damato received a competitive fellowship from our department to study Southern Resident Killer Whale policy. Along with colleagues Aaron Wirsing and Laura Prugh, I received a McIntire-Stennis grant to support incoming MS student Molly Rambeau, who will work closely with the Confederated Tribes of the Colville Reservation to study deer behavior in forest lands and connections between deer management and Indigenous environmental justice. Postdoc Meggie Callahan received funding from the Animal & Plant Health Inspection Service (APHIS) and the Washington Department of Fish and Wildlife (WDFW) to support a second year of her research on public attitudes and education on Chronic Wasting Disease. And finally, as postdoc Gretchen Sneegas wraps up her research on the Forest Practices HCP Adaptive Management Program, we are celebrating her new position as a teaching faculty member in UW's Department of Geography. It is a privilege to work with such a talented group.

Alongside these incredible students and postdocs, I've moved forward with several of my own research projects this year, including research on grizzly bear reintroductions, GPS tracking of hunters, environmental justice and urban wildlife, defining the concept of a "social-ecological niche," and contributing a chapter to the newest edition of the Human Dimensions of Wildlife textbook. I've continued to work with Montana Fish, Wildlife and Parks to set mountain lion hunting quotas through a structured decision making (SDM) process, and Sarah Converse and I will teach SDM courses again this year for WDFW and Washington Department of Natural Resources (WDNR). I've been fortunate to work closely with David Trimbach and Braeden Van Deynze at WDFW this year and have learned a lot from their remarkable efforts to strengthen the social science capacity of WDFW.

At UW, I'm ending my tenure as our department's co-chair of the Diversity, Equity, and Inclusion (DEI) Committee, where we've made important strides in building our capacity, training, and attention to DEI issues. This year, I'll continue to play a role in our departmental strategic planning process, and I'll be joining the Curriculum Committee. I'm looking forward to another year organizing our Fish and Wildlife Seminar, which has included speakers from UW, WSU, WDFW, WDNR, and NOAA, and which continues to grow.
In the coming year, I am excited about new possibilities for research, technical assistance, and collaboration in support of our commitments to Sustainability, Connection, and Community. I continue to prioritize working with our cooperators to make our state a leader in the human dimensions of wildlife science and management. I'm grateful for the opportunity to work with you, and I'd love to hear about your goals, needs, and ideas.

—Alex McInturff, *Seattle, September 22, 2023*

Photo: UW College of the Environment

Photos l to r: iStockphoto.com/Gerald Corsi and O megaforest

Unit Award Recipients

Courtesy of Jesse Burgher

The Gilbert B. Pauley Award

Awarded annually for best student presentation at the Annual Student Symposium

2022 Winner—Jesse Burgher

School of Biological Sciences, Washington State University; advised by Dr. Jonah Piovia-Scott

For his presentation, *Using environmental DNA to improve monitoring of relocated beaver and assess impacts on aquatic systems in Washington State.*

Courtesy of Jonathan Batchelor

The John Pierce Outstanding Graduate Student Award

Awarded annually to the graduate student who best embodies the spirit and mission of the WACFWRU

2022 Winner—Jonathan Batchelor

School of Environmental and Forest Sciences, University of Washington; advised by Dr. Monika Moskal

UW Coll. of the Environment

Unit Leader's Service Award Winner: Andre Punt

Presented to individuals who make significant contributions to the success of the Washington Cooperative Fish and Wildlife Research Unit

We recognize Dr. Andre Punt for his tireless commitment to the success of the Unit during his tenure as Director of the School of Aquatic and Fishery Sciences at the University of Washington. Dr. Punt was one of the few constants during a period of great change for the Unit, never wavering in his support of the Unit's mission and its personnel.

Courtesy of Verna Blackhurst

Unit Leader's Service Award Winner: Verna Blackhurst

Presented to individuals who make significant contributions to the success of the Washington Cooperative Fish and Wildlife Research Unit

We recognize Ms. Verna Blackhurst for her commitment to the success of the Unit during more than 20 years as the Unit's Manager of Program Operations, and for her exemplary service to six different Unit Leaders and countless students and cooperating faculty.

Annual Student Symposium

The 2022 WACFWRU Annual Student Symposium was held both virtually and in person at Washington State University on October 19. The full lineup of speakers included:

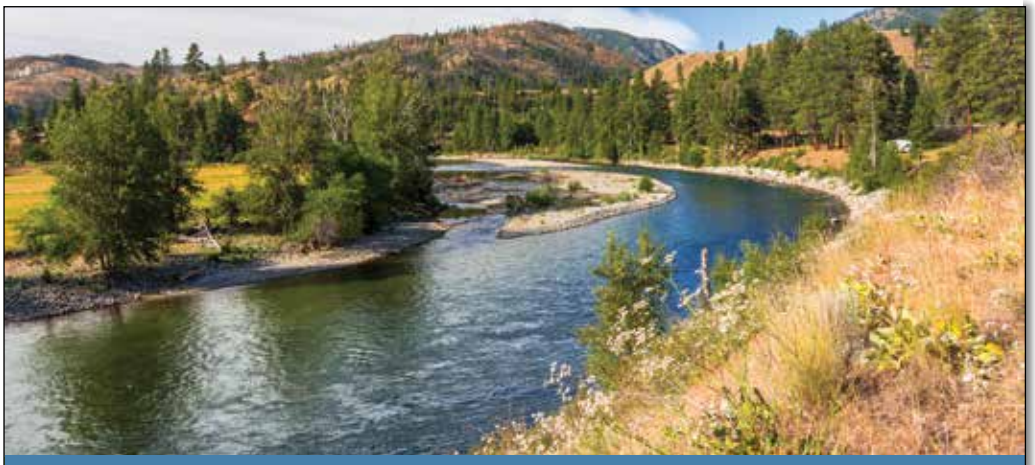


Photo: iStockphoto.com/Strekoza2

WASHINGTON COOPERATIVE FISH AND WILDLIFE RESEARCH UNIT

WACFWRU

Annual Student Symposium

Wednesday, October 19, 2022, 4:00–6:00 pm

https://washington.zoom.us/j/99490762693

depts.washington.edu/wacfwru/category/symposium/

4:00 pm **Welcome**
Sarah Converse & Mark Scheuerell, *Washington Cooperative Fish and Wildlife Research Unit*

4:10 pm **Mountain quail population ecology and monitoring in southeast Washington: first steps**
Kylie Denny, *School of the Environment, Washington State University*

4:20 pm **Prediction of Canada lynx habitat: Upscaling TLS ground cover classifications to landscape level ALS**
Jonathan Batchelor, *School of Environmental and Forest Sciences, University of Washington*

4:30 pm **Investigating the impacts of multiple stressors of an urban freshwater ecosystem on a threatened salmonid**
Nicole Doran, *School of Aquatic and Fishery Sciences, University of Washington*

4:40 pm **Tracking post-fire tree regeneration in the East Cascades**
Angie Gonzalez, *School of Environmental and Forest Sciences, University of Washington*

4:50 pm **Effect of oceanographic variability on demography of a planktivorous seabird in a dynamic upwelling system**
Amelia DuVall, *School of Aquatic and Fishery Sciences, University of Washington*

5:00 pm **Characterizing the habitat function of bivalve aquaculture farms using underwater video**
Karl Veggerby, *School of Aquatic and Fishery Sciences, University of Washington*

5:10 pm **A whole new ball game: using game theory for invasive species management problems**
Brielle Thompson, *Quantitative Ecology and Resource Management, University of Washington*

5:20 pm **Incorporating distribution shifts and spatio-temporal variation when estimating weight-at-age for stock assessments: a case study involving Bering Sea pollock**
Julia Indivero, *School of Aquatic and Fishery Sciences, University of Washington*

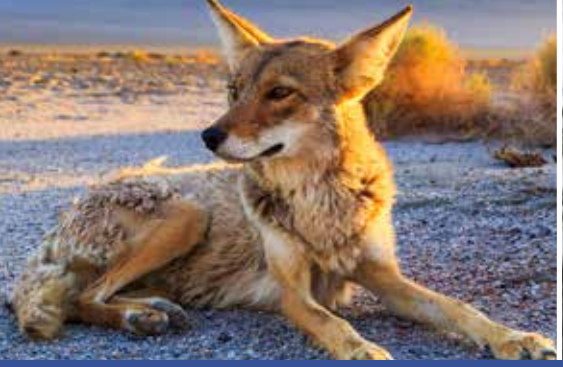
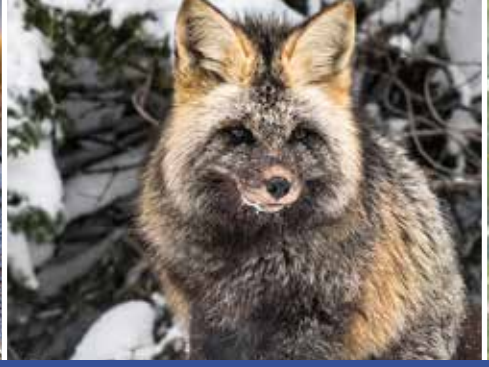
5:30 pm **Developing a decision framework for the reintroduction of Streaked Horned Larks**
Hannah Sipe, *School of Environmental and Forest Sciences, University of Washington*

5:40 pm **Using environmental DNA to improve monitoring of relocated beaver and assess impacts on aquatic systems in Washington State**
Jesse Burgher, *School of Biological Sciences, Washington State University*

5:50 pm **Wrap-up**
Mark Scheuerell

Disability Accommodations: Contact the Disability Services Office at 206-543-6450 (voice), 206-543-6452 (TTY), 206-685-7264 (fax) or dso@uw.edu for accommodation requests.

USGS science for a changing world · DEPARTMENT OF ECOLOGY State of Washington


Photos l to r: iStockphoto.com/dmodlin01, vndrpttn, and DC_Colombia

Research Projects

During state fiscal year 2023, the WACFWRU Cooperative Agreement facilitated $9,110,833 in project funding at UW, including $1,543,079 in new dollars, and $2,060,979 in project funds at WSU, including $336,385 in new dollars. The WACFWRU staff and cooperating faculty at UW and WSU worked with five federal agencies in addition to our three state cooperating agencies. All funded projects led by WACFWRU staff are listed by funder, including project title and dates, with student and postdoctoral scientist support listed below the project title. For cooperating faculty, projects are listed by university and funder, including project title, principal investigator, department, and project dates, along with student and postdoctoral scientist support.

Sarah Converse, WACFWRU Unit Leader

Department of the Navy—Joint Region Marianas

- **Evaluating and mitigating the effects of brown tree snakes on Guam's birds**
  Hannah Sipe, *PhD student*

National Oceanic and Atmospheric Administration

- **Integrating data sources to characterize demographic responses of Columbia River salmon and steelhead to threats and management actions**

National Park Service/U.S. Geological Survey

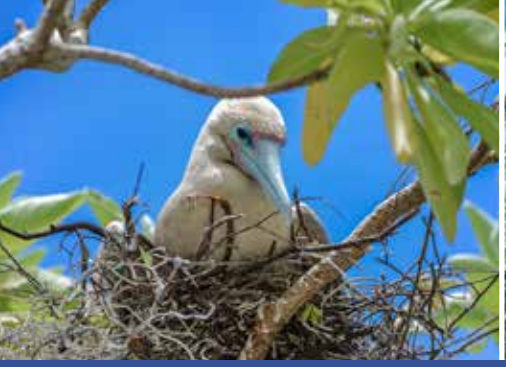
- **Assessing anthropogenic threats and predation/competition from coyotes on Cascade red fox combining spatial capture–recapture methods and historical Indigenous knowledge**
  Nathan Redon, *MS student*
- **Long-term seabird monitoring data analysis to update Channel Islands National Park Seabird Inventory and Monitoring Program and inform management and conservation**
  Amelia DuVall, *MS student*

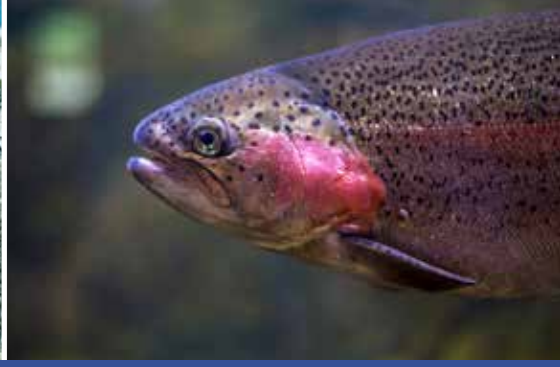
U.S. Fish and Wildlife Service

- **Assessing threats to critical seabird foraging habitat in the Salish Sea**
  Liam Pendleton, *MS student*
- **Evaluating sea duck detectability in the Puget Sound winter ambient monitoring program**
  Jamie Brusa, *postdoctoral scientist*
- **Monitoring Tufted Puffins in the United States**
  Matthew Farr, *postdoctoral scientist*

U.S. Geological Survey

- **Improving our tools for combating invasive species**
  Co-investigator: Julian Olden, *School of Aquatic and Fishery Sciences*
  Brielle Thompson, *PhD student*





Photos: iStockphoto.com: above l to r: Wirestock, PhilAugustavo, and Natalia Kokhanova; below: bgfoto

Washington Department of Fish and Wildlife

- **Cascade red fox threat assessment**
  Nathan Redon, *MS student*
- **Maximizing the value of Salish Sea aerial surveys for sea duck management**
  Matthew Farr, *postdoctoral scientist*

Other

- **Assessing threats to critical seabird foraging habitat in the Salish Sea** (*supported by the SeaDoc Society*)
  Liam Pendleton, *MS student*
- **Evaluating status and threats to foraging habitat for Rhinoceros Auklets in the Salish Sea** (*supported by American Wildlife Conservation Foundation, Inc.*)
  Liam Pendleton, *MS student*
- **Seabird ecology and conservation at Tetiaroa, French Polynesia** (*supported by private donors to University of Washington*)
  Co-investigators: Beth Gardner, *School of Environmental and Forest Sciences*, and Julia Parrish, *School of Aquatic and Fishery Sciences*
  Eve Hallock, *MS student*

Mark Scheuerell, WACFWRU Assistant Unit Leader—Fisheries

National Oceanic and Atmospheric Administration

- **Advancing sustainable shellfish aquaculture through machine learning and automated data collection on fish communities**
  Dara Farrell, *postdoctoral scientist*
- **Habitat function of shellfish aquaculture ecosystems: developing new technology to understand species use of nearshore habitats**
  Karl Veggerby, *MS student*

National Park Service

- **Estimating the natural range of abundance of pink salmon in the Indian River, Sitka National Historical Park**

U.S. Fish and Wildlife Service

- **Evaluating the relative effects of top-down and bottom-up factors on declines in Lake Sammamish kokanee salmon**
  Nicole Doran, *MS student*

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Washington Department of Fish and Wildlife

- **Toxics mussel monitoring program design**
  Andrea Richter-Sanchez, *MS student*

Other

- **A simulation and case-study comparison of existing and spatio-temporal methods to apportion coastwide catch limits for subregional management** (*supported by the National Oceanic and Atmospheric Administration through the Cooperative Institute for Climate, Ocean, and Ecosystem Studies*)
  Kelly Mistry, *MS student*

Alex McInturff, WACFWRU Assistant Unit Leader—Wildlife

U.S. Geological Survey

- **Measuring values, attitudes, beliefs, and behaviors of Washington residents toward contentious wildlife species**
- **Novel methods for studying human-wolf interactions in Washington**
  Lara Volski, *PhD student*

Washington Department of Fish and Wildlife

- **Assessing perceptions of risk and uncertainty during adaptive management: a case study of the Washington state forest practices habitat conservation plan**
  Gretchen Sneegas, *postdoctoral scientist*
- **Proactive development of Chronic Wasting Disease outreach, education, and policy to guide disease management in Washington**
  Meggie Callahan, *postdoctoral scientist*
  Erik Ertsgaard, *BA/BS student*
  Amishi Singh, *BA/BS student*
  Nick Petersen, *BA/BS student*

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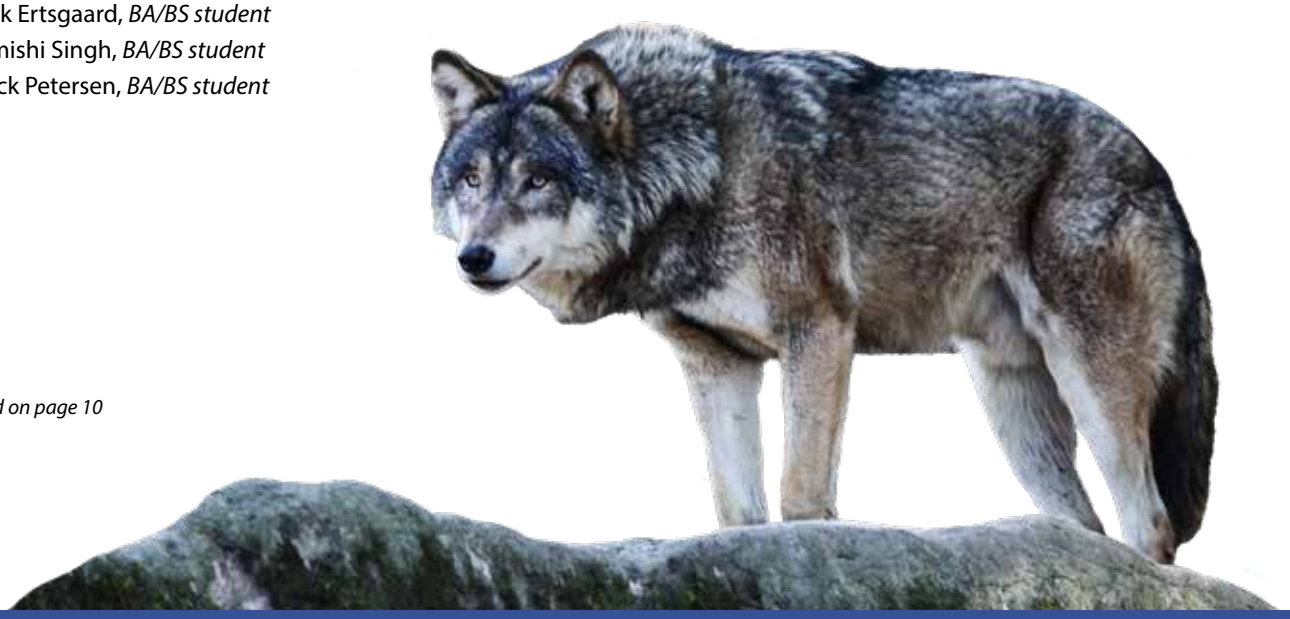

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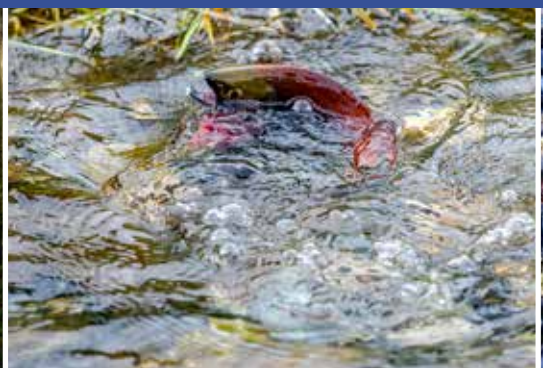


Photo: Emma van der Veen

PROJECT IN THE SPOTLIGHT

Climate adaptability and ecological connectivity of wildlife communities in multi-use sagebrush-steppe landscapes

Principal Investigators:	Dan Thornton and Lisa Shipley *School of the Environment (SOE), Washington State University (WSU)*
Student Researchers:	Allison Stift, *MS student* Katherine Burgstahler, *MS student*
Postdoctoral Researcher:	Steven Woodley, *2020–2022 (Currently adjunct faculty, SOE and Wildlife Research Biologist, Minnesota Department of Natural Resources)*
Funder:	Washington Department of Fish and Wildlife

Across the western United States, sagebrush-steppe ecosystems have been heavily altered or lost through human activities, and climate change is expected to cause further changes in the quality and connections between habitat patches that could exacerbate declining populations of vulnerable wildlife species. To better manage these ecosystems, we are examining how species use the mosaic of agricultural and intact sagebrush landscapes and how agricultural practices and increasingly severe and frequent wildfires influence the value of sagebrush patches and surrounding landscapes. We are using non-invasive survey methods (camera traps, scat, and songbird surveys) and spatially explicit climate models to determine how wildlife use components of the sagebrush-steppe landscape (native and restored sagebrush patches, agricultural fields, fire-impacted areas) and how management actions (e.g., direct seeding) influence this use. We will use these data to examine factors that influence movements of wildlife across the landscape and model how predicted future climate change will influence the distribution of wildlife within Washington and across the extent of sagebrush in the western U.S. To date, we have detected different community structure among sagebrush, Conservation Reserve Program, and agricultural habitats. We are currently developing occupancy models for mammals and continuing to collect additional data on fire-impacted sites.

Cooperating Faculty, University of Washington

National Oceanic and Atmospheric Administration

- **Characterizing Chinook salmon genomic diversity in support of conservation and management**
  PI: Kerry Naish, *School of Aquatic and Fishery Sciences*
- **Development of West Coast region scientific research permitting data visualization tools**
  PI: Anne Beaudreau, *School of Marine and Environmental Affairs*
- **Investigating how the dispersal of fry and distribution of redds interact to shape density–dependence and productive capacity in Skagit River winter steelhead**
  PI: Daniel Schindler, *School of Aquatic and Fishery Sciences*
  Nick Chambers, *MS student*
- **Refining statistical tools and analyses of ecological indicators for fisheries management**
  PI: Tim Essington, *School of Aquatic and Fishery Sciences*
  Julia Indivero, *MS student*
- **Rockfish remotely operated vehicle—MESA video review**
  PI: Peter Abe, *Seattle MESA*
- **Survey evaluating education and outreach associated with the rockfish recovery plan**
  PI: Anne Beaudreau, *School of Marine and Environmental Affairs*

U.S. Geological Survey

- **Development of novel SARS-CoV-2 tools with applications for wildlife and human health**
  PI: Ram Savan, *Department of Immunology*
  Kim Somfleth, *postdoctoral scientist*
- **Modeling the potential effects of cumulative stressors on polar bear population dynamics**
  Co-Investigators: Kristin Laidre, *School of Aquatic and Fishery Sciences* & *Applied Physics Laboratory,* and Eric Regehr, *Applied Physics Laboratory*
- **Tracing the age of wetland and aquatic carbon emissions across northern latitudes**
  PI: David Butman, *School of Environmental and Forest Sciences*

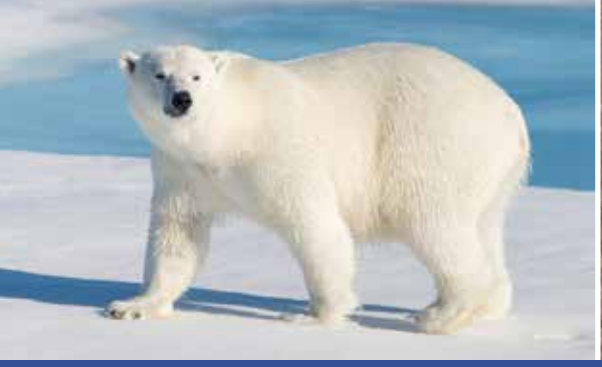
Washington Department of Ecology

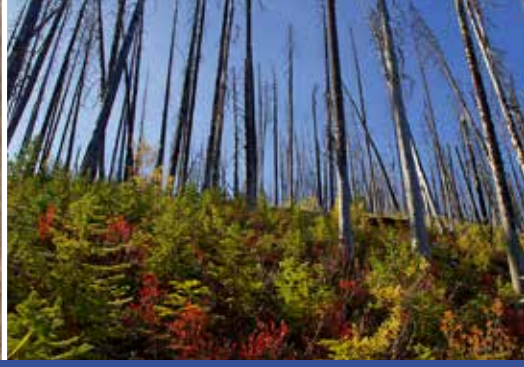
- **Testing diver-assisted and autonomous suction harvesting to control *Myriophyllum spicatum***
  PI: Julian Olden, *School of Aquatic and Fishery Sciences*
  Debbie Viona, *BS student*

Washington Department of Fish and Wildlife

- **Application of the Shoreline Monitoring Database to address restoration effectiveness and protection evaluation**
  PI: Jason Toft, *School of Aquatic and Fishery Sciences*
- **Black bear diet reconstruction**
  PI: Aaron Wirsing, *School of Environmental and Forest Sciences*
  Lauren Satterfield, *PhD student*

Photos l to r: iStockphoto.com/Vince Barnes, Fanliso, and CoreyFord





Photos l to r: iStockphoto.com/Alexey_Seafarer, JohnGollop, and Vince Barnes; bottom: iStockphoto.com/bgfoto

- **Climate refugia**
  PI: Josh Lawler, *School of Environmental and Forest Sciences*
  Aji John, *postdoctoral scientist*
- **Dispersal of steelhead fry in the Skagit River**
  PI: Daniel Schindler, *School of Aquatic and Fishery Sciences*
  Nick Chambers, *MS student*
- **Ecology of non-native fish**
  PI: Julian Olden, *School of Aquatic and Fishery Sciences*
- **Marine bird and mammal hot and cold spots in Washington's marine waters**
  PI: Beth Gardner, *School of Environmental and Forest Sciences*
- **Pacific Northwest floodplain restoration—compiling the state-of-the-science for assessing floodplain restoration**
  PI: Sunny Jardine, *School of Marine and Environmental Affairs*
  J Kahn, *MS student*
- **Potential impacts of future climate change on riparian ecosystems in Washington State: compiling the state-of-the-science**
  PI: Phil Levin, *School of Environmental and Forest Sciences*
  Sofi Courtney, *MS student*
- **Prioritizing sea level rise exposure and habitat sensitivity across Puget Sound**
  PI: Kate Litle, *Washington Sea Grant*
- **Protection and restoration of shoreline process: training, integration of green shores for homes and shore friendly**
  PI: Kate Litle, *Washington Sea Grant*
- **Shoreline monitoring toolbox—protocol implementation and data management**
  PI: Kate Litle, *Washington Sea Grant*
- **Streamflow projections to inform climate-adapted culvert designs that maintain lotic habitat connectivity**
  PI: Guillaume Mauger, *Climate Impacts Group*
- **Washington Sea Grant crab team**
  PI: Kate Litle, *Washington Sea Grant*
  Aina Hori, *MS student*
- **Washington Sea Grant crab team: European green crab control and coastal capacity building**
  PI: Kate Litle, *Washington Sea Grant*
  Mary Fisher, *PhD student*
- **Washington Sea Grant green crab management**
  PI: Kate Litle, *Washington Sea Grant*
  Ben Rubinoff, *postdoctoral scientist*
  Aina Hori, *MS student*

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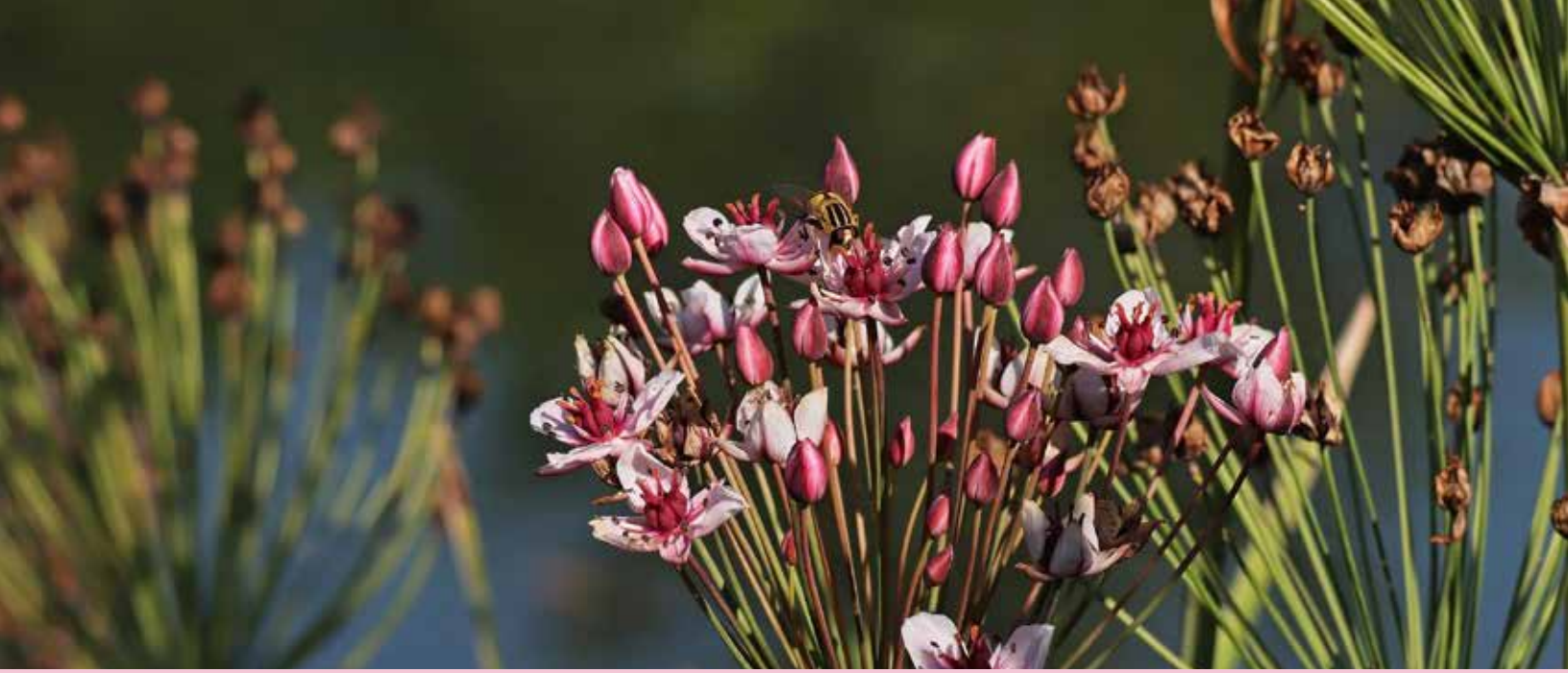


Photo: iStockphoto.coom/Stephane Etienne

PROJECT IN THE SPOTLIGHT

Improving our tools for combating invasive species

Principal Investigators:	Sarah Converse, *Washington Cooperative Fish and Wildlife Research Unit, University of Washington*
	Julian Olden, *School of Aquatic and Fishery Sciences, University of Washington*
Student Researcher:	Brielle Thompson, *PhD Student* *Quantitative Ecology and Resource Management, University of Washington*
Funder:	U.S. Geological Survey/U.S. Fish and Wildlife Service Science Support Program

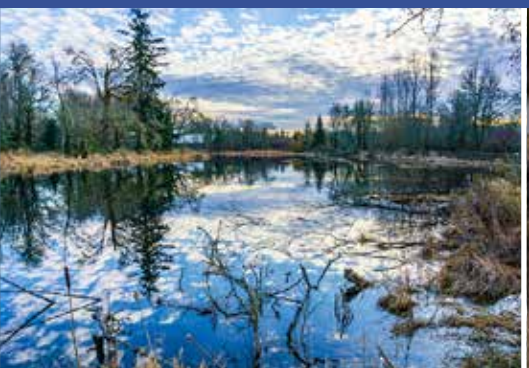
Invasive flowering rush (*Butomus umbellatus*) in the Columbia River produces dense stands that replace native vegetation, harm native aquatic species, and have negative impacts on recreation. Managers are working to control flowering rush, but management is hindered by uncertainty about the speed at which the flowering rush population grows and spreads, and the effectiveness of search efforts. Monitoring data can be used to reduce these uncertainties, allowing managers to improve their management decisions as new information becomes available, in an iterative process known as adaptive management. When managing for invasive species, especially those species that are difficult to locate, it is important to strike an optimal balance between spending time searching for versus spending time actively removing the species. We are collaborating with refuge managers at the Mid-Columbia River National Wildlife Refuge Complex to develop an adaptive management program designed to help managers optimally allocate resources to searching for and removing flowering rush. We are developing alternative adaptive strategies for both managing and reducing uncertainties, and we are developing a spatial simulation model that will allow us to evaluate the alternative strategies in terms of management objectives. We will compare outcomes from different strategies to see which strategies lead to the most desired outcomes. The modeling framework developed in this study is broadly applicable in situations where smart allocation of resources to the management and monitoring of invasive species is desired.

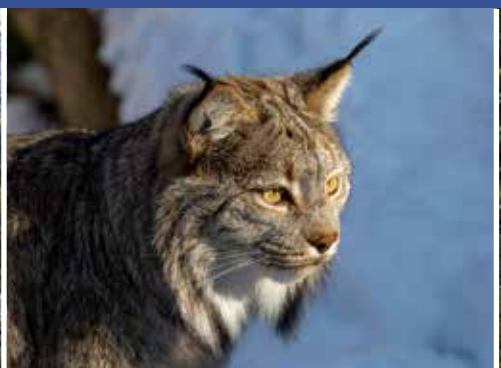
Washington Department of Natural Resources

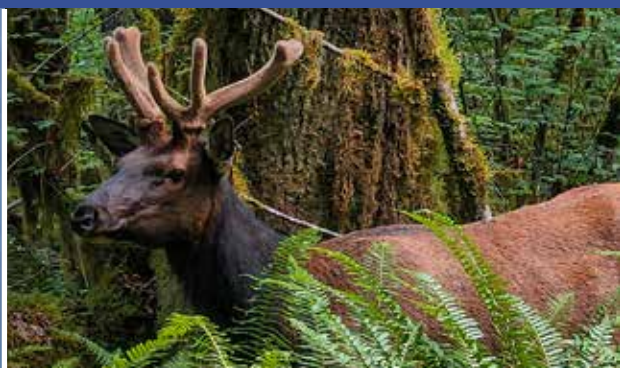
- **Assessing the climate change vulnerability of wetland habitats**
  PI: Monika Moskal, *School of Environmental and Forest Sciences*
- **DAP quantitative accuracy assessment to improve habitat mapping**
  PI: Monika Moskal, *School of Environmental and Forest Sciences*
- **Determining spatiotemporal habitat use of elk in response to recreation in the Western Cascades**
  PI: Laura Prugh, *School of Environmental and Forest Sciences*
- **DNR baseline high-resolution forest-snow analysis**
  PI: Jessica Lundquist, *Civil and Environmental Engineering*
  Cassie Lumbrazo, *PhD student*
- **Drivers of post-fire tree regeneration in the Eastern Cascades, Washington**
  PI: Brian Harvey, *School of Environmental and Forest Sciences*
  Angie Gonzalez, *PhD student*
- **Effects and drivers of Schneider Springs burn severity patterns on northern spotted owl habitat**
  PI: Van Kane, *School of Environmental and Forest Sciences*
  Caden Chamberlain, *PhD student*
  Astrid Sanna, *PhD student*
- **Nearshore habitats in Puget Sound**
  PI: Megan Dethier, *Friday Harbor Labs*
  Margaret (Mo) Turner, *PhD student*
- **Prediction of Canada lynx habitat with remote sensing**
  PI: Monika Moskal, *School of Environmental and Forest Sciences*
- **Roads prescription scale effectiveness monitoring project**
  PI: Erkan Istanbulluoglu, *Civil and Environmental Engineering*
  Amanda Alvis, *PhD student*
- **Work plan for the University of Washington (Washington Cooperative Fish and Wildlife Research Unit) in managing and facilitating a scientific review process for CMER by the Independent Scientific Peer Review Program**
  PI: Kevin Wheiler, *School of Environmental and Forest Sciences*

—continued on page 15

Photos: above: iStockphoto.com/Edward Palm, imamember; below, l to r: iStockphoto.com/gmc3101, Karel Bock, Jana Willis







Photos: forest: Garrett Meigs, Washington Department of Natural Resources; owl: Hollingsworth, John and Karen; USFS Region 5 (Pacific Southwest)

PROJECT IN THE SPOTLIGHT

Effects and drivers of Schneider Springs burn severity patterns on northern spotted owl habitat

Principal Investigator:	Van R. Kane, *Research Associate Professor, School of Environmental and Forest Sciences, University of Washington*
Student Researcher:	Caden P. Chamberlain, *PhD Student, School of Environmental and Forest Sciences, University of Washington*
Funder:	Washington Department of Natural Resources

Wildfires are increasing in size and severity across most forested ecosystems of western North America. Increasing fire severity can threaten critical habitat components, including areas of high canopy cover and tall trees, which are essential to the survival of endangered species like the northern spotted owl. Forest managers use fuel reduction and restoration treatments to improve forest health, increase resilience to fires, and protect critical habitat areas. We evaluated how the 2021 Schneider Springs Fire in Washington's eastern Cascade Range affected forest resilience and wildlife habitat, and the effectiveness of pre-fire treatments at mitigating habitat loss. Across the fire, we found that forest structures associated with spotted owl habitat burned at higher severities (i.e., greater loss of canopy cover) compared to other forested areas, with 36% of the highest quality habitat experiencing > 75% basal area mortality. However, we found that pre-fire restoration treatments, especially those that included prescribed burning, led to almost entirely low severity effects (< 25% basal area mortality) in this fire, and thus served to maintain or protect areas of critical habitat. Large fires like Schneider Springs are likely to become more common in eastern Cascade forests under warmer and drier climates of the future, which will pose continued threats to northern spotted owl habitat and overall forest resilience. Our results suggest that restoration treatments can be highly effective at moderating burn severity and protecting habitat; however, treatments will need to be applied across much larger spatial extents in order to protect habitat and other resources. Future analyses will focus on how the extent and spatial configuration of treatments influence burn severity patterns in the Schneider Springs Fire, as well as other recent large fire events in the eastern Cascade Range.

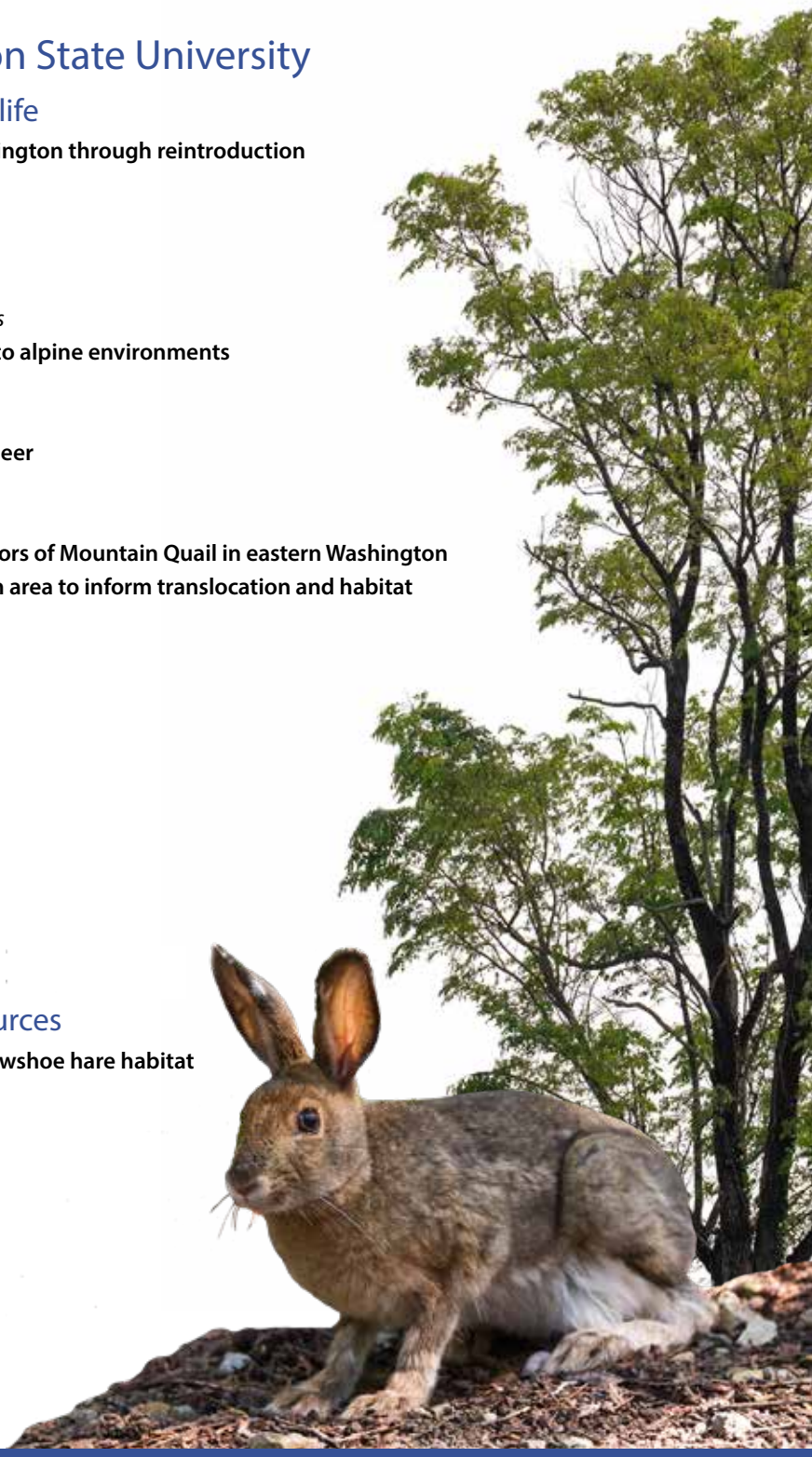
Cooperating Faculty, Washington State University

Washington Department of Fish and Wildlife

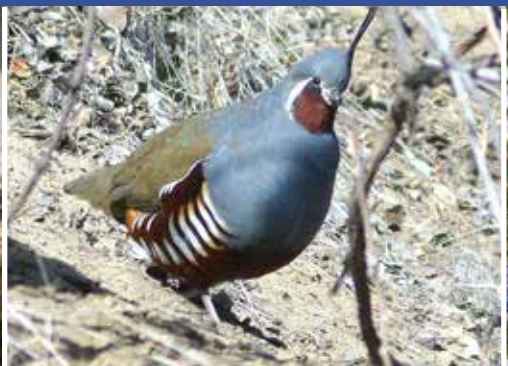
- **Advancing northern leopard frog recovery in Washington through reintroduction and habitat management: Phase II**
  PI: Caren Goldberg, *School of the Environment*
- **Beaver relocation research project**
  PI: Caren Goldberg, *School of the Environment*
  PI: Jonah Piovia-Scott, *School of Biological Sciences*
- **Ecology and impacts of coyotes from shrubsteppe to alpine environments**
  PI: Jeff Manning, *School of the Environment*
  Miles Hopkins, *PhD student*
- **Effects of Conservation Reserve Program on mule deer**
  PI: Lisa Shipley, *School of the Environment*
  Rebekah Lumkes Hallesto, *MS student*
- **Estimating population status, size, and limiting factors of Mountain Quail in eastern Washington state and surrounding interior Columbia River Basin area to inform translocation and habitat restoration efforts**
  PI: Jeff Manning, *School of the Environment*
  Georgia Isted, *PhD student*
- **WSU Coop Unit jackrabbit project**
  PI: Dan Thornton, *School of the Environment*
  Allison Stift, *MS student*
- **WSU Coop Unit shrubsteppe project**
  PI: Lisa Shipley, *School of the Environment*
  Kat Burgstahler, *MS student*
- **WSU Oregon spotted frog genomics**
  PI: Caren Goldberg, *School of the Environment*

Washington Department of Natural Resources

- **Assessing pre-commercial thinning impacts on snowshoe hare habitat selection and survival**
  PI: Dan Thornton, *School of the Environment*
  Nathan Hooven, *PhD student*



Photos: above: iStockphoto.com/janeff, Sarawut Opkhonburi; below, l to r: iStockphoto.com/PaulReevesPhotography; Alan Schmierer, and Aaron Wells



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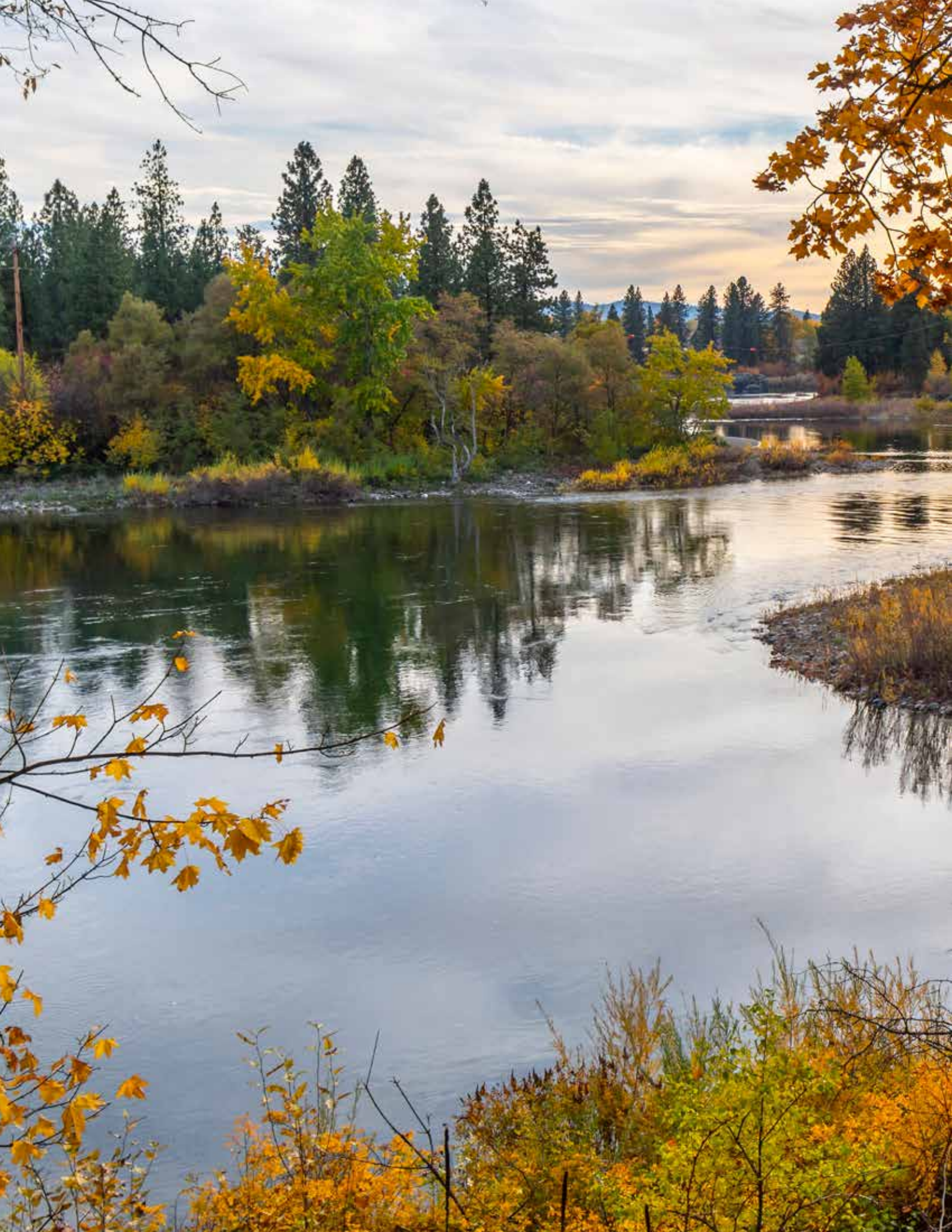
 Photo, inside back cover: iStockphoto.com/Kirk Fisher



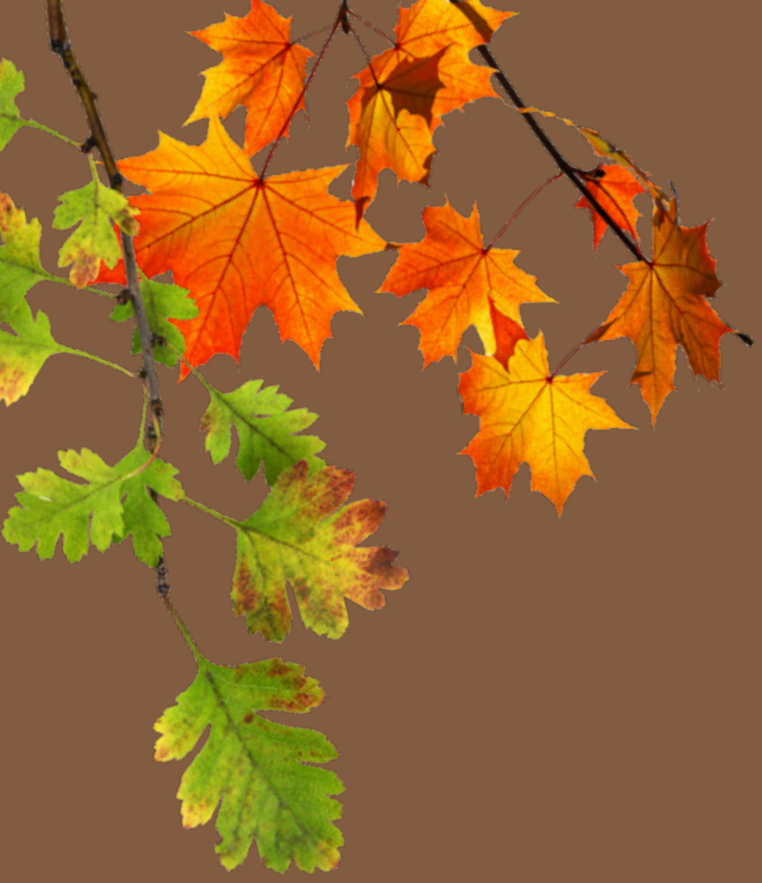


Photo: iStockphoto.com/ ksushsh and VvoeVale