ANNUAL REPORT

July 1, 2021–June 30, 2022

Washington Cooperative Fish and Wildlife Research Unit

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Sarah Converse

MESSAGE FROM
The Unit Leader

I'm happy to report that things are humming right along at the WACFWRU these days. After many years characterized by change, including complete restaffing of the Unit and a global pandemic, it feels like we're finally getting back to a normal rhythm.

My research lab is very busy, with three post-docs, three PhD students, four MS students, and two research scientists. In 2022, we completed initial data collection on a project investigating foraging habitat and demography of Pigeon Guillemots and Rhinoceros Auklets at Protection Island (Jefferson County, Washington) in collaboration with US Fish and Wildlife Service (USFWS) and Washington Department of Fish and Wildlife (WDFW). We're in the process of planning for a new project in collaboration with Mt. Rainier National Park on Cascade red fox. My first two PhD students graduated in 2022, including Dr. Mark Sorel, who has gone on to a position with WDFW, and Dr. Amanda Warlick, who is settling into postdoc life at University of Washington (UW) and the National Oceanic and Atmospheric Administration (NOAA). Staci Amburgey, a postdoc since 2019, took a position with WDFW. It's great to see the connections between us and our cooperating agencies grow as they hire our graduates. And I'm thrilled that I'll get to continue working with former lab members in the future.

My three priorities as Unit Leader are ensuring our Sustainability, increasing our Connection, and serving our Community. Anyone who has worked with our long-time administrator, Verna Blackhurst, knows that she is key to the WACFWRU's sustainability. She has kept the place running through thick and thin. This year, I'm pleased to say that we were joined by a new administrator, who is training with Verna ahead of Verna's anticipated retirement later this year (we will mourn that event in next year's annual report). Sarah Romero, who joined us in June, is uniquely qualified for the job, with Master's degrees in Biology and Resource Management (University of California-Davis) and Program Management (City University of Seattle). An experienced researcher herself, Sarah has found her calling on the administrative and management side of science, and we are thrilled that her calling brought her to us! Welcome, Sarah!

This year, one way we worked to build the connection with our state Cooperators was through training. In August, Alex McInturff and I, along with Justin Gude from Montana Fish, Wildlife, and Parks, held a two-day training in Structured Decision Making for WDFW. We're looking forward to building on this training going forward.

One thing we've created to serve the fish and wildlife community is the Fish and Wildlife Ecology Seminar Series. I want to thank Alex McInturff, who oversaw a change in the series' format: it is now permanently online and held monthly. We hope to broaden the attendance to connect the larger fish and wildlife research and management community in Washington. Please check depts.washington.edu/wacfwru/category/seminar-series/ for more information.

We had two changes in the Cooperator's Committee (CC) this year. After 10 years as Director of the UW School of Aquatic and Fishery Sciences (SAFS), Andre Punt has stepped down. SAFS' new Director and our new CC member is Tim Essington. Kent Keller, former Director of the School of the Environment at Washington State University (WSU), also stepped down, and Allyson Beall King has taken over that position. My sincerest thanks to both Andre and Kent for their strong support of the WACFWRU. We're thrilled to welcome Tim and Allyson to their new roles as Directors and CC members.

—Sarah Converse, *Seattle, September 16, 2022*

Photo: UW College of the Environment

Mark Scheuerell

MESSAGE FROM
Assistant Unit Leader–Fisheries

This past year has definitely seen its ups and downs, but I'm happy to report that things are generally quite good with my lab group.

At one point, we had expanded to six grad students and one postdoc, but Kelly Mistry finished her MS in June and will be starting as a research scientist with Sarah Converse this month. Karl Veggerby wrapped up his MS field work this summer and is on track to finish next summer. As part of her MS research, Nicole Doran has been collaborating with partners at the USFWS, 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 MS on rockfishes in Puget Sound. Dr. Dara Farrell, our postdoc, has been making great progress with our collaborators at NOAA and Microsoft on her development of a machine learning program to detect fish in underwater video. I am currently soliciting applications for a new postdoc to work with the National Park Service to develop better escapement goals for pink salmon in Sitka National Historical Park.

I was tasked with teaching a new course for me, Proposal Writing and Professional Development for Graduate Students, during the winter quarter last year. This course is required of all new grad students in the School of Aquatic and Fisheries Sciences (SAFS), and I had 20 students in class who were eager to learn about grant and paper writing, reviewing materials, giving oral presentations, and alternatives to academic careers. It was a lot of work, but very rewarding, and it was a great opportunity to get to know our newest cohort of students.

I continued assisting the USFWS with an updated species status assessment for Endangered Species Act (ESA)-listed bull trout in OR, WA, ID, and MT. I presented our findings at some internal meetings and in a special session at the annual meeting of the American Fisheries Society in August, which was well received. We are wrapping up this fall and writing a paper for a peer-reviewed journal. I also began a project with the ecotoxicology group at WDFW to help them better understand patterns and trends in their Puget Sound monitoring data and to use that information to develop a better monitoring program.

I served on the Cooperative Research Units (CRU) national Diversity Equity and Inclusion Committee and was the vice chair of the SAFS Equity and Inclusion Committee (EIC) at the UW this past year. One of the highlights for the CRU committee was organizing a training and informational session on recruiting and retaining diverse students and postdocs. I will transition off of the CRU committee this fall when I become the chair of the SAFS' EIC. This is important work, and I am fortunate to use my position of privilege to help advance policies and activities that improve outcomes for others.

I am excited to finally emerge from the pandemic with a renewed sense of direction and purpose. I look forward to working alongside Sarah, Alex, their lab groups, and our partners to make a positive impact on fish and wildlife conservation and management in Washington.

—Mark Scheuerell, *Seattle, September 18, 2022*

Photo: UW College of the Environment

Alex McInturff

MESSAGE FROM
Assistant Unit Leader–Wildlife

It has been an exciting first year for me as Assistant Unit Leader, and I've been thrilled to be able to kick off several exciting projects, begin building a research team, and get to know our cooperators and state better and better.

I am delighted to have recruited two postdocs and a graduate student this year, all of whom will be working closely with WDFW scientists and staff on projects of great interest and importance to the state. In June, postdoc Gretchen Sneegas began investigating the values and risk perceptions that have complicated the management of the state's largest adaptive management program under the Forest Practices Habitat Conservation Plan as well as the underappreciated benefits that may create new possibilities for collaboration. In August, a successful federal grant began supporting postdoc Meggie Callahan, who will bring her expertise in perceptions of wildlife and public education to inform the "human dimensions" of the state's Chronic Wasting Disease management plan and develop targeted outreach materials to reach a diverse constituency. In September, PhD student Lara Volski will begin studying wolf recolonization by combining longitudinal surveys of attitudes in newly recolonized areas with spatial models of tolerance for wolves at multiple scales. Each of these projects will not only make important theoretical strides, but will also address pressing applied problems here in Washington state.

Outside of my own research group, I have been fortunate to have had the opportunity to contribute to cooperators near and far. I facilitated a structured decision-making process with Montana Fish Wildlife and Parks to set mountain lion hunting quotas, the recommendations of which have now been adopted. Here in Washington, alongside Sarah Converse, I led a structured decision-making workshop for WDFW in Olympia, which was a great opportunity to teach, to learn from the best (our own unit leader!), to meet and learn from a wide range of compatriots at WDFW, and, maybe best of all, to have an in-person event for the first time since early 2020. At the UW, I've been honored to serve as my department's co-chair of the Diversity, Equity, and Inclusion Committee, where I've had the opportunity to deploy my own research in environmental justice to support our department, and to organize our Fish and Wildlife Seminar, which has included speakers from UW, WSU, and WDFW.

I am looking forward to the many possibilities for research, technical assistance, and collaboration in support of our commitments to Sustainability, Connection, and Community. One of the highest priorities for me is to continue to build relationships with our cooperators and work together to make our state a leader in the human dimensions of wildlife science and management. I'd love to hear from all of you about your goals, needs, and ideas!

—Alex McInturff, *Seattle, September 18, 2022*

Photo: UW College of the Environment


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Unit Award Recipients

Photo: Courtesy of Markus Min

The Gilbert B. Pauley Award

Awarded annually for best student presentation at the Annual Student Symposium

2021 Winner—Markus Min

School of Aquatic and Fishery Sciences, University of Washington; advised by Dr. Mark Scheuerell

For his presentation, *Reconstructing the exploitation history and population dynamics of ESA-listed rockfishes in Puget Sound.*

Photo: Courtesy of Lauren Satterfield

The John Pierce Outstanding Graduate Student Award

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

2021 Winner—Lauren Satterfield

School of Environmental and Forest Sciences, University of Washington; advised by Dr. Aaron Wirsing

Illustration: iStockphoto.com/Nosyrevy; Photos: Courtesy of Markus Min and Lauren Satterfield

Annual Student Symposium

The 2021 WACFWRU Annual Student Symposium was held virtually on October 27. The full lineup of speakers included:

Photo: iStock.com/Strekoza2

WASHINGTON COOPERATIVE FISH AND WILDLIFE RESEARCH UNIT

WACFWRU

Annual Student Symposium

Wednesday, October 27, 2021, 3:00–5:30 pm

https://washington.zoom.us/j/99237046462

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

3:00 pm **Welcome**
Sarah Converse & Mark Scheuerell, *Washington Cooperative Fish and Wildlife Research Unit*

3:10 pm **Tradeoffs, climate drivers, and asynchrony: evaluating demographic rates of alternative spring Chinook salmon juvenile life history pathways**
Mark Sorel, *School of Aquatic and Fishery Sciences (SAFS), University of Washington (UW)*

3:20 pm **Using environmental DNA to improve translocated beaver monitoring and assess impacts on aquatic systems in Washington State**
Jesse Burgher, *School of Biological Sciences, Washington State University (WSU)*

3:30 pm **Estimating survival, reproductive success, and the effects of ocean conditions on Pigeon Guillemots, an indicator species in Puget Sound, WA**
Amanda Warlick, *SAFS, UW*

3:40 pm **Comparison of existing and spatio-temporal methods to apportion catch limits for subregional management of groundfish in the Gulf of Alaska**
Kelly Mistry, *Quantitative Ecology and Resource Management (QERM), UW*

3:50 pm **Effects of oceanographic variability on demographic rates of a planktivorous seabird**
Amelia DuVall, *SAFS, UW*

4:00 pm **Reconstructing the exploitation history and population dynamics of ESA-listed rockfishes in Puget Sound**
Markus Min, *SAFS, UW*

4:10 pm **Inequities in time spent in urban greenspace across racial/ethnic groups 5associated with one's sense of belonging: a case study in Seattle during COVID-19**
Audryana Nay, *School of Environmental and Forest Sciences (SEFS), UW*

4:20 pm **BREAK**

4:30 pm **Are we telling the same story? Comparing inferences made from camera trap and telemetry data for wildlife monitoring**
Sarah Bassing, *SEFS, UW*

4:40 pm **Fuels treatment longevity in western dry forests: preliminary synthesis results and research needs**
Don Radcliffe, *SEFS, UW*

4:50 pm **An integrated population model of Atlantic Yellow-nosed Albatross in the South Atlantic**
Abby Bratt, *QERM, UW*

5:00 pm **Using non-invasive techniques to estimate snowshoe hare (*Lepus americanus*) density at a local and landscape scale**
Paul Jensen, *School of the Environment, WSU*

5:10 pm **Breaking the status quo: building a dynamic framework for invasive species management**
Brielle Kwarta, *QERM, UW*

5:20 pm **Fire on the mountain: how wildfire shapes interactions between deer and their predators in northern Washington**
Taylor Ganz, *SEFS, UW*

5:35 pm **Awards presentation**
Sarah Converse & 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 · DEPARTMENT OF ECOLOGY State of Washington



Photos l to r: Staci Amburgey, Amelia DuVall., iStockphoto.com/Frank Fichtmüller

Research Projects

During state fiscal year 2022, the Washington Cooperative Fish and Wildlife Research Unit (WACFWRU) Cooperative Agreement facilitated $10,424,102 in project funding at UW, including $4,404,491 in new dollars, and $2,799,973 in project funds at WSU, including $540,115 in new dollars. The WACFWRU Unit 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**
  Staci Amburgey, *postdoctoral scientist*
  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**
  Mark Sorel, *PhD student*

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 & Monitoring Program and inform management and conservation**
  Amelia DuVall, *MS student*

U.S. Fish and Wildlife Service

- **Evaluating sea duck detectability in the Puget Sound winter ambient monitoring program**
  Jamie Brusa, *postdoctoral scientist*
- **Monitoring Tufted Puffins in the United States**
  Co-investigator: Beth Gardner, *School of Environmental and Forest Sciences*
  Lisanne Petracca, *postdoctoral scientist*

Photos l to r: iStockphoto.com/ChristinaPrinn and nikkigensert

U.S. Geological Survey

- **Early detection and rapid response: choosing monitoring targets to promote management effectiveness**
  Brielle Thompson, *PhD student (co-advised by Julian Olden, School of Aquatic and Fishery Sciences)*
- **Improving our tools for combating invasive species**
  Brielle Thompson, *PhD student (co-advised by Julian Olden, School of Aquatic and Fishery Sciences*

Washington Department of Fish and Wildlife

- **Assessing the fish community in the Chehalis River with occupancy models**
  Mark Sorel, *PhD student*
- **Constructing a modeling tool for wolf status review in Washington**
  Co-investigator: Beth Gardner, *School of Environmental and Forest Sciences*
  Lisanne Petracca, *postdoctoral scientist*
- **Maximizing the value of Salish Sea aerial surveys for sea duck management**
  Matthew Farr, *postdoctoral scientist*

Other

- **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*
- **Integrated population modeling for evaluating status and effects of management actions in Streaked Horned Larks** (*supported by Washington Cooperative Fish and Wildlife Research Unit/NW Climate Adaptation Science Center*)
  Abby Bratt, *MS student*
- **Integrated population models that account for the effects of environmental variability on abundance and demographic rates for species with complex life histories** (*supported by National Science Foundation Graduate Research Fellowship*)
  Amanda Warlick, *PhD 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*

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Photo: iStockphoto.com/photographybyJHWilliams

Mark Scheuerell, WACFWRU Assistant Unit Leader—Fisheries

National Oceanic and Atmospheric Administration

- **A simulation and case-study comparison of existing and spatiotemporal methods to apportion coastwide catch limits for subregional management**
  Kelly Mistry, *MS student*
- **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**
  TBD, *postdoctoral scientist*

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*

Washington Department of Fish and Wildlife

- **Field survey design for toxic contaminants in the nearshore in Puget Sound**
  Catherine Wangen, *PhD 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**
  Lara Volski, *PhD student*
- **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*

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Photos, l to r: iStockphoto.com/pflemming, GarysFRP, and moose henderson



Photo: iStockphoto.com/estivillml

PROJECT IN THE SPOTLIGHT

Assessing perceptions of risk and uncertainty during adaptive management: a case study of the Washington State Forest Practices Habitat Conservation Plan

Principal Investigator:	Alex McInturff, *Washington Cooperative Fish and Wildlife Research Unit, School of Environmental and Forest Sciences, University of Washington*
Postdoctoral Researcher:	Gretchen Sneegas
Funder:	Washington Department of Fish and Wildlife

The adaptive management program (AMP) of the Washington Forest Practices Habitat Conservation Plan is perhaps the largest non-federal adaptive management program in the United States. Its successes and failures during its 20-year term can inform both local policy in Washington state as well as broader discussions about science-driven environmental management. This project will strive to understand how AMP participants, composed of scientists and policy makers, perceive the AMP; how the AMP addresses key scientific uncertainties, risks, goals, and performance targets identified by the AMP; how the values and risk perceptions of participants have influenced the functioning of the program; and the potential for the program's underappreciated benefits to unlock new insights and opportunities. Using social science methods, including semi-structured interviews and Q-methodological approaches, this project will not only contribute to the state's immediate applied goals, it will also improve our broader understanding of the functioning of adaptive management and stakeholder-engaged processes, especially when contentious issues and conflicting groups are involved.

Cooperating Faculty, University of Washington

National Oceanic and Atmospheric Administration

- **Development of West Coast region scientific research permitting data visualization tools**
  PI: Anne Beaudreau, *School of Marine and Environmental Affairs*
  Rory Spurr, *MS student*
  Alana Santana, *MS student*
- **Evaluating education and outreach associated with the rockfish recovery plan**
  PI: Anne Beaudreau, *School of Marine and Environmental Affairs*
  Emma Scalisi, *MS student*
  Ellie Mason, *MS student*
- **Investigating how the dispersal of fry and distribution of redds interact to shape density-dependence and productive capacity in Skagit River**
  PI: Daniel Schindler, *School of Aquatic and Fishery Sciences*
  Nicholas Chambers, *MS student*
- **Rockfish remotely operated vehicle—MESA video review**
  PI: Peter Abe, *Seattle MESA*

U.S. Geological Survey

- **Characterizing Chinook salmon genomic diversity in support of conservation and management**
  PI: Kerry Naish, *School of Aquatic and Fishery Sciences*
- **Crossing the divide: inundation drives hotspots of carbon flux**
  PI: David Butman, *School of Environmental and Forest Sciences*
  Fenix Garcia-Tigreros, *postdoctoral scientist*
- **Development of novel SARS-CoV-2 tools with applications for wildlife and human health**
  PI: Ram Savan, *Department of Immunology*
  Kim Somfleth, *postdoctoral scientist*
- **Factors influencing productivity of native adfluvial salmonids in mainstem Skagit River reservoirs**
  PI: Julian Olden, *School of Aquatic and Fishery Sciences*
- **Ichthyophonus in Pacific herring**
  PI: Chelsea Wood, *School of Aquatic and Fishery Sciences*
- **Refining statistical tools and analyses of ecological indicators for fisheries management**
  PI: Tim Essington, *School of Aquatic and Fishery Sciences*
  Julia Indivero, *MS student*
- **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*

Photos: above: iStockphoto.com/Gerald Corsi; l to r: UW Tetiaroa Seabird Team, iStockphoto.com/Jaimie Tuchman and Supercaliphotolistic





Photos l to r: iStockphoto.com/Mark Lee, PhilAugustavo, and Ryan Joyner

Washington Department of Fish and Wildlife

- **Assessing and minimizing genetic risks of hatchery production of native species for aquaculture**
  PI: Kate Litle, *Washington Sea Grant*
- **Black bear diet reconstruction**
  PI: Aaron Wirsing, *School of Environmental and Forest Sciences*
  Lauren Satterfield, *PhD student*
- **COVID-19 impacts on natural resource perceptions**
  PIs: Peter Kahn/Josh Lawler, *School of Environmental and Forest Sciences*
  Audryana Nay, *MS student*
- **Dispersal of steelhead fry in the Skagit River**
  PI: Daniel Schindler, *School of Aquatic and Fishery Sciences*
  Nicholas Chambers, *MS student*
- **Ecology of non-native fish**
  PI: Julian Olden, *School of Aquatic and Fishery Sciences*
- **Investigating the impacts of peak flows on the performance, design, and cost of water crossing structures in the Chehalis Basin to guide comprehensive fish passage restoration**
  PI: Erkan Istanbulluoglu, *Civil and Environmental Engineering*
- **Marine bird and mammal hot and cold spots in Washington's marine waters**
  PI: Beth Gardner, *School of Environmental and Forest Sciences*
  Jamie Brusa, *postdoctoral scientist*
- **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*
- **Ungulate-predator dynamics in northern Washington**
  PIs: Beth Gardner/Laura Prugh/Aaron Wirsing, *School of Environmental and Forest Sciences*
  Sarah Bassing, *PhD student*
  Taylor Ganz, *PhD student*
  Lauren Satterfield, *PhD student*
- **Washington Sea Grant Crab Team**
  PI: Kate Litle, *Washington Sea Grant*
- **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*

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Photo: Linda Snook, Monterey Bay National Marine Sanctuary, NOAA

PROJECT IN THE SPOTLIGHT

Refining statistical tools and analyses of ecological indicators for fisheries management

Principal Investigator:	Tim Essington, *School of Aquatic and Fishery Sciences, University of Washington*
Student Researcher:	Julia Indivero, MS student
Funder:	NOAA Fisheries Northwest Fisheries Science Center

Marine ecosystems are changing rapidly in response to combined effects of climate change, fishing, and habitat modification. Increasingly, there is a need to identify thresholds beyond which species, food webs, or other ecosystem processes undergo rapid change. Ecological indicators—reliably measured quantities of system state—are widely used to make inferences about the underlying attributes of ecosystems. Here we are developing new statistical methods to measure ecological threshold indicators of depleted dissolved oxygen that are informed by physiology, metabolic theory, and field observations of fish distributions in the California Current. We used experimental data to measure the evolution of oxygen sensitivity across marine taxa, and how this sensitivity depends on temperature. By combining this knowledge with standardized field data, we are evaluating the extent to which ecological oxygen thresholds can be reliably measured and used to project species distribution shifts given expected reductions in oxygen in marine ecosystems that will accompany climate change.

Washington Department of Natural Resources

- **DAP quantitative accuracy assessment to improve habitat mapping**
  PI: Monika Moskal, *School of Environmental and Forest Science*
- **Determining spatiotemporal habitat use of elk in response to recreation in the Western Cascades**
  PI: Laura Prugh, *School of Environmental and Forest Sciences*
  Angie Gonzalez, *PhD student*
  Jeff Miles, *MS student*
- **Drivers of post-fire tree regeneration in the Eastern Cascades, Washington**
  PI: Brian Harvey, *School of Environmental and Forest Sciences*
  Don Radcliffe, *PhD student*
- **Finalize Phase I and Phase II deliverables of the Wetlands Intrinsic Potential Tool**
  PI: Monika Moskal, *School of Environmental and Forest Sciences*
- **Long-term monitoring and focus studies in shoreline biota in Puget Sound: 2019–20 data analysis and 2020–21 data collection**
  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*
  Jonathan Batchelor, *PhD student*
- **Riparian extensive vegetation monitoring, model transferability testing**
  PI: Monika Moskal, *School of Environmental and Forest Sciences*
- **Roads prescription scale effectiveness monitoring project**
  PI: Erkan Istanbulluoglu, *Department of Civil and Environmental Engineering*
  Amanda Manaster, *PhD student*
- **Supplement to support dynamically downscaled projections for fish passage planning and design**
  PI: Guillaume Mauger, *Climate Impacts Group*
- **Work plan for the University of Washington 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*

Illustration: iStockphoto.com/rraya; Photos, l to r: iStockphoto.com/svetlana57 and lightstock

Photo: Alan Schmierer, https://www.flickr.com/photos/sloalan/8719265956/

PROJECT IN THE SPOTLIGHT

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

Principal Investigator:	Jeff Manning, *School of the Environment, Washington State University*
Student Researcher:	Kylie Denny and Georgia Isted, *School of the Environment, Washington State University*
Funder:	Washington Department of Fish and Wildlife

Mountain quail (*Oreortyx pictus*) range from southwest Canada to northern Baja, Mexico, with northern populations experiencing declines associated with habitat loss and fragmentation under changing climate and fire regimes. Despite a rich history of reintroductions and translocations, mountain quail in Washington state are "Critically Imperiled" and included on the state's "Priority Habitats and Species" list. Our goals include determining factors that influence vital rates and detection rates in order to develop a reliable and cost-effective population monitoring method that will inform conservation and management. We are comparing current and past habitat and climatic conditions among extant mountain quail populations and presently unoccupied introduction sites by developing cross-sectional and longitudinal datasets from historical descriptions, past studies, incidental observations, and new field surveys. We will use the latest tracking technology and non-invasive acoustic recorder array methods to develop land surface maps of survival and other vital rates in southeast Washington and adjacent areas of Idaho and Oregon. We will test the effects of various covariates (e.g., habitat, predation risk, competition, resources, weather severity) on vital rates and detection of quail. The comparison of previously and currently occupied sites will enable us to determine factors unique to southeast Washington that underpin population persistence. Results will also enable us to identify the relative importance of environmental covariates on quail vital rates, quantitatively rank sites for future habitat enhancement and translocation, and develop and validate an accurate and cost-effective population survey method that accounts for imperfect detection.

Cooperating Faculty, Washington State University

Washington Department of Ecology

- **2020 Columbia River supply–demand forecast**
  PI: Jennifer Adam, *Department of Civil and Environmental Engineering*
  Fabio Scarpare, *postdoctoral scientist*
- **Skagit Basin supply and demand analysis**
  PI: Jonathan Yoder, *School of Economic Sciences*
  Reetwika Basu, *PhD student*
  Kairon Garcia, *PhD student*
  Suhina Deol, *PhD student*

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*
  Alexa Dulmage, *MS student*
- **Beaver relocation research project**
  PI: Caren Goldberg, *School of the Environment*
  Jesse Burgher, *MS student*
  Alexandra Duke, *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*
  Kylie Denny, *MS student*

Illustration: iStockphoto.com/Nosyrevy; Photos: above, l to r: iStockphoto.com/PaulReevesPhotography, Abby Bratt; below, l to r: iStockphoto.com/Strekoza2 and Christina Radcliffe

Unit Staff

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