



## ANNUAL REPORT

July 1, 2023–June 30, 2024

# Washington Cooperative Fish and Wildlife Research Unit

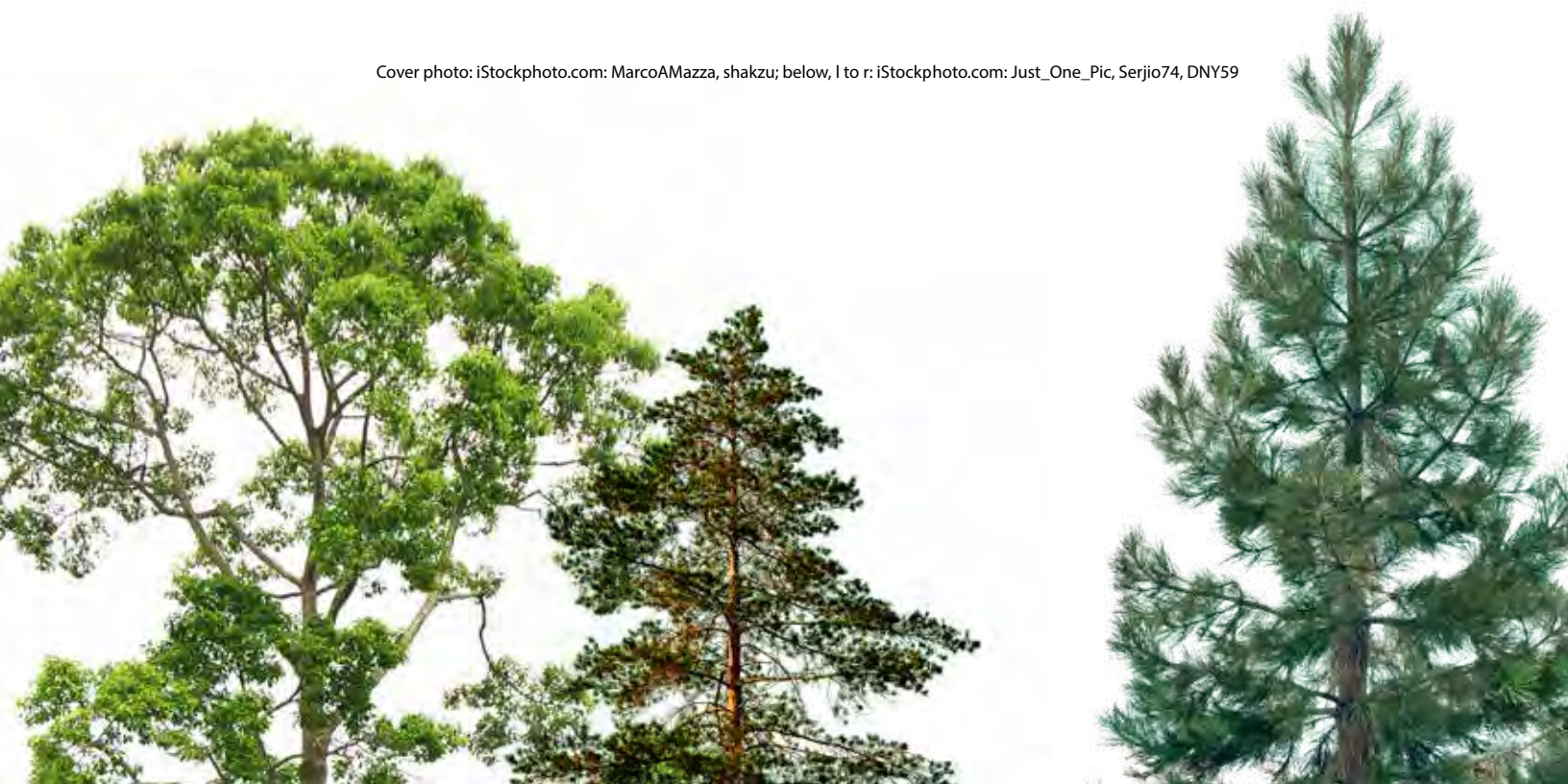




## Table of Contents

|  |    |
|--|----|
| Message from the Unit Leader                     | 1  |
| Message from the Assistant Unit Leader—Fisheries | 2  |
| Message from the Assistant Unit Leader—Wildlife  | 3  |
| Unit Award Recipients                            | 4  |
| In Memoriam—Gilbert “Gil” Pauley                 | 5  |
| Annual Student Symposium                         | 6  |
| Research Projects                                | 7  |
| Unit Staff and Cooperator’s Board Members        | 16 |

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## MESSAGE FROM THE UNIT LEADER

### Sarah Converse

Every year, I relish this time when I get to look back on the year and take stock of the state of the Unit. This year, I'm especially excited about where we are. I think that the Unit has never been in a stronger position to carry out our mission to support fish and wildlife conservation in Washington and beyond.

We accomplished one of the last of the major to-do items on my list this year, in terms of the sustainability of Unit operations. We amended our cooperative agreement to eliminate the long-standing state project waiver system. This system created two tiers of projects with respect to indirect costs. Going forward, all our state projects at Washington State University (WSU) or University of Washington (UW) will be charged an 18% indirect cost rate, unless the principal investigator is one of the federal unit staff, in which case it will be charged 0%. This change streamlines administration substantially and makes it easier for project officers and principal investigators to understand and plan for project costs. I deeply appreciate the willingness of all of our cooperators to work together to achieve this major change in our operations.

I'm also gratified to see the increasingly rich ways in which we're connecting with our agency cooperators. We've seen growing interest in structured decision-making courses and workshops. Alex and I held a 2-day course in November 2023 for the Adaptive Management Program that supports the Department of Natural Resource's Forest Practices Board. Other instructors were Larissa Bailey from Colorado State University, Dan Ohlson and Rae Failing from Compass Resource Management in Vancouver BC, Nikol Damato from Alex's lab, and Kelly Mistry from my lab. We were happy to be able to provide training and new direction for this large program. We're also working with the Washington Department of Fish and Wildlife (WDFW) and others to use structured decision making to frame and solve a variety of resource management problems.

Serving Washington's Fish and Wildlife community is critical to our mission. On this front, the Fish and Wildlife Ecology seminar is entering its seventh year, ably managed by Alex McInturff. We are committed to keeping this as an online forum that provides a unique opportunity to connect people across the state. Learn more here: <https://depts.washington.edu/wacfwru/category/seminar-series>.

Our efforts were recognized this year with kudos from the Cooperative Research Units program. Mark Scheuerell received an award in recognition of his contributions to diversity, equity, and inclusion. And the entire Unit received an Excellence in Science award.

I had three graduates from my lab this year: Hannah Sipe (PhD), Brielle Thompson (PhD, coadvised by Julian Olden), and Liam Pendleton (MS). The lab now consists of Matt Farr (postdoc, marine birds in the Salish Sea); Kelly Mistry (research scientist, Columbia Basin pygmy rabbits), Amelia DuVall (PhD candidate, seabirds in the California Channel Islands), Tim Chen (PhD student, Northwestern pond turtles), Eve Hallock (MS student, coadvised by Beth Gardner, seabirds in French Polynesia), and Nate Redon (MS student, Cascade red fox). I've enjoyed getting several new projects started in Washington this year, including collaborating with Dr. Staci Amburgey (a lab alum) and others at WDFW on Northwestern pond turtles, and with Jon Gallie, Miranda Crowell, and others at WDFW and U.S. Fish and Wildlife Service on Columbia Basin pygmy rabbits.

We're welcoming two new members to the Cooperator's Committee this year. Our new representative from the Wildlife Management Institute is Jen Newmark, who filled a vacancy after the retirement of Chris Smith. And Dan Thornton has taken over the job from Lisa Shipley at WSU. Welcome Jen and Dan!

—Sarah Converse, *Seattle, September 24, 2024*



## MESSAGE FROM ASSISTANT UNIT LEADER—FISHERIES

### Mark Scheuerell

#### My lab group continues to ebb and flow.

We said goodbye to Dr. Dara Farrell, our postdoc, in October after she wrapped up our project on developing machine learning algorithms for processing underwater video in collaboration with NOAA Fisheries. Nicole Doran defended her master's thesis in March and rolled right into her PhD research with our partners at U.S. Fish and Wildlife Service, the Washington Department of Fish & Wildlife (WDFW), and King County to study food web dynamics surrounding at-risk kokanee salmon in Lake Sammamish. Markus Min continues his PhD research on quantitative methods for inferring fish movements and population dynamics. Brian McGreal, a PhD student in the Quantitative Ecology and Resource Management program, has been collaborating with the National Park Service to develop better harvest management goals for pink salmon in Sitka National Historic Park.

Andrea Hennings continues to balance her duties with WDFW's groundfish assessment team while working towards her master's degree studying survey designs for rockfishes in Puget Sound. Tessa Code, a master's student and current USGS employee, has been studying the effects of artificial light at night on the spatial distributions of juvenile sockeye salmon and their predation risk in Lake Washington. Amirah Casey, master's student, has been working with folks from NOAA Fisheries to better understand the synergistic effects of contaminants and climate change on coho salmon in Puget Sound. Our undergraduate scholar, Callie Murakami, began examining spatio-temporal trends in marine debris within Puget Sound in collaboration with WDFW. Finally, we just welcomed Angela Dillon, a new PhD student and member of the Puyallup Tribe, who will be studying how salmon respond to habitat restoration in the Puyallup River.

I again served as the chair of the Diversity, Equity and Inclusion (DEI) committee in the School of Aquatic and Fishery Sciences this past year. We began working with our college's new Associate Dean and Program Specialist for DEI on expanding cross-unit collaboration. I was also surprised with a DEI award from the Cooperative Research Units (CRU) Program for helping to develop a mentoring program within the CRU to become a more inclusive and welcoming environment.

In April, we welcomed one of our safety officers from headquarters, Zack Holcomb, to co-teach a motorboat operators certification course with me. Zack was so impressed with our people and facilities that he suggested making Seattle the first site on the west coast with an annual training program. It was nice to be recognized for the strength of our safety and administrative programs here in the Washington Unit.

As part of our efforts to improve and expand our connections to our cooperators, I taught a course on time series analysis at Washington State University during their spring semester, which included three days of intensive in-person instruction in Pullman in early January, followed by 14 weeks of online project mentoring. I also just wrapped up a workshop with my CRU counterparts from Oregon, Idaho, and California, along with our state cooperators, on forecasting salmon returns along the West Coast. It was wonderful getting to know everyone better and working alongside them to improve our approaches for conserving and managing this iconic species. I look forward to collaborating with them in the future as well.

—Mark Scheuerell, *Seattle, September 16, 2024*



## MESSAGE FROM ASSISTANT UNIT LEADER—WILDLIFE

Alex McInturff

As another year passes, I continue to feel grateful for the work I get to do in this position, and for the group I work with in the People and Wildlife Lab.

This year, the lab reached many milestones. Postdoc Gretchen Sneegas is now Professor Gretchen Sneegas, having accepted a teaching faculty position at the University of Washington while continuing her work with the Washington Department of Fish and Wildlife (WDFW) on the Forest Practices Adaptive Management Plan. Postdoc Meggie Callahan received another major U.S. Department of Agriculture grant to continue research on Chronic Wasting Disease (CWD), which will support her leading a regional effort to coordinate the human dimensions of CWD management across nine states and provinces. Graduate student Lara Volski was the recipient of a National Science Foundation Graduate Research Fellowship Program (NSF GRFP) award, and she passed her qualifying exam with flying colors before setting off for a second summer field season studying people and wolves in the Columbia River Gorge.

We also welcomed several new graduate students and a postdoc this past year. Ellen Pero hit the ground running in her postdoc work on grizzly bear reintroduction, for which she's already drafted a major report and two manuscripts. Vivian Hawkinson started her PhD on a high note, receiving an NSF GRFP award and leading a successful grant proposal through Conservation, Research, and Education Opportunities International to fund her summer research alongside Lara in the Gorge, where she's working with ranchers to understand how cattle husbandry affects and is affected by predators. Nikol Damato began her PhD work by winning a student award for best poster at the North American Congress for Conservation Biology, and she received substantial funding from the Puget Sound Partnership in collaboration with WDFW for her work on Southern Resident Killer Whale policy. Both Nikol and Vivian celebrated their first published manuscripts this year as well. Finally, MS student Molly Rambeau successfully defended her thesis proposal, which bridges state-dependent behavioral ecology with Indigenous-led conservation. The lab is preparing to grow again, welcoming Nate Denke (MS) and Danny Kosiba (PhD) this fall.

Inspired by my industrious lab, I've led the submission of several papers and grants this year. I've been fortunate to raise over \$250,000 in grant funding this year in support of the many great projects the group is doing, almost all of which are being conducted collaboratively with cooperating agencies.

In support of our unit mission of connection, I've also taken on several service roles. In addition to hosting our ever-growing Fish and Wildlife Seminar series, I'm serving as an Associate Editor for *Conservation Science and Practice*, a reviewer for the Royalty Research Grant, a committee member for our department's curriculum committee, and a member of a faculty search committee for a new tenure-track avian ecology position. With UW students, I've revived our student chapter of *The Wildlife Society*, reestablishing it as an official organization this year. To contribute to our field more broadly, I've joined human dimensions working groups of the Society for Conservation Biology, The Wildlife Society, and the International Union for Conservation of Nature, which have provided interesting opportunities to contribute to national conversations on these topics.

I enter the new year with pride and gratitude for the students and collaborators I work with every day. I'm looking forward to deepening and strengthening relationships with cooperators as current projects mature and new projects emerge and grow.

—Alex McInturff, Seattle, September 25, 2024





Photo: iStockphoto.com: Brian Logan

## Unit Award Recipients



Tessa Code

### The Gilbert B. Pauley Award – 2023 award winner

*Awarded annually for best student presentation at the Annual Student Symposium*

#### 2023 Winner—Tessa Code

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



Hannah Sipe

### The John Pierce Outstanding Graduate Student Award

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

#### 2023 Winner—Hannah Sipe

School of Environmental and Forest Sciences, University of Washington; advised by Dr. Sarah Converse



Photo: Martin Grassley

## IN MEMORIAM

# Gilbert (Gil) Pauley

June 18, 1939–June 20, 2023

*Adapted from obituary on Dignity Memorial website*

Dr. Gilbert (Gil) B. Pauley was a past member and unit leader of the WACFWRU and a professor emeritus of the School of Aquatic and Fishery Sciences at the University of Washington. Gil had a long, distinguished career at the WACFWRU and School, serving from 1974 until 1997.

Gil grew up in Sumner, Washington, and graduated from Sumner High School. Gil (known as “Buddy” then) played a lot of baseball and enjoyed fishing in the local streams. His interest in fishing eventually led him to earn bachelor’s and master’s degrees from the University of Washington School of Fisheries. In 1963, while in graduate school, Gil was the recipient of the prestigious Thurlow C. Nelson Award for shellfish research.

Shortly after earning his degree, Gil married his wife Pat. After graduation, Gil was employed doing research at Battelle near Richland, Washington. After doing research for a few years, Gil was accepted into the PhD program at UC Irvine, and the family was off to Southern California. After receiving his PhD in Immunology and Microbiology, Gil did research in fisheries in St. Michaels, Maryland, and Leetown, West Virginia.

In 1974, Gil was delighted to bring his family back to the Pacific Northwest and take a position at the University of Washington as assistant unit leader—fisheries at the WACFWRU and professor at the (then) School of Fisheries. During his tenure, Gil conducted research, taught classes, and mentored graduate students for over 25 years, and published more than 160 peer-reviewed research papers in his field. In 1997, Gil received the Outstanding Achievement Award from the U.S. Fish and Wildlife Service.

Gil was appointed by Judge Boldt to advise the Federal Court on technical issues related to salmon and steelhead for the “United States vs Washington” case decision, commonly known as the “Boldt Decision.” He served as Federal Court Technical Advisor for 14 years with three federal judges.


In 2002, Gil and Pat established the Gilbert B. Pauley Endowed Student Support Fund. The fund pays travel expenses for UW and Washington State University students conducting WACFWRU research to attend conferences, where they can present their study results; the fund also provides awards for best oral and poster presentations at the Annual Cooperators Meeting.

At the time the fund was established, Gil explained: “Attending scientific conferences is critical to student development. It gives students the chance to practice communicating in front of a group of peers about their work; and, by presenting their work before it’s published, they have a chance to get some feedback. These conferences enable students to interact and network with the rest of the scientific community.”


After his retirement in 1997, Gil worked for 20 years at Brookside Dental with his wife, daughter, and son-in-law, who are all dentists. Gil is survived by his wife, Patricia, his daughter, Cynthia Pauley Cave, his son-in-law, Brian Cave, and his grandsons, Tyler and Jordan.

# Annual Student Symposium

The 2023 WACFWRU Annual Student Symposium was held both virtually and in person at the University of Washington on October 18.



**WASHINGTON COOPERATIVE FISH AND WILDLIFE RESEARCH UNIT**



## Annual Student Symposium









Wednesday, October 18, 2023, 4:00–5:35 pm  
<https://washington.zoom.us/j/99490762693>

[depts.washington.edu/wacfwru/category/symposium/](https://depts.washington.edu/wacfwru/category/symposium/)

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|--|--|
| <p><b>4:00 pm</b> Welcome and introductions<br/> Mark Scheuerell, he/him<br/> <i>Washington Cooperative Fish and Wildlife Research Unit, School of Aquatic and Fishery Sciences, UW</i></p>                                    | <p><b>4:45 pm</b> Climate adaptability and resiliency of wildlife communities in burned sage-brush-steppe landscapes<br/> Kat Burgstahler, she/her<br/> <i>School of the Environment, WSU</i></p>                  |
| <p><b>4:05 pm</b> Do forest treatments intended to promote fire resilience also promote hydrologic resilience in the Yakima River Basin?<br/> Cassie Lumbrazo, she/her<br/> <i>Civil and Environmental Engineering, UW</i></p> | <p><b>4:55 pm</b> Quantifying the effect of artificial light at night on juvenile salmon predation in an urban lake<br/> Tessa Code, she/her<br/> <i>School of Aquatic and Fishery Sciences, UW</i></p>            |
| <p><b>4:15 pm</b> Developing pre-commercial thinning treatments that mitigate negative impacts to snowshoe hares<br/> Nathan Hooven, he/him<br/> <i>School of the Environment, WSU</i></p>                                     | <p><b>5:05 pm</b> Evaluating status and threats to foraging habitat of two seabird species in the Salish Sea<br/> Liam Pendleton, he/him<br/> <i>School of Aquatic and Fishery Sciences, UW</i></p>                |
| <p><b>4:25 pm</b> People and wolves in the Columbia River Gorge<br/> Lara Volski, she/her<br/> <i>School of Environmental and Forest Sciences, UW</i></p>  | <p><b>5:15 pm</b> Evaluating trade-offs in survey methods to determine presence and species identification of jackrabbits in Washington<br/> Allison Stift, she/her<br/> <i>School of the Environment, WSU</i></p> |
| <p><b>4:35 pm</b> Viewing the colonization of America's waterways through an environmental lens<br/> Nicole Doran, she/her<br/> <i>School of Aquatic and Fishery Sciences, UW</i></p>  | <p><b>5:25 pm</b> Prioritization of management resources for invasive flowering rush adaptive management<br/> Brielle Kwarta, she/her<br/> <i>Quantitative Ecology and Resource Management, UW</i></p>             |

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

Photo: [iStockphoto.com/Alexander Fattal](https://www.istockphoto.com/Alexander-Fattal)





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## Research Projects

During state fiscal year 2024, the WACFWRU Cooperative Agreement facilitated \$6,094,097 in project funding at UW, including \$1,487,767 in new dollars, and \$1,976,078 in project funds at WSU, including \$238,257 in new dollars. The WACFWRU Unit staff and cooperating faculty at UW and WSU worked with 5 federal agencies in addition to our 3 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**

#### National Oceanic and Atmospheric Administration (Washington Sea Grant)

- **Integrating community science data with long-term aerial surveys to understand season and long-term shifts in marine bird use of Puget Sound**

Matthew Farr, *postdoctoral scientist*

#### 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**
- **Long-term seabird monitoring data analysis to update Channel Islands National Park Seabird Inventory & Monitoring Program and inform management and conservation**

Nathan Redon, *MS student*

Amelia DuVall, *PhD student*

#### U.S. Fish and Wildlife Service

- **Assessing threats to critical seabird foraging habitat in the Salish Sea**
- **Monitoring Tufted Puffins in the United States**

Liam Pendleton, *MS student*

Co-investigator: Beth Gardner, *School of Environmental and Forest Sciences*  
Matthew Farr, *postdoctoral scientist*

#### U.S. Geological Survey

- **Evaluating climate-related threats and conservation strategies for the Cascade red fox in Washington**
- **Improving our tools for combating invasive species**
- **Modeling brown tree snake management strategies**
- **Understanding threats to Pigeon Guillemot and Rhinoceros Auklet foraging habitat in the Salish Sea**

Co-investigator: Julian Olden, *School of Aquatic and Fishery Sciences*  
Brielle Thompson, *PhD student*

Liam Pendleton, *MS student*

## Washington Department of Fish and Wildlife

- **Cascade red fox threat assessment**  
Nate 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, Karen C. Drayer Wildlife Health Center, School of Veterinary Medicine, University of California, Davis*)  
Liam Pendleton, *MS student*
- **Conservation of Northwestern pond turtles in Washington** (*supported by the National Science Foundation Graduate Research Fellowship Program*)  
Timothy Chen, *PhD student*
- **Evaluating status and threats to foraging habitat for Rhinoceros Auklets in the Salish Sea** (*supported by American Wildlife Conservation Foundation*)  
Co-investigator: Eric Wagner, *Department of Biology*
- **Seabird ecology and conservation at Tetiaroa, French Polynesia** (*supported by private donors to the University of Washington*)  
Co-investigator: Beth Gardner, *School of Environmental and Forest Sciences*  
Eve Hallock, *MS student*

—continued on page 9



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Photos, l to r: iStockphoto.com: Svetlana Sarapultseva, T-Fujishima, JenRichards

## 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*

### National Park Service

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

Brian McGreal, *PhD student*

### 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*

### U.S. Geological Survey

- **Investigating the influence of Artificial Light at Night (ALAN) on juvenile sockeye salmon behavior and predation risk in an urban lake**

Tessa Code, *MS student (co-advised by Dave Beauchamp, USGS)*

### Washington Department of Fish and Wildlife

- **Evaluation of survey designs and spatial distributions of rockfish in Puget Sound**

Andrea Hennings, *MS student*

### Other

- **Identifying priority areas for mitigating contaminant and thermal stress on salmon** (*supported by UW Future Rivers via the National Science Foundation*)

Amirah Casey, *MS student*

- **Quantitative analyses to support the recovery and management of West Coast fishes** (*supported by the National Science Foundation Graduate Research Fellowship Program*)

Markus Min, *PhD student*

- **Rhythm and blooms: deciphering metabolic, functional and taxonomic interactions over the life cycle of a phytoplankton bloom** (*supported by National Science Foundation*)

Co-investigators: Brook Dunn, *UW Department of Genome Sciences*; Julia Kubanek, *Georgia Institute of Technology*; Tatiana Rynearson, *University of Rhode Island*

- **Spatiotemporal patterns of marine debris distribution in Puget Sound** (*supported by Conservation, Research and Education Opportunities International, CREOI*)

Callie Murakami, *BS student*

—continued on page 10





## PROJECT IN THE SPOTLIGHT

### Assessing pre-commercial thinning impacts on snowshoe hare habitat selection and survival

|                                   |   |
|-----------------------------------|---|
| Principal Investigator:           | Dr. Daniel Thornton, <i>Associate Professor, School of the Environment, Washington State University</i> |
| Student supported by the project: | Nathan Hooven, <i>PhD Program, School of Environment, Washington State University</i>                   |
| Funder:                           | Washington Department of Natural Resources  |

Silvicultural treatments to thin overstocked forest stands can be an important method for improving forest resilience to fire and increasing timber productivity on state and federal lands in the Pacific Northwest. Yet, impacts of these treatments on wildlife and assessments of potentially more “wildlife friendly” thinning techniques remain poorly studied. These uncertainties are of particular concern when threatened or endangered species could be negatively influenced. Our project is a collaborative initiative between Washington State University and Washington Department of Natural Resources to investigate the impacts of pre-commercial thinning on snowshoe hare (*Lepus americanus*) in northcentral Washington in the Loomis State Forest. Hare are a keystone boreal forest species and the most important prey of the federally threatened and state endangered Canada lynx (*Lynx canadensis*). We are testing the effectiveness of two “wildlife-friendly” and commercially viable thinning treatments designed to maintain cover for snowshoe hare within thinned stands: retention of unthinned refugia and construction of slash piles. To do this, we established 12 study sites (4 retention, 4 piling, 4 control) in early/mid-successional (20–25 yr) conifer stands to study several critical aspects of hare habitat and population ecology using a variety of established methodologies. After nearly a year of post-treatment monitoring, preliminary results suggest that hare survival rates are similar across treatments and controls, and many tracked hares have remained within, or adjacent to, treated stands. However, some of these qualitative patterns are likely due to the extensive but temporary ground cover created by woody debris from thinning; longer post-treatment monitoring of density, survival, and movement will aid in understanding overall hare responses to treatment and ultimately the viability of implementing these unique thinning treatments at a larger scale.

## 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*  
Viv Hawkinson, *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*
- **The role of local ecological knowledge and perceptions in southern resident killer whale policy**  
Nikol Damato, *PhD student*

### Other

- **Interdisciplinary evaluation of grizzly bear reintroduction to California** (*supported by Re:Wild*)  
Ellen Pero, *postdoctoral scientist*
- **Linking deer behavior to forest health on Tribal lands** (*supported by McIntire-Stennis Cooperative Forestry Research Program*)  
Molly Rambeau, *MS student*

## Cooperating Faculty, University of Washington

### National Oceanic and Atmospheric Administration

- **Development of orca occupancy model for Salish Sea for southern resident and transient killer whales**  
PI: Trevor Branch, *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*
- **Evaluating education and outreach associated with the rockfish recovery plan**  
PI: Anne Beaudreau, *School of Marine and Environmental Affairs*
- **Refining statistical tools and analyses of ecological indicators for fisheries management**  
PI: Tim Essington, *School of Aquatic and Fishery Sciences*  
Julia Indivero, *MS student*

—continued on page 13



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## PROJECT IN THE SPOTLIGHT

### Washington Sea Grant green crab management

**Principal Investigators:** Kate Litle, *Washington Sea Grant*

**Student Researchers:** Elyse Kelsey, *MS student, School of Marine and Environmental Affairs*  
Zachary Bengtsson, *PhD student, School of Aquatic and Fishery Sciences*

**Postdoctoral Researcher:** Benjamin Rubinoff, *Program on the Environment, Washington Sea Grant*

**Funder:** Washington Department of Fish and Wildlife

The European green crab (*Carcinus maenas*) is a shore crab native to Western Europe that was first detected in Washington in 1998. As one of the world's most damaging invasive species, green crabs cause ecological and economic harm to native bivalves, crabs, snails, seagrass, and salt marshes. In recent years, green crab populations have grown dramatically in coastal Washington, and spread to Salish Sea shorelines as well, which threatens critical estuarine ecosystems and aquaculture operations. Washington Sea Grant established Crab Team in 2015 as a citizen science monitoring program with the goal of early detection of green crab and identification of their ecological impacts. As a network of nearly 70 shoreline monitoring sites statewide, volunteers and staff at partner tribes and agencies sample the ecological community in pocket estuaries through monthly surveys from April through September in suitable green crab habitats. Crab Team students and staff facilitate training, review and analyze data, and provide science-informed recommendations for management decisions. Using a combination of monitoring data, multivariate population modeling, and manipulative field experiments, we found that green crab have a negative impact on the native hairy shore crab (*Hemigrapsus oregonensis*) in coastal estuaries—the first evidence of ecological impact by green crab in Washington. Within the Salish Sea, the network not only provides early detection monitoring for green crab, but also generates insights on the natural history and biodiversity of Puget Sound. We interpret green crab data from partner trappers to collaborate with and advise an interdisciplinary community of management agencies, tribes, aquaculture, academics, and NGOs in reducing the spread and impact of green crab throughout the Pacific Northwest.



## U.S. Geological Survey

- **Characterizing Chinook salmon genomic diversity in support of conservation and management**  
PI: Kerry Naish, *School of Aquatic and Fishery Sciences*
- **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**  
PIs: Kristin Laidre, *School of Aquatic and Fishery Sciences & Applied Physics Laboratory*  
and Eric Regehr, *Applied Physics Laboratory*

## 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*
- **Coastal habitat protection through European green crab early detection, management support and monitoring**  
PI: Kate Litle, *Washington Sea Grant*  
Elyse Kelsey, *MS student*  
Zachary Bengtsson, *PhD student*  
Ben Rubinoff, *postdoctoral scientist*
- **Crab Team: European green crab management support**  
PI: Kate Litle, *Washington Sea Grant*
- **Dispersal of steelhead fry in the Skagit River**  
PI: Daniel Schindler, *School of Aquatic and Fishery Sciences*  
Nick Chambers, *MS student*
- **Ecological effects of Graveyard Spit cobble beach revetment**  
PI: Jason Toft, *School of Aquatic and Fishery Sciences*
- **Ecology of non-native fish**  
PI: Julian Olden, *School of Aquatic and Fishery Sciences*
- **Hierarchical distance modeling to estimate spatially explicit density (hot and cold spots of abundance) and to assess the marine factors driving changes in abundance in Puget Sound**  
PI: Beth Gardner, *School of Environmental and Forest Sciences*  
Sierra Gilman, *PhD student*
- **Impacts of small overwater structures on beach processes important for salmon and kelp restoration**  
PI: Jason Toft, *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*  
Sierra Gilman, *PhD 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*
- **Tracking nitrous oxide emissions from Washington Department of Fish and Wildlife fish hatcheries: understanding contributions to climate change**  
PI: Mari Winkler, *Civil and Environmental Engineering*  
Bao Nguyen Quoc, *postdoctoral scientist*

—continued on page 14



## Washington Department of Natural Resources

- **Assessing the climate change vulnerability of wetland habitats**  
PI: Monika Moskal, *School of Environmental and Forest Sciences*  
Anthony Stewart, *PhD student*
- **Fire Severity**  
PI: Susan Prichard, *School of Environmental and Forest Sciences*  
Gina Cova, *postdoctoral scientist*
- **Long-term monitoring and focus studies in shoreline biota: 2023–24 data analysis and 2024–25 data collection**  
PI: Megan Dethier, *Friday Harbor Labs*
- **Roads prescription scale effectiveness monitoring project**  
PI: Erkan Istanbuluoglu, *Civil and Environmental Engineering*  
Amanda Alvis, *PhD student/postdoctoral scientist*

## Cooperating Faculty, Washington State University

### Washington Department of Ecology

- **Characterization of toxicity of 6PPD and alternatives**  
PI: Jen McIntyre, *School of the Environment*  
Caitlin Lawrence, *MS 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*  
Jonathan Schafer, *MS student*  
Dana Shellhorn, *MS student*
- **Ecology and impacts of coyotes from shrub-steppe to alpine environments**  
PI: Jeff Manning, *School of the Environment*  
Taylor Miles Hopkins, *PhD 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*
- **Movements and habitat selection of black-tailed and white-tailed jackrabbits in Washington State**  
PI: Lisa Shipley, *School of the Environment*  
Claire Kurlycheck, *MS student*
- **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*





## PROJECT IN THE SPOTLIGHT

### Evaluating the relative effects of top-down and bottom-up factors on declines in Lake Sammamish Kokanee salmon

**Principal Investigator:** Mark Scheuerell, *Washington Cooperative Fish and Wildlife Research Unit, School of Aquatic and Fishery Sciences, University of Washington*

**Graduate Student:** Nicole Doran, *PhD Student, School of Aquatic and Fishery Sciences, University of Washington*

**Funder:** U.S. Fish and Wildlife Service

Kokanee salmon in Lake Sammamish, Washington, were once abundant to support sustainable fisheries but have declined precipitously since the mid-1970s. Although loss of spawning habitat and degradation of water quality have been identified as drivers of their decline, changes in the predator and prey communities are also suspected to have played a role. The goal of this project is to estimate the relative effects of competition and predation on limiting the recovery of Lake Sammamish Kokanee. In cooperation with state, county, and tribal agencies, we have 1) conducted a population viability analysis based on adult counts; 2) calculated the growth potential of Kokanee and their competitor/predator Yellow Perch under current and future temperatures; and 3) used stable isotopes to estimate the proportion of Kokanee in the diets of Yellow Perch. The results of this research will help inform ongoing recovery efforts for this species of greatest concern, particularly with respect to proposed adaptive management options.



# Unit Staff

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