CATHERINE BREEN
cbreen@uw.edu
(703) 587 - 8699

education

2018—2024 **UNIVERSITY OF WASHINGTON** **SEATTLE, WA**
PhD Candidate, Environmental and Forest Sciences

2011—2015 **PRINCETON UNIVERSITY** **PRINCETON, NJ**
Bachelor of Arts in Ecology and Evolutionary Biology

experience

2019—Present **UNIVERSITY OF WASHINGTON** **SEATTLE, WA**
NASA Graduate Fellow
- **Thesis:** "Effects of snow on wildlife: advancing methodologies and understanding of winter wildlife dynamics"
- Field seasons in Norway (2020 and 2023) and Washington (2021) to evaluate remote wildlife cameras as ground-based remote sensing networks linking snow and wildlife

2020 2023 **NORWEGIAN INSTITUTE FOR NATURE RESEARCH** **OSLO, NORWAY**
Visiting Researcher
- Visiting researcher on Fellowship from the American Scandinavian Foundation (2023 – present) and formerly Erasmus+ Mobility Grant (Jan – Mar 2020).
- Conducted snow measurements in sub-alpine, forested areas to understand animal movement in relation to snow properties

Summers 2020, 2021, 2022 **NASA GODDARD SPACE FLIGHT CENTER** **GREENBELT, MD**
Summer intern
- Supported NASA's SnowEx mission efforts as part of Hydrological Sciences Lab
- Automated detection of snow depth from snow poles using the Hough Line Transform (poster: https://above.nasa.gov/SnowEx/2020_agenda.html)
- Compared snow detected from wildlife cameras to MODIS satellite imagery. Assessed areas of disagreement such as high latitudes and forested areas (*manuscript submitted to Journal of Remote Sensing in December 2022)*
- Served as Python Instructor and Tutorial Lead in NASA's SnowEx Hackweek in July 2021 and 2022

2018—2019 **NASA AMES RESEARCH CENTER** **MOUNTAIN VIEW, CA**
Earth Science Contractor through NASA DEVELOP Program
- Forecasted salt marsh decline in Chile's Atacama Desert using NASA Landsat and ESA Sentinel-2 imagery (code: https://code.earthengine.google.com/3d3819a25ef4961c07ce289700bea2f1)
- Detected *Cladofora* in Lake Michigan using Landsat, MODIS, Sentinel-2 imagery and predicted movement using water turbidity data in ArcGIS Pro.

Summer 2014 **EXTREME EVENTS AND ECOLOGICAL ACCLIMATION PROJECT** **SOUTHWEST, U.S.**
Research Intern
- Assessed tree physiological variation and recovery in response to atmospheric drought and soil moisture deficit in rugged, difficult-to-reach areas of the Rocky Mountains in Colorado, New Mexico, Utah, and Arizona.
- Undergraduate thesis: "The individual and community response of traits on carbon stock response
- across the Rocky Mountain rainfall gradient."

specialized workshops

Aug 2022 **CALIFORNIA INSTITUTE OF TECHNOLOGY** **PASADENA, CA**
Computer Vision for Ecology Summer Workshop
- 3-week intensive workshop training scientists to use computer vision methods for ecological applications
- Trained CNN model with ResNet backbone to detect winter weather from wildlife camera imagery
- Code repository: https://github.com/CV4EcologySchool/snow-Dayz

Jan 2020 **NASA AND NSF-FUNDED SNOW SCHOOL** **BRETTON WOODS, NH**
Visiting Researcher
- 1-week full-time snow methodology course on snow pits, magnaprobe, and remote sensing techniques
- Final project: Comparing results from ground and drone methods for snow depth

publications and datasets

1. **Breen CM,** C. Vuyovich, J. Odden, D. Hall, L. Prugh. (2023). Evaluating MODIS snow products using an extensive wildlife camera network. (*In review*)
2. Cunningham, C.X., Nuñez, T.A., Hentati, Y., Sullender, B., **Breen, CM.**, Ganz, T.R., Kreling, S.E.S., Shively, K.A., Reese, E., Miles, J., Prugh, L.R., (2022). Permanent daylight saving time would reduce deer-vehicle collisions. Current Biology 32, 4982-4988.e4. https://doi.org/10.1016/j.cub.2022.10.007
3. **Breen CM**, Lumbrazo C., Vuyovich C., Raleigh MS, Marshall HP (2022). SnowEx 2020 Time-lapse Images, Version 1. Boulder, CO USA. NASA National Snow and Ice Data Center. https://doi.org/10.5067/14EU7OLF051V.
4. **Breen CM**, Lumbrazo C., Vuyovich C., Raleigh MS, Marshall HP (2022). SnowEx 2020 Snow Depth from Snow Poles in Time-lapse Images, Version 1. Boulder, CO USA. NASA National Snow and Ice Data Center. https://doi.org/10.5067/14EU7OLF051V.
5. **C.M. Breen**, C.A. Lumbrazzo. "Time-lapse Cameras and Snow Applications." NASA's SnowEx Hackweek. *Tutorial.* (July 2021). https://snowex-hackweek.github.io/website/tutorials/camera-traps-tutorial/timelapse-camera-tutorial.html
6. Chalfoun J, Majurski M, Peskin A, **Breen CM**, Bajcsy P, Brady M. "Empirical gradient threshold technique for automated segmentation across image modalities and cell lines," J. Microsc. 2015 Oct; 260(1):86-99. doi:10.1111/jmi. 12269.
7. Booth L, **Breen CM**, Gullickson C, "Variations in Elephant (Loxodanta africana) Diet Along a Rainfall Gradient: The Effect of Latitude, Grass Reserves, and Proximity to Water." Consilience: The Journal of Sustainable Development. Vol. 13, Iss. 1 (2014), Pp. 327-335.

selected presentations

1. C.M. Breen, J Odden, C.M. Vuyovich, L. Prugh. Evaluating Camera Traps as Ground Based Remote Sensing Networks. 2021 School of Environmental and Forest Sciences Graduate Student Seminar. March 2021. *Awarded Best PhD Student Presentation.*
2. "Building a Bilingual Google Earth Engine Dashboard to Increase Accessibility to Long-term Time Series Remote Sensing Data for Monitoring Saline System Changes in Chile's Atacama Desert" eLightning presentation at American Geophysical Conference (December 2020), *Speaker*.
3. "SnowEx Snow Depth Automation from Timelapse Cameras" (September 2020), *Poster Presenter* at 2020 SnowEx Conference.
4. "Utilizing NASA Earth Observations and Community Science to Detect and Map the Displacement of *Cladophora* along the Milwaukee County Shoreline" presentation at American Geophysical Conference (December 2018), *Speaker.*
5. 2019 Winter Climate on Tap event sponsored by Program on Climate Change, *Speaker.*

graduate research funding

NASA Graduate Fellowship -- $150,000
American Scandinavian Fellowship –$23,000
Microsoft AI for Earth Grant –$30,000 in Azure credits between 2021-2023
Kappa Alpha Theta Foundation Merit Scholarship – $5,000
Erasmus + Mobility Grant -- $3,200
AGU Flash Freeze Competition Prize for Field Equipment –$1,000
Director's Fund Travel Scholarship –$300
CUAHSI Travel Scholarship – $500

teaching

Guest lecturer, CSE 599 Computing for Conservation, *November 2022*
Teaching Assistant, ESRM 150: Introduction to Wildlife in the Modern World, *Fall Quarter 2019*

skills

Python, R, Google Earth Engine, MATLAB, remote sensing, machine learning, statistics (e.g., frequentist approaches), wildlife models (e.g., activity and movement models)

community

UW Sea Kayaking Instructor and Guide, January 2022 -- *present*
Wilderness First Responder, *June 2018 – present*
500 Women Scientists, Seattle Chapter Strike Team member, *September 2019 – present.*
Senator, Graduate and Professional Student Senator, *September 2019 – 2021*