

Bailey A. Murphy

GRADUATE RESEARCH ASSISTANT

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Research Interests

- Terrestrial carbon cycle, ecosystem modeling, data assimilation, biosphere-climate feedbacks, forest management, regional impacts of climate change

Education

University of Wisconsin-Madison

PH.D., ATMOSPHERIC AND OCEANIC SCIENCE

Madison, WI

Sept. 2020-Present

- **Research Advisor:** Dr. Ankur Desai

University of Wisconsin-Madison

M.S., ATMOSPHERIC AND OCEANIC SCIENCE

Madison, WI

Sept. 2018-2020

- **Research Advisor:** Dr. Ankur Desai
- **Masters Thesis:** The devil is in the details: Emulation-based data assimilation to constrain a dynamic ecosystem model

Oregon State University

B.S. WITH RESEARCH HONORS, ENVIRONMENTAL SCIENCE

Corvallis, OR

Sept. 2011-Sept. 2015

- **Minor:** Land-Air Interactions
- **Research Advisor:** Dr. Christoph Thomas
- **Undergraduate Thesis:** Soil respiration flux in response to changing soil temperature, moisture, and pH

Research Experience

University of Wisconsin-Madison

GRADUATE RESEARCH ASSISTANT

Madison, WI

Aug. 2020 - Present

- **PI:** Dr. Ankur Desai
- Evaluation of mechanistic relationships between LiDAR-derived canopy structural complexity and ecosystem productivity, highlighting drivers of productivity as well as scale dependencies and mediation effects.
- Exploration of regional interactions between forest management, function, and climate in centennial model projections, contributing to the development of a framework for scaling hypotheses regarding ecosystem function.

University of Wisconsin-Madison

GRADUATE RESEARCH ASSISTANT

Madison, WI

Sept. 2018 - Aug. 2020

- **PI:** Dr. Ankur Desai
- Utilization of novel emulation-based Bayesian parameter data assimilation (PDA) techniques to constrain a dynamic vegetation model, using the Predictive Ecosystem Analyzer (PEcAn). Showed that error-space emulation-based PDA is a viable option to reduce predictive uncertainty related to carbon cycle dynamics in a computationally expensive model.

Montana State University

RESEARCH TECHNICIAN

Bozeman, MT

Sept. 2017 - Aug. 2018

- **PI:** Dr. Mary Burrows
- Assisted with study of the wheat streak mosaic pathosystem complex through the collection and analysis of field samples using ELISA techniques, and cultivation of mite populations to understand variance in pathogen transfer rates. This project contributed to the understanding of agricultural management impacts on disease incidence and severity, with the goal of supporting Montana farmers in making informed decisions.
- Wet lab analysis of samples, maintaining chemical supplies and greenhouse experiments, inoculation and field sampling.

United States Department of Agriculture-ARS

RESEARCH TECHNICIAN

Corvallis, OR

May 2015 - Feb. 2016

- **PI:** Dr. Claire Phillips
- Characterization of biochar properties and its potential to mitigate climate change impacts on agricultural systems as well as its potential in remediation efforts of soils contaminated with toxic mine tailings.
- Assisted with projects establishing greenhouse gas budgets of agricultural systems.
- Investigation of biochar application to address soil freeze-thaw cycle damage.
- In addition to wet lab analysis (cation exchange capacity, CHN, soil physics, etc.) I fabricated equipment for field trials, conducted field work, and managed multiple greenhouse studies.

- **PI:** Dr. Christoph Thomas
- Evaluated soil respiration contributions to mature forest net ecosystem exchange and productivity, and explored climate-driven variables impacting respiration and carbon storage estimates.
- Assisted with the construction of study plots in the H.J. Andrews Experimental Forest and conducted field work to download data, collect samples, and maintain equipment, in addition to data analysis and instrument calibration and maintenance.
- Conceived of and wrote a research thesis of my own design, evaluating soil respiration flux in response to changing soil temperature, moisture, and pH.

Publications

Peer-Reviewed

- Shveyster, V., Stoy, P. C., Butterworth, B. J., Wiesner, S., Skaggs, T., **Murphy, B.A.**, Wutzler, T., El-Madany, T. S., Desai, A. R. (2022). Evaporation and transpiration from multiple proximal forests and wetlands. *Water Resources Research*. <https://doi.org/doi.org/10.1002/essoar.10511759.1> (under review)
- Desai, A.R., **Murphy, B.A.**, Wiesner, S., Thom, J., Butterworth, B.J., Koupaie-Abyazani, N., Muttaqin, A., Paleri, S., Talib, A., Turner, J., Mineau, J., Merrelli, A., Stoy, P., Davis, K. (2022). Drivers of decadal carbon fluxes across temperate ecosystems. *Journal of Geophysical Research-Biogeosciences*, 127. <https://doi-org/10.1029/2022JG007014>
- **Murphy, B.A.**, May, J.A., Butterworth, B.J., Andresen, C.G., Desai, A.R. (2022). Unravelling forest complexity: resource use efficiency, disturbance, and the structure-function relationship. *Journal of Geophysical Research-Biogeosciences*. doi:<https://doi.org/10.1101/2021.04.28.441243>
- Fer, I., Shiklomanov, A., Novick, K.A., Gough, C.M., Altaf Arain, M., Chen, J., **Murphy, B.A.**, Desai, A.R., Dietze M.C. (2021). Capturing site-to-site variability through Hierarchical Bayesian calibration of a process-based dynamic vegetation model. *bioRxiv*. 2021.04.28.441243; doi:<https://doi.org/10.1101/2021.04.28.441243> (pre-print)

In Prep

- Fitzpatrick, L., Rollinson, C.R., Dietze, M. C., **Murphy, B.A.**, Desai, A.R. Management Legacies Interact with Forest Structure to Influence Biomass Responses to Increases in Atmospheric Water Vapor Deficit. (in-prep)

Technical Reports

- Phillips, C.L., Trippe, K., Kwon, H., **Murphy, B.A.**, Moore, W., Hanson, C.V., Law, B., Schmidt, A. (2021). Annual carbon balance of a second-year tall fescue seed crop. Seed Production Research Report. Oregon State University and the United States Department of Agriculture - Agricultural Research Service. Corvallis, Oregon.
- Wisconsin Academy of Arts, Science and Letters (2020). Natural climate solutions for Wisconsin: critical considerations and strategies. Madison, WI.

Honors and Awards

Funding Awards

- University of Wisconsin-Madison, Department of Atmospheric and Oceanic Sciences (AOS). Annual funding for the AOS undergraduate mentorship program. (\$350/yr)—Nov. 2022
- University of Wisconsin-Madison, AOS Travel Grant. (\$965)—Dec. 2021
- NSF, AMS Summer Policy Colloquium Support for Graduate Students. (\$5,300)—Apr. 2021
- University of Wisconsin-Madison, AOS Travel Grant. (\$1,000)—Oct. 2019
- University of Wisconsin-Madison, AOS Travel Grant. (\$570)—Jan. 2019
- Oregon State University, Outstanding Civic Engagement Scholarship. (\$1,000)—2014

Honors

- Department Student Service Award. Atmospheric and Oceanic Sciences, University of Wisconsin-Madison. —Apr. 2022
- Best poster, Celebrating Undergraduate Excellence Research Symposium, Oregon State University —May 2015
- Oregon State University Research Fellow —2015

Presentations

2022

- Management legacies interactions with forest structure influence forest biomass responses to climatic increases in atmospheric water vapor demand. American Geophysical Union Conference (poster). Chicago, IL. Dec. 2022
- Does management reinforce or mitigate climate change driven shifts in forest function? American Geophysical Union Conference (talk). Chicago, IL. Dec. 2022
- Global change in the upper Midwest: Drivers of decadal carbon fluxes across temperate ecosystems. Ameriflux Annual Meeting (talk). Pellston, MI. Sept. 2022
- A crash course in networking, Atmospheric and Oceanic Sciences Undergraduate Mentorship Program. University of Wisconsin-Madison (workshop). Madison, WI. Apr. 2022
- Unraveling forest complexity: Resource use efficiency, disturbance, and the elusive structure-function relationship. 11th annual Atmospheric, Oceanic, and Space Sciences Community Poster Reception (poster). Madison, WI. Feb. 2022

2021

- Exploring natural climate solutions: could flux towers be useful at industrial scales? American Geophysical Union Conference (poster). New Orleans, LA. Dec. 2021
- Unraveling forest complexity: Resource use efficiency, disturbance, and the elusive structure-function relationship. American Geophysical Union Conference (poster). New Orleans, LA. Dec. 2021
- Undergraduate resume and CV workshop, Atmospheric and Oceanic Sciences Mentorship Program. University of Wisconsin-Madison (workshop) Oct. 2021
- Unraveling forest complexity and the elusive structure-function relationship. RUBISCO-Ameriflux Lecture Series (talk) Sept. 2021
- From half hour to quarter century: Drivers of carbon fluxes across a northern ecosystem tower cluster. Ameriflux Annual Meeting (poster) Sept. 2021

2020

- The devil is in the details: emulation-based data assimilation to constrain a dynamic ecosystem model. American Geophysical Union Conference (poster) Dec. 2020
- The devil is in the details: emulation-based data assimilation to constrain a dynamic ecosystem model. Graduate Climate Conference (poster) Oct. 2020
- The devil is in the details: emulation-based data assimilation to constrain a dynamic ecosystem model. University of Wisconsin-Madison (master's defense). Madison, WI. Jul. 2020
- Introducing the Atmospheric and Oceanic Sciences Undergraduate Mentoring Program. University of Wisconsin-Madison (talk). Madison, WI. Feb. 2020
- Applying for Grants and Fellowships. University of Wisconsin-Madison (workshop). Madison, WI. Feb. 2020
- Assessing management impacts and representation of ecosystem heterogeneity in Northern Wisconsin forests: modeling for better stewardship. University of Wisconsin-Madison Climate Change Symposium (poster). Madison, WI. Feb. 2020

2019

- Assessing management impacts and representation of ecosystem heterogeneity in Northern Wisconsin forests: modeling for better stewardship. American Geophysical Union Conference (poster). San Francisco, CA. Dec.2019
- Impact of forest management and disturbance regimes on carbon and water cycling. RUBISCO-Ameriflux Workshop (talk). Berkeley, CA. Oct.2019
- Forecasting for Better Stewardship. Community Terrestrial Systems Model (CTSM) Workshop, National Center for Atmospheric Research (poster). Boulder, CO. Feb.2019

2015

- Soil Respiration Flux in Response to Soil Temperature, Moisture, and pH. Celebrating Undergraduate Excellence Research Symposium (poster), Oregon State University. Corvallis, OR. May 2015. **Won award for best poster*

Service and Outreach

University Service

- Treasurer, Atmospheric and Oceanic Sciences Graduate Student Association. University of Wisconsin-Madison—2022
- Organizer, Atmospheric and Oceanic Sciences Faculty Flash Talks. University of Wisconsin-Madison—Mar. 2022
- Member, Atmospheric and Oceanic Sciences Colloquium Committee. University of Wisconsin-Madison—2021-Present
- Faculty Liaison, Atmospheric and Oceanic Sciences Graduate Student Association. University of Wisconsin-Madison—2021
- Member, Teaching Assistants' Association. University of Wisconsin-Madison—2019-Present
- Member, Atmospheric and Oceanic Sciences Graduate Student Association. University of Wisconsin-Madison—2018-Present
- Facilitator, Atmospheric and Oceanic Sciences Graduate Student Association. University of Wisconsin-Madison—2020-2021
- Founding Member, Atmospheric and Oceanic Sciences Undergraduate Mentorship Program. University of Wisconsin-Madison—2019-2020
- Seminar Committee Chair, Atmospheric and Oceanic Sciences Graduate Student Association. University of Wisconsin-Madison—2019-2020
- Member, Graduate Women in Science. Madison Chapter—2018-2020
- Senior Staff Mentor, Student Sustainability Initiative. Oregon State University—2015
- Member and Student Liaison, Environmental Sciences Club. Oregon State University—2015

Community Service

- Judge, NASA GLOBE Midwest Earth System Science Symposium—May 2021
- Leadership Team, 500 Women Scientists, Madison Pod. Madison, WI—2019-2021
- Forestry working group, Natural Climate Solutions for Wisconsin. Wisconsin Academy. Madison, WI—2020
- Research Narrator, Seldom's production of FLOE: Dance theater work about climate instability. Madison, WI—Jan. 2019
- Volunteer, Fourth National Adaptation Forum. Madison, WI—April 2019
- Member and Student Liaison, Energy Action Team. Corvallis Sustainability Coalition. Corvallis, OR—2013-2015
- Community Outreach and Education Intern, Avery House Nature Center. Corvallis, OR—2013

Workshops and Professional Development

- Summer Policy Colloquium. American Meteorological Society—June-Aug. 2021
- Unlearning Racism in Geosciences (URGE). University of Wisconsin-Madison—Feb.-May 2021
- New Advances in Land Carbon Cycle Modeling Workshop. Northern Arizona University—July 2020
- Reducing Uncertainties in Biogeochemical Interactions through Synthesis and Computation (RUBISCO) Workshop. Berkely, CA—Oct. 2019
- TERENO/NEON Carbon Users Workshop. Duren, Germany—July 2019
- Community Terrestrial Systems Model (CTSM) Workshop. National Center for Atmospheric Research, Boulder, CO—Feb. 2019
- Teaching in Science and Engineering. University of Wisconsin-Madison—Sept.-Dec. 2018

Professional Memberships

- American Meteorology Society, 2021-Present
- American Geophysical Union, 2019-Present
- Ecological Society of America, 2019-2021

Teaching and Mentoring

Teaching Assistant

- AOS 171: Global Change - Atmospheric Issues. University of Wisconsin-Madison, Fall 2020
- BIO 151: Concepts in cellular and molecular biology, genetics and mammalian anatomy and physiology (taught 3 discussion sections/wk). University of Wisconsin-Madison, Fall 2019
- AOS 171: Global Change - Atmospheric Issues. University of Wisconsin-Madison, Fall 2018 (*Guest Lecture*: Stratospheric ozone and the ozone hole)

Lead Instructor

- English, GrapeTree English Academy. Seoul, South Korea. Feb. 2016-March 2017

Mentoring

- Mentor, Atmospheric and Oceanic Sciences Undergraduate Mentorship Program. University of Wisconsin-Madison—2020-Present
- Research Mentor Training. University of Wisconsin-Madison—2020
- Founding Member, Atmospheric and Oceanic Sciences Undergraduate Mentorship Program. University of Wisconsin-Madison—2019-2020
- *Mentored Undergraduates*: Connor Steinke, Ilana Greenspan, Jacob Coulombe, Calvin Luo