Jennifer D. Watts

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Research Appointments

08/2024 – present	Associate Scientist	Woodwell Climate Research Center, Falmouth, MA
02/2024 – 07/2025	Arctic Program Director	" "
08/2019 – present	Rangeland Program Co-Director	" "
08/2019 – 08/2024	Assistant Scientist	" "
09/2017 – 08/2019	Post-doctoral Fellow	Woodwell Climate Research Center, Falmouth, MA
01/2017 – 08/2017	Post-doctoral Fellow	University of Montana, Missoula, MT
06/2010 – 12/2016	Research Assistant	University of Montana, Missoula, MT
06/2009 – 05/2010	Research Assistant	Montana State University, Bozeman, MT
07/2008 – 05/2009	Research Assistant	United States Geological Survey, Bozeman, MT
06/2006 – 06/2008	Research Assistant	Montana State University, Bozeman, MT

Academic Courtesy Appointments

2017 – present Affiliate Assistant Professor of Remote Sensing, Department of Land Resources & Environmental Sciences, Montana State University, Bozeman, MT

2024 – present Affiliate Assistant Professor, Department of Earth Sciences, Montana State University, Bozeman, MT

Education

2017	Ph.D. Systems Ecology	University of Montana
2008	M.S. Land Rehabilitation	Montana State University
2006	B.S. Geospatial Analysis	Montana State University

Peer-Reviewed Publications

Mentored students indicated by*

A complete list can be found on Google Scholar.

Selected Publications

1. D.B. Millet, B.B. Demoz, J.D. Watts, R. Wright. NASA Earth science division provides key data. *Science*, 389. Doi: 10.1126/science.adz6100. **2025**.
2. Y. Xia, J. Sanderman, ***J.D. Watts***, M.B. Machmuller, A.L. Mullen, C. Rivard, et al. Coupling remote sensing with a process model for the simulation of rangeland carbon dynamics. *J. Advances in Modeling Earth Systems*, 17. **2025.**
3. B.A. Gay, N.J. Pastick, ***J.D. Watts***, A.H. Armstrong, K.R. Miner, C.E. Miller. Decoding the spatiotemporal complexities of the permafrost carbon feedback with multimodal ensemble learning. *J. Geophysical Research: Machine Learning & Computation*. **2025.**
4. E.S. Levenson, S. Cooley, A. Mullen, E.E. Webb, J.D. Watts. Glacial history modifies

permafrost controls on the distribution of lakes and ponds. *Geophysical Research Letters*, 52. 2025.

5. Virkkala, A.M., B.M. Rogers, ***J.D. Watts***, K.A. Arndt. et al. Wildfires offset the increasing but spatially heterogenous Arctic-boreal CO_2 uptake. *Nature Climate Change*, 15. **2025**.
6. ***J.D. Watts***, S. Potter, B.M. Rogers, A.M. Virkkala, G. Fiske, K.A. Arndt, A. Burrell, et al. Regional hotspots of change in northern high latitudes informed by observations from space. *Geophysical Research Letters*, **2025**.
7. G. Hugelius, J. Ramage, E. Burke, … ***J.D. Watts***, Q. Zhu, B. Zheng. Permafrost region greenhouse gas budgets for 2000-2020 based on ecosystem upscaling, process-based models, and atmospheric inversions. *Global Biogeochemical Cycles*, **2024**.
8. Z. Liu, J.S. Kimball, A. Ballantyne, **J.D. Watts**, S.M. Natali, B.M. Rogers, et al. Widespread deepening of the active layer. *Environmental Research Letters*, 19. **2024**.
9. S. Ma, A.A. Bloom, ***J.D. Watts***, G.R. Quetin, Z. Donatella, E.S. Euskirchen, et al. Resolving the carbon-climate feedback potential of wetland CO_2 and CH_4 fluxes in Alaska. *Global Biogeochemical Cycles*, 17. 2023.
10. Y. Yang, B.M. Rogers, G. Fiske, ***J.D. Watts***, S. Potter, et al. Mapping retrogressive thaw slumps using deep neutral networks. *Remote Sensing of Environment*, 288, **2023**.
11. A. Mullen, ***J.D. Watts***, B.M. Rogers, M. Carroll, et al. Ultra-high spatial resolution water maps detect rapid changes in pond area within Alaska terrains. *Geophysical Research Letters*. **2023.**
12. ***J.D. Watts***, M. Farina*, J.S. Kimball, L.D. Schiferl, Z. Liu, K.A. Arndt, D. Zona, A. Ballantyne, E. Euskirchen, F.-J. W. Parmentier, M. Helbig, O. Sonnentag, T. Tagesson, J. Rinne, H. Ikawa, M. Ueyama, H. Kobayashi, T. Sachs, D.F. Nadeau, J. Kochendorfer, M. Jackowicz-Korczynski, A. Virkkala, M. Aurela, R. Commane, B. Byrne, L. Birch, M.S. Johnson, N. Madani, B. Rogers, J. Du, A. Endsley, K. Savage, B. Poulter, Z. Zhang, L.M. Bruhwiler, C.E. Miller, S. Goetz, W.C., Oechel. Carbon uptake in Eurasian boreal forests dominates the high latitude net ecosystem carbon budget. *Global Change Biology*. Doi: 10.1111/gcb.16553, **2023**.
13. Y. Yang, B.M. Rogers, G. Fiske, ***J.D. Watts***, S. Potter, T. Windholz, A. Mullen, I. Nitze, S.M. Natali. Mapping retrogressive thaw slumps using deep neural networks. *Remote Sensing of Environment*, 288, **2023**.
14. L.D. Schiferl, ***J.D. Watts***, E.J.L., Larson, K.A., Arndt, S.C. Biraud, E.S. Euskirchen, J.M. Henderson, K. McKain, M.E. Mountain, J.W. Munger, W.C. Oechel, C. Sweeney, Y. Yi, D. Zona, R. Commane. Using atmospheric observations to quantify annual biogenic carbon dioxide fluxes on the Alaska North Slope. *Biogeosciences*, 19: 5953-5972, **2022**.
15. D. Zona, P.M. Lafleur, K. Hufkens, B. Gioli, B. Bailey, G. Burba, E.S. Euskirchen, ***J.D. Watts***, et al. Pan-Arctic soil moisture control on tundra carbon sequestration and plant productivity. *Global Change Biology*. https://doi.org/10.1111/gcb.16487, **2022**.
16. Y. Xia, ***J.D. Watts***, M.B. Machmuller, J. Sanderman. Machine learning based estimation of field-scale daily, high resolution, multi-depth soil moisture for the Western and Midwestern United States. *PeerJ*, 10, e14275, **2022**.
17. Z. Liu, J.S. Kimball, A.P. Ballantyne, N.C. Parazoo, W.J. Wang, A. Bastos, N. Madani, S.M. Natali, ***J.D. Watts***, B.M. Rogers, P. Ciais, K. Yu, A.-M. Virkkala, F. Chevallier, W. Peters, P.K. Patra, N. Chandra. Respiratory loss during the late-growing season determines the net carbon dioxide sink in permafrost regions. *Nature Communications*, 13: 1-13, **2022**.
18. J. Du, J.S. Kimball, R. Bindlish, J.P. Walker, ***J.D. Watts*** Local scale (3-m) soil moisture

mapping using SMAP and Planet SuperDove. *Remote Sensing*, 14, 3812, **2022**.
19. D. Zona, P.M. Lafleur, K. Hufkens, B. Bailey, B. Gioli, G. Burba, J.P. Goodrich, A.K. Liljedahl, E.S. Euskirchen, ***J.D. Watts***, et al. Earlier snowmelt may lead to late season declines in plant productivity and carbon sequestration in Arctic tundra ecosystems. *Scientific Reports*, 12: 1-10, **2022**.
20. E.S. Euskirchen, L.M. Bruhwiler, R. Commane, F.-J., W. Parmentier, C. Schadel, E.A.G. Schuur, ***J.D. Watts***. Current knowledge and uncertainties associated with the Arctic greenhouse gas budget. Balancing Greenhouse Gas Budgets. Pp. 159-201. Elsevier. **2022**
21. A.-M. Virkkala, S.M. Natali, B.M. Rogers, ***J.D. Watts***, et al. The ABCflux database: Arctic-boreal CO2 flux observations and ancillary information aggregated to monthly time steps across terrestrial ecosystems. *Earth System Science Data*, 14: 179-208, **2022**
22. ***J.D. Watts***, S. Natali, et al. Soil respiration strongly offsets carbon uptake in Alaska and Northwest Canada. *Environmental Research Letters*, 16, 084051, **2021**
23. A.M. Virkkala, J. Aalto, B.M. Rogers, T. Tagesson, C.C. Treat, S.M. Natali, ***J.D. Watts***, et al. Statistical upscaling of ecosystem CO_2 fluxes across the terrestrial tundra and boreal domain: regional patterns and uncertainties. *Global Change Biology*, 27: 4040-4059, **2021**
24. L. Birch, C.R. Schwalm, S. Natali, D. Lombardozzi, G. Keppel-Aleks, ***J.D. Watts***, et al. Addressing biases in Arctic-boreal carbon cycling in the Community Land Model Version 6. *Geoscientific Model Development*, 14: 3361-3382, **2021**
25. N. Madani, N.C. Parazoo, J.S. Kimball, R.H. Reichle, A. Chatterjee, ***J.D. Watts***, et al. The impacts of climate and wildlife on ecosystem gross primary productivity in Alaska. *Journal of Geophysical Research: Biogeosciences*, 126, e2020JG00607, **2021**
26. J. Du, J.S. Kimball, J. Sheffield, I. Velicogna, M. Zhao, M. Pan, C.K. Fisher, H.E. Beck, ***J.D. Watts***, E.F. Wood. Synergistic satellite assessments of global vegetation health in relation to ENSO-induced droughts and pluvials. *Journal of Geophysical Research: Biogeosciences*, 126, e2020JG006006, **2021**
27. D. Olefeldt,… ***J.D. Watts***. The Boreal-Arctic wetland and lake dataset (BAWLD). *Earth System Science Data*, 13: 5127-5149, **2021**
28. A.P. Ballantyne, A. Liu, W.R.L. Andregg, Z. Yu, P. Stoy, B. Poulter, J. Vanderwall, ***J.D. Watts***, K. Kelsey, J. Neff. Reconciling carbon-cycle processes from ecosystem to global scales. *Frontiers in Ecology and the Environment*, 19: 57-65, **2021**
29. K.A. Endsley, J.S. Kimball, R.H. Reichle, ***J.D. Watts***. Satellite monitoring of global surface soil organic carbon dynamics using the SMAP level 4 carbon product. Journal of Geophysical Research: Biogeosciences, 125, e2020JG006100, **2020**
30. Y. Yi, J.S. Kimball, ***J.D. Watts***, S.M. Natali, D. Zona, J. Liu, M. Ueyama, et al. Investigating the sensitivity of soil respiration to recent snow cover changes in Alaska using a satellite-based permafrost soil carbon model. *Biogeosciences Discussions*, 1-38, **2020**
31. S. Natali & ***J.D. Watts***; B. Rogers, S. Potter, S.M. Ludwig*, A.-K. Selbmann, P. Sullivan, B.W. Abbott, K.A. Arndt, L. Birch, M.P. Bjorkman, A. Bloom, G. Celis, T.R. Christensen, C.T. Christiansen, R. Commane, E.J. Cooper, P. Crill, C. Czimcik, S. Davydov, J. Du, J.E. Egan, B. Elberling, et al. Large loss of CO_2 in winter observed across the northern permafrost region. *Nature Climate Change*, 9, 852-857, **2019**
32. Z. Liu, J.S. Kimball, N. Parazoo, A.P. Ballantyne, W. Wang, N. Madani, C.G. Pan, ***J.D. Watts***, R.H. Reichle, O. Sonnentag, P. Marsh, M. Hurkuck, M. Helbig, W.L. Quinton, D. Zona, et al. Increased high-latitude photosynthetic carbon gain during an anomalously warm spring offset by respiration carbon loss during winter in high latitudes. *Global Change*

Biology, https://doi.org/10.1111/gcb.14863, **2019**
33. B.N. Duncan, L.E. Ott, J.B. Abshire, L. Brucker, M.L. Carroll, J. Carton, J.C. Comiso, E.P. Dinnat, B.C. Forbes, A. Gonsamo, W.W. Gregg, D.K. Hall, I. Ialongo, R. Jandt, R.A. Kahn, A. Karpechko, S.R. Kawa, S. Kato, T. Kumpula, E. Kyrola, T. V. Loboda, K.C. McDonald, P.M. Montesano, R. Nassar, C.S.R. Neigh, Claire L. Parkinson, B. Poulter, J. Pulliainen, K. Rautainen, B.M. Rogers, C.S. Rousseaux, A.J. Soja, N. Steiner, J. Tamminen. P.C. Taylor, M.A. Tzortziu, H. Virta, J.S. Wang, ***J.D. Watts***, D.M. Winker, D.L. Wu. Space-based observations for understanding changes in the Arctic-Boreal Zone. *Reviews of Geophysics*, https://doi.org/10.1029/2019rg000652, **2019**
34. J. Du, ***J.D. Watts***, L. Jiang, H. Lu, X. Cheng, C. Duguay, M. Farina*, Y. Qiu, Y. Kim, J.S. Kimball, P. Tarolli. Remote sensing of environmental changes in cold regions: methods, achievements and challenges. *Remote Sensing*, 11, 1952, **2019**
35. J. Du, J.S. Kimball, I. Velicogna, M. Zhao, L.A. Jones, ***J.D. Watts***, Y. Kim. Multicomponent satellite assessment of drought severity in the contiguous United States from 2002 to 2017 using AMSR-E and AMSR2. *Water Resources Research*, https://doi.org/0.1002/wrcr.v9999.9999, **2019**
36. J. Du, J.S. Kimball, J. Galantowicz, S.-B. Kim, S.K. Chan, R.R. Reichle, L.A. Jones, ***J.D. Watts***. Assessing global surface water inundation dynamics using combined satellite information from SMAP, AMSR2 and Landsat. *Remote Sensing of Environment*, 213, 1-17, **2018**
37. J. Du, J.S. Kimball, L.A. Jones, Y. Kim, J. Glassy, ***J.D. Watts***. A global satellite environmental data record derived from AMSR-E and AMSR2 microwave earth observations. *Earth System Science Data*, 9, 791, **2017**
38. A. Hursh*, A. Ballantyne, L. Cooper, M. Maneta, ***J.D. Watts***. The sensitivity of soil respiration to soil temperature, moisture and carbon supply at the global scale. *Global Change Biology*, 23, 2090-2109, **2017**
39. D. Zona, B. Gioli, R. Commane, J. Lindaas, S.C. Wofsy, C.E. Miller, S.J. Dinardo, S. Dengel, C. Sweeney, A. Karion, R.Y.-W. Chang, J.M. Henderson, P.C. Murphy, J.P. Goodrich, V. Moreaux, A. Liljedahl, ***J.D. Watts***, J.S. Kimball, D.A. Lipson, W. Oechel. Cold season emissions dominate the Arctic tundra methane budget. *Proc. Nat. Acad. Sci.*, 113, 40-45, **2016**
40. S.J. Davidson, M.J. Santos, V.L. Sloan, ***J.D. Watts***, G.K. Phoenix, W.C. Oechel, D. Zona. Remote sensing of arctic tundra vegetation communities along a latitudinal gradient in North Alaska, USA. *Remote Sensing,* 8, 1-14, **2016**
41. J. Du, J.S. Kimball, L.A. Jones, ***J.D. Watts***. Implementation of satellite based fractional water cover indices in the pan-Arctic region using AMSR-E and MODIS. *Remote Sensing of Environment*, 184, 469-481, **2016**
42. ***J.D. Watts***, J.S. Kimball, A. Bartsch, K.C. McDonald. Surface water inundation in the boreal-Arctic: impacts on regional methane emissions. *Environmental Research Letters*, 9, 1-13, **2014**
43. ***J.D. Watts***, J.S. Kimball, F-J.W. Parmentier, T. Sachs, J. Rinne, D. Zona, W. Oechel, T. Tagesson, M. Jackowicz-Korczyński, A. Aurela, et al. A satellite data driven biophysical modeling approach for estimating northern peatland and tundra CO_2 and CH_4 fluxes. *Biogeosciences*, 11, 1961-1980, **2014**
44. ***J.D. Watts***, J.S. Kimball, L.A. Jones, R. Schroeder, K.C. McDonald. Satellite microwave remote sensing of contrasting surface water inundation changes within the

Arctic-Boreal region. *Remote Sensing of Environment*, 127, 223-236, **2012**

45. ***J.D. Watts***, R.L. Lawrence, P. Miller, C. Montange. An analysis of cropland carbon sequestration estimates for North Central Montana. Climatic Change, 108, 301-331, **2011**
46. ***J.D. Watts***, S. Powell, R.L. Lawrence, T. Hilker. Improved classification of conservation tillage adoption using high temporal and synthetic satellite imagery. *Remote Sensing of Environment*, 115, 66-75, **2011**
47. ***J.D. Watts***, R.L. Lawrence, P. Miller, C. Montagne. Monitoring of cropland practices for carbon sequestration purposes in north central Montana by Landsat remote sensing. *Remote Sensing of Environment*, 113, 1843-1852, **2009**

Other Publications

48. ***J.D. Watts***, S. Gennet, C.N. Knapp, J. Lavalle, J. Ritten, et al. Grazing lands management practices: an assessment of climate outcomes. Report prepared for the USDA NRCS, on behalf of the Meridian Institute. In Publication**. 2025**.
49. Y. Xia, J. Sanderman***, J.D. Watts***, et al. Robust carbon monitoring, reporting, and verification for grassland management in the Great Plains. Report prepared for the U.S. National Wildlife Foundation. **2025**. https://hdl.handle.net/1912/71403
50. S.C. Reed, A.F. Feldman, N.P. Hanan. D.J.P. Moore, … ***J.D. Watts***, G.M. Wolfe, A. Flores, et al. The ARID Scoping Study Final Report. Report prepared for NASA Earth Science. https://doi.org/10.3334/ORNLDAAC/2408. **2025**.
51. ***J.D. Watts***, et al. Integrating remote sensing and field measurements to identify environmental nonstationarity on Interior Alaska DoD training lands. *Report to DoD SERDP*, RC18-L2-1486, 166 pp., **2019.**
52. S.M. Miller, M.A. Taylor, ***J.D. Watts***. Understanding high-latitude methane in a warming climate. *Earth & Space Science News*, https://doi.org/10.1029/2018EO091947 , **2018.**

Published Geospatial and Field Observation Datasets

- Watts, J.D., S. Potter, B.M. Rogers, A.-M. Virkkala, et al. Trends of thermal, wetness, and vegetative change in the circumpolar arctic. ORNL DAAC, Oak Ridge, Tennessee, USA. https://doi.org/10.3334/ORNLDAAC/2322.
- Watts, J.D., J. Noomah. **2023.** Environmental and biological controls on carbon uptake phenology in permafrost affected boreal forests, Alaska, 2021-2022. Arctic Data Center. https://doi.org/10.19739/A2P55DJ3K.
- Farina, M., ***J.D. Watts***. **2022.** Gridded CO_2 and CH_4 Flux Estimates for Pan-Arctic and Boreal Regions, 2003–2015. ORNL DAAC, Oak Ridge, Tennessee, USA. https://doi.org/10.3334/ORNLDAAC/2021.
- Mullen, A., ***J.D. Watts***, B.M. Rogers, M.L. Carroll, J.A. Caraballo-Vega, J. Noomah, Z.W. Williams, J.K.Y. Hung. **2022.** Lake and Pond Extent for Alaskan Boreal and Tundra Subregions, 2019–2021. ORNL DAAC, Oak Ridge, Tennessee, USA. https://doi.org/10.3334/ORNLDAAC/2134.
- ***Watts, J.D.,*** et al. **2021.** Soil Respiration Maps for the ABoVE Domain, 2016-2017. ORNL DAAC, Oak Ridge, Tennessee, USA. https://doi.org/10.3334/ORNLDAAC/1935
- ***Watts, J.D.***, S. Natali, S. Potter, B.M. Rogers. **2019**. Gridded Winter Soil CO_2 Flux Estimates for pan-Arctic and Boreal Regions, 2003-2100. ORNL DAAC, Oak Ridge, Tennessee, USA. https://doi.org/10.3334/ORNLDAAC/1683

- Natali, S., ***J.D. Watts***, S. Potter, B.M. Rogers, S. Ludwig, A. Selbmann, et al. **2019**. Synthesis of Winter In Situ Soil CO_2 Flux in pan-Arctic and Boreal Regions, 1989-2017. ORNL DAAC, Oak Ridge, Tennessee, USA. Https://doi.org/10.3334/ORNLDAAC/1692
- Natali, S., S. Ludwig, C. Minions, ***J.D. Watts***. **2018**. ABoVE: Thaw Depth at Selected Unburned and Burned Sites Across Alaska, 2016-2017. ORNL DAAC, Oak Ridge, Tennessee, USA. https://doi.org/10.3334/ORNLDAAC/1579
- Minions, C., S. Natali, S. Ludwig, ***J.D. Watts***. **2018**. ABoVE: Year-round Soil CO_2 Efflux in Alaskan Ecosystems. ORNL DAAC, Oak Ridge, Tennessee, USA. https://doi.org/10.3334/ORNLDAAC/1620
- Du, J., J.S. Kimball, ***J.D. Watts***. **2016**. ABoVE: Fractional Open Water Cover for Pan-Arctic and ABoVE-Domain Regions, 2002-2015. ORNL DAAC, Oak Ridge, Tennessee, USA. https://doi.org/10.3334/ORNLDAAC/1362

PI/Co-I for Environmental Field Sites

- Retrogressive Thaw Slump, North Slope Alaska: eddy covariance tower for detection of CO_2 and CH_4 fluxes from rapidly thawing permafrost.
- Soil Respiration Stations, Alaska: vegetation phenology cameras, temperature and soil moisture sensors, CO_2 chambers. NASA ABoVE and Woodwell Climate Research Center. See https://doi.org/10.3334/ORNLDAAC/1620 for site locations. With Dr. Sue Natali and Christina Minions (Woodwell Climate).
- Hess Creek, Alaska: paired burned and unburned CO_2 flux and radiocarbon experimental boreal site. With Dr. Claudia Czimczik (UC Irvine).
- Caribou-Poker Creek forest, Alaska: National Ecological Observatory Network (NEON) sensor augmentation site. Solar induced fluorescence (SIF) monitoring stations, GNSS microwave-based vegetation water tracking, soil carbon flux and stock surveys. With Drs. Howie Epstein and Xi Yang (U. Virginia) and Dr. Nick Parazoo (JPL).
- Howland forest, Maine: Wetland to upland methane emission and uptake experiment site. With Kathleen Savage (Woodwell), Dr. Debjani Sihi (Emory), Dr. Hinsby Cadillo-Quiroz (Arizona State U.), Dr. Shawn Fraver (U. Maine), Dr. Xiaofeng Xu (UC San Diego).
- Conscience Bay Ranches, western Colorado: Soil carbon and flux monitoring sites on working ranches and grazing leases in western Colorado. With Jon Sanderman, Yushu Xia (Woodwell) and Colorado State University.

- **Select Project/Program Websites**

Howland Forest CH_4 Project: https://www.woodwellclimate.org/project/methane-cycling-in-northern-forests/

Rangeland Program: https://www.woodwellclimate.org/project/carbon-monitoring-in-rangelands/

Student Advising

Developed research projects for and supervised the work of undergraduate and graduate students. *Posters and Presentations at conference or symposium, and articles by student (*).* ** Indicates National Science Foundation Research Experience for Undergraduate Students participant.

Undergraduate Supervision

2024 Elias Neitlich**, Earth Sciences, Montana State University, MT.

12/2024 E. Neitlich, J.D. Watts, K.E. Savage, A. Ouimette, S. Fraver, et al. Understanding the role of methane in ecosystem carbon budgets within a sub-boreal conifer forest. AGU Fall Meeting, December 2022, Chicago, IL.

2022 Giselle Elise Jimenez**, Earth Sciences, U. California Irvine, CA

12/2022 G. Jimenez*, ***J.D. Watts***, C.I. Czimczik, et al. Patterns and controls of ecosystem carbon sequestration and emissions along a hillslope-gradient of boreal forest stands in Alaska. AGU Fall Meeting, December 2022, Chicago, IL.

2022 Carmen Petras**, Environmental Sciences, U. Virginia, VA

12/2022 C. Petras*, A. Jablonski, W. Dawson III, ***J.D. Watts***, et al. Comparative patterns of intraspecific variability in canopy structure and foliar traits. AGU Fall Meeting, December 2022, Chicago, IL.

2021 Hector Delgadillo, Marine Biology Dept., California State U., CA

07/2021 H. Delgadillo*, ***J.D. Watts***. Investigating the biotic and abiotic controls on Alaskan soil CO_2 emissions. PEP Final Presentation, July, 2021, Woods Hole, MA.

10/2021 H. Delgadillo*, ***J.D. Watts***. Investigating the biotic and abiotic controls on Alaskan soil CO_2 emissions. SACNAS. October 25-90, 2021.

2021 Lyric Carter, Environmental Science. Tennessee State U., TN

07/2021 L. Carter*, ***J.D. Watts***. Investigating permafrost controls on Alaskan soil carbon emissions. PEP Final Presentation, July, 2021, Woods Hole, MA.

2017 Stephen Shirley, Geography Department, University of Montana, MT

12/2017 S. Shirley*, ***J.D. Watts***, J.S. Kimball, Z. Zhang, B. Poulter, A.E. Klene. Regional comparison of tundra carbon budget response over the Alaska North Slope to varying environmental conditions. AGU Fall Meeting, December 2019, New Orleans, LA.

09/2017 S. Shirley*, ***J.D. Watts***. Tracking changing soil temperature, moisture and carbon in the Arctic. *https://earthobservatory.nasa.gov/blogs/fromthefield/category/above/*

09/2017 S. Shirley*, ***J.D. Watts***. Regional carbon budget assessment for Alaska. Montana IoE Undergraduate Summer Research Project

Graduate Supervision and Advising

2021– present Wayne Dawson III, University of Virginia, VA

12/2022 W. Dawson III, A. Jablonski, ***J.D. Watts***, H.E. Epstein, X. Yang. Angular effects on SIF observations in deciduous and evergreen boreal forest stands. AGU Fall Meeting, December 2022, Chicago, IL

2018– present Mary Farina, Land Resources & Env. Sci., Montana State University, MT

12/2022 M. Farina*, ***J.D. Watts***, et al. Exploring fine-scale drivers of methane sources and sinks in a boreal wetland. AGU Fall Meeting, December 2022, Chicago, IL

12/2021 M. Farina*, ***J.D. Watts***, et al. Exploring environmental conditions driving high spatial variability in CO_2 and CH_4 fluxes in a boreal wetland. AGU Fall Meeting, December 2021, Virtual

12/2020 M. Farina*, ***J.D. Watts***, et al. The resilience and vulnerability of the regional carbon sink in Alaska and Canada. AGU Fall Meeting, December 2020, Virtual

09/2019 M. Farina*, ***J.D. Watts***, S. Powell, R. Commane, M. Powell, L. Schiferl, C. Elder, N. Barnes, H. Webb, et al. Understanding drivers of spatial variability in Alaska's wetland methane budget. NASA Terrestrial Ecology Meeting, September 2019, College Park, MD

12/2019 M. Farina*, ***J.D. Watts***, S.L. Powell, S. Natali, R. Commane, M. Powell, L. Schiferl, N. Jacobs, C.E. Miller, et al. Assessment of spatiotemporal variability in Arctic-boreal carbon flux budgets. AGU Fall Meeting, December 2019, San Francisco, CA

2020-2021 Kendall Morgan Wojcik, Land Resources, Montana State U., MT

12/2021 M.S. Professional Paper, *Assessing soil organic carbon cycling on semiarid grasslands using soil organic carbon inventories, C_4 grass establishment, and delta 13 (carbon) and 15 (nitrogen) values.*

2017– 2018 Brianna Rick, Geography Department, University of Montana, MT

05/2018 M.S. Thesis for B. Rick, *Greening of the Arctic: Plot-scale analysis of interactions between climate, vegetation, and permafrost at Toolik Lake, Alaska (1995-2017)*

Selected Oral Presentations

07/2025 "Permafrost thaw and global warming? Perspectives for Arctic wetlands," NTERCOL Wetland Conference, Tartu, Estonia, *Invited*.

07/2025 "Monitoring greenhouse gas budgets across the Arctic-boreal: how community-coordinated research is improving carbon flux detection and policy action," INTERCOL Wetland Conference, Tartu, Estonia, *Invited*.

04/2025 "The Woodwell Climate Rangeland Program," Woodwell Staff Retreat, Boston, MA.

03/2025 "Thawing Arctic – Important unknowns and implications for carbon emissions accounting," QArctic meeting, Ringberg Castle, Germany, *Invited*.

01/2025 "Understanding the high latitude terrestrial carbon cycle: progress and uncertainties," DOE NGEE Seminar Series, virtual, *Invited*.

12/2024 "Climate tipping point? The uncertain role of methane in rapidly warming natural systems," American Geophysical Union Fall Meeting, *Invited*.

11/2024 "Arctic wildfire (and related) emissions: Science updates," UN COP Climate Conference, Baku, Azerbaijan. *Invited.*

9/2024 "Understanding ecosystem carbon budgets, drivers, and response to warming and disturbance within permafrost-impacted boreal forests." TriPolar Conference, Shanghai, China, *Invited*.

9/2024 "Insights from 30+ years of arctic-boreal flux observations: key discoveries and future directions," DOE AmeriFlux Meeting, Berkeley, CA, *Invited*.

5/2024 "Updates on state of carbon cycle knowledge in the Arctic-boreal domain." NASA ABoVE Science Team Meeting. Boulder, CO.

3/2024 "Understanding arctic-boreal greenhouse gas budgets through integrated, community-

driven, research," University of Oslo Earth Science Seminar, Oslo, Norway, *Invited*.

5/2023 "Carbon in the cryosphere: insights into carbon budget status and vulnerability," Carbon Group Symposium, NASA JPL, Pasadena, CA, *Invited*

5/2023 "Carbon in the cryosphere: insights into carbon budget status and vulnerability," Earth Science Symposium, Brookhaven NL, Brookhaven, NY, *Invited*

3/2023 "Carbon in the Arctic: understanding linkages and feedbacks between biosphere and atmosphere during times of rapid change", Columbia/Lamont Earth Science Symposium, Palisades, NY, *Invited*

2/2023 "Increasing dangers of carbon emissions in the Arctic Boreal Zone", WMO Greenhouse Gas Monitoring Symposium, Geneva, CH, *Invited*

1/2023 "Integrating field observations, remote sensing and models for high latitude CH_4 budget assessments", AMPAC-CH_4 NASA/ESA joint meeting, Helsinki, FI, *Invited*

12/2022 "Understanding the northern carbon budget", AGU Fall Meeting, Chicago, IL, *Invited*

10/2022 "Rangelands as natural climate solutions in the U.S.", Briefing for the House Select Committee on the Climate Crisis, Virtual, *Invited*

9/2022 "Opportunities to use rangelands as natural climate mitigatory in the U.S.", Protect Our Winters Summit, Reno, NV, *Invited*

6/2022 "Rangeland carbon monitoring in the western U.S.", Woodwell Board Meeting, Falmouth, MA, *Invited*

5/2022 "Arctic-boreal methane: observations, models and scaling", NASA CMS-iLEAPS Wetland Workshop, Virtual, *Invited*

5/2022 "Arctic-boreal methane: observations, models and scaling", NASA CMS-iLEAPS Wetland Workshop, Virtual, *Invited*

5/2022 "Arctic-boreal carbon budgets: reducing uncertainty through integrated monitoring", NASA ABoVE Science Team Meeting Keynote, Fairbanks, AK, *Invited*

2/2022 "Understanding the large impact of soil respiration on ecosystem carbon budgets in Alaska", UAF Life Science Seminar, Virtual, *Invited*

2/2022 "Arctic-boreal carbon budgets: reducing uncertainty through integrated monitoring", NASA Goddard 7th CABS Quarterly Update, Virtual, *Invited*

12/2021 "New Insights into patterns and drivers of soil respiration in Alaska and Canada", AGU Fall Meeting, New Orleans, LA

10/2021 "Unstable Ground: Using data visualization and storymaps to communicate how the Arctic is Changing", NEARC Conference, Virtual, *Invited*

03/2021 "Arctic time bomb? The uncertain role of methane in high latitude carbon budgets", Yale Climate Seminar, Virtual, *Invited*

12/2019 "Soil CO_2 flux in the permafrost zone: new insight from a year-round chamber network in Alaska and Canada", AGU Fall Meeting, San Francisco, CA

10/2019 "Winter carbon emissions from permafrost", Congressional Briefing. Washington DC

03/2019 "Detecting and modeling CH_4 emissions from boreal wetlands", Yale Investments Office Wetlands Meeting, New Haven, CT, *Invited*

12/2018 "The problem with wetlands and methane: challenges in understanding regional biophysical drivers and spatial distributions of emissions", AGU Fall Meeting, Washington DC, *Invited*

04/2018 "The disparate north: using remote sensing and ground observations to characterize northern carbon flux", NASA JPL, Pasadena, CA, *Invited*

03/2018 "Challenges in scaling soil carbon flux", NCEAS, Santa Barbara, CA, *Invited*

12/2017 "Detecting recent changes in the Arctic-Boreal Carbon Sink", AGU Fall Meeting, New Orleans, LA

11/2017 "Microwave mapping of wetland properties", Global Carbon Project Wetland Meeting, Stanford in Washington, Washington DC, *Invited*

10/2017 "Opportunities and challenges for citizen science in Alaska", Woods Hole Research Center, Falmouth, MA, *Invited*

03/2017 "Carbon sink or source? Northern wetland response to climate warming", LRES Seminar Series, MSU, MT, *Invited*

03/2017 "Understanding scaling of wetland methane emissions", International Workshop to Reconcile Methane Budgets, Seattle, WA, *Invited*

11/2016 " Quantifying the pan-Arctic methane budget: a multi-scale approach", Woods Hole Research Center, MA, *Invited*

06/2016 "Monitoring a decade of change in pan-Arctic CO_2 and CH_4 exchange through integrated satellite remote sensing", International Conference on Permafrost, Potsdam, DE, *Invited*

11/2015 "Integrating tower eddy covariance, satellite remote sensing and ecosystem modeling to identify changes in hydrology and carbon fluxes across the Alaskan Arctic", Arctic Observing Open Science Meeting, Seattle, WA, *Invited*

12/2014 "Satellite microwave detection of boreal-Arctic wetland inundation changes and their impact on regional methane emission estimates", AGU Fall Meeting, San Francisco, CA, *Invited*

06/2014 "Using satellite remote sensing to monitor changing CO_2 and CH_4 emission constraints in Boreal-Arctic wetland regions", International Association of Landscape Ecology Meeting. Anchorage, AK, *Invited*

Selected Conference Presentations

01/2025 E. Jafarov, A. Mullen, K. Gurbanov, J. Hung, ***J.D. Watts***, S.M. Natali. Remote sensing and thermal biogeochemical modeling in the Yukon Kuskokwim Delta, Alaska. 105th Annual AMS Meeting, New Orleans, LA.

12/2024 M. Farina, W. Christian, ***J.D. Watts***, T. Mcdermott, R. Hatzenpichler, et al. AGU Fall Meeting, Washington, D.C.

12/2024 B. Maglio, R. Rutter, T. Carman, E.S. Euskirchen, V. Briones, ***J.D. Watts***, et al. Evaluating methane flux sensitivities and uncertainties in a terrestrial biosphere model. AGU Fall Meeting, Washington, D.C.

12/2022 Q. Ying, Z. Zhang, B. Poulter, S. Natali, H. Sullivan, B.M. Rogers, ***J.D. Watts.*** "Methane fluxes in the Arctic wetland: finer resolution upscaling using machine learning and remote sensing." AGU Fall Meeting, Chicago, IL

12/2022 A. Mullen, ***J.D. Watts***, B.M. Rogers, M. Carroll, C. Elder, S.W. Cooley "Developing high spatiotemporal resolution inundation maps to detect rapid changes in surface hydrology and methane emissions across ecosystem gradients in Alaska." AGU Fall Meeting, Chicago, IL

12/2022 Y. Xia, J. Sanderman, ***J.D. Watts***, H. Henandez, M. Machmuller, S. Ewing. "Developing a rangeland carbon tracking and monitoring tool using remote sensing imagery and process-based monitoring approach." AGU Fall Meeting, Chicago, IL

5/2022 M. Pallandt, M. Jung, S. Natali, B. Rogers, A. Virkkala, ***J.D. Watts***, M. Gockede. "Extrapolation error quantification of the Arctic flux network across space and time, with data

driven network optimization." EGU General Assembly Conference, Vienna, AT

12/2021 D. Olefeldt, M.K.A. Kuhn, D. Bastviken, P.M. Crill.. ***J.D. Watts***. "Warming, permafrost thaw, and altered hydrology: predictions and sources of uncertainty for future boreal-arctic methane emissions." AGU Fall Meeting, New Orleans, LA

12/2021 N. Parazoo, A.A. Bloom, X. Yang, T. Magney, J. Stutz, Z. Pierrat, K. Grossmann, P. Levine, A. Norton, ***J.D. Watts***, U. Seibt. "A data-model integration framework to study carbon uptake phenology in tropical and boreal forests." AGU Fall Meeting, New Orleans, LA

12/2021 S. Ma, A.A. Bloom, G. Quetin, ***J.D. Watts***, Z. Dona, E. Euskirchen, A. Norton. "Resolving the carbon-climate feedback potential of high latitude wetland CO_2 and CH_4 exchanges." AGU Fall Meeting, New Orleans, LA

12/2020 B.M. Rogers, A.M. Virkkala, S. Natali, ***J.D. Watts***, K.E. Savage, S.J. Giacomini. "Estimating the terrestrial ecosystem CO_2 flux budget for the Arctic-boreal zone using a synthesis of field observations and statistical upscaling." AGU Fall Meeting, Virtual

12/2020 S. Reault, L.D. Schiferl, R. Commane, ***J.D. Watts***. "Methane emissions in the North Slope: Identifying the source of model and observation disagreement." AGU Fall Meeting, Virtual

12/2020 J.M. Poe, E.E. Hoy, L.D. Schiferl, R. Commane, E.S. Euskirchen, E. Larson, N. Madani, N. Parazoo, O. Sonnentag, J. Wang, ***J.D. Watts***, D. Zona, A. Chatterjee. "Performance of carbon flux models across the ABoVE domain using eddy covariance measurements." AGU Fall Meeting, Virtual

12/2020 C. Rivard, J. Sanderman, ***J.D. Watts***, S.A. Ewing, K. Wojcik, M. McLeod. "Developing a new geospatial approach for rangeland carbo monitoring." AGU Fall Meeting, Virtual

12/2020 N. Madani, N. Parazoo, J.S. Kimball, A. Chatterjee, ***J.D. Watts***, S. Saatchi, et al. "Post-fire recovery of ecosystem productivity in Arctic and boreal forests of Alaska." AGU Fall Meeting, Virtual

12/2020 S. Potter, S. Natali, B.M. Rogers, A. Burrell, T. Shestakova, E. MacDonald, R. Treharne, A.-M., Virkkala, C.E. Frye, S. Breyer, ***J.D. Watts***. "Detecting ecosystem changes by merging multiple satellite remote sensing platforms across the Arctic-boreal zone." AGU Fall Meeting, Virtual

12/2020 M. Farina, ***J.D. Watts***, S.L. Powell, K.E. Savage, S. Natali, J.S. Kimball, Z. Liu, J. Du. "The resilience and vulnerability of the regional carbon sink in Alaska and Canada." AGU Fall Meeting, Virtual

12/2019 M. Farina, ***J.D. Watts***, S.L. Powell, S. Natali, R. Commane, M. Powell, L. Schiferl, N. Jacobs, C.E. Miller, et al. "Assessment of spatiotemporal variability in Arctic-boreal carbon flux budgets." AGU Fall Meeting, San Francisco, CA

12/2019 L.D. Schiferl, M. Powell, S. Biraud, E.S. Euskirchen, M. Farina, J. Henderson, E. Larson, J.W. Munger, C. Sweeney, ***J.D. Watts***, D. Zona, R. Commane. "Insights into changing regional-scale carbon dioxide and methane fluxes from arctic tundra ecosystems." AGU Fall Meeting, San Francisco, CA

12/2019 N. Jacobs, W.R. Simpson, F. Hase, T. Blumenstock, Q. Tu, M.K. Dubey, H.A. Parker, ***J.D. Watts***, M. Farina, S. Heerah. "Regional CH_4 column gradients over Tanana Flats wetlands in interior Alaska." AGU Fall Meeting, San Francisco, CA

12/2019 L. Birch, C.R. Schwalm, G. Keppel-Aleks, D.L. Lombardozzi, S. Natali, X. Lin, ***J.D. Watts***, B.M. Rogers. "Improving simulation of carbon cycle fluxes in Arctic-boreal vegetation in the Community Land Model." AGU Fall Meeting, San Francisco, CA

12/2019 ***J.D. Watts***, S. Potter, J.S. Kimball, T. Douglas, B.M. Rogers, et al. "Integrating remote sensing and field measurements to identify environmental nonstationarity on Interior Alaska DoD Training Lands." DoD SERDP-ESTCP Symposium, Washington DC

10/2019 J. Luo, M. Ueyama, M. Okamura, ***J.D. Watts***, H. Iwata, E. Euskirchen, M. Goeckede, O. Sonnentag, et al. "Estimating northern ecosystem methane flux based on a satellite data driven model, TCF." AsiaFlux2019, Takayama, Japan

09/2019 M. Farina, ***J.D. Watts***, S. Powell, R. Commane, M. Powell, L. Schiferl, C. Elder, N. Barnes, H. Webb, et al. Understanding drivers of spatial variability in Alaska's wetland methane budget. NASA Terrestrial Ecology Meeting, College Park, MD

05/2019 ***J.D. Watts***, et al. "Quantifying cold season CO_2 emissions in Alaska and Northwest Canada". NASA ABoVE Science Team Meeting, La Jolla, CA

12/2018 ***J.D. Watts***, et al. "Quantifying cold season CO_2 emissions in Alaska and Northwest Canada." AGU Fall Meeting, Washington, DC

01/2018 ***J.D. Watts***, et al. "Mapping cold season soil CO_2 emissions in the Arctic-boreal region." NASA ABoVE Team Meeting, Seattle, WA

12/2016 ***J.D. Watts***, et al. **"** Monitoring regional changes in Alaskan boreal-Arctic carbon flux and underlying biophysical processes using in situ observations, models and satellite remote sensing." AGU Fall Meeting, San Francisco, CA

06/2016 ***J.D. Watts***, et al. **"**Monitoring dynamic changes in pan-Arctic land surface water coverage." International Conference on Permafrost, Potsdam, Germany

04/2015 **J.D. Watts**, et al. **"**Monitoring surface water changes across North American Arctic-boreal regions and impacts on ecosystem carbon fluxes." NASA Carbon Cycle & Ecosystems Joint Science Workshop, Hyattsville, MD

400-level Teaching

Spring 2020 –Lecturer. GPHY 426/429, Remote Sensing, Montana State University. Class Leads, Jennifer Watts and William Kleindl; Lab Instructor, Mary Farina

Student Teaching

2008 – LRES 525, Applied Remote Sensing, Montana State University
2007 – LRES 426, Remote Sensing, Montana State University
2006 – LRES 454, Landscape Pedology (incl. lab), Montana State University

Invited Lecturer

2022 – Advanced Remote Sensing, University of Washington

2019 – Climate Change & Environment, Pringry School, New Jersey

2013 – Geography 487, Remote Sensing/Raster Analysis, University of Montana

Professional Activities and Service

Workshop/Meeting Organizing Committees (Recent, External):

2019-present: NASA ABoVE Science Team Meeting Organizing Committee

2024: Forest Methane Dynamics Workshop Co-Lead Organizer
2023: WMO International GHG Symposium, Observations & Models Session Chair
2023: 103rd AMS High-latitude Water and Carbon Cycles in a Warming World Session Co-chair
2022: Woodwell/Turner/Montana State Rangeland Carbon Workshop, Co-Lead Organizer
2020: Woodwell Arctic Carbon Workshop Co-organizer
2019: NASA ABoVE Data and Model Synthesis Group Co-chair
2019: Permafrost Carbon Network Organizing Committee
2017-2019: NASA ABoVE Hydrology & Permafrost Group Co-chair
2018: NASA ABoVE/Goddard/JPL Carbon Group Workshop Organizing Chair
2016: International Conference on Permafrost, Co-convener

Science Team and Professional Membership

NASA ABoVE Science Teams (Carbon; Permafrost & Hydrology; Citizen Science), American Geophysical Union (AGU), Association of Polar Early Career Scientists (APECS), US Permafrost Association (USPA), Permafrost Carbon Network (PCN), Arctic Research Consortium of the United States (ARCUS), Interagency Arctic Research Policy Committee

Guest Editor *Environmental Research Letters; Remote Sensing*

Journal Reviewer

Science; *Nature*; *Global Change Biology*; *Remote Sensing of Environment*; *Remote Sensing*; *Biogeosciences*; *Wetlands Ecology & Management*; *Environmental Research Letters*

Proposal and Panel Reviewer

USDA Small Business Innovation Research Program;
NASA Experimental Program to Stimulate Competitive Research (EPSCoR);
NASA Earth and Space Science Fellowship (now FINESST);
NASA Terrestrial Ecology;
NSF Polar Programs;
NSF Division of Environmental Biology;
DOE Earth Sciences

Science Outreach

2023: MountainFilm, Natural climate solutions panel.
2022-present: Protect Our Winters, science alliance team.
2022-2024: Science advisor and coordinator for Boreal Forest photography and multi-media art installation (led by Gabrielle Russomagno; russomagno.com).
20222024: Science advisor and coordinator for Thawing Permafrost multi-media art installation and experimental film. (led by Michaela Grill; migrill.klingt.org).
2022-2024: Arctic Basecamp science team.
2022-2023: PolarTREC project lead, with Eric Filardi (Principal, Anderson School, AK).

2020-2022: T-MOSAIC Remote Sensing Action Group.

2018: PolarTREC project lead, with Kim Young (Weston High School, MA).

2016-2018: ARCUS, The Arctic in the Classroom Project Lead for Atqasuk, AK project.

Professional Training

2019 – Training and Retaining Leaders in STEM – Geospatial Sciences (TRELIS) training and fellowship program for early career faculty. Washington, DC
2018 – Training for effective leadership, employee development and conflict management. Woods Hole Research Center, Falmouth, MA
2016 – Alaska Science Communication Workshop (NSF sponsored). Sitka Sound Science Center, Sitka, AK
2016 – ARCUS (Arctic Research Consortium of the United States) Make an Impact: The Arctic in the Classroom Workshop. Fairbanks, AK
2015 – FluxCourse Training Program. Niwot Ridge LTER, CO
2015 – Arctic Permafrost Training Program. North Central Siberia, RU
2014 – Greenhouse Gas Data Workshop. Observatoire de Haute-Provence, France. Hosted by the International Carbon Observing Program (ICOS) and the US National Ecological Observatory Network (NEON)
2014 – Summer Field Campaign, North Slope, Alaska. CO_2 and CH_4 carbon flux measurements at NASA SMAP partner Cal./Val. and Amerflux tower eddy covariance sites
2013 – Circumpolar Active Layer Monitoring (CALM) Network, AK
2012 – NASA SMAP-VEX12 Field Campaign, Winnipeg, CN
2012 – LI-COR Eddy Covariance Training Workshop. Berkeley, CA
2011 – Arctic Climate System Modeling Summer Program. International Arctic Research Center (IARC), Fairbanks, AK

Awards, Graduate

NASA Earth and Space Science Fellowship (NESSF) $90,000 (2013-2016)
Title: *Potential Contrasts in CO_2 and CH_4 Flux Response under Changing Climate Conditions: Satellite Driven Analysis of the Net Ecosystem Carbon Budget for Arctic and Boreal Regions*.
Award ID: 14-EARTH14R-25.
United States Permafrost Association Travel Grant $2,000 (2016)
ARCUS Travel Grant (Make An Impact Workshop) $1,300 (2016)
NASA Montana EPSCoR Visiting Speaker/Scientist $500 (2016)
NASA Montana EPSCoR Research Travel Grant $500 (2016)
International P.E.O. Scholar Award $15,000 (2015)
AmeriFlux Training Award $2,500 (2015)
NASA Montana EPSCoR Research Travel Grant $900 (2015)
University of Montana Office of Sponsored Programs Travel Grant $150 (2012)

Awards, Undergraduate

Montana Access Grant (2005-2006): $2,000
Montana Baker Grant (2005-2006): $900
Montana State University Scholars Program Research Grant (2003-2004): $3,000