Seth A. Spawn-Lee (formerly Seth A. Spawn)

Post-Doctoral Research Associate
University of Wisconsin-Madison
Department of Integrative Biology
Email: spawn@wisc.edu

Education

Ph.D. Geography, University of Wisconsin-Madison, August, 2023
Minor: Agronomy
Advisor: Dr. Holly K. Gibbs

M.S. Geography, University of Wisconsin-Madison, December, 2018
Advisor: Dr. Holly K. Gibbs

B.A. Biology, St. Olaf College, May, 2014
Concentrations: Environmental Studies, Mathematical Biology

Professional Experience

Post-Doctoral Research Associate, University of Wisconsin-Madison 2023 – present
Department of Integrative Biology
Supervisor: Dr. Monica G. Turner

Graduate Research Fellow, University of Wisconsin-Madison 2017 – 2023
i. Spatial analysis of the earth system impacts of US agricultural policies and practices
ii. Geographies and drivers of cropland expansion and abandonment
iii. Ecology, biogeography, and vulnerability of global terrestrial carbon stocks
iv. Assessing the potential of land-based climate mitigation efforts
Advisor: Dr. Holly K. Gibbs

Researcher, University of Minnesota, Department of Plant Pathology 2016 – 2018
i. Statistical analysis of the genetic and functional diversity of endophytic microbiomes.
ii. Network and lab analysis of soil microbial inoculants for potato yield improvement
Supervisor: Dr. Linda L. Kinkel

Research Assistant, Woods Hole Research Center, 2014 – 2016
i. Arctic system scientist participating in eight expeditions to Siberia and Alaska
ii. Assessed the magnitude and drivers of methane fluxes from arctic streams and rivers
iii. Managed studies on the effects of fire on ecosystem carbon balance and transpiration
iv. Pilot projects exploring the activity of microbial enzymes in thawing permafrost
Supervisor: Dr. Susan M. Natali

Honors and Awards

• Frontiers Planet Prize, International Champion (co-author)	2023
• Frontiers Planet Prize, Netherlands National Champion (co-author)	2023
• Trusted Reviewer, Institute of Physics	2020 –
• Outstanding Reviewer, Environmental Research Letters	2019, 2020, 2022
• National Science Foundation Graduate Research Fellowship	2019 – 2022
• Clarence W. Olmstead Award for Outstanding Publication (UW Geography)	2019
• University Fellowship, UW-Madison	2018 – 2019 2022 – 2023
• Trewartha Student Travel Award, UW-Madison Geography	2017 2018 2020
• National Geographic Young Explorer	2015
• Travel Grant, United States Permafrost Association	2014
• Polaris Project Undergraduate Researcher	2012 – 2014
• Research Experience for Undergraduates (REU), UW-Madison	2013
• Behrents Endowment Fund Award, St. Olaf College Department of Biology	2012
• Travel Grant, American Fisheries Society Minnesota Chapter	2012

Peer-Reviewed Publications

2023

1. Bendavid, N.S., H.D. Alexander, S.P. Davydov, H. Kropp, M.C. Mack, S.M. Natali, **S.A. Spawn-Lee**, N.S. Zimov, M.M. Loranty. Shrubs compensate for tree leaf area variation and influence vegetation indices in post-fire Siberian larch forests. *Journal of Geophysical Research-Biogeosciences* (2023) doi: 10.1029/2022JG007107

2022

2. Lark, T.J., N.P. Hendricks, A. Smith, N. Pates, **S.A. Spawn-Lee**, M. Bougie, E.G. Booth, C.J. Kucharik, H.K. Gibbs. Reply to Falconi et al.: Economic red herrings and resistance to new modeling hinder progress in assessing ethanol's land use change. *Proceedings of the National Academy of Sciences* (2022) doi: 10.1073/pnas.2216091119

3. Lesiv, M., D. Schepaschenko , M. Buchhorn, L. See, M. Dürauer, I. Georgieva, M. Jung, F. Hofhansl, K. Schulze, A. Bilous, V. Blyshchyk, L. Mukhortova, C.L. Muñoz Brenes, L.

Krivobokov, S. Ntie, K. Tsogt, S.A. Pietsch, E. Tikhonova, M. Kim, F. Di Fulvio, Y. Su, R. Zadorozhniuk, F. Sorin Sirbu, K. Panging, S. Bilous, S.B. Kovalevskii, F. Kraxner, A. Harb Rabia, R. Vasylyshyn, R. Ahmed, P. Diachuk, S.S. Kovalevskyi, K. Bungnamei, K. Bordoloi, A.Churilov, O. Vasylyshyn, D. Sahariah, A.P. Tertyshnyi, A. Saikia, Ž. Malek, K. Singha, R. Feshchenko, R. Prestele, I. ul Hassan Akhtar, K. Sharma, G. Domashovets, **S.A. Spawn-Lee**, O. Blyshchyk, O. Slyva, M. Ilkiv, O. Melnyk, V. Sliusarchuk, A. Karpuk, A. Terentiev, V. Bilous, K. Blyshchyk, M. Bilous, N. Bogovyk, I. Blyshchyk, S. Bartalev, M. Yatskov, B. Smets, P. Visconti, I. Mccallum, M. Obersteiner, S. Fritz. A global forest management map for 2015 at a 100m resolution. *Scientific Data* (2022) doi:10.1038/s41597-022-01332-3

4. Lark, T.J., N.P. Hendricks, A. Smith, N. Pates, **S.A. Spawn-Lee**, M. Bougie, E.G. Booth, C.J. Kucharik, H.K. Gibbs. Environmental outcomes of the US Renewable Fuel Standard. *Proceedings of the National Academy of Sciences* (2022) doi: 10.1073/pnas.2101084119

   Press: *Reuters, Bloomberg, The Hill, Politico Magazine, MSNBC, Fox News, Civil Eats, The Counter, Harvest Public Radio (Syndicated to NPR Stations in Iowa, Illinois, and Kansas), Iowa Public Television (PBS), NEXSTAR (Syndicated to TV stations in most US states), RFD-TV, Wisconsin State Journal, Des Moines Register, Bangor Daily News, Watertown Public Opinion, Lincoln Journal Star, Storm Lake Times, Winnipeg Sun, Daily Mail, CNET, Progressive Farmer, Inside Climate News, CarbonBrief, Inverse, Axios, Ars Technica, Tree Hugger, Car and Driver, The Drive, Motor Beam, The Washington Examiner, Euronews, Technology Networks, Interesting Engineering, Daily Yonder, Clean Technica*

   Policy: *Discussed in a hearing of the US Senate Environment and Public Works Committee (2/16/2022); Presented to the US EPA; Presented to an ad hoc panel of the National Academies of Sciences, Engineering and Medicine.*

   Recognition: *Named one of "The top 25 [15th] climate papers in for news and social media attention" by CarbonBrief*

5. Sun, Z., L. Scherer, A. Tukker, **S.A. Spawn-Lee**, M. Bruckner, H.K. Gibbs, P. Behrens. Dietary change in high-income nations alone can lead to substantial double climate dividend. *Nature Food* (2022) doi: 10.1038/s43016-021-00431-5.

   Press: *BBC News, BBC Outside Source (TV), Time Magazine, Carbon Brief, International Business Times, Phys.org, New Scientist, The Coversation, Vox, Ars Technica, Inverse, Daily Magazine, Mirage News, APA, Green Report, AgriHolland, Die Presse, Kleine Zeitung, ORF, Positive.News, La Stampa*

   Recognition: *Frontier's Planet Prize International Champion*

6. Noon, M., A. Goldstein, J.C. Ledezma, P. Roehrdanz, S.C. Cook-Patton, **S.A. Spawn-Lee**, T.M. Wright, M. Gonzalez-Roglich, D.G. Hole, J. Rockstrom, W.R. Turner. Mapping irrecoverable carbon in Earth's ecosystems. *Nature Sustainability* (2022) doi: 10.1038/s41893-021-00803-6

   Press: *The Guardian, The Hill, Bloomberg, Taipei Times, Fast Company, New Scientist, Environmental News Network, Physics Today, Science News, SciencePost, Free, Big Think, Focus.it, La Vanguardia, The Street, PR Newswire and News Break (syndicated to 3+ local newspapers and 30+ local NBC, CBS, ABC, and Fox television stations).*

7. Michalska-Smith, M., Z. Song, **S.A. Spawn-Lee**, Z.A. Hansen, M. Johnson, G. May, E. Borer, E. Seabloom, L.L. Kinkel. Characterizing network structure of resource competition within the endophyitic microbiome. *The ISME Journal* (2022) doi: 10.1038/s41396-021-01080-z

2021

8. **Spawn-Lee, S.A.**, T.J. Lark, H.K. Gibbs, R.A. Houghton, C.J. Kucharik, C. Malins, R.E.O. Pelton, G.P. Robertson. Comment on "Carbon intensity of corn ethanol in the United States: the state of the science." *Environmental Research Letters* (2021) doi: 10.1088/1748-9326/ac2e35

   Press: *Decorah News*

9. Pelton, R.E.O, **S.A. Spawn-Lee**, T.J. Lark, T. Kim, N.P. Springer, P.L. Hawthorne, D.K. Ray, J. Schmitt. Land use leverage points to reduce GHG emissions in U.S. agricultural supply chains. *Environmental Research Letters* (2021) doi: 10.1088/1748-9326/ac2775

10. Khanna, M., L. Chen, B. Basso, X. Cai, J.L. Field, K. Guan, C. Jiang, T.J. Lark, T.L. Richard, **S.A. Spawn-Lee**, P. Yang, K.Y. Zipp. Redefining marginal lands for bioenergy crop production. *Global Change Biology – Bioenergy* (2021) doi: 10.1111/gcbb.12877

    Recognition: *Named "one of 2022's 10 most-cited articles" by GCB-Bioenergy*

11. Drever, C.R., S.C. Cook-Patton, F. Akhter, P. Badiou, G.L. Chmura, S.J. Davidson, R.L. Desjardins, A. Dyk, J.E. Fargione, M. Fellows, B. Filewod, M. Hessing-Lewis, S. Jayasundara, W.S. Keeton, T. Kroeger, T.J. Lark, E. Le, M. LeClerc, A.C. Lempriere, J. Metsaranta, B. McConkey, E. Neilson, G. Peterson St-Laurent, D. Puric-Mladenovic, S. Rodrigue, R.Y. Soolanayakanahally, **S.A. Spawn**, M. Strack, C. Smyth, N.V. Thevathasan, M. Voicu, C.A. Williams, P.B. Woodbury, D.E. Worth, Z. Xu, S. Yeo, W.A. Kurz. Natural Climate Solutions for Canada. *Science Advances* (2021) doi: 10.1126/sciadv.abd6034

    Press: *CBC, The Globe and Mail, The Canadian Press, Winnipeg Free Press, Nelson Star, The Narwhal, Williams Lake Tribune, Saanich News, Yahoo Finance, The Academic Times,*

12. Graham, E.B., C. Averill, B Bond-Lamberty, J.E. Knelman, S. Krause, A.L. Peralta, A. Shade, A.P. Smith, S. Cheng, N. Fanin, C. Freund, P.E. Garcia, S.M. Gibbons, M.W. Van Goethem, M.B. Guebila, J. Kemppinen, R. Nowicki, J.G. Pausas, S. Reed, J. Rocca, A. Sengupta, D. Sihi, M. Simonin, M. Slowinski, **S.A. Spawn**, I. Suthernald, J. Tonkin, N. Wisnoski, S.C. Zipper, and Contributor Consortium. Towards a unifying framework of disturbance ecology through crowdsourced science. *Frontiers in Ecology and Evolution* (2021) doi: 10.3389/fevo.2021.588940

2020

13. Lark, T.J., **S.A. Spawn**, M.F. Bougie, H.K. Gibbs. Cropland expansion in the United States produces marginal yields at high costs to wildlife. *Nature Communications* (2020) doi: 10.1038/s41467-020-18045-z

Press: *The Guardian, National Geographic, Vox, The Star Tribune*

Special Recognition: *2020 Nature Communications Top 50 Earth, Environmental, and Planetary Sciences Articles*

14. Yin, H. A.O Brandao Jr., J. Buchner, D. Helmers, B.G. Iuliano, N. Kimambo, K.E. Lewinska, K. Ostapowicz, E. Razenkova, N. Rogova, **S.A. Spawn**, Y.H. Xie, V.C. Radeloff. Monitoring cropland abandonment with Landsat time series. *Remote Sensing of Environment* (2020) doi: 10.1016/j.rse.2020.111873

15. **Spawn, S.A.,** C.C. Sullivan, T.J. Lark, H.K. Gibbs. Harmonized global maps of above and below ground biomass carbon stocks in the year 2010. *Scientific Data* (2020) doi: 10.1038/s41597-020-0444-4

    Press: *NASA EarthData*

16. Goldstein, A., W.R. Turner, **S.A. Spawn**, K. Anderson-Teixeira, S. Cook-Patton, J.E. Fargione, H.K. Gibbs, B.W. Griscom, J.H. Hewson, J.F. Howard, J.C. Ledezma, S. Page, L. pin Koh, J. Rockstrom, J. Sanderman, D.G. Hole. Managing irreplaceable carbon in Earth's ecosystems. *Nature Climate Change* (2020) doi: 10.1038/s41558-020-0738-8

    Press: *Scientific American, The Hill, Bloomberg, Yahoo! News, Fast Company, The Conversation, Phys.org, PR Newswire and News Break (syndicated to 3+ local newspapers and 30+ local NBC, CBS, ABC, and Fox television stations).*

17. Brandão Jr., A., L. Rausch, A.P Durán, C. Costa Jr., **S.A. Spawn**, H.K. Gibbs. Estimating the potential for conservation and farming in the Amazon and Cerrado under four policy scenarios. *Sustainability* (2020) doi: 10.3390/su12031277

18. **Spawn, S.A.** and H.K. Gibbs. Global maps of above and below ground biomass carbon density in the year 2010 [data set]. *ORNL DAAC* (2020) doi: 10.3334/ORNLDAAC/1763

19. Soto-Navarro C., C. Ravilious, A. Arnell, X. de Lamo, M. Harfoot, S.L.L. Hill, O.R. Wearn, M. Santoro, A. Bouvet, S. Mermoz, T. Le Toan, J. Xia, S. Liu, W. Yuan, **S.A. Spawn**, H.K. Gibbs, S. Ferrier, T. Harwood, R. Alkemade, A.M. Schipper, G. Schmidt-Traub, B. Strassburg. L. Miles, N.D. Burgess, V. Kapos. Mapping co-benefits for carbon storage and biodiversity to inform conservation policy and action. *Philosophical Transactions of the Royal Society B: Biological Sciences* (2020) doi: 10.1098/rtsb.2019.0128

2019

20. Kropp, H., M.M. Loranty, S.M. Natali, A. Kholodov, H.D. Alexander, N. Zimov, M.C. Mack, **S.A. Spawn**. Tree density influences ecohydrological drivers of plant-water relations in a larch boreal forest in Siberia. *Ecohydrology* (2019) doi: 10.1002/eco.2132

21. **Spawn, S.A.**, T.J. Lark, H.K. Gibbs. Carbon emissions from cropland expansion in the United States. *Environmental Research Letters* (2019) doi: 10.1088/1748-9326/ab0399

    Press: *Politico Magazine, The Guardian, National Geographic, Physics World*

Award: *Clarence W. Olmstead Award for Outstanding Publication by a Graduate Student*

2018

22. Fargione, J.E., S. Bassett, T. Boucher, S. Bridgham, R.T. Conant, S.C. Cook-Patton, P.W. Ellis, A. Falcucci, J. Forqurean, T. Gopalakrishna, G. Huan, B. Henderson, M.D. Hurteau, K.D. Kroeger, T. Kroeger, T.J. Lark, S.M. Leavitt, G. Lomax, R.I. McDonald, P.J. Megonigal, D.A. Mitreva, C. Richardson, J. Sandermann, D. Shoch, **S.A. Spawn**, J.W. Veldman, C.A. Williams, P. Woodbury, C. Zganjar, M. Baranski, P. Elias, R.A. Houghton, E. Landis, E. Mcglynn, S. Ohler, W.H. Schlesinger, J.V. Siikamaki, A.E. Sutton-Grier, B.W. Griscom. Natural Climate Solutions for the United States. *Science Advances* (2018) **4**, 11, doi: 10.1126/sciadv.aat118.69

    Press: *New York Times, National Geographic, Newsweek, The Hill, CNBC, U.S. News, Los Angeles Times, Minneapolis Star Tribune, Washington Examiner, WBUR Boston, Minnesota Public Radio, New Hampshire Public Radio, St. Louis Public Radio, SFGate, The Conversation, Seattle Post-Intelligencer, Insurance News Net, Popular Science, Outside Magaizine, Physics World, E&E News, Quartz, MinnPost, Inside Climate News, Mongabay, Grist, Phys.org, Earth,com, CarbonBrief, Progressive Farmer, Santa Fe New Mexican, Arizona Daily Star, Billings Gazette, Lincoln Journal Star, Northwest Indiana Times.*

    Re-print: *Science Advances* special collection on "The Transformation of Climate and Biodiversity" (at UN COP 25)
    Policy: *Presented in testimony to the US House Select Committee on the Climate Crises (by J. Fargione, 10/22/2019)*

2017

23. Kropp, H., M.M. Loranty, H.D. Alexander, L.T. Berner, S.M. Natali, **S.A. Spawn**. Environmental constraints on transpiration and stomatal conductance in a Siberian Arctic boreal forest. *Journal of Geophysical Research – Biogeosciences*. (2017) doi: 10.1002/2016JG 003709

24. Crawford, J.T., L.C. Loken, W.E. West, B. Crary, **S.A. Spawn**, N. Gubbins, S.E. Jones, R.G. Striegl, E.H. Stanley. The geomorphic template as a driver of spatial variability in lotic CH4 concentrations. *Journal of Geophysical Research – Biogeosciences*. (2017) doi: 10.1002/2016 JG003698

2016

25. Schade, J.D., E.C. Seybold, T. Drake, **S.A. Spawn**, W.V. Sobczak, K.E. Frey, R.M. Holmes, N. Zimov. Variation in summer nitrogen and phosphorus uptake among Siberian headwater streams. *Polar Research*. (2016) 35. 24571 doi: 10.3402/polar v35.24571

2015

26. **Spawn, S.A.**, S.T. Dunn, G.J. Fiske, S.M. Natali, J.D. Schade, N. Zimov. Summer methane ebullition from a headwater catchment in Northeastern Siberia. *Inland Waters*. (2015) **5**, 224-230. doi: 10.5268/iw-5.3.845

27. Kannenberg, S.A., S.T. Dunn, S.M. Ludwig, **S.A. Spawn**, J.D. Schade. Effects of drying and rewetting on potential methanogenesis in seasonally-saturated wetland soils. *Wetlands* (2015). doi: 10.1007/s13157-015-0653-3

2014

28. Crawford, J.T., E.H. Stanley, **S.A. Spawn**, J.C. Finlay, L. Loken, R.G. Striegl. Ebullitive methane emissions from oxygenated wetland streams. *Global Change Biology* (2014) **20**, 3408–3422. doi: 10.1111/gcb.12614

Press: *Daily Mail, Nature World News, Science World Report*

Publications in Review

1. Narayan, K.B., A. Di Vittorio, E.R. Margiotta, **S.A. Spawn-Lee**, H.K. Gibbs. C.R. Vernon. Spatially explicit re-harmonized terrestrial carbon densities for calibrating Integrated human-Earth System Models. (In review, *Earth System Science Data*)

2. Felton, A., J.B. Fisher, A.J. Purdy, **S.A. Spawn-Lee**, L.F. Duloisy, G. Goldsmith. Global estimates of the storage and transit time of water through vegetation. (In review, *Nature Water*)

3. Ganzenmüller R., W.A. Obermeier, **S.A. Spawn-Lee**, F. Zabel, J. Pongratz. The terrestrial carbon deficit. (In review, *Nature Climate Change*)

Technical Reports and Conference Proceedings

1. **Spawn, S.A.**, T.J. Lark, M. Hunter. Description of the approach, data and analytical methods used for the Farms Under Threat 2040 projections of agricultural land conversion from 2016-2040. (2022) American Farmland Trust.

2. Leavitt, S.M., S.C. Cook-Patton, L. Marx, R. Drever, V. Carrasco-Denney, T. Kroeger, D. Navarrete, Z. Nan, N. Novita, A. Malik, K. Pelletier, K. Hamrick, B. Granziera, C. Zganjar, J. Gonzalez, P. Ellis, J. Verdieck, M.F. Ordóñez, C. Gongora, J. Del Castillo Plata, W. Longzhu, D. Arango, R. Gil, P. Premachandra, J. Fargione, S. Simpson, Z. Xianoquan, H. Li, A. Egolf, D. Majka, T.J. Lark, **S.A. Spawn-Lee**, M. Castro, C.A. Septiadi Putra. Natural Climate Solutions Handbook: A Technical Guide for Assessing Nature-Based Mitigation Opportunities in Countries. (2021) The Nature Conservancy, Arlington, VA, USA.

3. **Spawn, S.A.** T.J. Lark, H.K. Gibbs. US cropland expansion releases 115 million tons of carbon (2008-2012). (2018) In L. Knuffman (ed.) *Proceedings of the 4th Biennial Conference on the Conservation of America's Grasslands*. November 15-17, 2017, Fort Worth, TX. Washington, DC: National Wildlife Federation.

4. Natali, S.M., B.M. Rogers, **S.A. Spawn**. Permafrost: The Frozen Amplifier. Pages 11-14 *in Thresholds and Closing Windows: Risks of Irreversible Cryosphere Climate Change*. International Cryosphere Climate Initiative. www.iccinet.org/thresholds

   Press: *Washington Post, The Guardian, Scientific American (Blog), Deutsche Welle, The Nation, Pacific Standard, Press Herald, InsideClimate News, GlacierHub, Eco-Buisness*

Conference Oral Presentations

(† Presented by Seth Spawn-Lee)

1. M. Hunter, A. Sorensen. R. Murphy, P. Freeman, T.J. Lark, S. Lischka, **S.A. Spawn-Lee**, J. Suraci, Y. Xie. Forecast 2040: Will climate change make it easier or harder to farm in your neck of the woods? (2022) *Soil and Water Conservation Society Annual Conference*. Denver, CO.

2. †**Spawn-Lee, S.A.**. Carbon: where is it and how can we know? (2022) *US EPA Workshop on Biofuel Greenhouse Gas Modeling*. (virtual) [Invited]

3. Felton, A., A. Purdy, J.B. Fisher, **S.A. Spawn-Lee**, G. Goldsmith. Water storage and transit times in the world's terrestrial vegetation. (2021) *American Geophysical Union*, New Orleans, LA.

4. Fulcher, M.R., **S.A. Spawn**, Z. Hansen, M. Johnson, Z. Song, L.K. Otto-Hanson, G. May, E. Seabloom, E. Borer, L.L. Kinkel. Soil nutrient inputs shift endophyte phenotypes in a manner consistent with a significant role for species interactions in community assembly. (2021) *Ecological Society of America*, Salt Lake City, UT. [Invited]

5. **Spawn, S.A.** The underappreciated role of grasslands in our global climate system. (2020) *North American Prairie Conference*, Des Moines, Iowa. [Invited – canceled by COVID-19]

6. Fulcher, M.R., **S.A. Spawn**, Z. Hansen, M. Johnson, Z. Song, L.K. Otto-Hanson, G. May, E. Seabloom, E. Borer, L.L. Kinkel. Soil nutrient inputs shift endophyte phenotypes in a manner consistent with a significant role for species interactions in community assembly. (2020) *Ecological Society of America*, Salt Lake City, UT. [Invited]

7. Lark T.J., N.P. Hendricks, N. Pates, A. Smith, **S.A. Spawn,** M.F. Bougie, E.G. Booth, C.J. Kucharik, H.K. Gibbs. Developing counterfactual and comparison scenarios to evaluate the RFS. (2019) *Coordinating Research Council Life Cycle Assessment Workshop*, Lemont, IL. [Invited]

8. Ireland, K., P. Lendrum, A. Gage, J. Schmitt, T.J. Lark, **S.A. Spawn**, R.E.O. Pelton, T. Smith, T. Kim. Greenhouse gas emission trade-offs between cattle production and grassland conversion in the Northern Great Plains. (2019) *America's Grasslands Conference*. Bismark, ND.

9. Radeloff, V.C., H. Yin, J. Buchner, K.E. Lewinska, **S.A Spawn**, E. Razenkova, A. Rizayeva, N. Rogova, P. Hostert, P. Griffiths. Monitoring they dynamics of abandoned agriculture, fallow

fields, and grasslands. (2019) *NASA Land Cover Land Use Change Spring Science Team Meeting*. Rockville, MD.

10. †**Spawn, S.A.**, T.J. Lark. B. Tian, H.K. Gibbs. Carbon and yield trade-offs of cultivating remaining potentially available cropland in the United States. (2018) *American Geophysical Union*, Washington, DC.

11. †**S.A. Spawn**, T.J. Lark, H.K. Gibbs. Improved global biomass estimation for earth system and integrated assessment modeling. (2018) *United Nations Framework Convention on Climate Change (UNFCCC)*, Bonn, Germany. [Invited]

12. Hanssen, S., Z.J.N. Steinmann, **S.A. Spawn**, H.K. Gibbs, J. Whitaker, M.A.J. Huijbregts. The climate change impact of second-generation bioenergy. (2018). *European Biomass Conference and Exhibition*. Copenhagen, Denmark.

13. †**Spawn, S.A.,** T.J. Lark, H.K. Gibbs. Carbon losses from biofuel feedstock expansion. (2017) *America's Grasslands Conference*. Fort Worth, TX. [Invited]

    Press: *Reuters, Minneapolis Star Tribune, Wisconsin Public Radio, Milwaukee Journal Sentinel, Wisconsin State Journal, Public News Service (Wisconsin, New York, California, Oregon, Pennsylvania, Texas, Indiana), Wisconsin State Farmer, E&E News, Sucrose News, Shepherd Express, The Progressive Farmer, Brownfield Ag News for America, Macomb News Now 104.7-FM, Moi Truong & Do Thi (Vietnam). The Australian*

14. Dunn, S.T. **S.A. Spawn**, J.C. von Fischer, S.M. Natali, J.D. Schade. Siberian streams are stronger sources of CH_4 to the atmosphere than lakes. (2016) *Association for the Sciences of Limnology and Oceanography.* Santa Fe, NM.

15. †**Spawn, S.A**. A. Gabaidullin, S.T. Dunn, G.J. Fiske, S.M. Natali, J.D. Schade, N.S. Zimov. Significant methane emissions from Siberian Arctic Rivers: The importance of ebullition, a regional estimate, and the challenges of broader arctic scaling. (2015) *American Geophysical Union*. San Francisco, CA.

16. Egan, J., S.M. Natali, H.D. Alexander, M.M. Loranty, **S.A. Spawn**, D. Risk, Long-term impacts of fire on permafrost vulnerability and loss in Siberian Larch Forests. (2015) *American Geophysical Union*. San Francisco, CA.

17. Dunn, S.T., **S.A. Spawn**, J.D. Schade, S.M. Natali, J.C. von Fischer. Methane and carbon dioxide emissions from a stream network underlain by continuous permafrost in Northeastern Siberia. (2015) *Association for the Sciences of Limnology and Oceanography*, Grenada, Spain.

18. Natali, S.M., A.L. Kholodov, V.V. Spektor, A.G. Bunn, J.D. Schade, M.M. Loranty, P.J. Mann, N. Zimov, S. Davydov, L.T. Berner, E. Webb, K. Heard, S. Shin, **S.A. Spawn**, P. Han. Permafrost carbon pools in a larch-dominated watershed in northeast Siberia. (2013) *American Geophysical Union*, San Francisco, CA.

19. Spektor, V.V., A.L. Kholodov, **S.A. Spawn**, J.D. Schade, S.M. Natali, S. Davydov, E.B. Bulygina, G. Khokhlova. Permafrost organic matter study in the lower Kolyma lowland

(eastern Siberia) based on drilling record. (2013) *American Geophysical Union*, San Francisco, CA.

20. Spektor, V.V, A.L. Kholodov, E.B. Bulygina, **S.A. Spawn**, S. Davydov, I.V. Klimova. Yedoma of the Lower Kolyma: New insights on paleoenvironment. (2013) *International Conference on Earth Cryology: XXI century*, Puschino, Russia.

21. †**Spawn, S.A**., K. Sather, B. Weigel. Carbon and nitrogen cycling in Rice Creek. (2013) *St. Olaf International Symposium on Environmental Studies in Asia*, Northfield, MN. [Invited]

Conference Poster Presentations

(† Presented by Seth Spawn-Lee)

1. Hansen, Z.A., M.R. Fulcher, **S.A. Spawn-Lee**, , Z. Song, G. May, E.W. Seabloom, E.T. Borer, L.L. Kinkel. Nitrogen inputs alter composition and functional characteristics of foliar fungal endophytes. (submitted) *The American Phytopathological Society Annual Meeting*. Denver, CO.

2. Hansen, Z.A., M.R. Fulcher, N. Worson, **S.A. Spawn-Lee**, M. Johnson, Z. Song, G. May, E.W. Seabloom, E.T. Borer, L.L. Kinkel. Soil nutrient amendment differentially alters carbon utilization of bacterial and fungal foliar endoyphytes in Andropogon gerardii. (2022) *18th International Symposium on Microbial Ecology*. Lausanne, Switzerland.

3. M.M. Loranty, N.S. Bendavid, H.D. Alexander, S.P. Davydov, H. Kropp, M.C. Mack, S.M. Natali, **S.A. Spawn-Lee**, N.S. Zimov. Shrubs compensate for tree leaf area index (LAI) variation and influence vegetation indices in post-fire Siberian larch forests. (2022) *16th International Circumpolar Remote Sensing Symposium*, Fairbanks, AK.

4. Bendavid, N.S., M.M. Loranty, H.D. Alexander, S.P. Davydov, H. Kropp, M.C. Mack, S.M. Natali, **S.A. Spawn-Lee**, N.S. Zimov. Shrubs compensate for tree leaf area index (LAI) variation and influence vegetation indices in post-fire Siberian larch forests. (2021) *American Geophysical Union*, New Orleans, LA.

5. Zolkos, S., S.M. Natali, P.H. Balcom, B.M. Rogers, S.M. Ludwig, C. Minions, A.L. Kholodov, **S.A. Spawn-Lee**, N. Baillargeon, R. MacArthur-Thompson, L.M. Bröder, E.M. Sunderland. Permafrost mercury sources and implications for methylation among Alaskan ecoregions. (2021) *American Geophysical Union*, New Orleans, LA.

6. Fulcher, M.R., **S.A. Spawn**, Z. Hansen, M. Johnson, Z. Song, L.K. Otto-Hanson, G. May, E. Seabloom, E. Borer, L.L. Kinkel. Soil nutrient amendments alter fungal endophyte phenotypes and phylogenetic composition. (2020) *Mycological Society of America Annual Meeting*. Online.

7. †**Spawn, S.A.**, C.C. Sullivan, T.J. Lark, H.K. Gibbs. Harmonized global maps of above and belowground biomass carbon density in the year 2010. (2019) *American Geophysical Union*, San Francisco, CA.

8. Lark T.J., N.P. Hendricks, N. Pates, A. Smith, **S.A. Spawn,** M.F. Bougie, E.G. Booth, C.J. Kucharik, H.K. Gibbs. Effects of the U.S. Renewable Fuel Standard – Linking policy, economics, and environmental observations with observations of land use change. (2019) *American Geophysical Union*, San Francisco, CA.

9. Booth, E.G., T.J. Lark, N.P. Hendricks, N. Pates, A. Smith, **S.A. Spawn**, M.F. Bougie, C.J. Kucharik, H.K. Gibbs. Water quality impacts of the U.S. Renewable Fuel Standard. (2019) *American Geophysical Union*, San Francisco, CA.

10. Pelton, R.E.O., **S.A. Spawn**, T.J. Lark, T. Kim, J. Schmidt. Land use change doubles estimated emissions from US corn supply chains. (2019) *10th International Conference on Industrial Ecology*, Beijing, China.

11. Lark, T.J., N. Hendricks, N. Pates, A. Smith, E. Booth, C. Kucharik, M. Bougie, **S.A Spawn**, Y. Xie, H.K. Gibbs. Impacts of the Renewable Fuel Standard on America's land and water resources – Linking policy, economics and environmental models with observations of land use change. (2019) *Open Science Meeting of the Global Land Programme*. Bern. Switzerland.

12. Lark T.J., N. Hendricks, N. Pates, A. Smith, **S.A. Spawn**, M.F. Bougie, E. Booth, C. Kucharik, H.K. Gibbs. Impacts of the Renewable Fuel Standard on America's land and water resources. (2019) *AAAS Annual Meeting*, Washington, DC.

Press: *Minneapolis Star Tribune, Indiana Public Radio, Public News Service (New York), Erie Times News*

13. †**Spawn, S.A.**, T.J. Lark, H.K. Gibbs. Carbon emissions from recent United States cropland expansion. (2018) *American Geophysical Union*, Washington, DC.

14. Kinkel, L.L., L. Otto-Hanson, Z. A. Hansen, M. Johnson, **S.A. Spawn**, Z. Song, G. May, E. Seabloom, E. Borer. Foliar endophytic microbiome composition and functional capacities vary with soil nutrient inputs. (2018) *International Congress of Plant Pathology (ICPP) 2018: Plant Health in A Global Economy*. Boston, MA.

15. †**Spawn, S.A.,** T.J. Lark, H.K. Gibbs. High carbon losses due to recent cropland expansion in the United States. (2017) *American Geophysical Union*. New Orleans, LA.

16. †**Spawn, S.A.,** T.J. Lark, H.K. Gibbs. A New Global Biomass Map for the Year 2010. (2017) *American Geophysical Union*. New Orleans, LA.

17. Tobio, A., M.M. Loranty, H. Kropp, H. Pena, H.D. Alexander, S.M. Natali, A.L. Kholodov, **S.A. Spawn**, S. Farmer. Driving factors of understory evapotranspiration within a Siberian larch forest. (2017) *American Geophysical Union*. New Orleans, LA.

18. Kuhn, M.A., J.D. Schade, S.M. Natali, **S.A. Spawn**, Fire effects on methane emissions from a larch forests in Northeastern Siberia. (2015) *American Geophysical Union*. San Francisco, CA.

19. Behnke, M.I., P.J. Mann, J.D. Schade, **S.A. Spawn**, N.S. Zimov. Photooxidation and microbial processing of ancient and modern dissolved organic carbon in the Kolyma River, Siberia. (2015) *American Geophysical Union*. San Francisco, CA.

20. †**Spawn, S.A.**, S.T. Dunn, G.J. Fiske, J.D. Schade, N. Zimov. Pathway and feature specific CH_4 emissions from a small Siberian watershed: A first order approximation. (2015) *Arctic LTER Meeting*, Woods Hole, MA.

21. **Spawn, S.A.**, S.T. Dunn, G.J. Fiske, J.D. Schade, N. Zimov. Methane ebullition from an upland Stream network in Northeastern Siberia. (2015) *Association for the Sciences of Limnology and Oceanography*, Grenada, Spain.

22. †**Spawn, S.A.**, S.T. Dunn, G.J. Fiske, J.D. Schade, N. Zimov. Ebullition of CO2 and CH4 from an upland stream network in Northeastern Siberia. (2014) *American Geophysical Union*, San Francisco, CA.

23. Schade, J.D., S.M. Natali, **S.A. Spawn**, S. Sistla, E.A.G. Schuur. Impacts of warming and drying on microbial activity in subarctic tundra soils: inferences from patterns in extracellular enzyme activity. (2014) *American Geophysical Union*, San Francisco, CA.

24. Spektor, V., J. Vonk, A.L. Kholodov, **S.A. Spawn**, V.B. Spektor, V.V. Andreeva, S. Natali. Isotopic content of ground ice in the lower Kolyma river valley (Eastern Siberia). (2014) *American Geophysical Union*, San Francisco, CA.

25. Kuhn, M.A., J. Eason, S. Dunn, **S.A. Spawn**, J.D. Schade. Topographic variation and methane production in Siberian Arctic tundra. (2014) *American Geophysical Union*, San Francisco, CA.

26. Connolly, C.T., **S.A. Spawn**, S. M. Ludwig, J.D. Schade, S.M. Natali. The Effects of permafrost thaw on organic matter quality and availability along a hill slope in Northeastern Siberia. (2014) *American Geophysical Union*, San Francisco, CA.

27. Natali, S.M., H.D. Alexander, S. Davydov, M.M. Loranty, M.C. Mack, N. Zimov, **S.A. Spawn**. Effects of fire on ecosystem carbon exchange in Siberian larch forest. (2014) *American Geophysical Union*, San Francisco, CA.

28. †**Spawn, S.A.**, K. Whittinghill. Temperature affects the fate of riverine carbon pools: a modeling study. (2014) *St. Olaf Mathematical Biology Department*. Northfield, MN.

29. †**Spawn, S.A.**, J.T. Crawford, E.H. Stanley. Stream sediment decomposition in contrasting glacial sand, peat and muck reaches of a wetland stream. (2013) *American Geophysical Union*, San Francisco, CA.

30. Crawford, J.T., E.H. Stanley, **S.A. Spawn**, R.G. Striegl. Methane ebullition from contrasting stream sediments in a wetland catchment. (2013) *American Geophysical Union*, San Francisco, CA.

31. Schade, J.D., S.M. Ludwig, L.C. Nelson, J. Porterfield, K.L. Sather, M. Songpitak, **S.A. Spawn**, B. Weigel. Impact of agricultural activities on anaerobic processes in stream sediments. (2013) *American Geophysical Union*, San Francisco, CA.

32. Sather, K., M. Songpitak, **S.A. Spawn**, J.D. Schade. A statewide survey of dissolved methane in streams. (2013) *Minnesota Academy of Science*, Minneapolis, MN.

33. †Spektor, V.V., A.L. Kholodov, E.B. Bulygina, V. Andreeva, D. Broderick, **S.A. Spawn**, S.M. Natali, A. I. Davidova. Preliminary results of the permafrost carbon study in the lower Kolyma lowland based on drilling record. (2012) *American Geophysical Union*, San Francisco, CA.

34. Rich H., S.A. Kannenberg, S.M. Ludwig, L.C. Nelson, **S.A. Spawn**, J. Porterfield, J. D. Schade. Spatial variation in anaerobic microbial communities in wetland margin soils. (2012) *American Geophysical Union,* San Francisco, CA.

35. Kannenberg, S.A., S.M. Ludwig, L.C. Nelson, H. Rich, **S. A. Spawn**, J. Porterfield, J.D. Schade. The impacts of drying and rewetting cycles on potential methanogenesis in wetland soils. (2012) *American Geophysical Union,* San Francisco, CA.

36. Nelson, L.C., S.A. Kannenberg, S.M. Ludwig, H. Rich, **S.A. Spawn**, J. Porterfield, J.D. Schade. A comparison of methane flux rates from the margins of a permanent wetland and an ephemeral wetland in southern Minnesota. (2012) *American Geophysical Union*, San Francisco, CA.

37. Ludwig, S.M., B. Johnson, S.A. Kannenberg, L.C. Nelson, J. Porterfield, H. Rich, J.D. Schade, **S.A. Spawn**. Impacts of *Phalaris arundinacea* on wetland methane emissions. (2012) *Ecological Society of America*, Portland, OR.

38. †**Spawn, S.A**., E.B. Bulygina, V. Andreeva, A.L. Kholodov, P.J. Mann, V.V. Spektor. Permafrost enzyme activity in a boreal borehole, Northeast Siberia. (2012) *St. Olaf College Summer Research Symposium*, Northfield, MN.

Research Grants Awarded (Total: $145,100)

- University of Wisconsin, Trewartha Graduate Research Award, $600 2020
  "Mapping cropland abandonment on the Mid-Atlantic Coastal Plain"

- National Science Foundation Graduate Research Fellowship, $138,000 2019
  "Seeking space for diversification in U.S. commodity crop production"

- National Geographic Society Young Explorer Grant, $5,000 2015
  "Late season methane emissions from the Kolyma River floodplain"

- The Explorer's Club – Exploration Fund Grant, $1,500 2015

"Late season methane emissions from the Kolyma River floodplain"

Media and Science Communication Experience

Interviews:

- **Print:** *The New York Times, Politico Magazine, Reuters, The Financial Times, The Minneapolis Star Tribune, Wisconsin State Journal. Milwaukee Journal Sentinel, Shepherd Express, E&E News, Physics World, The Pulitzer Center (blog)*

- **Radio:** *Wisconsin Public Radio, Public News Service*

Research Coverage:

- **Print**: *New York Times, Washington Post, BBC News, Politico Magazine, Reuters, National Geographic, The Hill, Los Angeles Times, The Guardian, The Financial Times, The Daily Mail, Deutsche Welle, The Globe and Mail, The CBC, CNBC, Taipei Times, Bloomberg, The Australian, Moi Truong & Do Thi (Vietnam), Outside Magazine, †The Minneapolis Star Tribune, Wisconsin State Journal, Milwaukee Journal Sentinel, The Washington Examiner, The Nation, Pacific Standard, Press Herald, Inside Climate News, Grist, Mongabay, Fast Company, Glacier Hub, Eco-Business, Shepherd Express, Wisconsin State Farmer, Erie Times News, E&E News, Sucrose News, Brownfield Ag News for America, Nature News, Science World Report, Phys.org, Earth.com, CarbonBrief, Physics World, New Scientist, Science News,*

- **Radio:** *WBUR Boston, Minnesota Public Radio, Wisconsin Public Radio, New Hampshire Public Radio, Public News Service (Wisconsin, New York, California, Oregon, Pennsylvania, Texas, Indiana), Macomb News Now 104.7-FM, St. Louis Public Radio*

- **TV:** *BBC Outside Source, NEXTAR (Syndicated to local TV in most US States), Gutfeld! (Fox News), RFD-TV.*

- **Blogs:** *Scientific American, Popular Science, The Pulitzer Center*

- **Books:** *The Big Thaw*

Science Leadership and Service

- Member — Environmental Research Letters editorial advisory board (January 2023–present)

- Co-contributor — National Geographic Magazine, Maps in the September 2022 issue.

- Invited Participant — Coordinating Research Council (CRC) Life Cycle Analysis Workshop (October 19-22, 2021)

- Ad hoc reviewer — Conservation Science Partners report: "Carbon benefits of new protections and restoration under a 30x30 framework. (September 2021)

- Invited testimony — National Academies of Sciences, Engineering, and Medicine (NASEM), ad hoc committee on "Current Methods for Life Cycle Analyses of Low-Carbon Transportation Fuels in the United States". (August 31, 2021)

- Signatory — "Letter Regarding Use of Forests for Bioenergy" to the Biden administration advocating against the use of pulpwood as a bioenergy feedstock. (February 11, 2021)

- Judge — Outstanding Student Poster Awards (OSPA), American Geophysical Union (AGU) Fall Meeting (December 2020)

- Co-Convener — American Geophysical Union (AGU) Fall Meeting session (December 2020)

- Convener — Great Lakes Bioenergy Research Center (GLBRC) All Scientists Meeting session: Reconciling competing land demand for natural climate solutions and bioenergy (May 2020; Canceled due to COVID-19)

- Pro bono advisor — United States Environmental Protection Agency (US-EPA), representation of global carbon stocks in the Integrated Assessment Models for US biofuel policy. (June 2019–present)

- Invited contributor — UN Environment World Conservation Monitoring Centre, "Technical Report: SDSN sub-grant on global carbon and biodiversity mapping" presented at the Global Climate Action Summit (September 2018)

- Invited contributor —The Nature Conservancy, Analysis of the climate mitigation potential of US grassland conservation and restoration presented at the Global Climate Action Summit (September 2018)

- Invited contributor — World Wildlife Fund, Analysis of carbon-tradeoffs associated with grass- vs. grain-fed beef production. (June 2018)

- Co-convener — UN Framework on Climate Change Conference (UNFCC) session "Carbon and Biofuels: Are Biofuels a Good Carbon Deal?" in Bonn, Germany (May 2018).

- Fact-checker — CBS 60 Minutes, episode: "Seaweed farming and its surprising benefits" (April 2018)

- Pro bono advisor — California Air Resources Board (CARB), representation of global carbon stocks in Integrated Assessment Models for US biofuel policy. (September 2017–2020)

- Peer reviewer (50):
    - *Nature Climate Change (1)*
    - *Nature Ecology and Evolution (1)*
    - *Nature Food (1)*
    - *Nature Communications (2)*
    - *Environmental Research Letters (27)*
        - *As adjudicating reviewer (7)*
    - *Earth System Science Data (3)*
    - *Scientific Data (2)*
    - *Global Change Biology (2)*
    - *Global Biogeochemical Cycles (1)*
    - *Remote Sensing of Environment (1)*
    - *Carbon Balance and Management (1)*
    - *Biogeosciences (1)*
    - *Biogeochemistry (1)*
    - *Frontiers in Sustainable Food Systems (1)*
    - *Regional Environmental Change (1)*
    - *Environmental Science and Pollution Research (1)*
    - *Forest Science (1)*
    - *Journal of Forestry (1)*
    - *Inland Waters (1)*

- Expert Reviewer — IPCC Working Group I contribution to AR6.

Educational Outreach Activities

Environmental Educator at YMCA Camp Widjiwagan, Ely, MN 2016 – 2017

"Permafrost: The Silent Amplifier" Community Lectures:

- Peace Lutheran Church, Sudbury, MA 2015
- Christ United Methodist Church, East Moline, IL 2014
- 3M Company, St. Paul, MN 2013

Classroom teaching and project mentoring, Harding High School, St. Paul, MN 2013
"Arctic Environmental Science" – a semester long classroom partnership

Presentation to Cannon River Watershed Partnership, Northfield MN 2013

Teaching Experience

At University of Wisconsin-Madison:

- Lectures: Geography 309: People, Land and Food 2020-2023
  "Regreening our emerald planet: Leveraging nature to mitigate climate change."
- Reader/Grader for Geography 338: Environmental Biogeography 2018
- Reader/Grader for Geography 309: People, Land and Food 2018

At Woods Hole Research Center:

- Undergraduate Research Mentor 2015 - 2016

At St. Olaf College:

- Teaching Assistant, Biology 350: Biogeochemistry 2013
- Teaching Assistant, Biology 261: Ecological Principles 2013
- Departmental Tutor/Clinician, Introductory and Intermediate Statistics 2012 – 2013

University Service

- Student Representative to Faculty Hiring Committee 2019 – 2020
- GLBRC Aim-1 representative to the ASM planning committee 2019 – 2020

Professional Development

- Workshop participant: "Searching for Excellence and Diversity", October 18th, 2019 & December 10th, 2019
- Workshop participant: "Empowering People to Break the Prejudice Habit: Creating Inclusion and Overcoming Bias", April 16th, 2018
- Workshop participant: "A primer in generalized linear mixed model (GLMM) applications for complex ecological data", February 8th, 2018
- UMN Graduate Seminar: "Environmental Microbiomes", Spring Semester 2017

Professional Affiliations

- American Geophysical Union (AGU)
- Great Lakes Bioenergy Research Center (GLBRC)
- Global Land Programme (GLP)

Skills and Expertise

- Planetary scale remote sensing and geospatial analysis of biomass carbon stocks
- Remote sensing and geospatial analysis of land use change and associated carbon and climate outcomes
- Big-data geospatial analytics
- Google Earth Engine
- DayCent soil carbon modeling

Research Expeditions

Toolik Lake Research Station, Alaska[1]	2016
Cherskiy, Russia[1]	2015 2014 2013 2012
Yukon Kuskokwim River Delta, Alaska[1]	2015
Healy, Alaska[1]	2014
Nome Creek, Alaska[2]	2011

[1] with Woods Hole Research Center
[2] with UW-Madison and USGS