Thomas A. Lake

Postdoctoral Research Scholar, Center for Geospatial Analytics
North Carolina State University
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Education

Postdoctoral Research Scholar 2023-present
North Carolina State University, Center for Geospatial Analytics, Raleigh, NC
Advisor: Dr. Ross Meentemeyer

Ph.D., Plant & Microbial Biology 2018-2023
University of Minnesota Twin Cities, Minneapolis, MN
Thesis: Improving predictive models of range expansion in invasive species
Advisor: Dr. David Moeller

B.S., Conservation Biology 2013-2017
Minor: Geographic Information Sciences
University of Minnesota Twin Cities, Minneapolis, MN

Research & Teaching

Graduate Research Assistant, University of Minnesota 2021-2023

Graduate Teaching Assistant, Plant, Algal, and Fungal Diversity and Adaptation 2019-2020
University of Minnesota

Graduate Teaching Assistant, Foundations of Biology, University of Minnesota 2019

Researcher 1, USDA ARS Cereal Disease Lab, St. Paul, MN 2017-2018

Undergraduate Teaching Assistant, Plant Immunity Gene Discovery, University of Minnesota 2017

Undergraduate Research Assistant, UROP, University of Minnesota 2015-2017

Grants, Fellowships, & Awards

NASA-MSU Professional Enhancement Award, NASA-Michigan State University 2024
$1,000. Detecting invasive trees with computer vision.
Travel award for outstanding junior scholars.

Doctoral Dissertation Research Fellowship, University of Minnesota Graduate School 2022-2023
$35,000. Predicting biological invasions using remote sensing and artificial intelligence.
Competitive internal fellowship, stipend, and tuition for "most accomplsihed PhD candidates".

Climate Innovation Challenge, Google 2022-2023
Remote sensing of biological invasions using high resolution imagery and deep learning.
$13,500 equivalent in Google Cloud research credits.

Hatch Grant, USDA National Institute of Food and Agriculture (PI: D. Moeller) 2021-2023
Remote sensing biological invasions: Using satellite imagery to detect and monitor leafy spurge population dynamics across the Northern Great Plains.
Contributed to grant writing and submission, awarded $65,000 for research.

Bill Dahl Graduate Student Research Award, Botanical Society of America 2020-2021
$1,500. Does adaptation facilitate or impede future plant invasions?
Award to support PhD field research in adaptation and climate change study.

Bell Museum Dayton Natural History Award, University of Minnesota 2020-2021
$2,500. Does adaptive genetic differentiation facilitate or impede future plant invasions? Award to support PhD field research and conference travel.

Earth Observation Grant, European Space Agency 2020-2021
Population monitoring of invasive species using satellite imagery.
$12,000 equivalent in to access high resolution satellite imagery.

Accelerated Data Science Grant, NVIDIA 2019-2020
$1,000. Awarded graphics processing unit (GPU) for deep learning model development.

Grants-in-Aid, University of Minnesota 2018-2022
$5,000 total. Four small internal grants supporting field research and travel.

Undergraduate Research Opportunity Program, University of Minnesota 2016-2017
$3,600. Award for undergraduate research in plant breeding and cytogenetics.

Publications & Presentations

Refereed Publications

1. **Lake, T. A.**, Runquist, R. D. B., Flagel, L. E., & Moeller, D. A. (2023). Chronosequence of invasion reveals minimal losses of genomic diversity, niche expansion, and trait divergence in the polyploid, leafy spurge. Evolutionary Applications, 16(10), 1680-1696. https://doi.org/10.1111/eva.13593

2. **Lake, T. A.**, Briscoe Runquist, R. D., & Moeller, D. A. (2022). Deep learning detects invasive plant species across complex landscapes using Worldview-2 and Planetscope satellite imagery. Remote Sensing in Ecology and Conservation, 8(6), 875-889. https://doi.org/10.1002/rse2.288

3. Briscoe Runquist, R. D., **Lake, T. A.**, & Moeller, D. A. (2021). Improving predictions of range expansion for invasive species using joint species distribution models and surrogate co-occurring species. Journal of Biogeography, 48(7), 1693-1705. https://doi.org/10.1111/jbi.14105

4. **Lake, T. A.**, Runquist, R. D. B., & Moeller, D. A. (2020). Predicting range expansion of invasive species: Pitfalls and best practices for obtaining biologically realistic projections. Diversity and Distributions, 26(12), 1767-1779. https://doi.org/10.1111/ddi.13161

5. Briscoe Runquist, R. D., **Lake, T. A.**, Tiffin, P., & Moeller, D. A. (2019). Species distribution models throughout the invasion history of Palmer amaranth predict regions at risk of future invasion and reveal challenges with modeling rapidly shifting geographic ranges. Scientific Reports, 9(1), 1-12. https://doi.org/10.1038/s41598-018-38054-9

Manuscripts in Prep

1. **Lake, T. A.**, Runquist, R. D. B., & Moeller, D. A. (in-prep). Two decades of satellite images reveals the spatial and temporal dynamics of leafy spurge invasion and improves species distribution models.

2. **Lake, T. A.**, Laginhas, B. B., Jones, C. M., & Meentemeyer, R. K. (in-prep). Best practices and challenges for urban tree detectiono, classification, and geolocation with street-level images and computer vision.

3. Sanchez, F., **Lake, T. A.**, Galvis, J.A., Jones, C. M., & Machado, G. (in-prep). Predicting commercial swine premise locations using deep learning and aerial imagery to improve disease monitoring and surveillance.

Selected Presentations

1. **Lake, T. A.**, Briscoe Runquist, R. D., & Moeller, D. A. Two decades of satellite images reveals the spatial and temporal dynamics of leafy spurge invasion and improves species distribution models. Ecological Forecasting Initiative Conference (EFI). Blacksburg, VA. 05/2025.

2. **Lake, T. A.**, Laginhas, B. B., Jones, C. M., & Meentemeyer, R. K. Mapping species occurrences with street-view remote sensing and computer vision. International Association of Landscape Ecology (IALE). Raleigh, NC. 04/2025.

3. **Lake, T. A.** Deep learning, an introduction and applications. Invited Lecturer. Center for Geospatial Analytics. North Carolina State University. 01/2025.

4. **Lake, T. A.**, Jones, C. M., & Meentemeyer, R. K. Detecting invasive trees with computer vision. International Association of Landscape Ecology (IALE). Oklahoma City, OK. 04/2024.

5. **Lake, T. A.**, Briscoe Runquist, R. D., & Moeller, D. A. Detecting invasive plant species across complex landscapes using satellite imagery and deep learning. Upper Midwest Invasive Species Conference, Green Bay, WI. 10/2022.

6. Briscoe Runquist, R. D., **Lake, T. A.**, & Moeller, D. A. Landscape genetics of Common Tansy reveals spatial genetic differentiation. Upper Midwest Invasive Species Conference, Green Bay, WI. 10/2022.

7. **Lake, T. A.**, Briscoe Runquist, R. D., & Moeller, D. A. Detecting invasive plant species across complex landscapes using satellite imagery and deep learning. Joint Annual Meeting of the Ecological Society of America (ESA) and Canadian Society for Ecology & Evolution (CSEE), Montreal, Canada. 8/2022.

8. **Lake, T. A.** Ecology and Impacts of Invasive Species. Invited Lecturer. Ecology, Evolution, and Behavior. University of Minnesota. 10/2020.

Service & Outreach

Mentorship

Lindsey Howell[1], Joan Barreto Ortiz[2], Alina Smolskaya[2], Jessica Zhang[1], Nolan Kerr[1], Christina Berg[1]

[1]Undergraduate student
[2]Graduate student

CFANS Mentor Program, University of Minnesota 2018-2022

CFANS Mentor Matching Committee, University of Minnesota 2021, 2022

Peer Reviews

Ecological Applications, Journal of Ecology, Diversity and Distributions, GIScience & Remote Sensing, Urban Ecosystems, Global Ecology and Conservation

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References

David Moeller
Professor
Plant and Microbial Biology
University of Minnesota
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Associate Professor
Plant and Microbial Biology
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Ross Meentemeyer
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Director, Geospatial Analytics
North Carolina State University
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