Thomas A. Lake

PhD Candidate, University of Minnesota
Department of Plant & Microbial Biology
Lakex055@umn.edu lake-thomas

Education

PhD Candidate, Plant & Microbial Biology 2018-present
University of Minnesota Twin Cities, Minneapolis, MN
Research focus: Improving predictive models of range expansion in invasive species
Advisor: Dr. David Moeller

BS, Conservation Biology 2013-2017
Minor Geographic Information Sciences
University of Minnesota Twin Cities, Minneapolis, MN

Research & Teaching

Graduate Research Assistant, University of Minnesota (PI: D. Moeller) 2021-present

Teaching Assistant, "Plant, Algal, and Fungal Diversity and Adaptation" 2019 - 2020
University of Minnesota (PI: D. Moeller)

Teaching Assistant, "Foundations of Biology", University of Minnesota (PI: C. Kirkpatrick) 2019

Researcher 1, USDA ARS Cereal Disease Lab, St. Paul, MN (PI: J. Kolmer) 2017-2018

Teaching Assistant, "Plant Immunity Gene Discovery", University of Minnesota (PI: F. Katagiri) 2017

Undergraduate Research Assistant, University of Minnesota (PI: D. Moeller) 2016-2017

Undergraduate Research Assistant, University of Minnesota (PI: C. Chen) 2015-2016

Grants, Fellowships, & Awards

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 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
$65000."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 supporting 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 access to high resolution satellite imagery.

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

Grants-in-Aid, University of Minnesota 2019-2022
$2,000 total. Four small internal grants supporting field research and travel.

Conference Travel Awards, University of Minnesota 2018-2022
$3,000 total. Three awards for domestic and international conference travel.

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

Publications & Presentations

Refereed Publications

4. **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

2. **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

1. 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

Non-refereed Articles

1. Briscoe Runquist, R. D., **Lake, T. A.**, & Moeller, D. A. (2019). MITPPC Practical Guide to Species Distribution Modeling in R. Minnesota Invasive Terrestrial Plants and Pests Center.

Manuscripts in Prep

2. **Lake, T. A.**, Runquist, R. D. B., Flagel, L. E., & Moeller, D. A. (in-prep). Chronosequence of invasion reveals minimal losses of genomic diversity, niche expansion, and trait divergence in the polyploid, leafy spurge.

1. **Lake, T. A.**, Runquist, R. D. B., & Moeller, D. A. (in-prep). Inference of invasive species population dynamics with time series satellite imagery.

Selected Presentations

7. **Lake, T. A.** Temporal Convolutional Neural Networks for Satellite Image Time Series Classification. Presentation. American Society of Photogrammetry and Remote Sensing Student Chapter. University of Minnesota. 11/2022.

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

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

4. **Lake, T. A.**, Briscoe Runquist, R. D., & Moeller, D. A. Deep learning detects invasive plant species across complex landscapes using Worldview-2 and Planetscope satellite imagery. Presentation. Joint Annual Meeting of

the Ecological Society of America (ESA) and Canadian Society for Ecology & Evolution (CSEE), Montreal, Canada. 8/2022.

3. **Lake, T. A.** Remotely sensed image segmentation approaches in ArcGIS. Presentation. American Society of Photogrammetry and Remote Sensing Student Chapter. University of Minnesota. 11/2021.

2. **Lake, T. A.** Ecology and Impacts of Invasive Species. Invited Lecturer. Ecology, Evolution, and Behavior. University of Minnesota. 10/2019.

1. Briscoe Runquist, R. D., **Lake, T. A.**, & Moeller, D. A. 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. Presentation. Joint Summit of the Minnesota Terrestrial Invasive Plants and Pests Center and Minnesota Department of Agriculture. 02/2019.

Service & Outreach

Undergraduate Student Mentorship

Lindsey Howell, CFANS Mentor Program, University of Minnesota	2022
Joan Barreto Ortiz, CBS Field Guides Mentor Program, University of Minnesota	2022
Alina Smolskaya, CFANS Mentor Program, University of Minnesota	2021
Jessica Zhang, CFANS Mentor Program, University of Minnesota	2020
Nolan Kerr, CFANS Mentor Program, University of Minnesota	2019
Christina Berg, CFANS Mentor Program, University of Minnesota	2018

Broader Community

American Society of Photogrammetry and Remote Sensing Student Chapter, Coordinator	2020-present
University of Minnesota CFANS Mentor Program Matching Committee	2022-present
Community Scientist, iNaturalist Contributor	2018-present
Minnesota Student's Cooperative, Coordinator	2018-present

References

David Moeller
Professor
Plant and Microbial Biology
University of Minnesota
moeller@umn.edu

Lex Flagel
Senior Data Scientist
Gencove
Adjunct Professor
Plant and Microbial Biology
University of Minnesota
flag0010@umn.edu

Rob Venette
Adjunct Associate Professor
Director, Minnesota Invasive Terrestrial Plants and Pest Center
venet001@umn.edu