Thomas A. Lake

PhD Candidate, University of Minnesota
Department of Plant & Microbial Biology
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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: 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 Diversity & Adaptation", University of Minnesota (PI: D. Moeller) 2019 - 2020

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
$25,000. "Predicting biological invasions using remote sensing and artificial intelligence"
Competitive internal fellowship for "most accomplsihed PhD candidates"

Climate Innovation Challenge, Google 2022-2023
$13500. "Remote sensing biological invasions using high resolution imagery and deep learning"
Google Cloud research credits for remote sensing model development in Google Earth Engine

Hatch Grant, USDA National Institute of Food and Agriculture 2021-2023
$65000. "Remote sensing biological invasions: Using satellite imagery to detect and monitor leafy spurge population dynamics across the Northern Great Plains"
Award to assess extensibility and uncertainty in satellite imagery for detecting invasive species

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
$12000. "Population monitoring of invasive species using satellite imagery"
Granted access to high resolution Worldview-2 satellite imagery for invasive species mapping

Accelerated Data Science Grant, NVIDIA 2019-2020
$1000. 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
$3600. Pilot award for independent research in plant cytogenetics

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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. (2023). Rapid evolution and niche expansion despite losses of genetic variation during invasion in the polyploid plant, leafy spurge.

1. **Lake, T. A.**, Runquist, R. D. B., & Moeller, D. A. (2023). Using satellite imagery to quantify population dynamics of leafy spurge and build predicitive models of range shifts.

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	2023
Joan Barreto Ortiz, 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

Society for the Study of Evolution (SSE), Member	2021-present
Ecological Society of America (ESA), Member	2021-present
American Society of Photogrammetry and Remote Sensing (ASPRS), Member, Chapter Coordinator	2020-present
University of Minnesota CFANS Mentor Program Matching Committee, Member	2021-present
Community Scientist, iNaturalist Contributor	2018-present
Minnesota Student's Cooperative, Coordinator	2018-present

References