

# Thomas A. Lake

PhD Candidate, University of Minnesota  
Department of Plant & Microbial Biology

✉ [Lakex055@umn.edu](mailto:Lakex055@umn.edu) 📍 [lake-thomas](#) 🌐 [cbs.umn.edu/academics/departments/pmb](https://cbs.umn.edu/academics/departments/pmb)

## 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  
\$25,000. “Predicting biological invasions using remote sensing and artificial intelligence”  
Competitive internal fellowship for “most accomplished PhD candidates”

**Climate Innovation Challenge**, Google 2022-2023  
\$13,500. “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 (PI: D. Moeller) 2021-2023  
\$65,000. “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  
\$12,000. “Population monitoring of invasive species using satellite imagery”  
Granted access to high resolution Worldview-2 satellite imagery for invasive species mapping

<b>Accelerated Data Science Grant</b> , NVIDIA	2019-2020
\$1000. Gifted graphics processing unit (GPU) to accelerate deep learning model development	
<b>Grants-in-Aid</b> , University of Minnesota	2019-2022
\$2,000 total. Four small internal grants supporting field research and travel	
<b>Conference Travel Awards</b> , University of Minnesota	2018-2022
\$3,000 total. Three awards for domestic and international conference travel	
<b>Undergraduate Research Opportunity Program</b> , 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 predictive 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.

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## 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

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	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

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## References

David Moeller Professor Plant and Microbial Biology University of Minnesota moeller@umn.edu (612) 624-1037	Lex Flagel Adjunct Professor Plant and Microbial Biology University of Minnesota moeller@umn.edu (636) 328-5376	Rob Venette Adjunct Associate Professor Director, Minnesota Invasive Plant and Microbial Biology Terrestrial Plants and Pest Center venet001@umn.edu (612) 624-3636	Yaniv Brandvain Associate Professor University of Minnesota ybrandva@umn.edu (612) 624-4375
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