

Curriculum Vitae

Dr. Michael France Nelson

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Education

Doctor of Philosophy, Plant Biological Sciences, University of Minnesota **2014**
Bachelor of Science, Biology, Bowling Green State University **2006**

Professional Experience

Lecturer **September 2019-Present**

Department of Environmental Conservation

University of Massachusetts, Amherst

Courses Taught

- Analysis of Environmental Data ECO 602
- Analysis of Environmental Data Lab – ECO 634
- Introduction to Quantitative Ecology – NRC 290B
- Spatial Data Analysis in R – ECO 697DR
- Introduction to Geographic Information Science - NRC 585

Postdoctoral Research Associate **2017-2019**

Ecosystem Workforce Program

Institute for Sustainable Environment, University of Oregon

Supervised by Dr. Jesse Abrams, jesse.abrams@uga.edu

Research focus: Mountain Pine Beetles (MPB), in support of National Science Foundation grant # 141404

- Continued development of agent-based models of bark beetles and pine forest succession.
- Developed an agent-based model of Forest District Rangers' management of national forest resources.
Conducted spatial analyses of spatiotemporal relationships between climate and the spread of MPB epidemics in Western North America.

Postdoctoral Research Associate

2014-2017

Department of Geography, Shed and S3C Labs, University of Oregon
Mentored by Dr. Chris Bone, chrisbone@uvic.ca

Research focus: Sudden Oak Death Pathogen (SOD)

- Analyzed the spread of the invasive SOD pathogen, *Phytophthora ramorum*, in its introduced ranges in California and Great Britain using network models, cellular automata, and climate space analysis.
- Studied the effectiveness of quarantines in the horticultural trade network to curb the spread of SOD.

Research focus: Mountain Pine Beetles (MPB), in support of National Science Foundation grant # 141404

- Studied the relationships of time-lagged bark beetle and fire disturbances in pine forests of Western North America.
- Developed a spatially-explicit agent-based model of coupled pine and bark beetle populations.
- Built gap and state/transition models of pine forest succession.

Teaching

- Instructor: Spatial Modeling, GEOG 490 Spring 2016
- Instructor: Spatial Analysis, GEOG 494/594 Fall 2017
- Course Assistant: Spatial Modeling, GEOG 494/594 Fall 2014
 - Delivered guest lectures and assisted in the lab

Graduate Research and Teaching Assistant

2008 – 2014

Department of Horticulture University of Minnesota
Advised by Dr. Neil O. Anderson, ander044@umn.edu

Dissertation Research Focus: Reed Canarygrass (*Phalaris arundinacea* L.)

- Conducted a molecular population genetics study of relationships within and among populations of *P. arundinacea* in North America and Europe using dominant genetic markers.
- Created a simulation model of dominant markers in populations and evaluated the effects of sample size, within/among population variability, number of markers, and unbalanced sampling on the results from population clustering analyses.
- Conducted greenhouse and field studies to examine the relative drought tolerance of *Phalaris* genotypes collected in contrasting upland and wetland environments. Analyzed responses using a variety of physical and ecophysiological techniques.

- Created an interacting particle system model of *P. arundinacea* clonal spread using growth data from the greenhouse and field experiments to examine the population-level genetic diversity responses to differing levels of disturbance.

Teaching Experience: teaching assistant in the following courses:

- General Botany Laboratory, BIOL 2022 Spring 2011
- Foundations of Biology Research Lab, BIOL 2002 Fall 2012
- Plant Function Lab, BIOL 3005W Spring 2013, Spring 2014
- Applied Biostatistics, BIOL 3272/5272 Fall 2013

Microbiologist

2006 – 2008

LexaMed Ltd, Toledo, Ohio

- Extensive work with culturing and identifying microbes, assessing the sterility of medical devices, testing for endotoxin contamination of medical devices, and designing/executing protocols to test the efficacy of a novel sterilization technique.

Publications

- Abrams, Jesse, Heidi Huber-Stearns, Michelle Steen-Adams, Emily Jane Davis, Chris Bone, Michael F. Nelson, and Cassandra Moseley. 2020. "Adaptive Governance in a Complex Social-Ecological Context: Emergent Responses to a Native Forest Insect Outbreak." *Sustainability Science*, July. <https://doi.org/10.1007/s11625-020-00843-5>.
- Bone, and Michael Nelson. 2019. "Improving Mountain Pine Beetle Survival Predictions Using Multi-Year Temperatures Across the Western USA." *Forests* 10 (October): 866. <https://doi.org/10.3390/f10100866>.
- Nelson, Michael France, John T. Murphy, Christopher Bone, and Mark Altaweel. 2018. "Cyclic Epidemics, Population Crashes, and Irregular Eruptions in Simulated Populations of the Mountain Pine Beetle, *Dendroctonus Ponderosae*." *Ecological Complexity* 36 (December): 218–29. <https://doi.org/10.1016/j.ecocom.2018.08.006>.
- Abrams, Jesse, Heidi Huber-Stearns, Marlene Luviano Palmerin, Chris Bone, Michael F. Nelson, R. Patrick Bixler, and Cassandra Moseley. 2018. "Does Policy Respond to Environmental Change Events? An Analysis of Mountain Pine Beetle Outbreaks in the Western United States." *Environmental Science & Policy* 90 (December): 102–9. <https://doi.org/10.1016/j.envsci.2018.09.019>.
- Nelson, Michael F., Mark Ciochina, and Christopher Bone. 2016. "Assessing Spatiotemporal Relationships between Wildfire and Mountain Pine Beetle Disturbances across Multiple Time Lags." *Ecosphere* 7 (10): n/a-n/a. <https://doi.org/10.1002/ecs2.1482>.

- Nelson, Michael F., and Neil O. Anderson. 2016. "Adaptive Responses to Water Stress in *Phalaris Arundinacea*, an Invasive Wetland Grass | Request PDF." In *Invasive Species: Ecology, Management Strategies & Conservation*, 1–20. Environmental Research Advances. Nova Science Publishers, Inc. https://www.researchgate.net/publication/320233200_Adaptive_responses_to_water_stress_in_phalaris_arundinacea_an_invasive_wetland_grass.
- Nelson, Michael F., and Christopher E. Bone. 2015. "Effectiveness of Dynamic Quarantines against Pathogen Spread in Models of the Horticultural Trade Network." *Ecological Complexity* 24 (December): 14–28. <https://doi.org/10.1016/j.ecocom.2015.07.002>.
- Nelson, Michael F., and Neil O. Anderson. 2015. "Variation Among Genotypes and Source Habitats in Growth and Fecundity of the Wetland Invasive Plant *Phalaris Arundinacea* L." *Wetlands* 35 (6): 1175–84. <https://doi.org/10.1007/s13157-015-0704-9>.
- Nelson, Michael F., Neil O. Anderson, Michael D. Casler, and Andrew R. Jakubowski. 2014. "Population Genetic Structure of N. American and European *Phalaris Arundinacea* L. as Inferred from Inter-Simple Sequence Repeat Markers." *Biological Invasions* 16 (2): 353–363.
- Nelson, Michael F., and Neil O. Anderson. 2013. "How Many Marker Loci Are Necessary? Analysis of Dominant Marker Data Sets Using Two Popular Population Genetic Algorithms." *Ecology and Evolution* 3 (10): 3455–70. <https://doi.org/10.1002/ece3.725>.

Skills and Experience

Research and Writing

- Extensive experience with the research process beginning with defining research questions and hypotheses and proceeding through conducting literature reviews, experimental design, analyses of results, and presentation of findings in peer-reviewed journals and oral presentations.

Plant Identification

- Completed undergraduate and graduate course work in plant systematics/taxonomy and identification.
- Extensive experience using dichotomous keys and herbarium specimens for plant identification.
- Contributed herbarium specimens to the Bowling Green State University herbarium, and the Bell Herbarium at the University of Minnesota.

Laboratory Techniques

- Experience with many laboratory techniques, including PCR, gas chromatography/mass spectrometry, sterile technique, plant tissue culture, and others.

Teaching and Mentoring

- Experience as laboratory instructor or course assistant in various subjects including general biology, botany, plant physiology, and statistics.
- Served as course instructor for courses in agent-based modeling and spatial statistics. Received student ratings higher than both the department and university-wide averages despite students also rating the courses as having more work than other courses at the same level.
- Served as an informal mentor to several Ph.D. and Master students in areas including technical aspects of research tools and statistical analyses, refining research questions and methods, writing, and navigating graduate coursework.

Statistics

- Experience performing a wide variety of spatial and aspatial descriptive and inferential statistical techniques including regression, hypothesis testing, mixed models, simulation, bootstrapping, Kriging, geographically weighted regression, and others.

Computer programming

- R: Extensive experience in using the R programming language for statistical analysis, data visualization, network analysis, and as a Geographic Information System (GIS). Experience teaching students to use R for coursework in spatial and general statistics.
- Java: Used the Java language to build agent-based models of bark beetles, forest growth and succession, forest management, and for processing large climate data sets.
- NetLogo: Utilized NetLogo as a teaching tool, both in coursework and informal mentoring of graduate students, and as a tool for creating prototype agent-based models for later implementation in Java.

Honors and Awards

- William H. Alderman Memorial Graduate Award, Department of Horticultural Science, University of Minnesota, academic year 2013/14.
- Integrative Graduate Education and Research Traineeship in Risk Analysis for Introduced Species and Genotypes (ISG-IGERT), University of Minnesota, academic years 2009/10, 2011/12
- Department of Horticultural Science Fellowship, University of Minnesota, academic year 2010/11
- Graduate School Fellowship, University of Minnesota, academic year 2008/09

Manuscripts in Review or Preparation

- Nelson MF, Bone C, Abrams J. Exploring the interactions of management, climate, and population dynamics in an agent-based model of the mountain pine beetle system. (in preparation)
- Nelson MF, Bone C, Abrams J. Optimizing management strategies for mountain pine beetle outbreaks in National Forests. (in preparation)
- Nelson MF, Bone C. Differences in scale: an exploration of the ecological fallacy in spatial and temporal patterns of mountain pine beetle outbreaks. (in preparation)

- Nelson MF, Bone C. A coupled model of mountain pine beetle and pine population dynamics: an analysis of refugia and long-range dispersal. (in preparation)
- Nelson MF, Bone C, Shamoun S. A spatio-climatic analysis of habitat suitability of *Phytophthora ramorum* in Western North America. (in preparation)

Presentations

- Nelson, MF. 2018. Linking weather and recent mountain pine beetle epidemics using physiological and agent-based models. Ecological Society of America annual meeting, New Orleans, Louisiana, August 7, 2018.
- Nelson, MF. 2017. Mountain pine beetle: breakpoints and Equilibria in simulated forest stands. Ecological Society of America annual meeting, Portland, Oregon, August 8, 2017.
- Nelson, MF; Schworer, C. 2015. Postdocs Talk Trees: Oral Presentation at the University of Oregon Department of Geography seminar series, Eugene, Oregon, May 7, 2015
- Nelson, MF. 2013. Midwest Genotypes of Reed Canarygrass Harbor Significant Drought Tolerance Diversity. Oral Presentation at the 2013 Society of Wetland Scientists Annual Meeting, Duluth, Minnesota, June 2-6, 2013
- Nelson, MF. 2013. Genetic Structure and Diversity of Drought Tolerance Traits in Reed Canarygrass. Guest lecture at Gustavus Adolphus College, Saint Peter, Minnesota, March 22, 2013
- Nelson, MF. 2012. Diversity in Drought Tolerance Traits of Midwest Genotypes of Reed Canarygrass. Oral Presentation at the Upper Midwest Invasive Species Conference, La Crosse, Wisconsin, October 29-31, 2012
- Nelson, MF. 2012. Determining the Population Genetic Structure of *Phalaris arundinacea* L. Using ISSR Markers. Oral presentation at the University of South Bohemia, February 13, 2012
- Nelson, MF; Anderson, NO. 2012. Genetic Differentiation of *Phalaris arundinacea* Using ISSR Markers and Simulations to Model Dispersal. Poster presentation at the Molecular Ecology 2012 Conference, Vienna, Austria, February 4 – 7, 2012
- Nelson, MF; Anderson, NO. 2012. Modeling *Phalaris* Population Growth, Migration, Selection, and Unbalanced Sampling Using Simulated Dominant Marker Data. Poster presentation at Plant and Animal Genomics 2012, San Diego, California, January 14-18, 2012
- Nelson, MF; Anderson, NO; Casler MD; Jakubowski AR. 2010. Population Structure as Inferred by ISSR Variation in Reed Canarygrass (*Phalaris arundinacea* L.). Poster presentation at the Minnesota-Wisconsin Invasive Species Conference, Saint Paul, Minnesota, November 8 – 10, 2010