

# SARAH McCARTHY NEUMANN

## CURRICULUM VITAE

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TENNESSEE STATE UNIVERSITY  
DEPARTMENT OF AGRICULTURE & ENVIRONMENTAL SCIENCES  
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### PROFESSIONAL PREPARATION:

University of the South	Biology	B.S. 1999
Michigan State University	Forestry & EEBB	Ph.D. 2008
University of Michigan	Global Change & Forest Ecology	Postdoc 2009-2012

### APPOINTMENTS:

2022- Assistant Professor, Dept. of Agriculture & Environmental Sciences, Tennessee State University

2014- Adjunct Assistant Professor, Dept. of Forestry, Michigan State University

2014-2021 Assistant Professor, Dept. of Biology, Alma College

2013- 2014 Research Assistant Professor, Dept. of Forestry, Michigan State University Fall

2012 Instructor, Dept. of Forestry, Michigan State University

2009-2012 Postdoctoral Research Fellow, School of Natural Resources and the Environment, University of Michigan

2008-2009 Instructor, Dept. of Plant Biology, Michigan State University

2003 Instructor, Dept. of Forestry, Michigan State University

1999-2002 Field Project Manager, U.S. Geological Survey and the University of the South

### SKILLS / SPECIALIZATIONS:

- ~ Exceptional communication skills
- ~ Professional, scientific and grant writing
- ~ Project management (scientific elements of project, personnel and financial)
- ~ Experienced teacher, trainer, supervisor and mentor
- ~ Complex database management and statistical analysis
- ~ Natural resource experimental design
- ~ Plant identification and field measurements
- ~ Greenhouse and nursery management skills
- ~ Laboratory skills (i.e. mycorrhizal colonization, soil pathogen isolation and propagation, non-structural carbohydrate, total phenolics, lignin, soil nutrient analysis)

### TECHNICAL CAPABILITIES:

- ~ Statistics: Frequentist (e.g., ANOVA and ANCOVA) and Bayesian (Cox Survival Analysis)
- ~ Software: SPSS, R, Most Microsoft products and ArcGIS
- ~ Equipment: Most plant-related measurement tools, GPS
- ~ Certification: Michigan commercial pesticide applicator's certification

## RESEARCH:

- 2014-2021 **Assistant Professor, Alma College, Department of Biology**  
~ Conducting research on the effect of light availability and light history strategies on the occurrence and strength of plant-soil feedbacks (mediated by fungal pathogens and mycorrhizal fungi) in temperate tree species. This research attempts to bridge two seemingly disparate hypotheses for how tree species coexistence can be maintained.  
~ Principle author of grant (National Science Foundation (NSF), \$508,213).
- 2013-2014 **Research Assistant Professor, Michigan State University, Department of Forestry**  
~ Conducting research on the effect of soil fertility for the occurrence and strength of plant-soil feedbacks in temperate tree species.
- 2009-2012 **Post-doctoral Research Associate, University of Michigan, School of Natural Resources & Environment**  
~ Lead scientist and supervisor for a field transplant experiment assessing the role of soil pathogens, mycorrhizal fungi, irradiance, soil nutrients and climate on regeneration and potential range expansion for 24 Great Lakes tree species and a greenhouse experiment assessing the role of plant-soil feedbacks on regeneration and potential range expansion for 8 Great Lakes tree species.  
~ Co-author of grants (USDA McIntire-Stennis Cooperative, \$58,684 & NSF, \$247,752).
- 2001-2008 **Graduate Research Assistant, Michigan State University, Department of Forestry**  
~ Lead scientist and supervisor for research assessing the role that plant-soil feedbacks and plant pathogens have on maintenance of tree species diversity in temperate and tropical forests.  
~ Co-author of grant (NSF, \$297,218).
- 2001-2001 **Research Assistant, Michigan State University, Department of Forestry**  
~ Assisted in census of seedlings in long-term transects in both Michigan and Costa Rica.
- 1999-2002 **Field Project Manager, USGS Tennessee Water Science Center and University of the South**  
~ Manager and lead scientist for plant-oriented component of project investigating the altered hydrology of Sinking Pond National Landmark and its effect on tree regeneration in the area.  
~ Co-author of grant (Department of Defense, \$95,000).

## TEACHING:

- 2014-2021 **Assistant Professor of Biology, Alma College**  
~ Have taught *Botany, Forest Vegetation, Experimental Design and Analysis, Forest Ecology, Field Investigations in Tropical Rainforest Ecology, Tropical Rainforest Ecology, Contemplation of Nature: A Gateway into the Study of Biology, Ecology of Eastern Deciduous Forests, Ecology of Terrestrial Ecosystems, General Cell Biology Lab, Aquaponics*.
- 2003 & '12-'13 **Instructor, Forest Ecology (FOR 404 and FOR 404L), Michigan State University**
- 2013 & 2008 **Instructor, Plant Ecology (PLB 441), Michigan State University**
- 2009 **Instructor, Plant Biology (PLB 105), Michigan State University**

## PEER-REVIEWED PUBLICATIONS:

12. Evans, J., **S. McCarthy-Neumann**, A. Pritchard, J. Cartwright & W. Wolfe. 2022. A forested wetland at a climate-induced tipping-point: 17-year demographic evidence of widespread tree recruitment failure. population dynamics of four wetland tree species in response to climate change. *Forest Ecology and Management*. doi.org/10.1016/j.foreco.2022.120247
11. Reinhart, K.O., B. T. Bauer, **S. McCarthy-Neumann**, A.S. MacDougall, J.L. Hierro, M.C. Chiuffo, S.A. Mangan, J. Heinze, J. Bergmann, J. Joshi, R.P. Duncan, J.M. Diez, P. Kardol, G. Rutten, M. Fischer, W. H. van der Putten, T.M. Bezemer & J. Klironomos. 2021. Globally, plant- soil feedbacks are weak predictors of plant abundance. *Ecology and Evolution*. doi: 10.1002/ece3.7167
10. **McCarthy-Neumann, S.** & R.K. Kobe. 2019. Site soil-fertility and light availability influence plant-soil feedback. *Frontiers in Ecology and Evolution*. doi: 10.3389/fevo.2019.00383.
9. Ibáñez, I. and **McCarthy-Neumann, S.** 2016. Effects of mycorrhizal fungi on tree seedling growth: quantifying the parasitism-mutualism transition along a light gradient. *Canadian Journal of Forest Research* 46:48-57.
8. Ibáñez, I. and **McCarthy-Neumann, S.** 2014 Integrated assessment of the direct and indirect effects of resource gradients on tree species recruitment *Ecology* 95(2):364-375.
7. **McCarthy-Neumann, S.** & I. Ibáñez. 2013. Negative-plant soil feedback links negative distance dependence and light gradient partitioning during seedling establishment. *Ecology* 94: 780-786.
6. **McCarthy-Neumann, S.** & I. Ibáñez. 2012. Escape from negative plant-soil feedbacks may enhance tree range expansion. *Ecology* 93: 2637-2649.
5. **McCarthy-Neumann, S.** & R.K. Kobe. 2010. Conspecific plant-soil feedbacks reduce survivorship and growth of tropical tree seedlings. *Journal of Ecology* 98: 396-407.
4. **McCarthy-Neumann, S.** & R.K. Kobe. 2010. Conspecific and heterospecific plant-soil feedbacks influence survivorship and growth of temperate tree seedlings. *Journal of Ecology* 98: 408-418.
3. **McCarthy-Neumann, S.** & R.K. Kobe. 2008. Tolerance of soil pathogens co-varies with shade tolerance across species of tropical tree seedlings. *Ecology* 89: 1883-1892.
2. Wolfe, W., J. Evans, **S. McCarthy**, W. Gain, & B. Bryan. 2004. Tree-regeneration and mortality patterns and hydrologic change in a forested karst wetland- Sinking Pond, Arnold Air Force Base, TN. USGS. *Water-Resources Investigations Report*.
1. **McCarthy, S.** & J. Evans. 2000. Population dynamics of overcup oak (*Quercus lyrata*) in a seasonally flooded karst depression. *Journal of the Torrey Botanical Society* 127:9- 18.

## MANUSCRIPTS IN REVIEW:

3. Xi, N., **S. McCarthy-Neumann**, H. Wu, D. Chen, W. Wang, C. Chu & M. Semchenko. Light availability and species shade-tolerance modify plant-microbial interactions and feedbacks in subtropical trees. *In review at New Phytologist*.
2. Wood, K.E.A., R.K. Kobe, I. Ibáñez & **S. McCarthy-Neumann**. Tree seedling functional traits mediate survival responses to light availability and plant-soil feedback. *In review at Functional Ecology*.
1. Wood, K.E.A., R.K. Kobe & **S. McCarthy-Neumann**. Tree seedling shade tolerance arises from interactions between soil microbes and low light availability, mediated through phenolics and nonstructural carbohydrates. *In review at Oecologia*.

## MANUSCRIPTS IN PREPARATION:

1. **McCarthy-Neumann, S.**, K.E.A Wood, R.K. Kobe & I. Ibáñez. In a field transplant experiment, plant-soil feedback is widespread in temperate tree species regardless of light availability.
2. **McCarthy-Neumann, S.**, J. Evans & C. Oldfield. Similar forested watersheds on the Cumberland Plateau reveal different patterns of biomass accumulation over a forty-year period.
3. Evans, J., **S. McCarthy-Neumann**, J. Cartwright & W. Wolfe. Climate change drives state change in an interior wetland forest ecosystem.

**RESEARCH GRANTS:****Funding to date: \$1,249,863**

- 2018-2020 *20-year study examining the relationship of tree regeneration and hydrologic change in Sinking Pond, Arnold Air Force Base, TN. Department of Defense, CoPI's: Shannon Allen, Jonathan Evans, William Wolfe, Scott Schlarbaum, Sarah McCarthy-Neumann (\$150,000 total; \$11,200 is my portion)*
- 2017 *Plant-soil feedback and species coexistence: interactions among soil pathogens, irradiance, and species life histories. NSF-DEB REU Supplemental Grant. PI: Sarah McCarthy-Neumann. (\$7,500).*
- 2017 *Plant-soil feedback and species coexistence: interactions among soil pathogens, irradiance, and species life histories. NSF-DEB RAHSS Supplemental Grant. PI: Sarah McCarthy-Neumann. (\$7,620).*
- 2015-2020 *Plant-soil feedback and species coexistence: interactions among soil pathogens, irradiance, and species life histories. NSF-DEB. PI: Sarah McCarthy-Neumann, CO-PI's: Richard Kobe, and Inés Ibáñez. (\$493,093).*
- 2013 *Restoring Emerald ash borer impacted forests in the face of climate change. US Forest Service – Great Lakes Restoration Initiative, PI: Ron Murray, Co-PI's: Shawna Patterson-Meyer and Sarah McCarthy-Neumann. Declined*
- 2013 *Plant-soil feedback and species coexistence: interactions among pathogens, resources, and species life histories. NSF-DEB. PI: Sarah McCarthy-Neumann, Richard Kobe, David Rothstein and Stephanie Grand. Declined.*
- 2013 *Climate change impacts on tropical tree seedling dynamics: direct physiological effects and indirect effects mediated through soil pathogens. NSF-DEB. PI: Richard Kobe, Co-PI's: Andrew Finley, Sarah McCarthy-Neumann and Michael Walters. Declined.*
- 2013 *Effect of site soil fertility on the strength of plant-soil feedbacks, MSU – Faculty Incentive Grant, PI: Sarah McCarthy (\$1000)*
- 2009-2011 *The role of plant-soil feedback on species potential to expand their distributional ranges in response to climate change, NSF-EAGER, PI: Inés Ibáñez, CoPI: Sarah McCarthy-Neumann (\$247,752)*
- 2008-2009 *Plant-soil feedback effects on colonization potential of migrant species during climate change, McIntire-Stennis USDA, PI: Inés Ibáñez, CoPI: Sarah McCarthy-Neumann (\$58,684)*
- 2003-2006 *Soil pathogen mediated tree species coexistence, NSF-DEB, PI: Richard Kobe, CoPI: Sarah McCarthy-Neumann (\$297,218)*
- 2002 *Soil pathogen mediated tree species coexistence: A mechanistic approach to Janzen-Connell processes, Organization for Tropical Studies, PI: Sarah McCarthy (\$5,000)*
- 2002 *Effect of neighborhood soil pathogens on seedlings of six temperate tree species, MSU - Incentive Grant, PI: Sarah McCarthy (\$500)*
- 2001 *Effect of neighborhood soil pathogens on seedlings of six temperate tree species, MSU - Graduate Student Research Enhancement Award, PI: Sarah McCarthy (\$1,000)*
- 2000 *Herbivory differences in two color variants of *Triolena hirsuta* and the effect on their population structure, Organization for Tropical Studies, PI: Sarah McCarthy (\$500)*
- 1999-2002 *Analysis of Regeneration Failure in Wetland Tree Species in Conjunction with an Overall Hydrological Assessment at Sinking Pond National Natural Landmark, Department of Defense, PI: William Wolfe; CoPI: Jonathan Evans and Sarah McCarthy (\$95,000)*
- 1998 *Population dynamics of overcup oak in Sinking Pond, University of the South-Mac Greene Summer Research Grant, PI: Sarah McCarthy-Neumann (\$3,500)*

**INVITED SEMINAR PRESENTATIONS:****(20 total)**

- 2022 University of Kentucky, Forestry Dept. *The role of plant-soil feedback in tree seedling establishment.*
- 2022 Ball State University, Biology Dept. *The role of biotic interactions in tree seedling establishment.*
- 2021 Tennessee State University, Ag & Env Sciences Dept. *Plant-soil feedback in forests.*

- 2021 University of Maryland Eastern Shore, Natural Sciences Dept. *Moving plant- soil feedback research from the greenhouse into the forest.*
- 2021 Southeast Missouri State University, Biology Dept. *Shade tolerance: What's soil microbes got to do with it?*
- 2021 Mississippi State University, College of Forest Resources. *Shade tolerance: What's soil microbes got to do with it?*
- 2021 Oglethorpe University, Biology Dept. *Plant-soil feedback in forest community ecology and management.*
- 2021 St. Edward's University, Biology Dept. *Plant-soil feedback in forest ecology.*
- 2020 Auburn University, School of Forestry and Wildlife Sciences. *Plant-soil feedback and tree species coexistence: interactions among soil pathogens, irradiance, and species life histories.*
- 2020 Utah Valley University, Biology Dept. *The role of soil microbes in seedling shade tolerance.*
- 2020 Northern Research Station, USDA Forest Service. *The role of biotic interactions in tree seedling establishment.*
- 2016 Grand Valley State University, Biology Dept. *Plant-soil feedback and tree species coexistence: interactions among soil pathogens, irradiance, and species life histories.*
- 2013 Alma College, Biology Dept. *The role of plant-soil feedbacks in forest community dynamics.*
- 2012 Michigan State University, Forestry Department. *The role of plant-soil feedbacks in forest community dynamics.*
- 2011 University of Michigan, Ecology and Evolutionary Biology Dept. *Plant-soil feedback effects on the colonization of tree species tracking climate change.*
- 2011 University of Michigan, School of Natural Resources and Environment. *Testing the Janzen-Connell model with plant-soil feedbacks.*
- 2008 University of Wisconsin – Superior, Biology and Earth Science Dept. *Role of plant-soil feedbacks in maintaining temperate and tropical forest diversity.*
- 2008 Michigan State University, Forestry Dept. *Plant-soil feedbacks in temperate and tropical forests.*
- 2007 University of the South, Biology Dept. *Feedbacks between soil pathogens and tree communities.*
- 2006 Michigan State University, Ecology, Evolutionary Biology and Behavior. *Feedbacks between soil pathogens and tree communities.*

**PRESENTATIONS at SCIENTIFIC CONFERENCES:**

**(13 total)**

- 2021 *Spatial and temporal change in the population dynamics of four wetland tree species in response to climate change.* Oral Presentation. Annual Mtg. of the Ecological Society of America (ESA).
- 2020 *In a field transplant experiment, plant-soil feedback is widespread in temperate tree species regardless of light availability.* Poster. Annual Mtg. of ESA.
- 2019 *Tree seedling shade tolerance arises from interactions with soil microbes and low light.* Oral Presentation. Annual Mtg. of ESA.
- 2018 *Plant-soil feedbacks influence tree seedling light-gradient partitioning.* Poster. Annual Mtg. of ESA.
- 2017 *Site soil-fertility and light availability can influence plant-soil feedback.* Poster. Annual Mtg. of ESA.
- 2015 *Effects of mycorrhizal fungi on tree seedling growth: quantifying the parasitism-mutualism transition along a light gradient.* Poster. 8<sup>th</sup> International Conference on Mycorrhiza.
- 2013 *Plant-soil feedback and species coexistence: Interactions among pathogens, resources and species life histories.* Oral presentation. Annual Mtg. of ESA.

- 2011 *Inclusion of plant-soil feedbacks in assessing Great Lakes tree range expansion in response to climate change.* Oral presentation. Annual Mtg. of ESA.
- 2009 *Consppecific tree-soil feedbacks reduce survivorship and growth of tropical tree seedlings.* Oral presentation. Annual Mtg. of ESA.
- 2008 *Consppecific and heterosppecific tree-soil feedbacks influence survivorship and growth of temperate tree seedlings.* Oral presentation. Annual Mtg. of ESA.
- 2005 *Response to soil pathogens as a function of adult abundance and shade tolerance classification in tropical tree seedlings.* Poster. Annual Mtg. of ESA.
- 2003 *Survivorship and growth of tropical tree seedlings to fungal pathogen extracted from soil cultured under conspecific adults.* Poster. Annual Mtg. of ESA.
- 1998 *Regeneration failure in a disjunct population of Overcup oak.* Poster. Annual Mtg. of ESA and the Botanical Society of America.

## **SERVICE:**

### **Synergistic Activities:**

1. Scientific Review Committee, National Socio-Environmental Synthesis Center. (3 review panels convene per year: 2018-2021 appointment)
2. Panelist Proposal Reviewer, National Science Foundation, Population and Community Ecology Section. 2016 & 2019.
3. Grant Proposal Reviewer for National Science Foundation, Population and Community Ecology Section, Full Proposals [2011 (1), 2013 (1), 2015 (2), 2016 (1), 2017 (1), 2021 (1)]
4. Reviewer for *Acta Oecologia*, *Ecological Applications*, *Ecology*, *Ecology Letters*, *Forest Ecology and Management*, *Journal of Ecology*, *Journal of Tropical Ecology*, *Journal of Vegetation Science*, *New Phytologist*, *Oecologia* and *PLoS ONE*.
5. Ecological Science Association Education Scholar

### **University Service & Leadership:**

#### **Alma College**

2014-2021 ~ Campus Tree Map, director

- Created new campus tree map (alma.edu/trees) with information on 128 campus trees, their size and estimated monetary benefit, storm water retention, energy savings and carbon sequestration with high resolution images and plant characteristics. All trees have posts, new plates and qr codes for access to online information.

~ Greenhouse, director

~ Employed and mentored 40 undergraduate students working on research in my lab

~ Academic advisor for 20 undergraduate students

~ Education Technology Committee (ETC), chair (3 years)

~ Venture Grant Committee, member (4 years)

~ Health Care Benefits Committee, member (3 years)

~ Anthropology Faculty Search Committee, member (2 years)

~ Dow Digital Science Center Director Search Committee, member

~ Psychology Faculty Search Committee, member

~ Biology/Environmental Studies Faculty Search Committee, member

~ Dow Digital Science Center Interior Design Committee, member

~ DIG into Data, participant of NSF funded faculty mentorship network

- McCarthy-Neumann, S. (2018). Data Management Adaptation: Correlating Forest Community Dynamics to Climate. DIG into Data FMN (2018), QUBES Educational Resources. [doi:10.25334/Q4V43M](https://doi.org/10.25334/Q4V43M)

~ Multidirectional Faculty Mentoring Network, participant

~ BioQuest Wicked Problems, teaching conference, participant

~ Gateway Experience Conference, Gardner Institute for Excellence in Undergraduate Education, participant.

## **Michigan State University**

2014- ~ PhD Graduate Co-advisor for Katherine Wood (expected thesis defense in January 2022)

2014-2021 ~ Ph.D. Graduate Committee Member for Clarice Esch

## **REFERENCES:**

- Richard Kobe, Chair and Professor, Department of Forestry, Michigan State University, East Lansing MI 48824. (517) 355-0093. kobe@msu.edu.
- Amanda Harwood, Natural Resources Division Chair and Associate Professor, Department of Environmental Studies and Department of Biology, Alma College, Alma MI 48801. (989) 463-7235. harwoodad@alma.edu.
- Inés Ibáñez, Associate Professor, School of Environment and Sustainability and Department of Ecology and Evolutionary Biology, University of Michigan, Ann Arbor, MI 48109. (734) 615-8817. iibanez@umich.edu.
- Jon Evans, Professor, Department of Biology, University of the South, Sewanee TN 37375. (931) 598-1304. jon.evans@sewanee.edu.