

## Matthew E. Craig

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### *Research Areas*

Terrestrial ecosystem ecology, soil biogeochemistry

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## EDUCATION

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| 2019 | <b>Ph.D.</b> Ecology, Evolution, and Behavior (Minor: Geography)<br>Indiana University, Bloomington  |
| 2014 | <b>M.S.</b> Natural Resources and Environmental Sciences<br>University of Illinois, Urbana-Champaign |
| 2011 | <b>B.A.</b> Biology (Minor: Environmental Studies)<br>Augustana College, Rock Island, Illinois       |

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## PROFESSIONAL APPOINTMENTS

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| 2019 – present | Postdoctoral Research Associate, Environmental Sciences Division and<br>Climate Change Science Institute, Oak Ridge National Laboratory |
| 2011           | District Forester Assistant, Illinois Department of Natural Resources   |

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## PUBLICATIONS

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11. **Craig ME**, Mayes MA, Sulman BN, Walker AP (*In Press*) Biological mechanisms may contribute to soil carbon saturation patterns. Global Change Biology.
10. Terrer C, Phillips RP, Hungate BA, Rosende J, Pett-Ridge J, **Craig ME**, van Groenigen KJ, Keenan TF, Sulman BN, Stocker BD, Reich PB, Pellegrini AFA, Pendall E, Zhang H, Evans RD, Carrillo Y, Fisher JB, Jackson RB (*In Press*) A global tradeoff between plant and soil carbon storage under elevated CO<sub>2</sub>. Nature.
9. Keller AB, Brzostek ER, **Craig ME**, Fisher JB, Phillips RP (*In Press*) Root-derived inputs are major contributors to soil carbon in temperate forests, but vary by mycorrhizal type. Ecology Letters.
8. Mushinski RM, Payne ZC, Raff JD, **Craig ME**, Pusede SE, Rusch DB, White JR, Phillips RP (2021) Nitrogen cycling microbiomes are structured by plant mycorrhizal associations with consequences for nitrogen oxide fluxes in forests. Global Change Biology 27:1068-1082.
7. Walker et al. (**Craig ME** one of 61 co-authors) (2021) Integrating the evidence for a terrestrial carbon sink caused by increasing atmospheric CO<sub>2</sub>. New Phytologist 229:2413-2445.
6. **Craig ME**, Lovko NL, Flory SL, Wright JP, Phillips RP (2019) Impacts of an invasive grass on soil organic matter pools vary across a tree-mycorrhizal gradient. Biogeochemistry 144:149-164.

5. Zak DR, Pellitier PT, Argiroff WA, Castillo B, James TY, Nave LE, Averill C, Beidler KV, Bhatnagar J, Blesh J, Classen A, **Craig ME**, Fernandez C, Gundersen P, Johansen R, Koide R, Lileskov E, Lindahl B, Nadelhoffer K, Phillips RP, Tunlid A (2019) Exploring the role of ectomycorrhizal fungi in soil organic matter dynamics. *New Phytologist* 223:33-39.
4. **Craig ME**, Turner BL, Liang C, Clay K, Johnson DJ, Phillips RP (2018) Tree mycorrhizal type predicts within-site variability in the storage and distribution of soil organic matter. *Global Change Biology* 24:3317-3330.
3. **Craig ME**, Fraterrigo JM (2017) Plant–microbial competition for nitrogen increases microbial activities and carbon loss in invaded soils. *Oecologia* 184:583-596 (*highlighted student paper*).
2. **Craig ME**, Pearson SM, Fraterrigo JM (2015) Grass invasion effects on forest soil carbon depend on landscape-level land use patterns. *Ecology* 96:2265-2279.
1. Hager SB, **Craig ME** (2014) Bird-window collisions in the summer breeding season. *PeerJ* 2:460.

#### Submitted manuscripts:

Lin G, **Craig ME**, Wang X, Zeng D, Phillips RP. Mycorrhizal group influences soil nitrogen dynamics via effects on soil acid-base chemistry. (*In revision for Global Ecology and Biogeography*).

Vela Diaz DM et al. (**Craig ME** one of 30 co-authors). Local niche-assembly mechanisms influence species diversity across temperate and tropical forests. (*In review*).

Liu Y, Agee E, **Craig ME**, Jurgens AM, Rupe A, Walker AP, Besnard S, Crutchfield JP, Hoffman FM, King AW, Kraft B, Lu D, Ogle K, Peltier D, Warren JM. Understanding ecological memory: Plants, communities, and ecosystems as information processors. (*In review*).

#### Manuscripts in preparation:

**Craig ME**, Geyer KM, Biedler KV, Brzostek ER, Frey SD, Grandy AS, Liang C, Phillips RP. High quality litters promote mineral retention of soil carbon, but not through alteration of microbial physiological traits.

**Craig ME\***, Keller AB\* (\*equal contribution), Sulman BN, Wieder WR, Phillips RP. Climate modulates coupling of plant and soil stoichiometry.

**Craig ME**, Podzikowski LY, Johnson RA, Lee MR, Phillips RP. Differential mycorrhizal colonization rates enable consistently high invader productivity across a soil nutrient gradient.

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### RESEARCH GRANTS AWARDED

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#### External:

National Science Foundation, Doctoral Dissertation Improvement Grant, \$20,275, 2017-2019

- *Where plant litter ends and soil carbon begins: The role of microbial physiology in stabilizing soil organic matter*

Smithsonian Tropical Research Institute, CTFS-ForestGEO Research Grant, \$14,999, 2014-2016

- *A new framework for quantifying drivers of soil carbon dynamics within and among forests*

Garden Club of America of Downer's Grove Research Grant, \$2,500, 2012

Internal:

Indiana University Research and Teaching Preserve Grant, \$2,000, 2018

Indiana University Research and Teaching Preserve Grant, \$500, 2014

Augustana College Student Summer Research Grant, \$3,500, 2010

**TEACHING**Associate Instructorships:

Biology of the Senses, Indiana University, 2019

General Ecology, Indiana University, 2013-2018 (6 semesters)

Ecology, Augustana College, 2011

Guest lectures:

Soil organic matter formation and decomposition, Ecosystem Ecology, Indiana University, 2018

Mutualism, competition, and predation, General Ecology, Indiana University, 2018

Primary production and nutrient limitation, General Ecology, Indiana University, 2016

Nutrient cycling, General Ecology, Indiana University, (5 times from 2014 – 2018)

Designing Observational Studies, Research in Field Biology, Augustana College, 2012

Other relevant teaching experience:

Optimal Foraging Theory, Field Ecology, Indiana University, 2017

Biology Summer Institute, Indiana University, 2014 – 2016, 2018

Structural Equation Modeling, EcoLunch Statistics Workshop, co-led with A. Strauss, 2016

Teacher Training Workshop, Indiana University, (1-week workshop; 2013)

Laboratory Proctor, General Botany, Augustana College, 2010

Laboratory Proctor, Organic Chemistry, Augustana College, 2009

**MENTORING**Independent research (\*denotes student authorship on a peer-reviewed publication):

Julius Hain, Independent Study, BIOL-X490\*

- *Soil extracellular enzyme responses to plant invasion*

Robin Johnson, Master's research

- *Mycorrhizal colonization of invasive plant roots along nutrient gradients*

Peyton Joachim, Independent Study, BIOL-X490

- *Invasive plant effects on earthworm community composition*

Nadia Lovko, Independent Study, BIOL-X490\*

- *Invasive plant effects on soil organic matter pools along a tree-mycorrhizal gradient*

High school student internship:

Mari Walter-Bailey, Internship Program, Bloomington High School South

Field and lab experience:

Corben Andrews, Madison Barney, Tommmy Beresky, Dan Du, Kelly Fox, Cara Grabowski, Matt Hamilton, Emma Hand, Samuel Incardona, Peyton Joachim, Robin Johnson, Yuejong Lee, Joey Maddon, Emily McGrath, Brindin Parrot, Rebecca Pronschinske, Naomi Reibold, Mari Walter-Bailey, Rachel Zeunik

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**HONORS, AWARDS, AND FELLOWSHIPS**


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*Floyd Plant and Fungal Biology Summer Fellowship*, Indiana University, (5 awards; 2014-2019)

*Best Student Talk; Soil Health Session* at International SOM Symposium in Fall 2017 (£250)

*Alfred Parson Mower Fellowship*, Indiana University, 2017 (\$1,500)

*Highlighted Student Paper*, *Oecologia*, 2017

*Blatchley Nature Study Club Fellowship*, Indiana University, 2017 (\$500)

*Best Student Talk in Biogeosciences* for presentation given at ESA in August 2016 (\$250)

*Louise Constable Hoover Fellowship*, Indiana University, 2016 (\$1,000)

*Spaeth and Boggess Graduate Scholarship in Forestry*, University of Illinois, 2012 (\$1,000)

*Odell Soil Science Fellowship* 2011-2012, University of Illinois

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**SERVICE AND OUTREACH**


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Professional service:

NSF-NEON Technical Working Group Member, Terrestrial Biogeochemistry, 2020 – present

Internal Technical Reviewer, Oak Ridge National Laboratory, 2020 – present

Ecosystem Science meeting, planning committee, Oak Ridge National Laboratory, 2020 – present

Local Emergency Squad member, Oak Ridge National Laboratory, 2020 – present

Concerned Scientists at Indiana University, 2018 – 2019

Invited talk, Blatchley Nature Study Club in Noblesville, Indiana, 2018

EcoLunch committee member and co-chair, EEB, Indiana University, 2016 – 2019

Graduate Recruitment Week Planning Committee, Indiana University, 2014 – 2019

Midwestern Ecology and Evolution Conference, planning committee, 2015

Jim Holland Summer Enrichment Program Instructor, 2014-2017

University of Illinois Representative, Coweeta LTER graduate committee, 2012 – 2013

Reviewer for:

Nature  
 Global Change Biology  
 Science Advances  
 Biological Reviews  
 Journal of Ecology  
 Biogeochemistry  
 Plant and Soil  
 Scientific Data  
 Land Degradation and Development

Professional society membership:

Ecological Society of America, 2013 – present  
 American Geophysical Union, 2016, 2019 – present  
 Phi Beta Kappa, Zeta Chapter of Illinois, 2011

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**SELECTED PRESENTATIONS**


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Oral:

- Craig ME**, Mayes MA, Sulman BN, Walker AP. Microbial control over soil carbon saturation. 105<sup>th</sup> Annual Ecological Society of America meeting, August 2020
- Craig ME**, Beidler KV, Phillips RP. Microbial growth dynamics form a poor link between litter quality and mineral-associated organic matter formation. American Geophysical Union Fall Meeting, San Francisco, CA. December 2019.
- Craig ME**, Beidler KV, Phillips RP. Soil carbon formation and decay along an experimental litter chemistry gradient. 104<sup>th</sup> Annual Ecological Society of America meeting, Louisville, KY. August 2019.
- Craig ME**, Geyer KM, Brzostek ER, Phillips RP. Linking mycorrhizal associations with microbial growth and soil organic matter properties across temperate forests. 103<sup>rd</sup> Annual Ecological Society of America meeting, New Orleans, LA. August 2018.
- Craig ME**, Lovko NL, Flory SL, Wright JP, Phillips RP. Tree community modulates the effects of an invasive grass on soil organic matter pools. 6<sup>th</sup> International Symposium on Soil Organic Matter, Rothamsted Research, Harpenden, UK. September 2017. (*Awarded Best Student Talk*)
- Craig ME**, Turner BL, Bourg N, McShea B, Phillips RP. Higher carbon-to-nitrogen ratios in soils dominated by ectomycorrhizal-associated trees do not equate to greater soil carbon storage. 101<sup>st</sup> Annual Ecological Society of America meeting, Ft Lauderdale, FL. August 2016. (*Awarded Best Student Talk for Biogeosciences Section of ESA*)
- Craig ME**, Pearson SM, Fraterrigo JM. Grass invasion differentially affects carbon cycling across an urban-rural gradient in Southern Appalachian forests. 98<sup>th</sup> Annual Ecological Society of America meeting, Minneapolis, MN. August 2013.

Posters:

**Craig ME**, Turner BL, Liang C, Bourg N, McShea B, Phillips RP. Toward a Simple Framework for Understanding the Influence of Litter Quality on Vertical and Horizontal Patterns of Soil Organic Matter Pools. American Geophysical Union Fall Meeting, San Francisco, CA. December 2016.

**Craig ME**, Phillips RP. Do mycorrhizal associations influence landscape-scale soil C dynamics? A spatially explicit approach. 100<sup>th</sup> Annual Ecological Society of America meeting, Baltimore, MD. August 2015.

**Craig ME**, Pearson SM, Fraterrigo JM. Variation in carbon cycling impacts of an invasive grass (*Microstegium vimineum*) across an urban-rural gradient in Southern Appalachian forests. Long-Term Ecological Research – All Scientists Meeting. Estes Park, CO. September 2012.

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#### WORKSHOP ATTENDANCE

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“New Advances in Land Carbon Cycle Modeling”, Virtual Training Course, Center for Ecosystem Science and Society, Northern Arizona University, July 2020

“Fungal Communities and Soil Carbon Storage”, sponsored by the Energy Institute at the University of Michigan and the Beyond Carbon Neutral Program; Ann Arbor, MI; May 2018

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#### DATASETS

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**Craig ME**, Walker AP (2021) Microbial biomass in soils receiving varying levels of organic inputs - A data compilation. *Oak Ridge National Laboratory, TES SFA, U.S. Department of Energy, Oak Ridge, Tennessee, U.S.A.* <https://doi.org/10.25581/ornlfsa.021/1768047>

**Craig ME**, Walker AP (2021) Biological mechanisms may contribute to soil carbon saturation patterns: modeling archive. *Oak Ridge National Laboratory, TES SFA, U.S. Department of Energy, Oak Ridge, Tennessee, U.S.A.* <https://doi.org/10.25581/ornlfsa.022/1768048>

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