

# KAYLA C. MATHES, PH.D

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## RESEARCH AND ACADEMIC INTERESTS

Forest ecology, disturbance, climate and environmental policy, ecosystem resilience and stability, soil, carbon cycling.

## EXECUTIVE SUMMARY

I received my Ph.D. in May 2023 with 5 years of experience designing and executing field and lab research assessing the impacts forest disturbances on above and belowground carbon cycling stability. I have demonstrated my ability to publish and present this research with 11 peer-reviewed publications and 15 first-authored presentations at both national and international academic conferences. I have proven leadership skills, having served as president of my executive student board and mentored six REU (Research Experience for Undergraduates) fellows. During my graduate career, I received over \$25,000 from grants and won 9 separate awards.

## EDUCATION

**August 2018 – May 2023**

*GPA: 4.00/4.00*

**Ph.D, Integrative Life Sciences, VCU.**

**Advisor: Dr. Christopher Gough**

Dissertation title: *Patterns, Mechanisms, and Characterization of Carbon Cycling Stability Following Partial Forest Disturbance.*

**May 2018**

Graduated with highest honors

*GPA: 3.99/4.00*

**BS, Environmental Studies, University of Michigan (U of M) – Ann Arbor.** Concentration: Forest Ecology.

Senior Thesis title: *Impacts of forest vegetative barriers on deer herbivory.*

**May 2018**

Graduated with highest honors

*GPA: 4.00/4.00*

**BM, Cello Performance, School of Music, Theater & Dance, U of M – Ann Arbor.**

## PEER-REVIEWED RESEARCH

*In-prep*

**Mathes, KC**, Delany T, Nalliah L, Gough CM. Dynamic rhizosphere processes drive immediate soil respiration response to phloem-disruption. In prep for: *Frontiers in Forests and Global Change*

*In-prep*

Gough CM, Bond-Lamberty B, Fahey RT...**Mathes KC**...*Resist!* Sustaining forest carbon sequestration and wood production after insect disturbance. In prep for: *Frontiers in Ecology and Environment.*

- 2023** **Mathes, KC**, Pennington S, Rodriguez C, Bond-Lamberty B, Atkins JW, Vogel CS, Gough CM. Sustained three-year declines in forest soil respiration are proportional to disturbance severity. *Ecosystems* <https://doi.org/10.1007/s10021-023-00863-z>
- Atkins JW, Shiklomanov A, Mathes KC, Bond-Lamberty B, Gough CM. Effects of forest structural and compositional change on forest microclimates across a gradient of disturbance severity. *Agricultural and Forest Meteorology*. <https://doi.org/10.1016/j.agrformet.2023.109566>
- 2022** Crystal-Ornelas, R. Varadharajan, C. ... **Mathes KC** ... Pennington, SC., Robles, E. Data from: “Enabling FAIR data in Earth and environmental science with community-centric (meta)data reporting formats” ESS-DIVE. DOI: <https://doi.org/10.15485/1866606>
- Clippard EA, Haruna SI, Curtis PS, Clay C, Bond B, **Mathes KC**, Vogel CS, Gough CM. 2022. Decadal forest soil respiration following stem girdling. *Trees*. <https://doi.org/10.1007/s00468-022-02340-x>
- Dorheim K, Gough CM, Haber LT, **Mathes KC**, Shiklomanov AN, & Bond-Lamberty B. Climate drives modeled forest carbon cycling resistance and resilience in the Upper Great Lakes Region, USA. *Journal of Geophysical Research: Biogeosciences*. DOI: [10.1029/2021JG006587](https://doi.org/10.1029/2021JG006587)
- 2021** **Mathes KC**, Ju Y, Kleinke C, Oldfield C, Bohrer G, Bond-Lamberty B, Vogel CS, Dorheim K, and Gough CM. A multidimensional stability framework enhances interpretation and comparison of carbon cycling response to disturbance. *Ecosphere*. DOI: [10.1002/ecs2.3800](https://doi.org/10.1002/ecs2.3800)
- Gough CM, Bohrer G, Hardiman BS, Nave LE, Vogel CS, Atkins JW, Bond-Lamberty B, Fahey RT, Fotis AT, Grigri MS, Haber LT, Ju Y, Kleinke CL, **Mathes KC**, Nadelhoffer KJ, Stuart-Haentjens EJ, and Curtis PS. Disturbance-accelerated succession increases the production of a temperate forest. *Ecological Applications*. DOI: <https://doi.org/10.1002/eap.2417>
- Bond-Lamberty B, Christianson DS, Crystal-Ornelas R, **Mathes KC**, and Pennington SC. A reporting format for field measurements of soil respiration. *Ecological Informatics* DOI: [10.1016/j.ecoinf.2021.101280](https://doi.org/10.1016/j.ecoinf.2021.101280)
- Atkins JW, Agee E, Barry A, Dahlin KM, Dorheim K, Grigri MS, Haber LT, Hickey LJ, Kamoske AG, **Mathes KC**, McGuigan C, Paris E, Pennington SC, Rodriguez C, Shafer A, Shiklomanov A, Tallant J, Gough CM, and Bond-Lamberty B. The *fortedata* R package: open-science datasets from a manipulative experiment testing forest resilience, *Earth Syst. Sci. Data*. DOI: <https://doi.org/10.5194/essd-13-943-2021>

Gough CM, Atkins JW, Bond-Lamberty B, Agee EA, Dorheim KR, Fahey RT, Grigri MS, Haber LT, **Mathes KC**, Pennington SC, Shiklomanov AN, and Tallant JM. Forest structural complexity and biomass predict first-year carbon cycling responses to disturbance. *Ecosystems*. DOI: <https://doi.org/10.1007/s10021-020-00544-1>

**2020** Bond-Lamberty B, Christianson DS, Malhotra A, ..., **Mathes KC**, ... et al. COSORE: A community database for continuous soil respiration and other soil-atmosphere greenhouse gas flux data. *Global Change Biology*. DOI: <https://doi.org/10.1111/gcb.15353>

## **EMPLOYMENT**

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**2023 – 2024** *Laboratory Research Consultant:* Dr. Chris Gough's Lab at VCU. Assisted with ongoing research, publications and summer field work at the Rice River Center at VCU as well as mentored undergraduate students on lab-related projects.

**2020 – 2022** *Graduate Teaching Assistant (GTA):* VCU Biology Department: Fall 2020: taught Biology 151, Introductory Biology Lab for majors. Spring 2021-2022: taught Biology 317, Ecology Field Laboratory + writing intensive course.

**2018 – 2020** *Graduate Research Assistantship (GRA):* VCU Biology Department in conjunction with the National Science Foundation funded grant (Award # 1655095), Forest Resilience Threshold Experiment (FoRTE) conducted at the University of Michigan Biological Station (UMBS).

**2018** *Laboratory Assistant:* Dr. Donald R. Zak's Soil and Microbial Ecology Lab at the U of M School of Environment and Sustainability. Assisted with various plant and fungal chemical and molecular analyses (e.g. PCR, C:N ratios, Ph, assays, culturing), set up lab work and graded papers for 400 level soil ecology course.

**2017-2018** *Undergraduate Teaching Assistant:* UMBS: Assisted and co-taught Forest Ecosystems 348, a 5 week summer course. Co-designed curriculum, and co-led instruction and field labs with the professor, Dr. Jill Witt.

**2016-2017** *Peer tutor & study group facilitator:* U of M Science Learning Center. Led group study sessions, held office hours and privately tutored peers for Introduction to Biology and Evolutionary Ecology 117.

## **HONORS, AWARDS & GRANTS**

- 2023** (\$9,375) Dissertation Assistantship Award, Graduate School, VCU.
- 2022** Outstanding PhD Student Award, Biology Department, VCU.  
  
(\$5,000) Thomas F. Huff Life Sciences PhD Student Research Fellowship, VCU.  
  
(\$2,576) Marian P. & David Gate Graduate Student Endowment Fund Fellowship, University of Michigan Biological Station.
- 2021** (\$2,312) Marian P. & David Gate Graduate Student Endowment Fund Fellowship, University of Michigan Biological Station.  
  
(\$200) Winner of Outstanding Student Presentation Competition, North American Carbon Program 7<sup>th</sup> Annual Meeting.  
  
(\$1,184) Voices for Science Program Grant, American Geophysical Union.
- 2020** Honorable Mention, Graduate Research Fellowship Program (GRFP), National Science Foundation.
- 2019-2020** (\$4,721) Dr. Henry A. Gleason Graduate Student Fellowship, University of Michigan Biological Station.
- 2013-2017** University Honors (GPA > 3.5), University of Michigan – Ann Arbor.
- 2014-2017** James B. Angell Scholar (Two consecutive terms of all As), University of Michigan – Ann Arbor.
- 2014** William J. Branstorm Freshman Prize: Awarded to top 5% of freshmen class. University of Michigan – Ann Arbor.

## **ORAL PRESENTATIONS**

- 2022** **Mathes KC**, Delaney T, Nalliah L, Gough CM. Immediate Rhizosphere Carbon and Nitrogen Cycling Response to Phloem-disrupting Disturbance. American Geophysical Union Fall Meeting 2022, Session GC26D “Land Biogeochemical Cycling Under Global Environmental Change: Patterns, Drivers, and Mechanisms.” December 13, 2022. *In-person*.
- Mathes KC**, Haber LT, Niedermaier K, Gough CM, Integrating divergent above- and belowground carbon flux response to rising disturbance severity: Four years of FoRTE. University of Michigan Biological Station Winter Research Meeting 2022, “Graduate Student Research Symposium”, January 14, 2022. *Virtual. Team talk*.

**2021**

Haber LT, **Mathes KC**, Atkins JW, Bond-Lamberty B, and Gough CM. Integrating divergent above- and belowground carbon flux responses to rising disturbance severity. Co-led talk for the American Geophysical Union Fall Meeting 2021, Session B52B, “Forest Disturbance and Resulting Changes in structure, Composition, and Biogeochemistry II,” December 17, 2021. *Virtual. Team talk.*

Gough CM, Bohrer G, Clay C, ... **Mathes KC**, and Curtis PS. Promoting forest carbon cycling resilience to disturbance: Lessons learned and management recommendations from the US-UMB and -UMd AmeriFlux sites. AmeriFlux 2021 Annual Meeting, “Natural Climate Solutions” Session, September 21, 2021. *Virtual. Team Talk.*

**Mathes KC**, Ju Y, Oldfield CA, Bohrer G, Vogel CS, Bond-Lamberty B, and Gough CM. A multidimensional framework enhances interpretation and comparison of carbon cycling response to disturbance. North American Carbon Program 7<sup>th</sup> Open Science Meeting in “Next-Gen Data Management, Syntheses, and Products” session, March 7<sup>th</sup>, 2021. *Virtual.*

**Mathes KC**. A multidimensional framework enhances interpretation and comparison of carbon cycling response to disturbance. University of Michigan Biological Station Winter Research Meeting 2021, “Graduate Student Research Symposium”, February 4, 2021. *Virtual.*

**2020**

**Mathes KC**. Belowground carbon cycling resistance to forest disturbance. Integrative Life Sciences PhD Program’s Spring Research Symposium, VCU. February 27<sup>th</sup>, 2020. *In-person.*

**Mathes KC**, Grigri MS, Clay C, Gough CM. Gough Lab UMBS Research Updates 2020 (FoRTE, FASET & LTREB). University of Michigan Biological Station Winter Research Meeting 2020, “Graduate Student Research Symposium”, February 7<sup>th</sup>, 2020. *In-person. Team Talk.*

**2019**

**Mathes KC**, Gough CM. FASET Results: Soil respiration resistance and resilience following moderate disturbance. University of Michigan Biological Station Winter Research Meeting 2019, “Graduate Student Research Symposium”, February 4<sup>th</sup>, 2019. *In-person.*

**2018**

**Mathes KC**, Witt J. The potential for braken fern (*Pteridium aquilinum*) to provide a barrier against deer herbivory in Northern Michigan Temperate Forests. University of Michigan, Program in the Environment “Senior Honor Thesis Symposium”, April 27<sup>th</sup>, 2018. *In-person.*

## **POSTER PRESENTATIONS**

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- 2022**      **Mathes KC**, Haber LT, Johnson A, Grigri MS, Niedermaier K, Atkins J, Bond-Lamberty B, Gough CM. Forest carbon cycling across a disturbance severity gradient: Forest Resilience Threshold Experiment. “Autumn School: Thinking Community Ecology in the Anthropocene”. Université Grenoble Alpes (UGA), Laboratoire d’Écologie Alpine, November 14-18, Grenoble, France. *In-person*.
- 2021**      **Mathes KC**, Haber LT, Atkins J, Bond-Lamberty B, Gough CM, Unraveling mechanisms underlying coupled above and belowground carbon flux responses to increasing disturbance. Session B55A-1194 Forest Disturbance and Resulting Changes in Structure, Composition, and biogeochemistry III. American Geophysical Union Fall Meeting 2021, December 13-17, New Orleans, LA. *In-person*.
- Mathes KC**, Ju Y, Kleinke C, Oldfield C, Bohrer G, Bond-Lamberty B, Vogel CS, Dorheim K, and Gough CM. A multidimensional framework enhances interpretation of carbon cycling stability following disturbance. VCU, Integrative Life Sciences PhD Program’s Spring Research Symposium, February 24, 2021. *Virtual*.
- 2020**      **Mathes KC**, Ju Y, Kleinke C, Oldfield C, Bohrer G, Bond-Lamberty B, Vogel CS, Dorheim K, Gough CM. A multidimensional framework enhances interpretation of carbon cycling stability following disturbance. Session B064-0022A Forest Disturbance in the Context of Shifting Climate: Understanding Disturbance and Their Interactions As Agents of Forest Change II. American Geophysical Union Fall Meeting 2020, December 1-17, 2020. *Virtual*.
- Mathes KC**, Ju Y, Bohrer G, Bond-Lamberty B, Vogel CS, Gough CM. US-UM“d” is for disturbance: A framework for interpreting carbon cycling stability following disturbance. AmeriFlux 2020 Annual Meeting, October 6-8, 2020. *Virtual*.
- 2019**      **Mathes KC**, Rodriguez C, Pennington SC, Bond-Lamberty B, Gough CM. Soil respiration across a disturbance severity gradient: Assessing thresholds of belowground carbon cycling resistance. B13K-2620 Observing and Modeling the Influence of Disturbance on Ecological, Biogeochemical, and hydrological Processes: Toward a Predictive Understanding II. American Geophysical Union Fall Meeting 2019, December 9-13, 2019, San Francisco, CA. *In-person*.
- 2017**      **Mathes KC**, Morris J, Perfecto I. Local coffee farm intensification impacts on ant community composition and biological control in Chiapas, Mexico. Association for Tropical Biology & Conservation Annual Meeting 2017, July 11-17, 2017, Merida, Mexico. *In-person*.

## **RELEVANT CO-AUTHORED PRESENTATIONS**

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**2022**

*American Geophysical Union Fall Meeting 2022, December 12-16, Chicago, IL, USA.*

Delaney T, Nalliah L, **Mathes KC**, Bertman S, Gough CM. “Non-structural Carbohydrate Dynamics Regulate Soil Respiration Following Phloem-Girdling”: GC26D: Land Biogeochemical Cycling Under Global Environmental Change: Patterns, Drivers, and Mechanisms II. Poster presentation. *In-person*.

Nalliah L, Delaney T, **Mathes KC**, Gough CM “Linking nitrogen cycling with forest soil respiration following a simulated insect disturbance”. GC26D: Land Biogeochemical Cycling Under Global Environmental Change: Patterns, Drivers, and Mechanisms II. Poster Presentation. *In-person*.

Gough CM, **Mathes KC**, Haber LT, Bond-Lamberty B, Dorheim K, Niedermaier K, Clay C. “Cellular to ecosystem processes drive forest carbon cycling resistance to increasing disturbance severity”. B52B: Forest Ecophysiology: Forest Physiological and Ecological Processes from Molecules to Ecosystems I, Oral presentation. *Virtual*.

**2021**

*American Geophysical Union Fall Meeting 2021, December 13-17, New Orleans, LA.*

Dorheim K, Bond-Lamberty B, Gough CM, Haber LT, **Mathes KC**, Shiklomanov AN, Modeling FoRTE, the Forest Resilience Threshold Experiment. Oral presentation. *Virtual*.

Gough, CM, Atkins J, Bond-Lamberty B, Clay C, Niedermaier K, Dorheim K, Fahey RT, Grigri MS, Haber LT, **Mathes KC**, Pennington SC, Shiklomanov AN, Tallant J. Divergent patterns of forest carbon uptake and loss stabilize net carbon balance as disturbance severity increases. Oral presentation. *Virtual*.

**2020**

*American Geophysical Union Fall Meeting 2020, December 1-17, Online:*

Gough CM, Bond-Lamberty B, Nave LE, ..., **Mathes KC**, ..., Hardiman B, Bohrer G. Dynamic mechanisms support forest carbon cycling stability following disturbance. Oral Presentation. *Virtual*.

**2019**

*American Geophysical Union Fall Meeting 2019, December 9-13, San Francisco, CA:*

Gough CM, Atkins J, Bond-Lamberty B, Shiklomanov AN, Grigri MS, Haber LT, **Mathes KC**, Barry A, Hickey LJ, Shafer A. Does canopy structure affect carbon cycling resistance to disturbance?: Insights from an ecosystem experiment. Oral Presentation. *In-person*.

Bond-Lamberty B, Gough CM, Shiklomanov AN, Atkins J, Haber LT, **Mathes KC**, Grigri MS, Tallant J, Kamoske A, Dahlin K. Linking field model, and remote sensing methods to understand when tree mortality breaks the forest carbon cycle. Oral Presentation. *In-person*.

Agee E, Atkins J, Gough CM, Bond-Lamberty B, **Mathes KC**, Matheny AM, Ivanov VY. Below-ground structural and ecohydrological feedbacks across disturbance severity gradients. Oral Presentation. *In-person*.

## **LEADERSHIP EXPERIENCES**

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**2022**

*Host and Organizer*, Integrative Life Sciences Student Organization (ILSSO) Spring Research Symposium, 2022. Hosted and organized all presenters, judges and attendees for an all-day research showcase with 20 PhD student presenters and 75+ attendees. VCU's President Michael Rao was in attendance.

**2021- 2022**

*President*, Integrative Life Sciences Student Organization (ILSSO), PhD program, VCU. Elected to led four Executive Board meetings each semester, organized social, academic and outreach events, served as official spokesperson for ILSSO between the university administration and the 50 + graduate student members from 10 different university departments.

**2021**

*Session co-chair*, AGU Fall Meeting, 2021. Facilitated hybrid (in-person and online) oral session: "Forest Disturbance and Resulting Changes in structure, Composition, and Biogeochemistry II."

*Moderator and host*, "Early Career Science Communication + Advocacy Panel", UMBS. Recruited four graduate student panelist and designed and moderated discussion about the future role of science communication and advocacy at our research station.

*Host and designer*, Integrative Life Sciences Virtual Spring Symposium, 2021. Designed and hosted a virtual conference with 40 participants and 75 attendees on "Gather", a virtual interactive conferencing program with real time poster and oral sessions.

**2020-2021**

*Treasurer*, Integrative Life Sciences Student Organization (ILSSO), PhD program, VCU. Elected to managed annual budget, filed expense reports and reimbursement requests for the Executive Board.



**2019** *Session co-chair*, AGU Fall Meeting, 2019. Assisted in organizing, recruited invited speaker and facilitated oral session for “Observing and modeling the influence of disturbance on ecological, biogeochemical, and hydrological processes: Toward a predictive understanding.”

## **MENTORING EXPERIENCES**

**2023** *Co-Advisor*, UMBS & VCU, served as mentor for Research Experience for Undergraduates (REU, National Science Foundation, NSF) participant Sona Sunil.

**2022** *Primary Advisor*, UMBS. served as primary mentor for *two* Research Experience for Undergraduates (REU, National Science Foundation, NSF) participants, Tatum Delaney and Lisa Nalliah.

**2021** *Co-Advisor*, UMBS. Served as graduate student assistant mentor, along with Dr. Chris Gough, for a Research Experience for Undergraduates (REU, NSF) participant, Leah Capili.

**2020** *Co-Advisor*, UMBS. Served as graduate student assistant mentor, along with Dr. Chris Gough, for a Research Experience for Undergraduates (REU, NSF) participant, Elizabeth Clippard.

**2019** *Co-Advisor*, UMBS. Served as graduate student assistant mentor, along with Dr. Chris Gough, for a Research Experience for Undergraduates (REU, NSF) participant, Carly Rodriguez.

## **INTERSHIPS, PROFESSIONAL NETWORKS & OTHER EXPERIENCES**

**2022** *Cohort member*, Local Science Partners Program 2022, American Geophysical Union (AGU). Building relationships with local legislators with the goal of advocating and advancing AGU’s science policy agenda. Received training on how to effectively communicate with policymakers and their staff on science policy issues.

**2021-2022** *Cohort member*, Voices for Science Program – Science Policy Track, American Geophysical Union (AGU). Selected to be a part of a network of scientists learning how to engage with science policy. Received training from staff and completed one science policy related action every month for a year, including hosting meetings with staff members of Congressman McEachin and Senator Kaine on increasing federal funding for science agencies in FY2022.

*Intern*, Virginia League of Conservation Voters. Worked with the communications team to build a Student Voter Education Guide for the Virginia 2021 primary elections. Emphasized messaging on building trust within the community and making non-partisan voting information easily accessible to young and first-time voters.

- 2021** *Cohort member*, Foundations of Open Science Skills, CyVerse. Completed a 10 week introduction to open science course. Learned how to use current software and platforms to produce and use findable, accessible, interoperable and reusable data (e.g. github, command line, containers).
- 2016-2017** *Laboratory Assistant*, Dr. Ivette Perfecto's Agroecology Lab in the School of Environment and Sustainability, U of M. Identified, cataloged and analyzed arthropod samples from a biological pest control experiment on an organic coffee farm in Chiapas, Mexico.

## **OUTREACH & VOLUNTEERING**

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- 2022** *Student host*, University Regents site visit to UMBS. Invited to speak about my research at UMBS and give a site tour for the University Regents, Executives and press.
- 2019-2020** *Panelist*, "Graduate Student Panel" for Research Experience for Undergraduates (REU) program, UMBS.
- 2020** *Guest lecturer*, Introductory Biology for non-majors, VCU. Invited to give a joint seminar on topics of forest disturbance, carbon cycling and global change biology for an introductory college course with 100 + attendees.
- 2019** *Guest instructor*, Field Biology course, Collegiate High School, Richmond, VA. Invited to lead a field lab trip to discuss forest disturbance and succession with high school juniors/seniors.
- 2017** *Invited alumni lecturer*, Earth Week Symposium, Bosque Preparatory School, Albuquerque, NM. Invited to speak about importance of science + art collaboration in context of youth climate change advocacy.
- 2015-2017** *Lead Volunteer*, Huron River Watershed Council, Ann Arbor, MI. Led and taught team of volunteers with the water quality monitoring program.

## **PRESS**

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["Putting science on the ballot," VCU News Article, June 2<sup>nd</sup>, 2021.](#)

["A VCU-led experiment will improve forecasts of how the forest carbon cycle responds to disturbances — a key question for climate change," VCU News Article, September 2<sup>nd</sup>, 2020.](#)

["MC<sup>2</sup>: Michigan and the Climate Crisis. The University Confronts the Future," School of Environment and Sustainability, University of Michigan, October 2, 2017.](#)

## **PROFESSIONAL NETWORK MEMBERSHIPS**

American Geophysical Union; Ecological Society of America; National Science Policy Network; Phi Beta Kappa Society.

## **REFERENCES**

Christopher Gough, Ph.D. (Doctoral Advisor)

Title: Associate Professor

Institution: Virginia Commonwealth University, Department of Biology

Email: [cmgough@vcu.edu](mailto:cmgough@vcu.edu) : Phone: (804) 827-8596

Ben Bond-Lamberty, Ph.D. (Doctoral committee member)

Title: Research Scientist

Institution: Joint Global Change Research Institute (collaboration between DOE Pacific Northwest National Laboratory and the University of Maryland, College Park)

Email: [BondLamberty@pnnl.gov](mailto:BondLamberty@pnnl.gov) : Phone: (301) 314-6759

Jill Witt, Ph.D. (Undergraduate research advisor)

Title: Associate Professor

Institution: University of Michigan-Flint

Email: [wittjill@umich.edu](mailto:wittjill@umich.edu) : Phone: (810) 766-6733