

# KATHRYN DARIA SZERLAG

Assistant Professor of Soil and Water Chemistry  
Texas A&M University

kate.szerlag@ag.tamu.edu

## EDUCATION

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<b>PhD</b>	University of Delaware, Plant and Soil Sciences Dissertation: <i>Advances in the use of synchrotron-based radiation for spatially-resolved imaging and spectroscopy to speciate phosphorus in agricultural soils</i>	2021
<b>MS</b>	University of Massachusetts, Amherst, Environmental Conservation Concentration in Water, Wetlands, and Watersheds Thesis: <i>Specific phosphate sorption mechanisms of unaltered and altered biochar</i>	2016
<b>BS</b>	University of Massachusetts, Amherst, Environmental Science	2013
<b>AA</b>	Quinsigamond Community College, General Studies	2011

## WORK EXPERIENCE

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**Texas A&M University**, College Station, Texas  
**Assistant Professor** of Soil and Water Chemistry August 2023 - Present

**Westfield State University**, Westfield, Massachusetts  
**Assistant Professor** of Environmental Science September 2020 – August 2023

- Taught 12 credits per semester
- Developed the Environmental Soil Science course and lab
- Developed the Environmental Chemistry, Toxicology, and Pollution course
- Instructor of four courses, multiple semesters each
  - Principles of Environmental Science
  - Environmental Soil Science, with lab.
  - Environmental Chemistry, Toxicology, and Pollution
- Advised 17 undergraduate students per year

**University of Massachusetts**, Amherst, Massachusetts  
**Adjunct Professor**, Stockbridge School of Agriculture Summer 2022

- Taught Agricultural Soil Chemistry

## MANUSCRIPTS AND PUBLICATIONS

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1. **Szerlag, K.D.**, Elavarthi, M., Siebecker, M.G., Gu, C., McCrone, C., Sparks, D.L. (2022). Systematic study of legacy phosphorus (P) desorption mechanisms in high-P agricultural soils. *Minerals* 12 (4), 458. <https://doi.org/10.3390/min12040458>
2. Wang, L., Chen, G., Ling, C., Zhang, J., and **Szerlag, K.D.** (2017). Adsorption of ciprofloxacin on to bamboo charcoal: Effects of pH, salinity, cations, and phosphate. *Environmental Progress and Sustainable Energy*, 36(4), 1108–1115. <https://doi.org/10.1002/ep.12579>
3. **Szerlag, K.D.**, M.G. Siebecker, F. Izaditame, P. Northrup, R. Tappero, D.L. Sparks. Multi-modal, micro-spectroscopic speciation of legacy phosphorus in two U.S. mid-Atlantic agricultural soils. *In preparation for SSSAJ*.
4. **Szerlag, K.D.**, P. Northrup, R. Tappero, and D.L. Sparks. A multi-modal investigation of mounting techniques for soil P determination via  $\mu$ -XRF and  $\mu$ -XANES. *In preparation for SSSAJ*.
5. **Szerlag, K.D.**, F. Izaditame, P. Northrup, R. Tappero, M.G. Siebecker, D.L. Sparks. Phosphorus solid phase speciation and Hedley sequential extraction residues: using  $\mu$ -XRF mapping and  $\mu$ -XANES to speciate P in agricultural soils. *In preparation for Science of the Total Environment*.

## INVITED PRESENTATIONS

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1. **Kathryn D. Szerlag**. 2021. Advances in the use of synchrotron-based radiation for spatially-resolved imaging and spectroscopy to speciate phosphorus in soils. SAC review for the Beamline 8-BM (TES), Brookhaven National Lab, Upton, NY, USA, September 15. (*Invited Oral*)
2. **Szerlag, K.D.**, P. Northrup, R. Tappero, M.G. Siebecker, D.P. Jaisi, D.L. Sparks. 2019. The Solid Phase Speciation of Legacy Phosphorus in US Mid-Atlantic Agricultural Soils Using  $\mu$ -XRF Mapping and  $\mu$ -XANES. The University of Torino, Torino, Italy, August 27. (*Invited Oral*)

## OTHER PRESENTATIONS

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1. **Szerlag, K.D.**, Elavarthi, M., Siebecker, M.G., Gu, C., McCrone, C., Sparks, D.L. 2022. Systematic study of legacy phosphorus (P) desorption mechanisms in high-P agricultural soils. ASA-CSA-SSSA International Meeting. Baltimore, Maryland, November 9-9. (Poster)
2. **Szerlag, K.D.** 2022. Tackling eutrophication using synchrotron-based radiation to determine phosphorus types in agricultural soils. Biology and Environmental Science Seminar Series. Westfield State University, Westfield, MA. April 22, 2022. (Oral)
3. **Szerlag, K.D.**, P. Northrup, R. Tappero, M.G. Siebecker, and D.L. Sparks. 2021. Advances in the use of synchrotron-based radiation for spatially-resolved imaging and spectroscopy to speciate phosphorus in soils. ASA-CSA-SSSA International Meeting. Salt Lake City, Utah, November 7-10. (Oral)
4. Elavarthi, M., **K.D. Szerlag**, D.L. Sparks. 2020. Legacy phosphorus characterization and desorption of U.S. Mid-Atlantic agricultural soils. University of Delaware Summer Research Symposium, Newark, DE, USA, August. (Poster)
5. Elavarthi, M., **K.D. Szerlag**, D.L. Sparks. 2020. Legacy phosphorus desorption from US Mid-Atlantic agricultural soils. DENIN Spring Undergraduate Research Symposium,

Newark, DE, USA, April 17. <https://www.denin.udel.edu/wp-content/uploads/2020/05/Legacy-phosphorus-desorption-from-U.S.-Mid-Atlantic-agricultural-soils-Poster.pdf> (Poster)

6. \***Szerlag, K.D.**, Izaditame, F., P. Northrup, R. Tappero, M.G. Siebecker, D.P. Jaisi, D.L. Sparks. 2020. Speciation of legacy P in soils using multi-modal  $\mu$ -XRF mapping and  $\mu$ -XANES. ACS Spring National Meeting, Philadelphia, PA, USA, March 22-26. (Oral)
7. \*Elavarthi, M., **K.D. Szerlag**, D.L. Sparks. 2020. Legacy phosphorus desorption from US Mid-Atlantic agricultural soils. ACS Spring National Meeting, Philadelphia, PA, USA, March 22-26. (Poster)
8. Elavarthi, M., **K.D. Szerlag**, D.L. Sparks. 2020. Legacy phosphorus desorption from US Mid-Atlantic agricultural soils. DENIN Graduate Student Research Symposium in Newark, Delaware, USA, March 5. (Poster, winner)
9. **Szerlag, K.D.**, Izaditame, F., P. Northrup, R. Tappero, M.G. Siebecker, D.P. Jaisi, D.L. Sparks. 2019. Phosphorus solid phase speciation and Hedley sequential extraction residues: using multi-modal  $\mu$ -XRF mapping and  $\mu$ -XANES to speciate legacy P in agricultural soils. ASA-CSA-SSSA National Meeting. San Antonio, TX, November 10-13. (Oral)
10. **Szerlag, K.D.**, P. Northrup, R. Tappero, M.G. Siebecker, D.P. Jaisi, D.L. Sparks. 2019. Direct detection of solid-phase phosphorus speciation in agricultural soils using paired  $\mu$ -XRF mapping and  $\mu$ -XANES. Goldschmidt. Barcelona, Spain, August 17-23. (Oral and Poster)
11. Elavarthi, M., **K.D. Szerlag**, D.L. Sparks. 2019. Legacy phosphorus desorption and  $\mu$ XANES speciation from US Mid-Atlantic agricultural soils. DENIN Scholars Summer Undergraduate Research Symposium, Newark, Delaware, USA, August 15. (Poster)
12. McCrone, C., **K.D. Szerlag**, D.L. Sparks. 2019. Investigation of the Hedley sequential extraction in the identification of phosphorus pools and mobility in agricultural soils. DENIN Scholars Spring Undergraduate Research Symposium, Newark, Delaware, USA, May 10. (Poster)
13. **Szerlag, K.D.**, P. Northrup, R. Tappero, M.G. Siebecker, D.P. Jaisi, D.L. Sparks. 2019. The Solid Phase Speciation of Legacy Phosphorus in U.S. Mid-Atlantic Agricultural Soils Using  $\mu$ -XRF Mapping and  $\mu$ -XANES. Delaware Environmental Institute Graduate Student Research Symposium in Newark, Delaware, March 7. (Poster)
14. **Szerlag, K.D.**, P. Northrup, R. Tappero, M.G. Siebecker, D.P. Jaisi, D.L. Sparks. 2019. The Solid Phase Speciation of Legacy Phosphorus in US Mid-Atlantic Agricultural Soils Using Micro-XRF Mapping and Micro-XANES. Soil Science Society of America annual meeting, San Diego, CA, Jan 6-9. (Oral)
15. **Szerlag K.D.**, M.G. Siebecker, D. Jaisi, P. Northrup, D.L. Sparks. 2018. The chemistry of legacy phosphorus in US Mid-Atlantic agricultural soils. 21st World Congress of Soil Science. Rio de Janeiro, Brazil, August 12-17. (Poster)
16. Elavarthi, M., **K.D. Szerlag**, D.L. Sparks. 2018. Legacy phosphorus desorption from U.S. Mid-Atlantic agricultural soils. DENIN Scholars Summer Undergraduate Research Symposium, Newark, Delaware, USA, August 9. (Poster)
17. **Szerlag, K.D.**, P. Northrup, M.G. Siebecker, D.P. Jaisi, D.L. Sparks. 2018. Legacy phosphorus speciation in US Mid-Atlantic agricultural soils using tender energy X-ray absorption spectroscopy (TES). The National Synchrotron Light Source II (NSLS-II) and Center for Functional Nanomaterials (CFN) Users' Meeting, Brookhaven National Laboratory, New York, May 21-23. (Poster)

18. Northrup P., R. Tappero, G. Flynn, S. Wirick, **K.D. Szerlag**, D. Sparks, S. Gill, M. Schoonen. 2018. Tender energy imaging and spectroscopy at TES (8-BM). The National Synchrotron Light Source II (NSLS-II) and Center for Functional Nanomaterials (CFN) Users' Meeting, Brookhaven National Laboratory, New York, May 21-23. (Poster)
  19. **Szerlag K.D.**, M.G. Siebecker, D. Jaisi, P. Northrup, D.L. Sparks. 2018. The chemistry of legacy phosphorus in US Mid-Atlantic agricultural soils. University of Delaware College of Agriculture and Natural Resources Research Symposium. Newark, Delaware, April 30. (Poster)
  20. **Szerlag, K.D.**, Gamble, A.V., Northrup, P., Shoer, A., Jaisi, D., and Sparks, D.L. Elucidation of legacy phosphorus speciation in Delmarva soils using synchrotron-based techniques, presented at the 2017 Delaware Environmental Institute Graduate Student Research Symposium in Newark, Delaware, March 16, 2017. (Poster).
  21. **Szerlag, K.D.**, and Sparks, D.L. How safe is your water? Understanding the environmental impact of phosphorus, presented at the Delaware Environmental Institute Pitch:90 Elevator Speech Competition. November 16, 2016. (Oral).
- \*Accepted, but canceled due to Covid-19

## RESEARCH EXPERIENCE

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### **Current Research**, *Effects of sulfate on phosphate adsorption and desorption in high legacy P agricultural soils*

- Completed adsorption and desorption experiments using sulfate to investigate phosphate release from high legacy P agricultural soils
- Analyzed the solid phase using advanced, synchrotron based microspectroscopic techniques including micro X-ray fluorescence ( $\mu$ -XRF) mapping and micro X-ray absorption near edge structure ( $\mu$ -XANES) using the National Synchrotron Light Source II (NSLS II) beamline 8-BM (TES)
- Several beamtrips to the National Synchrotron Light Source II

### **Ph. D. Dissertation**, *Advances in the use of synchrotron-based radiation for spatially-resolved imaging and spectroscopy to speciate phosphorus in agricultural soils*

University of Delaware

Advisor: Donald L. Sparks

- Link to dissertation <https://udspace.udel.edu/handle/19716/29045>
- Numerous beamtrips to U.S. synchrotrons including the National Synchrotron Light Source II (NSLS II) and the Stanford Synchrotron Radiation Lightsource (SSRL)
- Specialized in tender energy spectroscopy (2-5.5 keV)  $\mu$ -XRF mapping and  $\mu$ -XANES spectroscopy of high legacy P agricultural soils at NSLS II beamline 8-BM (TES)
- Collected  $\mu$ -XRF maps at the hard energy (4-20 keV) on the X-ray fluorescence microprobe (XFM) beamline 4-BM at NSLS II and matched them with their corresponding tender element soil maps
- Collected P K-edge XANES at SSRL beamline 14-3
- Completed several desorption kinetics, sequential extractions, and physicochemical characterizations of soils throughout the Delmarva
- Synchrotron data analysis using Athena
- Software used for additional data analysis include Microsoft Excel, SigmaPlot, Origin, and Igor

**M. S. Thesis, *Specific phosphate sorption mechanisms of altered and unaltered biochar***

University of Massachusetts, Amherst

Advisor: Baoshan Xing

- Chemically engineered biochar to adsorb phosphate
- Completed the physicochemical characterization of the biochar along with phosphate adsorption kinetics and isotherms
- Used the scanning electron microscope (SEM) to image biochar and X-ray diffraction (XRD) to determine crystallinity of the engineered biochar

**ADDITIONAL TEACHING AND MENTORSHIP**

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**University of Massachusetts, Amherst, Amherst, Massachusetts**

**Teaching Assistant, Stockbridge School of Agriculture**

Introductory Soil Science Fall 2014, Spring 2015, and Fall 2015

- Independently taught 1-2 lab sections per semester
- Taught 10-20 students per lab section
- Graded all lab exercises and lecture exams
- Helped tutor students

Organic Gardening and Farming Spring 2016

- Set up lab experiments for classes of 20-30 students
- Assisted professor during lab sections to guide students through experiments
- Started several varieties of plants from seed in an organic amendment pot study
- Taught one lecture course on light

**University of Massachusetts, Amherst, Amherst, Massachusetts**

**Teaching Assistant, Department of Environmental Science**

Career and Curriculum Planning Seminar Spring 2014

- Graded assignments

Introduction Environmental Science Seminar 2 Spring 2014

- Graded assignments

Introduction Environmental Science Seminar 1 Fall 2013, Fall 2014

- Graded assignments

Environmental Soil Science Fall 2013

- Assisted the professor on class fieldtrips around the Pioneer Valley
- Graded assignments and exams

**Undergraduate Mentees**

Monica Elavarthi Summer 2018-2020

*Two-time DENIN Summer Scholar Intern*

- Working on characterizing the legacy phosphorus availability from various Delmarva high P agricultural soils using desorption kinetics with various desorbing agents
- Assisted in the collection of  $\mu$ -XRF maps and  $\mu$ -XANES of soils at the National Synchrotron Light Source II
- Successfully completed many desorption experiments and data analysis.
- Two undergraduate research poster presentations.

Conner McCrone

Winter and Spring 2019

*WiCCED Academic Year Scholar Intern*

- Worked on investigating the general phosphorus pools in various Delmarva soils using the Hedley sequential extraction for phosphorus fractionation
- Successfully completed a literature review, many sequential extraction experiments, and data analysis
- One undergraduate research poster presentation

Alex Liquori

2015-2016 academic year

- Completed undergraduate senior thesis on phosphate adsorption onto biochar
- Successfully completed adsorption kinetics, adsorption isotherms, and data analysis
- One undergraduate poster presentation.

James Goodwin

Summer 2015

- Learned how to make biochar to tailor it to his needs
- Successfully used the biochar to adsorb organic contaminants

### **Certifications, Courses, and Workshops**

Westfield State University Professional Development Days

Mini-Conference. Westfield, Massachusetts.

May 22 – 24, 2023

Westfield State University Professional Development Workshop

Scaffolding in COVID Times: Elevating Student Achievement  
Workshop. Westfield, Massachusetts

August 30, 2021

Westfield State University Professional Development Workshop

Cultivating a sense of belonging among BIPOC and first-generation multilingual students  
Workshop. Westfield, Massachusetts

August 31, 2021

Center for Teaching and Assessment of Learning (CTAL)

First Friday Roundtable: Documenting Your Teaching for Promotion and Tenure  
Workshop. Newark, Delaware

February 28, 2020

Center for Teaching and Assessment of Learning (CTAL)

First Friday Roundtable: Testing Tools and Environments that Foster Integrity  
Workshop. Newark, Delaware

February 14, 2020

Center for the Integration of Research, Teaching, and Learning (CIRTL)

Associate Certificate

December 2018

Summer Institute of Teaching (SIT)

Workshop. Newark, Delaware

May 30-31, 2018

Center for Teaching and Assessment of Learning (CTAL)

First Friday Roundtable: How can self-care help me become a mindful instructor  
Workshop. Newark, Delaware

May 4, 2018

Teaching as Research (TAR)

Documenting your teaching effectiveness  
Workshop. Newark, Delaware.

May 3, 2018

UNIV600: Learning (course)

University of Delaware

Spring 2018

UNIV601: Pedagogy (course)

**PROFESSIONAL POSITIONS**

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University of Massachusetts, Amherst Soil and Plant Tissue Testing Laboratory Laboratory assistant	2011-2015
University of Massachusetts, Amherst, Cranberry Station Research assistant	2013

**OUTREACH, AWARDS, AND ACCOMPLISHMENTS**

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NASA Innovative Conceptual Engineering Design (ICED)	Spring 2018
<ul style="list-style-type: none"> <li>Mentored student team from Nipmuc Regional High School in Upton, Massachusetts.</li> <li>A team of four high school seniors were given Mars rover soil data and tasked with designing experiments to test growing food on Mars</li> </ul>	
“Healthy Soil, Healthy Plants”	July 6, 2017
<ul style="list-style-type: none"> <li>Gave workshop for groups of campers (8-12 y/o) at the 2017 4-H Environmental Summer Camp</li> </ul>	
Worcester County Farm Bureau Scholarship	2015, 2013, and 2012
<ul style="list-style-type: none"> <li>Scholarship recipient</li> </ul>	
Massachusetts Farm Bureau Gregory Finn Scholarship	2014
<ul style="list-style-type: none"> <li>Scholarship recipient</li> </ul>	
Hatch Fund	Spring 2014, Fall 2013
<ul style="list-style-type: none"> <li>Research Assistant including partial academic scholarship</li> <li>University of Massachusetts, Amherst</li> </ul>	
University of Massachusetts Soil and Plant Tissue Testing Laboratory	Spring 2014, Fall 2013
<ul style="list-style-type: none"> <li>Research Assistant including partial academic scholarship</li> <li>University of Massachusetts, Amherst</li> </ul>	

**MEMBERSHIPS**

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Soil Science Society of America	2016-Present
American Chemical Society	2019-2021
Student member of the Massachusetts Farm Bureau	2011-2016
Member of Phi Theta Kappa National Honor Society	Inducted May 2011

**BACKGROUND INFORMATION**

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**Other Experience**

Szerlag Farms (family owned farm), Northbridge, Massachusetts	1995-2016
<ul style="list-style-type: none"> <li>I was raised on a dairy farm</li> <li>Assisted in the nutrient management of cropland and soil conservation through transitioning to no-till agriculture</li> </ul>	