

Sam J. Leuthold

Soil Systems Scientist

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Education

Colorado State University: Fort Collins, CO

PhD Ecology

Expected: May 2024

Dissertation Title: *The functional nature of soil organic matter pools: Identifying mechanistic indicators for soil health and agronomic outcomes*

University of Kentucky: Lexington, KY

May 2021

M.S. Plant and Soil Sciences

Thesis Title: *Interactive effects of landscape topography and cover crops in Southeastern Agroecosystems*

Montana State University: Bozeman, MT

December 2017

B.S. Soil and Water Sciences (Minor: GIS)

Research Experience

Graduate Research Assistant

June 2021 – Current

CSU Soil Innovation Lab: Fort Collins, CO

Dr. Francesca Cotrufo and Dr. Jocelyn Lavallee

- Coordinated with various academic and industry partners to acquire a substantial soil sample collection, spanning regions, cropping systems, and management regimes.
- Performed a range of laboratory analyses on a diverse sample set, including iron and aluminum extractions, physical soil organic matter fractionations, and textural determinations.
- Managed and mentored undergraduate research assistants, with a focus on advancing their scientific understanding of soil organic matter dynamics. Participated in scientific outreach opportunities, communicating soil organic matter science topics to children ranging from 10 – 17 years old.
- Wrote and published an invited book chapter concerning physical fractionation techniques and soil analysis methodology.

Graduate Research Assistant

January 2019 – June 2021

UK Agroecological Nutrient Cycling Lab: Lexington, KY

Dr. Hanna Poffenbarger

- Managed and maintained a multi-year field study involving cover crops, corn, and soybeans at four locations, including two on-farm experimental sites with a farmer-cooperator.
- Constructed and managed a large (3,000+ observations) multivariate environmental dataset, with an emphasis on clarity, transparency, and practicality.
- Calibrated, evaluated, and presented results from complex crop modeling simulations of treatments effects on yield stability and environmental quality across 30 years of weather data used the R software environment, CENTURY, and DSSAT v4.7.5.
- Performed predictive modeling and statistical analysis, created complex data visualizations, and processed large datasets using the R software environment and relevant packages (e.g. ggplot2, aqp, lme4, multcomp, dplyr).
- Presented results and implications to a wide range of audiences, including farmer groups, academic professionals, and funding agencies, receiving regional and national awards.
- Published three first-author, peer reviewed journal articles, and co-authored 2 others,

Research Associate

December 2017 – August 2018

MSU Soil Biogeochemistry Lab; Bozeman, MT

Dr. Stephanie Ewing and Dr. Rob Payn

- Developed a self-contained multi-layer soil model to track the isotopic character of soil water throughout the year in a semi-arid agricultural system using R.
- Analyzed a range of environments such as mountain and agricultural watersheds for geospatial characteristics using ArcGIS and GRASS, producing a series of spatial data visualizations.
- Maintained a large dataset of environmental and geochemical parameters for collaborative team use.
- Presented complex biogeochemical research results to a variety of audiences, including tribal members, academics, and agricultural producers via written reports and oral presentations.
- Analyzed spatially distributed biogeochemical data for statistical significance, submitted 1 first author paper for peer-review concerning streamflow generation in mountain watersheds, and co-authored 2 others surrounding hydrology in natural and agricultural systems.

Undergraduate Research Assistant

November 2016 – December 2017

MSU Soil Biogeochemistry Lab; Bozeman, MT

Dr. Stephanie Ewing

- Organized and conducted large scale soil sampling efforts related to long term crop rotations and their influence on soil carbon storage.
- Analyzed soil carbon data including models of carbon accrual and decomposition following disturbances in agroecosystems using R.
- Synthesized and prepared results related to soil carbon storage in agricultural lands for farmers and academics.

Peer Reviewed Publications

Leuthold, S. J., Wendroth, O., Salmerón, M., Haramoto, E., & Poffenbarger, H. (In-Prep) Impacts of topography on biomass production and nitrogen uptake of cereal rye and mixed cereal rye-crimson clover cover crops. In preparation for submission to Agriculture Ecosystems and Environment in July 2022.

White, C., Ordóñez, R.A., Spargo, J., Kaye, J.P., Ruark, M., Iqbal, J., Shapiro, C.A., Thomason, W.E., Fiorellino, N.M., Shoiber, A., Grove, J.H., Hirsh, S., Weil, R.R., Castellano, M.J., Archontoulis, S.V., Hatfield, J., Lee, C., Quinn, D.J., Sanders, Z.P., Rivera-Ocasio, Z., Tierney, S., Danalatos, G.N., Puntel, L.A., Poffenbarger, H., **Leuthold, S.J.**, Miller, J., Toor, G.S. (In-Review) Predicting nitrogen fertilizer requirements from delta yield in USA maize. Submitted to F. Crop. Res. March 2022.

Sigler, W.A., Ewing, S.A., Wankel, S.D., Jones, C.A., **Leuthold, S.J.**, Brookshire, E.N.J., Payn, R.A. (2022) Isotopic signals in an agricultural watershed suggest denitrification is locally intensive in riparian areas but extensive in upland soils. Biogeochemistry 158. <https://doi.org/10.1007/s10533-022-00898-9>

Leuthold, S. J., Wendroth, O., Salmerón, M. & Poffenbarger, H. (2022) Weather-dependent relationships between topographic variables and yield of maize and soybean. F. Crop. Res. 276. <https://doi.org/10.1016/j.fcr.2021.108368>

Leuthold, S.J., Quinn, D.J., Miguez, F., Wendroth, O., Salmerón, M., and Poffenbarger, H. (2021) Topographic effects on soil microclimate and surface cover crop residue decomposition in rolling cropland. Agriculture, Ecosystems, and Environment, 320. <https://doi.org/10.1016/j.agee.2021.107609>

Quinn, D.J., Poffenbarger, H.J., **Leuthold, S.J.** and Lee, C.D. (2021) Corn response to in-furrow fertilizer and fungicide across rye cover crop termination timings. Agron. J. <https://doi.org/10.1002/agj2.20723>

Leuthold, S.J., Salmerón, M., Wendroth, O., Poffenbarger, H. (2021) Cover crops decrease maize yield variability in sloping landscapes through increased water during reproductive stages. F. Crop. Res. 265. <https://doi.org/10.1016/j.fcr.2021.108111>

Leuthold, S.J., Ewing, S.A., Payn, R.A., Miller, F.R., Custer, S.G. (2021) Seasonal connections between meteoric water and streamflow generation along a mountain headwater stream. *Hydrological Processes*. 35. <https://doi.org/10.1002/hyp.14029>

Miller, F.R., Ewing, S.A., Payn, R.A., Paces, J.B., **Leuthold, S.J.**, Custer, S.G. (2020) Sr and U isotopes reveal the influence of lithologic structure on groundwater contributions along a mountain headwater catchment (Hyalite Canyon, MT). *J. Hydrology*. <https://doi.org/10.1016/j.jhydrol.2020.125653>

Book Chapters

Leuthold, S. J., Haddix, M. L., Lavalley, J. & Cotrufo, M. F. (2022) Physical fractionation techniques. *Ref. Modul. Earth Syst. Environ. Sci.*10.1016/B978-0-12-822974-3.00067-7.

Grants and Fellowships

Graduate Degree Program in Ecology Small Research Grant. Relationships between crop yield stability and soil organic matter fraction distribution. **S. Leuthold** (PI) 1 year. (\$2,430)

Kentucky Corn Growers Association Research Grant. Understanding subfield variation in corn fertilizer needs. H. Poffenbarger (PI) with **S. Leuthold** (co-PI). 1 year. (\$12,000).

2019 Southern SARE Graduate Student Grant. Quantifying decomposition rates nitrogen fixation ability of leguminous cover crops in production fields characterize rolling hills. **S. Leuthold** (PI) with H. Poffenbarger (co-PI). 2 years. (\$16,450)

Karri Casner Environmental Sciences Fellowship. Sustainable corn nitrogen fertilizer management for complex agricultural terrain. **S. Leuthold** (PI) with H. Poffenbarger (Co-PI). 1 year. (\$3,500)

Montana Institute on Ecosystems Grant. Stable water isotopes in the Hyalite Canyon Watershed. **S. Leuthold** (co-PI), R. Payn (co-PI) and S. Ewing (co-PI). 1 year. (\$3,000)

Presentations

Leuthold, S.J., Lavalley, J., Haddix, M., King, A., Machmuller, and Cotrufo, M.F. (2022) Exploring shifts in the character and distribution of soil organic matter fractions across a physicochemical soil gradient. 2022 Front Range Student Ecology Symposium. February 23 – 24. Fort Collins, CO.

Ison, J., Canisares, L.P., **Leuthold, S.J.**, Wendroth, O., Poffenbarger, H.J. (2021) Landscape position and cover crop effects on soil greenhouse gas fluxes. 2021 ASA-CSSA-SSSA Annual Meeting. 7 – 10 November. Salt Lake City, UT.

Leuthold, S., Poffenbarger, H. (2020) Understanding and addressing spatial variability in corn yield, University of Kentucky Corn, Soybean, and Tobacco Field Day. 21 June. Princeton, KY (Remote presentation)

Leuthold, S., Poffenbarger, H., Salmeron, M., Wendroth, O., Haramoto, E. (2020) Do cover crops increase or decrease spatiotemporal variability in maize yield? iCROPm 2020. 1 February. Montpellier, France. (H. Poffenbarger presenting author)

Poffenbarger, H., **Leuthold, S.**, Salmeron, M., Wendroth, O., and Haramoto, E. (2020) Corn, complex topography, and cover crops. Kentucky Corn CORE farmer program. 10 January. Versailles, KY.

Leuthold, S., Wendroth, O., Salmeron, M., Haramoto, E., Poffenbarger, H. (2020) Corn, cover crops, and complex topography. Southern ASA Regional Meeting. 2 February. Louisville, KY.

Poffenbarger, H., **Leuthold, S.**, Salmeron, M., Wendroth, O., and Haramoto, E. Investigating nitrogen rates across areas of complex topography and the interaction with cover crops. Kentucky Corn Growers Annual Meeting. 5 November. Elizabethtown, KY.

- Sigler, W.A., Ewing, S.A., Wankel, S., Jones, C., **Leuthold, S.**, Brookshire, J., Payn, R. (2019) Denitrification patterns across a dryland agroecosystem in the Northern Great Plains, AGU Fall Meeting. 9-13 December. San Francisco, CA.
- Poffenbarger, H., **Leuthold, S.** (2019) Cover crops, hillslopes, and corn nitrogen requirements. Tri-State Advanced Soil Health Training. 10 December. Princeton, KY.
- Leuthold, S.**, Wendroth, O., Salmeron, M., Haramoto, E., Poffenbarger, H. (2019) Cover crops response to landscape topography, and the effect on maize yield stability. ASA-CSSA-SSSA Annual Meeting. 10-13 November. San Antonio, TX.
- Leuthold, S.**, Wendroth, O., Salmeron, M., Haramoto, E., Poffenbarger, H. (2019) Cover crop growth varies by landscape position but does not affect spatial variability of maize yield. North Central Soil Fertility Conference, 5-6 November, Des Moines, IA.
- Leuthold, S.**, Poffenbarger, H.J. (2019) Quantifying decomposition rates and nitrogen fixation ability of leguminous cover crops in production fields characterized by complex topography. Southern Cover Crops Council Fall Meeting, July 16-17, Auburn, AL.
- Leuthold, S.**, Ewing, S.A., Payn, R., Miller, F., Paces, J. (2018) Longitudinal Patterns in Stream Stable Isotope Chemistry along a Snowmelt Driven Headwater Suggest Seasonally Dynamic Connectivity between Proximal Streamflow Generation Sources. AGU 2018 Fall Meeting. 11 December, Washington, DC.
- Payn, R.A., Ewing, S.A., Miller, F., **Leuthold, S.**, Paces, J.B., Michalek, T., Custer, S.G. (2018) Using longitudinal synoptics of water quality along Hyalite Creek and the Gallatin Valley to understand the distribution of groundwater sources to stream flow generation in the Gallatin River Watershed, Montana. Montana chapter, American Water Resources Association, 18-19 October, West Yellowstone, MT.
- Miller, F.R., Ewing, S.A., Payn, R.A., Paces, J.B., **Leuthold, S.**, Michalek, T., Custer, S. (2018) Sr and U isotopes reveal the influence of lithologic structure and weathering on surface-groundwater interaction along a mountain stream (Hyalite Canyon, MT). Oral presentation HS2.3.3, Isotope and Tracer Methods: Flow paths characterization, catchment response and transformation processes, Goldschmidt Conference, August, Boston MA.
- Leuthold, S.**, Ewing, S.A., Payn, R., Miller, F., Klassen, J., Paces, J., (2018) Where should we begin; a conversation between soils and streams in Hyalite Canyon. Oral presentation presented at MSU LRES Research Colloquium. 16 April, Bozeman, MT.
- Leuthold, S.**, Ewing, S.A., Payn, R., Miller, F., Klassen, J., Paces, J., (2017) Using stable liquid water isotopes to understand sources of stream flow generation in a mountainous headwaters catchment. Poster presented at 25th Annual NSF EPSCoR National Conference. 5 - 8 November, Missoula, MT
- Ewing, S.A., Miller, F., Payn, R., **Leuthold, S.**, Paces, J., (2017) Using weathering and solute geochemistry to understand sources of base flow water supply across mountain-basin transitions in the Upper Missouri Watershed. Poster presented at Catchment Science: Interactions of Hydrology, Biology and Geochemistry Gordon Research Conference. 24 - 25 June, Lewistown, ME.

Engagement and Advocacy

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| Skype a Scientist Member | <i>February 2022 - Current</i> |
| Front Range Student Ecology Symposium Fundraising Committee | <i>October 2021 - Current</i> |
| Plant and Soil Science Department Graduate Student Congress Representative | <i>May 2019 – August 2020</i> |
| Graduate Student Liaison – UK Student Sustainability Council | <i>May 2019 – August 2020</i> |
| Sustainability Advocate – Graduate Student Congress Internal Advocacy Committee | <i>May 2019 – August 2020</i> |
| Plant and Soil Science Social Event Chair | <i>February 2019 – August 2020</i> |

Awards and Achievements

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| GDPE Recruitment Fellowship Award | <i>August 2021</i> |
| Johnston-Carringer Agronomy Award | <i>May 2021</i> |
| Plant and Soil Science Outstanding Continuing MS Student | <i>May 2020</i> |
| 2 nd place MS Student Oral Presentation – Southern Regional ASA Meeting | <i>February 2020</i> |
| 1 st place Graduate Student Oral Presentation – National ASA Nutrient Management Division | <i>November 2019</i> |
| North Central Soil Fertility Outstanding Graduate Student Award | <i>November 2019</i> |
| University of Kentucky Dean's List | <i>May 2019, December 2019, May 2020</i> |
| 2 nd Place student Oral Presentation – LRES Annual Research Colloquium | <i>April 2018</i> |
| National Outdoor Leadership School (NOLS) Graduate | <i>August 2015</i> |

Teaching Experience

University of Kentucky

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| Teaching Assistant – Introduction to Soils (PLS366) | <i>January – May 2020</i> |
| Teaching Assistant – Introduction to Soils (PLS366) | <i>January – May 2019</i> |
| Invited Lecture – Soil Nutrient Management (NRE470G) | <i>March 2020</i> |

Montana State

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| Teaching Assistant – Landscape Pedology (ENSC454) | <i>August – November 2017</i> |
| Teaching Assistant – Soils (ENSC245) | <i>August – December 2016</i> |