

Samuel M. Smith

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Education

Colorado State University

Fort Collins, Colorado

M.Sc. Ecology

Aug. 2021 - present

- Advisor: Colleen Webb
- Thesis: Evaluation and optimization of state dependent Food-and-Mouth Disease response strategies in a national scale livestock disease model.

Lewis & Clark College

Portland, Oregon

B.A. Biology, with Honors

Aug. 2017 - May 2021

- Honors Thesis: Can seedling functional traits explain changing forest dynamics in an everwet tropical forest?

Selected Research Experience

Exploration of the impact of tracing cattle to and from TB-affected herds on the predicted national-scale patterns of bovine TB outbreaks

Fort Collins, CO

Graduate Research Assistant

Aug. 2021 - present

- Partnered with the United States Department of Agriculture's Center for Epidemiology & Animal Health and Animal & Plant Health Inspection Service to conceive this project, acquire funding, and develop the model.
- Developed C++ code in a large Suspected Infected Exposed and Recovered model (United States Disease Outbreak Simulation) that stochastically simulates the spread of Foot-and-Mouth Disease across the United States. New functionalities allowed the model to output farm diagnostic statuses every timestep.
- Used version control software to maintain development versions of the model that would later be incorporated into United States Disease Outbreak Simulation.
- Developed R code to process and analyze simulation results.

Foot-and-Mouth Disease response planning for the State of Colorado

Fort Collins, CO

Graduate Research Assistant

May. 2022 - Aug. 2022

- Developed C++ code to allow United States Disease Outbreak Simulation to output farm control statuses every timestep.
- Used version-control software during model development.
- Partnered with Colorado State Veterinarian's office to solicit Colorado-specific cattle movement data.
- Visualized Foot-and-Mouth Disease outbreak patterns with publicly available and custom R packages.
- Developed R code to process and analyze simulation results.

Do state-dependent control strategies improve Foot-and-Mouth Disease Outbreak outcomes?

Fort Collins, CO

Master's Thesis Research

Aug 2021 - present

- Developed C++ code to implement new epidemiological intervention strategies into the United States Disease Outbreak Simulation.
- Investigated the role of structured-decision making on Foot-and-Mouth Disease outbreak outcomes.
- Conducted sensitivity analysis on control USDOS control parameters.
- Developed R code to visualize outbreak outcomes and summarize cost estimates.
- Working to wrap the complex simulation model in Python to use Reinforcement Learning to optimize intervention strategies.
- Used version control software to develop new model code.
- Communicated early findings of this work to the public and other academics at the Ecology and Evolution of Infectious Diseases conference.
- Developed R code to process and analyze simulation results.

Can seedling functional traits explain liana and tree seedling dynamics in an everwet tropical forest?

Portland, OR

Lewis & Clark College's Department of Biology Honors Thesis

Aug. 2020 - May 2021

- Conceived a research question, conducted 6 months of analyses on a large, complex dataset from eastern Ecuador, and produced an undergraduate honors thesis.
- Conducted all analyses in R and heavily used mixed effects (multilevel) models. Interpreted and communicated the results from complex models to supervisor weekly, both orally as a written manuscript at the end of the semester.
- Transformed life table data into demographic time series data and then analyzed the time series.
- Fit multilevel statistical models (generalized linear mixed effects models) to abundance data under Poisson and negative binomial distributions. Used information criteria, drop-in-deviance, and residuals to determine model fit.
- Conducted Principal Component Analyses to understand trade-offs between resource investment and demography.
- Conducted a full suite of comparative phylogenetic analyses (Phylogenetically Independent Contrasts, Blomberg's K and λ) to understand whether of evolutionary history drives trait distributions in eastern Ecuador.
- Successfully defended statistical analyses used and conclusions drawn from this work to Lewis & Clark Department of Biology during a Thesis defense. Communicated findings both during live talks and during poster presentations to the public and other researchers.

Understanding the role of precipitation regimes on plant diversity and above ground biomass in the Chihuahuan Desert

Las Cruces, NM

National Science Foundation Research Experience for Undergraduates (REU)

Jun. 2020 - Aug. 2020

- Responsible for the implementation and maintenance of Automatic Rainfall Manipulation Shelters for 3 ongoing experiments. Routinely repaired plumbing and electrical systems to ensure the shelters remained operational throughout the summer.
- Developed and conducted an independent project examining the effects of long-term drought stress on Honey mesquite (*Prosopis glandulosa*) stem and leaf traits.

Dynamical interactions between plant and oomycete biodiversity in a temperate forest

Wind River, WA

Lewis & Clark College Roger's Summer Science Intern

May 2019 - Aug. 2019

- Conducted plant community composition and structure surveys in a mixed conifer forest.
- Collected duff and sorted out conifer seeds by species and viability. Routinely identified various species of conifer seedlings, shrubs, and forbs.
- Conducting statistical analyses in R to understand the effects of soil moisture on coniferous seedling growth and survival rates.

Olympic Marmot Population Monitoring - National Park Service

Olympic National Park, WA

Civilian Scientist & New Student Trip Leader

Aug 2019

- Partnered with the National Park Service and Lewis & Clark College Outing program to bring incoming first-year students into Olympic National to conduct Marmot burrow occupancy surveys.

Patch-Burn Grazing in Southwestern North Dakota: Assessing Above-and Belowground Rangeland Ecosystem Responses

Hettinger, ND

Research Technician

May 2018 - Aug. 2018

- Conducted community structure and composition surveys. Collected and processed forage samples for later analyses. Collected soil samples and conducted chemical extractions. Routinely identified 40 species of grasses and forbs.

Publications

- [1] Metz, M.R., Wright, S.J., Zimmerman, J.K., Hernández, A., **Smith, S.M.**, Swenson, N.G., Umaña, M.N., Valencia, L.R., Waring-Enriquez, I., Wordell, M., Zambrano, M., Garwood, N.C.. "Functional traits of young seedlings predict trade-offs in seedling performance in three neotropical forests." *Journal of Ecology*, *accepted*, Dec. 2022.
- [2] **Samuel M. Smith**, Colleen T. Webb, Lindsay M. Beck-Johnson. "Supporting Emergency Disease Management with Structured Decision-Making." *in prep*, 2022.
- [3] Simony, B.S., **Smith, S.M.**, *et al.* "Wildlife's role in driving the persistence of bovine Tuberculosis in United States' cattle herds." *Journal of Preventative Veterinary Medicine*. *In prep*, 2023.
- [4] **Samuel M. Smith**, Colleen T. Webb, Lindsay M. Beck-Johnson, *et al.* "United States annual cattle market sales estimate data," Data in Brief. *In prep*, 2023.
- [5] **Samuel M. Smith**, Nancy C. Garwood, Margaret R. Metz. "Can seedling functional traits help explain liana and tree seedling dynamics in an everwet tropical forest?," *Biotropica*. *In prep*, 2023.

Presentations

Supporting emergency disease management with structured decision-making Samuel M. Smith, Lindsay M. Beck-Johnson, Colleen T. Webb 2023 Front Range Student Ecology Symposium	<i>Fort Collins CO</i> Feb. 24, 2023
Do flexible, state-dependent control strategies improve Foot-and-Mouth Disease outbreak outcomes? Samuel M. Smith, Lindsay M. Beck-Johnson, Colleen T. Webb Ecology and Evolution of Infectious Diseases Annual Meeting	<i>Emory University, Atlanta, GA</i> Jun. 4 - 10, 2022
Can seedling functional traits help explain liana and tree seedling dynamics in an everwet tropical forest? Samuel M. Smith, Nancy C. Garwood, Margaret R. Metz Ecological Society of America Annual Meeting	<i>Montreal, Quebec, Canada</i> Aug. 14 - 19, 2022
Seedling functional traits help explain liana and tree seedling dynamics in an everwet tropical forest. Samuel M. Smith, Nancy C. Garwood, Margaret R. Metz 2022 Front Range Student Ecology Symposium	<i>Fort Collins CO</i> Feb. 24, 2022
Seedling functional traits may help explain changing liana and tree seedling dynamics in an everwet tropical forest. Samuel M. Smith, Nancy C. Garwood, Margaret R. Metz 2021 Graduate Student Showcase	<i>Fort Collins, CO</i> Nov. 9, 2021

Awards and Honors

Feb. 2023	Front Range Student Ecology Symposium: Supporting emergency disease management with structured decision-making. Third Place, Best Presentation.	<i>Fort Collins, CO</i>
Sep. 2022	Co-PI, USDA Cooperative Agreement: Exploration of the impact of tracing cattle to and from (Bovine Tuberculosis) TB-affected herds on the predicted national-scale patterns of bovine TB outbreaks (\$80,000)	<i>Fort Collins, CO</i>
Oct. 2021	Office of International Programs Global Impact Award for a poster presentation at the Graduate Student Showcase	<i>Fort Collins, CO</i>
Aug. 2021	Colorado State Graduate Fellowship	<i>Fort Collins, CO</i>
May 2021	Departmental Honors: Lewis & Clark Biology Department Thesis	<i>Portland, OR</i>
Nov. 2019	Dinah Dodds Endowment for International Education awarded funding to conduct an informal study the impacts of small women's groups on Tanzania's natural resources (\$1,830)	<i>Arusha, Tanzania</i>
Dec. 2016	Eagle Scout Award	<i>Sewanee, TN</i>

Teaching

Basic Concepts of Plant Life Laboratory (BZ105) Graduate Teaching Assistant	<i>Fort Collins, CO</i> Aug. 2021 - Dec. 2021
Principles of Plant Biology (BZ120) Graduate Teaching Assistant	<i>Fort Collins, CO</i> Jan. 2022 - May 2022
Plant Biology (BIO323), Ecology and Environmental Science (BIO141), Biological investigations into the formation and function of cilia (BIO110) Undergraduate Teaching Assistant	<i>Portland, OR</i> August 2019 - May 2022

Training

Pandemic Scenario Modeling and Science Communication Ecology and Evolution of Infectious Diseases	<i>Emory University, Atlanta, GA</i> Jun. 2022
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Inclusive Pedagogy The Institute for Learning and Teaching	<i>Fort Collins, CO</i> Jan. 2022 - Feb. 2022
Transforming graduate education to meet challenges of the Anthropocene Graduate Degree Program in Ecology, Front Range Student Ecology Symposium	<i>Fort Collins, CO</i> Feb. 24, 2022
Wildland Firefighting Certification The University of the South, Department of Earth and Environmental Systems	<i>Sewanee, TN</i> Jan. 2022
Wilderness First Responder Training NOLS Wilderness Medicine	<i>Portland, OR</i> Nov. 2020

Service

Front Range Student Ecology Symposium Graduate Degree Program in Ecology steering committee member	<i>Colorado State University</i> Aug. 2022 - Present
Graduate Degree Program in Ecology Peer Mentor Peer mentor for incoming graduate students	<i>Colorado State University</i> Aug. 2022 - Present
Library Education and Technology Committee Student representative	<i>Lewis & Clark College</i> Aug. 2020 - May 2022
57th Annual International Affairs Symposium Steering committee member	<i>Lewis & Clark College</i> Aug. 2018 - April 2019