

# TOBY MAXWELL

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## EDUCATION

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**University of California, Davis**

*September 2012-March 2018*

*Ph.D. Agricultural and Environmental Chemistry*

*Adviser: William Horwath*

Dissertation Title: Advancing molecular to regional understanding of carbon-water relations in managed and natural systems across California

**State University of New York, Geneseo**

*September 2007-May 2011*

*B.S. Chemistry, Magna Cum Laude*

## EXPERIENCE

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**USGS - Forest, Rangeland, and Ecosystem Science Center**

December 2019 - Present

*Title: Visiting Scientist*

*Supervisor: Matthew Germino*

*Evaluating the use of soil nutrient management as a tool to promote resistance and resilience after wildfire in shrubland ecosystems*

### Responsibilities

- Analysis of data from experiments restoring native species in the sagebrush steppe.
- Grant writing to support research that enhances success of ecological restoration, and translate knowledge into management.

**University of Oregon**

April 2018 - March 2020

*Title: Postdoctoral Scholar*

*Supervisor: Professor Lucas Silva*

*Project 1: Using soil-plant relationships to evaluate the resilience of Oregon's treeline forests*

*Project 2: Evaluating invasive plant encroachment in Pacific Northwest prairies as a function of soils, plant diversity, and climate.*

### Responsibilities

- Prepare and analyze soil and plant material for physical, chemical, and biological data.
- Prepare manuscripts, reports, talks, and posters to present research findings at regional/national/international scientific meetings.
- Use Geographic Information Systems and R statistical software to aggregate and apply meteorological, hydrological, geological, soil, and vegetation data to study soil-plant interactions.
- Know the taxonomy and ecology of common plants and functional groups across pacific northwest prairies, from the coast to the Great Basin.

### Technical Skill Requirements

- Create original, independent research. Adapt and modify data collection and processing methods of soils, vegetation, rocks, and geographic features to assess the impacts of climate change.
- Quantitative analysis of soil biogeochemical properties, plant traits, and both remotely sensed and on site metrics of forest productivity.
- Analyze and visualize data in R and QGIS.

**University of Oregon**

April 2018 - December 2019

*Title: Lab Manager*

*Supervisor: Professor Lucas Silva*

### Responsibilities

- Run and maintain lab instrumentation, maintain detailed records of methodologies and quality control on data collection.

- Supervise and teach seasonal technicians and students from the undergraduate to PhD level in statistical analysis of complex datasets in R.
- Lead field crews and provide guidance in experimental design, data acquisition, and QA/QC for extended field campaigns.

### **Technical Skill Requirements**

- Modify and design methods for field investigations and laboratory protocols.
- Maintain lab instrumentation, design, customize, and build field and lab equipment to suit analytical and experimental needs.
- Communicate and teach interdisciplinary science (i.e. biology, geology, hydrology, soil and vegetation sciences) to people from diverse backgrounds (e.g. policy, industry).

### **University of California, Davis**

October 2012 - March 2018

*Title: Graduate Student Researcher*

*Supervisor: Professor William Horwath*

*Project 1: Using soil-plant interactions to predict the impacts of climate change on carbon-water relations in Sierra Nevada Forests*

*Project 2: Identifying the role of climate and management in driving declining resource use efficiency in common wheat across California*

### **Responsibilities**

- Generate and adapt experimental design, and data acquisition methods for soil and vegetation collection across diverse ecological landscapes.
- Use natural abundance and enriched stable isotope techniques to study interactions of ecological patterns and processes across climatic and management intensity gradients.
- Restore, maintain, and generate protocols for gas chromatograph/mass spectrometer, trace gas analyzer, carbon and nitrogen analyzer, HPLC, UV-VIS spectrophotometer.

### **Technical Skill Requirements**

- Apply advanced statistical software (i.e. R) for descriptive and predictive multivariate modeling, data collection, analysis, and visualization.
- Write and collaborate on peer reviewed research papers.
- Aggregate and analyze complex ecological data sets, implement structural equation models, process based models.
- Applications of stable isotopes to study intra- and interspecific interactions.

## **MENTORSHIP EXPERIENCE**

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### **Current Mentees**

#### **Hilary Dawson**

*Technician*

*May 2019-Present*

*Project: Identifying the role of biodiversity and plant traits in determining ecological resilience of native plants in Pacific Northwest prairies*

- Teaching how to apply knowledge of plant taxonomy and techniques in plant ecology to field collection of experimental specimens.
- Oversight in preparation of vegetation and soil samples for physical and chemical analysis in the laboratory.
- Teaching advanced statistical software (i.e. R) and principles of statistical analysis to assist in preparation of a refereed journal article.

#### **Adriana Uscanga**

*PhD Student*

*August 2019-Present*

*Project: Identifying the role of land use and interactions between soil and vegetation features in determining ecosystem services in Mexican cloud forests*

- Teaching scientific methods and techniques of ecology, and statistical design and analysis.
- Teaching advanced statistical software (i.e. R) and methods of retrieving and aggregating meteorological data.
- Teaching methods of soil and vegetation chemical analysis and executing extended field campaigns with complex logistics associated with sample quality control.

### **Sydney Katz**

*Undergraduate Student*

*August 2019-Present*

*Project: Determining thresholds for the transfer of isotopic signals in decomposing organic matter*

- Teaching principles of vegetation and soil processing and data collection.
- Performing extractions of soil and plant material.
- Preparation of samples for chemical analysis.

### **Past Mentees**

- **Jamie Wright**, *PhD Student*, April 2018–December 2019, Taught protocols and maintenance for lab instrumentation, statistical methods and interpretation of ecological data.
- **Michael Faranacci**, *Masters Student*, August 2018–August 2019, Connecting principles of plant ecology and soil science to understand the impacts of forest management.
- **Monika Ruwaimana**, *PhD Student*, March 2019–June 2019, Preparation of tropical soils for physical and chemical analysis.
- **Hunter Mackin**, *Undergraduate Student*, June 2018–June 2019, Measuring leaf traits and soil properties of forest soils.
- **Tara Seely**, *Masters Student*, August 2015–August 2017, Determining the role of climate change and mangement on ecophysiology and productivity in Almond Orchards.
- **Laura Emberson**, *Masters Student*, August 2015–August 2017, Identifying long term effects of climate change compared to management in common wheat in California cropping systems.
- **Lynette Williams** *Undergraduate Student*, May 2015–September 2015, Measuring the relationship between soil carbon storage and mineralogy.

## **PUBLICATIONS AND REPORTS**

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**Maxwell, T.M.** and Silva, L.C.R, (2020). A State Factor Model of Ecosystem Carbon-Water Relations. *Trends Plant Sci.*

Liles, G.C., **Maxwell T.M.** et al., (2019). Two decades of experimental manipulation reveal potential for enhanced biomass accumulation and water use efficiency in ponderosa pine plantations across climate gradients *J. Geophys. Res Biogeosciences.*

**Maxwell, T.M.**, et al., (2018). Integrating effects of species composition and soil properties to predict shifts in montane forest carbon–water relations. *Proc. Natl. Acad. Sci.*

**Maxwell T.M.**, et al., (2018). Predictable oxygen isotope exchange between plant lipids and environmental water: implications for ecosystem water balance reconstruction. *J. Geophys. Res Biogeosciences.*

**Maxwell, T.M.** (2018). Advancing molecular to regional understanding of carbon-water relations in managed and natural systems across California. *PhD Dissertation, University of California, Davis.*

Jeszurki, D., Couvreur, V., **Maxwell T.M.**, et al., (2017). Impact of root growth and hydraulic conductance on canopy carbon-water relations of young walnut trees (*Juglans regia* L.) under drought. *Scientia horticulturae.*

**Maxwell, T.M.**, et al., (2014). Using multielemental isotopic analysis to decipher drought impacts and adaptive management in ancient agricultural systems. *Proc. Natl. Acad. Sci.*

Culman, S.W., Haden, V.R., **Maxwell, T.M.**, Waterhouse, H., and William Horwath. (2014). Greenhouse Gas Mitigation Opportunities in California Agriculture: Review of California Cropland Emissions and Mitigation Potential. NI GGMOCA R 3. Durham, NC: Duke University.

## SUBMITTED PUBLICATIONS

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Broz, A., Retallack, G.J., **Maxwell, T.M.** and Silva, L.C.R., (In Review). Vapor pressure deficit preserved in wood and soil across biomes. *Scientific Reports*.

## PUBLICATIONS IN PREPARATION

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**Maxwell, T.M.**, Bridgham, S., and Silva, L.C.R. Biodiversity drives ecological interactions that control native plant resilience to drought. For submission to *Nature Climate Change*.

**Maxwell, T.M.**, and Silva, L.C.R. Rising influence of soil properties over the last century explains shifting productivity thresholds in Oregon's sub-alpine forests. For submission to *Science Advances*.

Dawson, H.R., **Maxwell, T.M.**, and Silva, L.C.R. Plant traits drive water use efficiency and resilience to drought across a climate gradient in Pacific Northwest Prairies. For submission to *Plant and Soil*.

## SELECTED PRESENTATIONS

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**Maxwell, T.M.** Understanding the role of forests in the global carbon cycle and climate change. University of Oregon, Introductory Environmental Science Course. 23, October, 2019 (Invited).

**Maxwell, T.M.** From molecules to ecosystems: using plant-soil inter-relations to decipher climate change impacts on carbon-water cycles. University of Oregon Department of Geography Seminar Series, 7, March, 2019 (Invited).

**Maxwell, T.M.** Understanding the global carbon cycle: Feedbacks, disturbance, and the role of soils in driving forest responses to climate change. University of Oregon. Introductory Environmental Science Course, 11, February, 2019 (Invited).

**Maxwell, T.M.** Using stable isotopes to investigate forest carbon-water relations. UC Davis Stable Isotope Seminar, 5, Nov. 2018 (Invited).

**Maxwell, T.M.**, et al., Dynamic and inertial controls on forest carbon-water relations. Abstract PP31D-2311, Oral presentation at 2017 Fall Meeting, American Geophysical Union, New Orleans, LA, Dec. 11-15.

**Maxwell, T.M.**, et al., Soil properties drive carbon-water relations across a climate gradient in Sierra Nevada forests. Abstract 60315, Oral Presentation at 2016 Annual Meeting, Ecological Society of America, Ft. Lauderdale, FL, Aug. 7-12.

**Maxwell, T.M.**, et al., Soil properties drive water use efficiency across a climate gradient. Abstract B53G-0641, Poster presentation at 2015 Fall Meeting, American Geophysical Union, San Francisco, CA, Dec. 14-18.

**Maxwell, T.M.**, et al., Expanding lipid proxies to the next dimension. Abstract PP34B-02, Oral presentation at 2014 Fall Meeting, American Geophysical Union, San Francisco, CA, Dec. 15-19.

**Maxwell, T.M.**, et al., Quantifying carbon storage water Balance relationships using oxygen isotope ratios of Plant Lipids. Poster presentation at 2014 European Geochemical Society Goldschmidt Conference, Sacramento, CA, June. 9-12.

Maxwell, T.M., et al., Quantifying carbon storage water Balance relationships using oxygen isotope ratios of Plant Lipids. Poster presentation at 2014 Soil Science Society of America conference: Soil's Role in Restoring Ecosystem Services, Sacramento, CA, March. 7-9.

## TEACHING EXPERIENCE

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### University of Oregon

Lecturer

Environmental Soil Chemistry

January 2019

- Taught introductory lectures in the Soil Chemistry course at the covering applications of periodic trends in environmental science.
- Discussed applications of soil science to terrestrial ecosystem ecology and ecosystem restoration and rehabilitation.

### University of California, Davis

Teaching Assistant

Science and Society - Forests in Society

Spring 2014, 2015, 2016

- Designed curriculum and taught 3x1 hour discussions per week including field-based labs, discussions, citizen science, and presentation skills workshops.
- Presented lectures and organized discussions on the science and policy of post fire restoration and rehabilitation in the Western United States.
- Gave in class lectures, wrote and graded tests and quizzes, held office hours.

### University of California, Davis

Lecturer/Organizer

Stable isotopes in environmental science

Fall 2015

- Organized course, arranged for visiting speakers, lecturer.
- Lecture title: *Integrating carbon-water relations using multielemental and compound specific isotopic measurements*

## RELEVANT COURSEWORK AND TRAININGS

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**UC Davis summer field course - Field studies of soils in California ecosystems** *Field classification of soil taxonomy, topographic features, land use classification, vegetation composition from the Great Basin desert, to Sierra Nevada alpine biomes across agricultural and natural ecosystems. Evaluation of ecosystem ecological interactions between animal-soil-plant-climate systems.*

**University of Utah Isocamp - Stable isotope ecology and biogeochemistry** *Application of stable isotopes to study plant ecology, feedback mechanisms, and ecosystem dynamics, ranging from plant-ecology, to animal community dynamics and trophic structures.*

**Relevant undergraduate and graduate coursework** *Geomorphology and River Management; Environmental Geology; Conservation and resource management; Experimental Design and Analysis; Applied Multivariate Statistical Modeling; Quantitative Geography; Plant-Soil Interrelations; Soil Genesis and Classification; Environmental Soil Chemistry; Soil Microbiology; Soil Physics; Environmental Toxicology; River Basin Biogeochemistry.*

## AWARDS

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National Geographic Exploration and Research, 2018 - \$5000, award: EC-422R-18  
Jastro Shields Research Award, 2015 - \$3000  
William and Linda Sullivan Fellowship, 2014 - \$1240

## PROFESSIONAL MEMBERSHIPS

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Soil Science Society of America  
American Geophysical Union  
Ecological Society of America

## SERVICE

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### Peer Review

Spring 2017 - Present

- Served as a referee for peer review of the following journals: Agricultural and Forest Meteorology, Ecology, Global Change Biology, Journal of Geophysical Research: Biogeosciences, Plant and Soil, PLOS-ONE, Nature Scientific Reports.

### Center for Land Based Learning

Spring 2013 - Spring 2017

- Assisted high school programs from rural communities to participate in ecological restoration projects at reclaimed wilderness sites in coordination with agricultural land owners.

### Pacific Crest Trail Association

Winter 2016 - Spring 2018

- Wrote scientific blog post about human-environment interactions along the trail.
- Clerical assistance for database organization and volunteer coordination.

## PROFESSIONAL REFERENCES

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**Dr. Lucas Silva**

*Postdoctoral advisor*

University of Oregon

*March 2018 - Present*

· email: lsilva7@uoregon.edu

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**Dr. William Horwath**

*PhD advisor*

University of California, Davis

*October 2012 - March 2018*

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· phone: 530-754-6029

**Dr. Randy Dahlgren**

*Professor/Dissertation committee advisor*

University of California, Davis

*Summer 2014 - March 2018*

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