

**Peter M. Homyak, Ph.D.**

Assistant Professor  
 Department of Environmental Sciences  
 University of California, Riverside  
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**APPOINTMENTS**

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***Assistant Professor***

2018 – present University of California, Riverside

- Ecosystem and Soil Microbial Processes

***Ford Foundation Postdoctoral Research Fellow***

2017 – 2018 University of California, Santa Barbara

- Topic: Ecosystem Organic N Cycling: Soil–plant Feedbacks
- Sponsoring Scientists: Joshua P. Schimel and Oliver A. Chadwick

***Postdoctoral Research Scientist***

2016 – 2017 University of California, Santa Barbara.

- Topic: Ecosystem Organic N Cycling: Soil–plant Feedbacks
- Sponsoring Scientist: Joshua P. Schimel

2015 – 2016 University of California, Irvine.

- Synthesized drought effects on soil N cycling. Compiled global database to assess degrees of ecosystem N saturation
- Sponsoring Scientists: Steve Allison, Travis Huxman, Mike Goulden, and Kathleen Treseder

***National Science Foundation Postdoctoral Research Fellow***

2012 – 2015 University of California, Santa Barbara.

- Furthered understanding of trace gas emission and dryland ecosystem N cycling.
- Sponsoring Scientist: Joshua P. Schimel.

**EDUCATION**

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***Ph.D. Soil and Water Science***

2007 - 2012 University of California, Riverside

- Dissertation: “Nitrogen and Phosphorus Biogeochemistry of Watersheds Along the Western Slope of the Sierra Nevada”
- Major Professor: James O. Sickman

***M.S. Forest and Natural Resources Management***, Ecosystem biogeochemistry

2004 - 2006 SUNY College of Environmental Science and Forestry, Syracuse, NY.

- Thesis: “Nitrogen Immobilization by Wood-chip Application: Protecting Water Quality in a Northern Hardwood Forest”
- Major Professor: Ruth D. Yanai

***B.S. Environmental Studies***, Ecosystem biogeochemistry

2001 - 2004 Binghamton University, Binghamton, NY.

- Chemistry minor
- Graduated Cum Laude
- Undergraduate Research: “Biogeochemical cycling of N and P in the Whitney Point watershed”

## RESEARCH FUNDING

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UC Regents Faculty Development Award. 2021. Linking wildfire-impacted soils with regional air quality and Earth's climate [\$6,000]

UC Regents Faculty Fellowship. 2020. Nitrogen pollution in drylands: Processes controlling emission of air pollutants and greenhouse gases from soils [\$3,000]

NSF-DEB. 2019. PI:Homyak P.M. Co-PIs: Hanan E., Aronson E.L., Schimel J.P. How can we assess nitrogen saturation in xeric ecosystems? Accounting for water, time, and nitrogen availability [\$1,113,865]

Ford Foundation Postdoctoral Fellowship. 2017. Ecosystem organic N cycling: Plant uptake, diffusion, and availability of soil amino acids [\$45,000]

NSF Postdoctoral fellowship. 2012. Biotic and abiotic mechanisms of gaseous N production in semiarid environments [\$189,000]

## AWARDS AND RECOGNITION

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Nature Research Awards for Driving Global Impact 2020 (finalist). <https://www.nature.com/collections/ccjnyjxvmp/shortlist>

S.A. Wilde Early Career Achievement Award from the Forest Range and Wildland Soil Division of the Soil Science Society of America 2017

University of California President's Postdoctoral Fellowship (finalist). 2015, 2017 and 2018

Gene E. Likens Outstanding Publication Award. Biogeosciences section of the Ecological Society of America 2016

Elizabeth Sulzman Outstanding Publication Award. Biogeosciences section of the Ecological Society of America 2015 (honorable mention)

NSF GK-12 Teaching Fellowship, SUNY-ESF 2004 – 2006

## PUBLICATIONS

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†Denotes undergraduate student mentee

1. Slessarev E.W., A.C. Greene, **P.M. Homyak**, S.C. Ying, and J.P. Schimel. "High resolution measurements reveal abiotic and biotic mechanisms of elevated nitric oxide emission after wetting dry soil. 2021. **Soil Biology & Biochemistry**
2. Bingham N.L., E.W. Slessarev, **P.M. Homyak**, and O.A. Chadwick. "Rock-sourced nitrogen in semi-arid, shale-derived California soils. 2021. **Frontiers in Forests and Global Change**
3. **Homyak P.M.**, E.W. Slessarev, S. Hagerty, A.C. Greene, K. Marchus, K. Dowdy, S. Iverson, and J.P. Schimel. 2021. Amino acids dominate diffusive

nitrogen fluxes across soil depths in acidic tussock tundra. **New Phytologist**

4. Eberwein, J.R.\* , **P.M. Homyak\***, C.J. Carey\*, E.L. Aronson, D.J. Jenerette. 2020. Large nitrogen oxide emission pulses from desert soils and associated microbiomes. **Biogeochemistry Letters** 149:239-250  
\*contributed equally to this work
5. Slessarev E.W., Y. Lin, B.Y. Jimenez, **P.M. Homyak**, O.A. Chadwick, C.M. D'Antonio, and J.P. Schimel. 2020. Cellular and extracellular C contributions to respiration after wetting dry soil. **Biogeochemistry** 147:307-324
6. Lu Y., **P.M. Homyak**, X. Kang, P.C. Brookes, Y. Ye, Y. Lin, A. Muhammad, J. Xu. 2020. Changes in abundance and composition of nitrifying communities in barley (*Hordeum vulgare* L.) rhizosphere and bulk soils over the growth period following combined biochar and urea amendment. **Biology and Fertility of Soils** 56:169-183
7. Lyu M., X. Li, J. Xie, **P.M. Homyak**, L. Ukonmaanaho, Z. Yang, X. Liu, C. Ruan, Y. Yang. 2019. Root–microbial interaction accelerates soil nitrogen depletion but not soil carbon after increasing litter inputs to a coniferous forest. **Plant and Soil** 444:153-164
8. Sickman J.O., A. E. James, M.E. Fenn, A. Bytnerowicz, D.M. Lucero, and **P.M. Homyak**. 2019. A test of the Integrated Total Nitrogen Input (ITNI) method for quantifying N deposition rates in a semi-arid region. **Science of the Total Environment** 646:1253-1264
9. Hall S.J., L. Reyes, W. Huang, and **P.M. Homyak**. 2018. Wet spots as hotspots: Moisture responses of nitric and nitrous oxide emissions from poorly drained agricultural soils. **Journal of Geophysical Research-Biogeosciences** 123:3589-3602
10. **Homyak P.M.**, J.C. Blankinship, E.W. Slessarev, S.M. Schaeffer, S. Manzoni, and J.P. Schimel. 2018. Effects of altered dry-season length and plant inputs on soluble soil carbon. **Ecology** 99:2348-2362
11. **Homyak P.M.**, S.D. Allison, T.E. Huxman, M.L. Goulden, and K.K. Treseder. 2017. Effects of drought manipulation on soil nitrogen cycling: A meta-analysis. **Journal of Geophysical Research-Biogeosciences** 122: 3260-3272
12. Leitner S., **P.M. Homyak**, J.C. Blankinship, J. Eberwein, D.J. Jenerette, S. Zechmeister-Boltenstern, and J.P. Schimel. 2017. Linking NO and N<sub>2</sub>O emission pulses with the mobilization of mineral and organic N upon rewetting dry soils. **Soil Biology & Biochemistry** 115: 461-466
13. Schaeffer S.M., **P.M. Homyak**, C.M. Boot, D. Roux-Michollet, and J.P. Schimel. 2017. Soil carbon and nitrogen dynamics throughout the summer drought in a California annual grassland. **Soil Biology & Biochemistry** 115: 54-62
14. **Homyak P.M.**, M.T. Kamiyama†, J.O. Sickman, and J.P. Schimel. 2017. Acidity and organic matter stimulate abiotic nitric oxide production in drying soils. **Global Change Biology** 23: 1735-1747
15. **Homyak P.M.\***, J.C. Blankinship, K. Marchus, D.M. Lucero, J.O. Sickman,

and J.P. Schimel. 2016. Aridity and plant uptake interact to make dryland soils hotspots for nitric oxide (NO) emissions. **Proceedings of the National Academy of Sciences of the United States of America** 113: E2608-E2616

\*Received the Gene E. Likens Award of the Ecological Society of America Biogeosciences section

16. **Homyak P.M.**, K.T. Vasquez†, J.O. Sickman, D.R. Parker, and J.P. Schimel. 2015. Improving nitrite analysis in soils: Drawbacks of the conventional 2 M KCl extraction. **Soil Science Society of America Journal** 79: 1237-1242  
**Press Release:** Standard Extraction Method Underestimates Nitrite in Soils. **CSA News Magazine**. August 2015, 60 (8): 14
17. **Homyak P.M.\***, J.O. Sickman, A.E. Miller, J.M. Melack, T. Meixner, and J.P. Schimel. 2014. Assessing nitrogen-saturation in a seasonally dry chaparral watershed: Limitations of traditional indicators of N-saturation. **Ecosystems** 17: 1286-1305  
\*Received the Elizabeth Sulzman Award (honorable mention) of the Ecological Society of America Biogeosciences section
18. **Homyak P.M.**, J.O. Sickman, and J.M. Melack. 2014. Phosphorus in sediments of high-elevation lakes in the Sierra Nevada (California): Implications for internal phosphorus loading. **Aquatic Sciences** 76: 511-525
19. **Homyak P.M.** and J.O. Sickman. 2014. Influence of soil moisture on the seasonality of nitric oxide emissions from chaparral soils, Sierra Nevada, California, USA. **Journal of Arid Environments** 103: 46-52
20. **Homyak P.M.**, J.O. Sickman, and J.M. Melack. 2014. Pools, transformations, and sources of P in high-elevation soils: Implications for nutrient transfer to Sierra Nevada lakes. **Geoderma** 217-218: 65-73
21. **Homyak P.M.**, R.D. Yanai, D.A. Burns, R.H. Germain, R.D. Briggs. 2008. Nitrogen immobilization by wood-chip application: protecting water quality in a northern hardwood forest. **Forest Ecology and Management**. 255: 2589-2601

## PROFESSIONAL EXPERIENCE

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### ***Consultant***

2006 – 2007 *Upper Susquehanna Coalition, Owego, NY.*

Nutrient cycling in forested ecosystems of the Upper Susquehanna watershed.

Investigated stream nutrient loading and N export from forested watersheds

### ***National Science Foundation GK12 Graduate Teaching Fellow***

2004 – 2006 SUNY College of Environmental Science and Forestry, Syracuse, NY.

- Developed and integrated inquiry based lesson plans into the course curriculum of a college-level environmental science course. Incorporated research and scientific literacy into the high-school learning experience

### ***Research Specialist***

Summer 2004 Binghamton University, Binghamton, NY.

- Sample and data analysis, development of experimental designs, and fieldwork

### ***Intern***

Summer 2002 Broome County Soil and Water Conservation District, Binghamton, NY

- Stream and ditch assessment of the Castle Creek Watershed, Broome County, NY  
Surveyed erosion, stream banks, and riparian buffer zones

***Tutor***

2000 - 2001 Broome Community College, Binghamton, NY.

- Worked with the Learning Assistance Center helping students in the subjects of algebra, chemistry, and statistics

**RESEARCH INTERESTS**

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Microbial and abiotic controls on soil trace gas emissions and elemental cycling/Ecosystem biogeochemistry/Global change

Stable isotope biogeochemistry/Linking biogeochemical cycles across the terrestrial-aquatic-atmospheric interfaces

**TEACHING EXPERIENCE**

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***Courses taught at UCR:***

- ENSC 002: Introduction to Environmental Science; ENSC 232: Biogeochemistry; ENSC 100: Introduction to Soil Science

***Other courses:***

- Co-Instructor, Introduction to Environmental Science. SUNY-ESF course taught to high-school seniors for college credit (2004 and 2005 academic calendar)

**PROFESSIONAL MEMBERSHIPS**

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American Geophysical Union, Ecological Society of America, Soil Science Society of America, American Association of the Advancement of Science

**FOREIGN LANGUAGES**

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Spanish (native language)

**INVITED TALKS**

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- Homyak, P.M. Drought effects on trace and greenhouse gas emissions from soils. Weber State University. April 2, 2021
- Homyak, P.M. Losing too much when there's too little: A case for widespread N limitation in dryland ecosystems. Iowa State University. November 19, 2020
- Homyak, P.M. The role of microscale processes and microbial metabolic handoffs on ecosystem N limitation. University of Michigan. March 16, 2019
- Homyak, P.M. How drought controls ecosystem N loss: From soil microscales to landscapes. University of California, Irvine. March 21, 2018
- Homyak, P.M. Microbial controls on soil N trace gas emissions. University of California, Riverside. March 1, 2018
- Homyak, P.M. Aridity and plant uptake interact to make dryland soils hotspots for nitric oxide emissions. Invited talk at the Soil Science Society of America annual meeting. October 22-25, 2017

- Homyak, P.M. Linking soil aridity with regional air quality: Drought-stress effects on microbial and abiotic nitric oxide production. University of California, Riverside. April 10, 2017
- Homyak, P.M. Coupling soils with the atmosphere: Landscape controls on nitric oxide emissions. California State University, San Bernardino. Feb 10, 2016
- Homyak, P.M. Linking ecosystem processes with atmospheric chemistry: Mechanisms regulating nitric oxide emissions. University of California, Irvine. Feb 8, 2016
- Homyak, P.M. The role of mathematics in biogeochemical research: Understanding elemental cycling in remote ecosystems of the Sierra Nevada. Talk to calculus students at Riverside City College. May 22, 2015
- Homyak, P.M. Sources of P supply to alpine ecosystems in the Sierra Nevada: Challenging long-held paradigms. IGERT UC Riverside. Riverside, CA. November 12, 2014
- Homyak, P.M. Plant and soil moisture controls on NO and CO<sub>2</sub> emissions in a California annual grassland. Biogeosciences seminar UC Santa Barbara. March 11, 2014
- Homyak, P.M. Alteration of N and P biogeochemical cycles in the Sierra Nevada: Effects on dryland and alpine ecosystems. University of Redlands. January 28, 2014
- Homyak, P.M. Linking mathematics with ecological research in the Sierra Nevada: N and P biogeochemistry. Talk to students of underrepresented groups in the PUENTE program at Riverside Community College. Riverside, CA. 2011
- Homyak, P.M. Nitrogen dynamics in semiarid ecosystems of California: application of basic mathematics. Talk to calculus students at Riverside Community College. 2011

## **PRESENTATIONS AT PROFESSIONAL MEETINGS**

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(Selected presentations since 2005)

- Homyak, P.M. Nitrogen Saturation: Mechanisms controlling ecosystem N loss. Talk at the Ecological Society of America annual meeting. August 2020
- Homyak, P.M. Mechanisms controlling Ecosystem N limitation: The role of microscale processes and microbial metabolic handoffs. Talk at the American Geophysical Union fall meeting. San Francisco, CA. December 9-13, 2019
- Greene, A.C., S. Ying, E.L. Aronson, D. Jenerette, J.O. Sickman, P.M. Homyak. Nitrous oxide emissions in response to wetting dryland soils along a carbon gradient. Poster displayed at the American Geophysical Union fall meeting. San Francisco, CA. December 9-13, 2019
- Andrews H., P.M. Homyak, and D. Jenerette. Spatiotemporal heterogeneity in trace gas nitrogen pulses from desert soils. Poster displayed at the American Geophysical Union fall meeting. Washington, D.C. December 10-14, 2018
- Homyak, P.M., J.C. Blankinship, E.W. Slessarev, S.M. Schaeffer, S. Manzoni, and J.P. Schimel. Mechanisms governing soluble soil carbon in drying soils: Exoenzymes vs. physics. Talk at the Ecological Society of America annual meeting. New Orleans, LA. August 5-10, 2018
- Homyak, P.M., S.L. Iverson, E.W. Slessarev, K.A. Marchus, and J.P. Schimel. Organic N cycling in Arctic ecosystems: Quantifying root uptake kinetics and temporal variability of soil amino acids. Poster displayed at the American Geophysical Union fall meeting. New Orleans, LA. December 11-15, 2017
- Homyak, P.M., S.L. Iverson, E.W. Slessarev, K.A. Marchus, and J.P. Schimel.

- Temporal variability of soil amino acids in N-limited ecosystems. Talk at the Ecological Society of America annual meeting. Portland, OR. August 6-11, 2017
- Slessarev, E.W., Y. Ling, P.M. Homyak, and J.P. Schimel. Soil wetting-respiration integrates microbial and extracellular C sources across a lithologic gradient. Talk at the Ecological Society of America annual meeting. Portland, OR. August 6-11, 2017
  - Homyak, P.M., M.T. Kamiyama, J.O. Sickman, and J.P. Schimel. Acidity and organic matter stimulate abiotic nitric oxide emissions in drying soils. Poster displayed at the American Geophysical Union fall meeting. San Francisco, CA. December 12-16, 2016
  - Homyak, P.M., J.C. Blankinship, and J.P. Schimel. Mechanisms controlling CO<sub>2</sub> pulses upon rewetting dry soils: Effects of vegetation on soil C dynamics. Poster displayed at the American Geophysical Union fall meeting. San Francisco, CA. December 14-18, 2015
  - Sadro, S., G. De La Rosa, C. Nelson, P.M. Homyak, J.O. Sickman. Effects of soil dissolved organic matter inputs on high-elevation lake metabolism. Poster displayed at the American Geophysical Union fall meeting. San Francisco, CA. December 14-18, 2015
  - Homyak, P.M., J.P. Schimel, and J.O. Sickman. The influence of dry-season processes on soil NO emissions: A  $\delta^{15}\text{N}$ -NO and  $\delta^{18}\text{O}$ -NO isotopic approach. Talk at the Ecological Society of America annual meeting. Baltimore, MA. August 9-14, 2015
  - Homyak, P.M., J.P. Schimel, and J.O. Sickman. Using  $\delta^{15}\text{N}$ - and  $\delta^{18}\text{O}$ -NO to evaluate mechanisms of nitric oxide production following the wetting of dry soil. Poster displayed at the American Geophysical Union fall meeting. San Francisco, CA. December 15-19, 2014
  - Homyak, P.M., J. Blankinship, J.O. Sickman, and J.P. Schimel. Dry season length and vegetation controls on soil nitric oxide emissions from a semiarid annual grassland. Talk at the Ecological Society of America annual meeting. San Jose, CA. August 11-15, 2014
  - Homyak, P.M., J.P. Schimel, and J.O. Sickman. The elusiveness of measuring nitrite in soils: fast chemical reactions or inadequate extraction methods? Poster displayed at the American Geophysical Union fall meeting. San Francisco, CA. December 9-12, 2013
  - Homyak, P.M., J.P. Schimel, and J.O. Sickman. Nitrogen dynamics in chaparral ecosystems: limitations to the use of traditional N saturation indicators. Talk at the Ecological Society of America meeting. Minneapolis, MN. August 3-7, 2013
  - Homyak, P.M., J.O. Sickman, A.E. Miller, J.P. Schimel, J.M. Melack, and T. Meixner. Nitrogen dynamics in chaparral ecosystems: limitations to the use of traditional N saturation indicators. Talk at the American Geophysical Union fall meeting. San Francisco, CA. December 3-7, 2012
  - Homyak, P.M., J.O. Sickman, J.M. Melack. High-elevation soils and lake sediments as sources of excess P to aquatic ecosystems of the Sierra Nevada, CA. Talk at the Ecological Society of America meeting. Portland, OR. August 5-10, 2012
  - Homyak, P.M., J.O. Sickman, A.E. Miller, K. Skeen, and J.M. Melack. Gaseous and hydrologic nitrogen fluxes indicate seasonal N saturation in chaparral ecosystems. Poster displayed at the American Geophysical Union fall meeting. San Francisco, CA. December 5-9, 2011
  - Homyak, P.M., J.O. Sickman, J.M. Melack. Soil P dynamics in the Sierra Nevada: Exploring the connection between soils and eutrophication of high-elevation lakes. Talk at the Soil Science Society of America annual meeting. San Antonio, TX. October 16-19, 2011
  - Homyak, P.M., and J.O. Sickman. Pulses of NO and N<sub>2</sub>O in Mediterranean

- ecosystems of the Sierra Nevada (California): importance of gaseous fluxes in annual N budgets. Talk at the Ecological Society of America meeting. Austin, TX. August 7-12, 2011
- Homyak, P.M., J.O. Sickman, J.M. Melack. Phosphorus forms and pools in high-elevation soils of the Sierra Nevada: Sensitivity to climate change. Talk at the American Geophysical Union fall meeting. San Francisco, CA. December 13-17, 2010
  - Homyak, P.M. Atmospheric nitrogen retention in forests of the upper Susquehanna watershed, New York. Poster displayed at the Cornell Agricultural Ecosystems Program Poster Session. Ithaca, NY. November 29, 2006
  - Homyak, P.M., R.D. Yanai, D.A. Burns, R.H. Germain, R.D. Briggs. Nitrogen immobilization by woodchip application: protecting water quality in a northern hardwood forest. Poster displayed at the American Water Resources Association National Conference. Seattle, WA. November 6-10, 2005
  - Homyak, P.M., D.A. Burns, R.H. Germain, R.D. Briggs, R.D. Yanai. Nitrogen immobilization by woodchip application: protecting water quality in a northern hardwood forest. Talk at the Annual Conference on Watershed Protection and New York City Watershed Science and Technical Conference. Fishkill, NY. September 21-22, 2005
  - Scanga, S., R. Barber, E. Cheshire, A. Dechen, P. Homyak, R. Jarrell, K. Miller, K. Shoemaker, D. Raynal, C. Spuches, R. Beal, D. DeSiato, and S. Tankersley. Bringing research into central New York classrooms: SUNY-ESF Science Corps. Poster displayed at the NSF Graduate Teaching Fellows in K-12 Education Annual Project Meeting. Arlington, VA. March 4-6, 2005

## **COMMUNITY AND ACADEMIC SERVICE**

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### **Associate Editor**

- Elementa: Science of the Anthropocene. Jan 2020-Present

### **Presider**

- Homyak, P.M. (convener), E. Slessarev, J.P. Schimel. Drought effects on soil biogeochemical cycling. Soil Science Society of America annual meeting, 2019
- Homyak, P.M. (convener), M. Maier, N. Brüggemann, and C. Wagner-Riddle. Understanding mechanisms governing ecosystem biogeochemical cycling in the solid, liquid, and gas phase: Physiology vs. physics and chemistry. American Geophysical Union fall meeting, 2016
- Biogeo Patterns Along Environmental Gradients. Ecological Society of America annual meeting, 2015. Session COS-134
- Biogeochemistry: New Paradigms in Biogeochemical Cycling II. Ecological Society of America annual meeting, 2013. Session COS-21
- Biogeochemistry: Aboveground-Belowground Interactions I. Ecological Society of America annual meeting, 2012. Session COS-74
- Changes in soil carbon due to climate and human activities. Soil Science Society of America annual meeting, 2011. Session 390

### **Synergistic interactions**

- UCR Career Mentoring of Underrepresented STEM Students for the Professoriate (CUSP) Mentor, 2021-Present
- Woodlake High-school science outreach, 2021
- PUENTE Program Mentor. Riverside City College, 2016-Present
- Soil Ecology Section Mentor. ESA annual meeting, 2015



- Biogeosciences Section Judge. ESA annual meeting, 2014-2018
- Biogeosciences Section Judge. AGU annual fall meeting, 2012-2016
- Mentor to Women in Math and Sciences Organization. UCR, May 30, 2013
- Panelist. Obtaining Postdocs in the Sciences Workshop. UCR, January 22, 2013
- Represented UC-Riverside during Graduate Research Advocacy Day. Interacted with California legislature to advocate continued funding for graduate student research. Sacramento, CA May 11, 2011
- Activity leader-What is a watershed? Activity for middle school students. 2006
- Science fair judge, SUNY-ESF middle school science fair, 2005, 2006
- Science fair mentor, Riverside Middle School, Riverside, CA. 2012
- Science project mentor, La Colina Junior High School, Santa Barbara, CA. 2015
- Science project mentor, Laguna Beach High School, Laguna Beach, CA. 2016