

# **SARAH M. BISBING\***

University of Nevada - Reno  
Reno, NV 89557

## **PROFESSIONAL APPOINTMENTS**

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Assistant Professor, Forest Science University of Nevada - Reno Natural Resources & Environmental Sciences	2017 – present
Affiliated Faculty University of Nevada - Reno Graduate Program in Ecology, Evolution, & Conservation Biology	2017 – present
Assistant Professor, Forest Ecology & Silviculture California Polytechnic State University Natural Resources Management & Environmental Sciences	2013 - 2017

## **EDUCATION**

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Ph.D. Ecology Colorado State University, Fort Collins, CO	2013
M.S. Forestry University of Montana, Missoula, MT	2008
B.S. Forest Resource Management University of Montana, Missoula, MT	2005

## **PROFESSIONAL EXPERIENCE**

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Graduate Research Assistant Forest & Rangeland Stewardship, Colorado State University	2009 - 2013
Associate Director, Nevada Conservation Corps Great Basin Institute, Las Vegas, NV	2008 – 2009
The Wilderness Society (TWS) Research Associate Condon and Bozeman, MT	2007 - 2008
National Science Foundation Teaching Fellow (GK-12) University of Montana, Missoula	2006 - 2007

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\* Updated: April 20<sup>th</sup>, 2018

**Bisbing, S.M.**, B.J. Buma, L.E. Oakes, J. Krapek, and A.L. Bidlack. 2019. From canopy to seed: loss of snow drives directional changes in forest composition. *Ecology & Evolution*. *Accepted*.

Buma, B., E. Batllori, **S. Bisbing**, A. Holz, S.C. Saunders, A.L. Bidlack, M.K. Creutzburg, D.A. DellaSala, D. Gregovich, P. Hennon, and J. Krapek. 2019. Emergent freeze and fire disturbance dynamics in temperate rainforests. *Austral Ecology*.

**Bisbing, S. M.** and D. V. D'Amore. 2018. Nitrogen dynamics vary across hydrologic gradients and by forest community composition in the perhumid coastal temperate rainforest of southeast Alaska. *Canadian Journal of Forest Research*. 48: 180-191. *Published online Dec 2017*: doi: 10.1139/cjfr-2017-0178

Bidlack, A. **S. Bisbing**, B. Buma, D. D'Amore, P. Hennon, J. Krapek, R. Mulvey, and L. Oakes. 2017. Alternative interpretation and scale-based context for *No evidence of recent (1995-2013) decrease in yellow-cedar in Alaska* (Barrett and Pattison 2016). *Canadian Journal of Forest Research*. 47(8): 1145-1151.

Buma, B, **S. Bisbing**, J. Krapek, and G. Wright. 2017. A foundation of ecology re-discovered: 100 years of succession on 100 William S. Cooper plots in Glacier Bay, Alaska. *Ecology*. 98(6): 1513-1523.

Brousil, M.\* and **S. Bisbing**. 2017. Influence of fire history on coast redwood regeneration and stand structure. In Standiford and Valachovic. *Proceedings of the Coast Redwood Science Symposium*. Gen. Tech. Rep. PSW-GTR-258.

Petrasova, M., I. Matecny, I., E. Uhercikova, P. Pisut, S. Kubalova, M. Valachovic, I. Hodalova, P. Mered'a Jr., **S.M. Bisbing**, and J. Medvecká. 2017. Effect of the Gabčíkovo waterworks (Slovakia) on riparian floodplain forest ecosystems the Danube inland delta: vegetation dynamics and trends. *Biologia*. 72 (7): 722-734.

Mulvey, R. and **S. Bisbing**. 2016. Complex interactions among agents affect shore pine health in southeast Alaska. *Northwest Science* 90 (2): 176 – 194.

**Bisbing, S.M.**, D.J. Cooper, D.V. D'Amore, and K.M. Marshall. 2016. Determinants of conifer species distributions across peatland to forest gradients in the coastal temperate rainforest of southeast Alaska. *Ecohydrology*. *Published online Dec 2015*: doi: 10.1002/eco.1640

Budzakova, M., I. Hodalova, P. Mered'a Jr., L. Somlyay, **S.M. Bisbing**, and J. Sibik. 2014. Karyological, morphological, and ecological differentiation of *Sesleria caerulea* and *Sesleria tatrae* (Poaceae) in the Western Carpathians and adjacent regions. *Preslia* 86: 245 - 277.

Cooper, D.J., **S Bisbing**, D. Millar, and E. Gage. 2013. The biology of freshwater wetlands by Arnold G. van der Valk. *The Quarterly Review of Biology* 88 (2): 133.

Bothwell, H., **S. Bisbing**, L. Crawford, N. Therkildsen, N. Alvarez, R. Holderegger, and S. Manel. 2013. Identifying genetic signatures of selection in a non-model species: a case study of the alpine gentian (*Gentiana nivalis* L.). *Conservation Genetics* 14 (2): 476-481.

**Bisbing, S.M.**, P.B. Alaback, and T.H. DeLuca. 2010. Carbon storage of old-growth and second growth fire-dependent western larch (*Larix occidentalis* Nutt.) forests of the Inland Northwest, USA. *Forest Ecology and Management* 259 (5): 1041-1049.

#### **PUBLICATIONS - SUBMITTED & IN PREP**

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Nelson, K.\*, **S. Bisbing**, M. Ritter, and J. Yost. Testing an invasion mechanism for *Eucalyptus globulus*: is there evidence of allelopathy? *American Journal of Botany*. *In Review*.

**Bisbing, S. M.**, A. Urza, D.J. Cooper, and A.L. Angert. Subspecies designations reflect genetic, geographic, & morphologic variation in *Pinus contorta*. *Journal of Biogeography*. *In Revision for new submission*.

**Bisbing, S.M.**, B.J. Buma, T.S. Davis, D. Canestro, K. Hurt\*, and M. Terzes\*. Compounding disturbance from drought and disease shape forest demographic processes. *Journal of Ecology*. *In Prep*.

Brousil, M.\*, T.S. Davis, and **S.M. Bisbing**. Adaptive traits determine regeneration dynamics and post-fire community composition in coast redwood forests. *Ecosphere*. *In Prep*.

#### **FUNDING**

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Bisbing, S.M. Silviculture for climate change: Sierra Nevada-wide treatments to promote resistance, resilience, and adaptation to altered climate and disturbance regimes. California Department of Forestry & Fire Protection Forest Health California Climate Investments Grant Program, \$2,697,153 (2018 – 2021)

Bisbing, S.M. Impacts of genetics, local environment, and stand history on quaking aspen susceptibility to the emerging white satin moth defoliation event. Tahoe License Plate Program, \$120,953 (2018 – 2021)

Bisbing, S.M. Whitebark pine survival potential: tracking demographic patterns in the Interior West & Great Basin. Region 4 Forest Health Protection, \$44,523 (2018 – 2019)

Bisbing, S.M. Climate change disruption in Sierra Nevada forests: treatments to promote resistance, resilience, and adaptation under future climate and disturbance regimes. Cal Fire, \$155,183 (2018 – 2021)

Bisbing, S.M. Quantifying thresholds and predicting changes in Great Basin forest community stability under drought and ongoing climate change. USDA NIFA Hatch Funding, \$90,000 (2017-2020)

Bisbing, S.M. Forest health and demography of Cambria’s Monterey pine forest. Fire Safe Council - SLO, \$76,480 (2016 – 2017)

Bisbing, S.M. Effects of variable density thinning and prescribed fire on forest resilience and stand dynamics in Sierra Nevada forests. California Agricultural Research Initiative (ARI), \$218,904 (2015 – 2018)

Bisbing, S.M. Treatment effects on the regeneration environment: the influence of soil legacies and microclimate on germination and success of Sierra mixed-conifer species. USDA Forest Service, Pacific Southwest Research Station, \$15,000 (2015 – 2017)

Bisbing, S.M. Establishment and survival of yellow-cedar, a climate-change impacted species in southeast Alaska. California Polytechnic State University: Research, Scholarly, and Creative Activities Grant Program, \$13,947 (2015 – 2016)

Bisbing, S.M. Treatment effects on the regeneration environment: the influence of soil legacies and microclimate on germination and success of pines and understory vegetation. USDA McIntire-Stennis, \$45,000 (2015 – 2018)

Bisbing, S.M. Interacting effects of wildfire and salvage logging on forest regeneration following the Rim Fire. California Polytechnic State University: Research, Scholarly, and Creative Activities Grant Program, \$13,500 (2014 – 2015)

Bisbing, S.M. Coast redwood regeneration and forest resilience under multiple, interacting disturbances. USDA McIntire-Stennis, \$45,000 (2014 – 2017)

Bisbing, S.M. Coastal forests under a changing climate: identifying the regeneration niche of coast redwood. California ARI New Investigator, \$40,000 (2014 – 2016)

Bisbing, S.M. Pacific Coast tree species’ distributions across a gradient of spatial scales. California ARI SEED, \$5,000 (2014 – 2015)

Bisbing, S.M., K. Corella, H. Mehl, and Z. Heath. Monitoring, extension, management, and mitigation of Sudden Oak Death on the Central Coast. USDA Forest Service, \$69,456 (2014 – 2016)

Bisbing, S.M. Quantifying local adaptation of *Pinus contorta* to support forest conservation under a changing climate. California Polytechnic State University: Extramural Funding Initiative, \$10,000 (2014 – 2015)

Bisbing, S.M. and K. Corella. Southern Area Sudden Oak Death Monitoring. USDA Forest Service, \$49,456 (2013 – 2015)

Mark, W., K. Corella, and **S.M. Bisbing**. Forest Health Research and Development. Cal Department of Forestry, \$402,029 (2013 – 2015)

Mulvey, R., T. Barrett, **S. Bisbing**, and E. Graham. Investigation of factors contributing to shore pine (*Pinus contorta* ssp. *contorta*) mortality and damage in southeast Alaska. USDA Forest Service, National Forest Health & Monitoring, \$57,000 (2011 – 2013)

Bisbing, S.M. Conserving the adaptive potential of western forests: Using range-wide patterns of genetic structure & niche modeling to predict the response of *Pinus contorta* to climate change. Gloria Barron Wilderness Society Fellowship, \$10,000 (2012 – 2013)

Bisbing, S.M. Discrete Populations? Examining the role of genetic variation and landscape heterogeneity in the phenotypic divergence of *Pinus contorta*. National Park Service George Melendez-Wright Climate Change Fellowship, \$19,196 (2011 – 2013)

Cooper, D.J. and **S. Bisbing**. Hydrophyte status assessment of southeast Alaska wetland plants. USDA Forest Service Pacific Northwest Research Station, \$20,000 (2009 – 2012)

Cooper, D.J. and **S.M. Bisbing**. What is a hydrophyte? How plant species grow in upland and wetland environments. U.S. Army Corps of Engineers, Cold Regions Research and Engineering Laboratory, \$180,000 (2008 – 2012)

#### **CONTRACTS & COLLABORATIONS**

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Bidlack, A<sup>†</sup>, B. Buma<sup>†</sup>, D. Butman<sup>†</sup>, **S. Bisbing\***, D. D'Amore,\* B. Hunt,\* and S. Tank\*. RCN: Coastal Rainforest Margins Research Network - understanding materials flux in linked terrestrial and marine ecosystems in the face of climate change. National Science Foundation, \$498,970 (2016 – 2020) <sup>†</sup> Project Investigators, \*Steering Committee

Turner, D., **S.M. Bisbing\***, C. Dicus\*, and R. Thompson\*. Forest health and demography of Cambria's Monterey pine forest. Cal Fire Greenhouse Gas Reductions Fund, \$498,736 (2015 – 2020). \*Project Contractors

**Bisbing, S.M.** and D. Canestro. Evaluating effects of local climate, climate fluctuations, and compounding disturbance on distributional and demographic patterns of Monterey pine (*Pinus radiata*). Private Donation to UC Ranch Marino, \$25,000 (2016 – 2018)

**Bisbing, S.M.** Cambria Monterey Pine (*Pinus radiata*) Forest Health & Carbon Stocks Assessment. California Fire Safe Council, \$40,000 (2015 – 2016)

## FELLOWSHIPS AND AWARDS

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Outstanding New Faculty Teaching (Cal Poly, \$750)	2016 - 2017
GDPE Travel Award (\$600)	2013
George Melendez-Wright Student Travel Award (\$2,500)	2012
Gloria Barron Wilderness Society Fellow	2012 - 2013
Global Sustainability Leadership Fellow, Colorado State University	2012 - 2013
National Park Service George Melendez-Wright Climate Change Fellow	2011 - 2012
The Wilderness Society, Graduate Research Funding (\$25,000)	2007 - 2008
National Science Foundation Gk-12 Fellowship (\$35,000)	2006 - 2007
Robert Morgan Forestry Scholarship (\$2,000)	2005 - 2006
Bonhomme General Scholarship (\$1,000)	2005 - 2006
Irene Evers Undergraduate Research Grant (\$2,500)	2005
Dean's List, University of Montana	2003 - 2005
Illinois House of Representatives Scholarship (Full Tuition Waiver)	2000 - 2002

## SELECTED PRESENTATIONS

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- Bisbing, S.,** A. Urza, A. Angert, and D.J. Cooper. Support for subspecies designations in a widespread conifer: the influence of geographic barriers and climate on *Pinus contorta*. Annual Meeting of the US International Association for Landscape Ecology, Fort Collins, CO, April 2019.
- Bisbing, S.,** B. Buma, J. Krapek, L. Oakes, A. Bidlack, and M. Brousil. Multi-scale climatic and topographic characteristics of low snow mortality and regeneration in yellow-cedar suggest directional changes in forest composition. Annual Meeting of the US International Association for Landscape Ecology, Chicago, IL, April 2018.
- Bisbing, S.M.,** B. Buma, and J. Krapek. Microclimate drivers of decline and forest compositional shifts in yellow-cedar forests of southeast Alaska. Annual Meeting of the US International Association for Landscape Ecology, Asheville, NC, April 2016.
- Bisbing, S.M.,** D.J. Cooper, D.V. D'Amore, and K.M. Marshall. Determinants of conifer distributions in the coastal temperate rainforest of southeast Alaska. Annual Meeting of the International Association of Landscape Ecology, Portland, OR, July 2015.
- Bisbing, S.M.,** D.J. Cooper, and D.V. D'Amore. Physiological stress and interspecies competition determine tree species distributions along an environmental gradient in southeast Alaska. Annual Meeting of the Ecological Society of America, Sacramento, CA, August 2014.

Bothwell, HM, **S Bisbing**, N Therkildsen, L Crawford, N Alvarez, R Holderegger, & S Manel. Identifying genetic signatures of selection in a non-model species, alpine gentian (*Gentiana nivalis* L.) using a landscape genetic approach. US-International Association for Landscape Ecology Annual Symposium, April 2013.

**Bisbing, S.M.**, D.J. Cooper, and A.L. Angert. Genetic and geographic distributions of the west's most widespread conifer, *Pinus contorta*. George Wright Society Conference on Parks, Protected Areas, and Cultural Sites, Denver, CO, March 2013.

**Bisbing, S.M.**, D.J. Cooper, and A.L. Angert. Assessing the evolutionary history and potential geographic distributions of *Pinus contorta*: conservation and management implications for western North America's most widespread conifer. Front Range Student Ecology Symposium, Fort Collins, CO, February 2013.

**Bisbing, S.M.**, D.J. Cooper, and A.L. Angert. Range-wide patterns of genetic population structure and potential geographical range shifts of *Pinus contorta* (ssp. *latifolia*, *murrayana*, *contorta*, and *bolanderi*). Annual Meeting of the Ecological Society of America, Portland, OR, August 2012.

**Bisbing, S.M.** and D.J. Cooper. Discrete Populations? Examining the role of genetic variation & landscape heterogeneity in the phenotypic divergence of *Pinus contorta*. Front Range Student Ecology Symposium, Fort Collins, CO, February 2011.

Bothwell, HM, **S Bisbing**, L Crawford, N Therkildsen, J Bregy, R Holderegger, & S Manel. *Gentiana nivalis* L.: Identifying genetic variation of adaptive relevance in an alpine plant species. NCEAS International Landscape Genetics Symposium, Santa Barbara, CA, May 2010.

**Bisbing, S.**, T. DeLuca, and P. Alaback. Carbon Storage in Old-Growth Western Larch (*Larix occidentalis*) Forests of Western Montana. Annual Meeting of the Ecological Society of America, Milwaukee, WI, August 2008.

#### INVITED SEMINARS

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- UNR, ASUN Sustainability Earth Day Seminar Series, April 2019
- Wild & Scenic Film Festival, Forest Health & Carbon Panel, January 2019
- Alpine Biomass Collaborative Meeting, Alpine County, California, April 2018
- Cambria Forest Committee Meeting, Cambria, CA, January 2018
- University of California – Davis, Forest Biology Research Center, December 2017.
- University of Montana – Missoula, September 2017.
- High Sierra - California Society of America Foresters Chapter Meeting, May 2017.
- University of Nevada – Reno, March 2017.
- University of Wisconsin - Madison, February 2017.
- University of California Naturalist Program, August 2016 & February 2017.
- California Silviculture Working Group Meeting, Blodgett Forest, November 2016.
- Cambria Forest Committee Meeting, August 2016.
- California Polytechnic State University, Biology Department Seminar, June 2016.

- Friends of Fiscalini Ranch Preserve, February 2016.
- University of California – Davis, Forest Biology Research Center, December 2015.
- University of California – Merced, School of Natural Sciences, September 2015.
- California State University – Dominguez Hills, Department of Biology, Feb 2015.
- University of Washington, School of Environmental and Forest Sciences, Nov 2014.
- Alaska Coastal Rainforest Center, Juneau, AK, July 2014.

#### **ADDITIONAL RESEARCH EXPERIENCE**

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Research Assistant, Aspen Decline on Colorado’s Western Slope Colorado State University	2012
Research Assistant, Carbon Budgets of Rocky Mountain Fens Colorado State University	2012
Research Assistant, Willow Decline in Yellowstone National Park Colorado State University	2010
Research Assistant, Stable Oxygen Isotope Analysis Colorado State University	2009 - 2010
Research Assistant, San Juan Fen Restoration Colorado State University	2009
Research Assistant, Forest Restoration in the Bitterroot Valley, MT University of Montana, Missoula	2006 - 2007
Biological Technician, Amphibian Decline Research USGS, Glacier National Park, Montana	2005 - 2006
Biological Technician, Bark Beetle Research University of Montana, Missoula	2005

#### **TEACHING & MENTORING**

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##### **Assistant Professor, California Polytechnic State University**

- Intro to Forest Ecosystems, Fall & Winter 2013 - 2015
- Silviculture, Fall & Spring 2013 – 2017
- Natural Resource Ecology, Winter & Spring 2014 – 2017
- Sierra Nevada Forest Ecology, Spring 2016
- Forest Practices, Winter 2014 - 2016
- Logging Team Practices, Spring 2014 – 2017
- Ecosystem Management (capstone), Spring 2014 – 2017
- Sustainable Forest Management, Winter 2015 – 2016
- Current Topics in Environmental Science & Management, Fall & Winter 2015 - 2016
- Ecosystem Modeling (graduate course), Winter 2016
- Graduate Research Seminar (graduate course), Spring 2016

##### **Instructor, Colorado State University**

- Silviculture, Spring 2013
- Forest Stand Management (capstone), Fall 2012
- Silviculture (graduate level), Spring 2011 & 2012



**Instructor, Field Courses**

Fire Ecology, University of Montana, Summer 2015  
 Colorado Ecosystem Field Studies, Summer 2013  
 Landscape & Livelihood Program, Northwest Connections, Fall 2006 & 2007

**Teaching Assistantships**

Forest Ecology, Colorado State University, Fall 2010 & 2011  
 Forest Ecology, University of Montana, Spring 2007

**Guest Lecturer, Colorado State University**

Watershed Hydrology, Fall 2009 & 2010  
 Physical Geography, Spring 2010 & 2011  
 The Institute of Learning & Teaching, Undergraduate Learning Program, 2010 – 2011

**ADVISING & MENTORING**

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<b>Postdoctoral Advisor, UNR</b>	2018 - Present
Kellen Nelson (2019 – Present), Alexandra Urza (2018)	
<b>Graduate Advisor, UNR</b>	2018 - Present
Lacey Hankin (PhD, EECB), Tessa Putz (MS, NRES)	
<b>Graduate Studies Committee Member, UNR</b>	2018 - Present
Christopher Halsch (PhD, EECB), Adriana Parra (PhD, EECB), Ryan Kasten (MS, NRES)	
<b>Graduate Advisor, Cal Poly, MS in Forestry</b>	2015 - 2018
Matthew Brousil, Tori Norville, Emily O’Dean, Matthew Terzes, Marissa Vossmer	
<b>Research Mentor, Undergraduate Senior Thesis</b>	2013 – 2017
Forest Ecology Research (16 students) California Polytechnic State University	
<b>Research Mentor, Undergraduate Senior Thesis</b>	2011 - 2013
Forest Restoration Research (1 student) Colorado State University	
<b>Undergraduate Research Mentorship Program (TiLT)</b>	2010
Colorado State University	

**UNIVERSITY AND PROFESSIONAL SERVICE**

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<b>Gloria Barron Graduate Fellowship Reviewer</b>	2019
The Wilderness Society	
<b>Great Basin Institute Board of Directors</b>	2019 - Present
University of Nevada - Reno	
<b>Whittell Forest Advisory Board</b>	2019 - Present
University of Nevada - Reno	
<b>NRES Faculty Search Committee Member</b>	2017
Fire Ecology Position University of Nevada – Reno	

<b>Forest Management &amp; Ecology Curriculum Committee</b> University of Nevada - Reno	2017 - Present
<b>Faculty Advisor</b> Society of American Foresters Logging Team University of Nevada - Reno	2017 - Present
<b>NRES Faculty Search Committee Member</b> Forest Health Position California Polytechnic State University	2017
<b>NRES Faculty Search Committee Member</b> Department Head Position California Polytechnic State University	2016
<b>NRES Faculty Search Committee Member</b> Soil Ecologist Position California Polytechnic State University	2015
<b>NRES Faculty Search Committee Chair</b> Forest Disturbance Ecologist Position California Polytechnic State University	2014
<b>Campus Landscape Committee Member</b> California Polytechnic State University	2015 - 2017
<b>Academic Senate Sustainability Advisory Committee Member</b> California Polytechnic State University	2014 - 2017
<b>College Sustainability Advisory Committee Member</b> California Polytechnic State University	2014 - 2017
<b>Faculty Advisor</b> Society of American Foresters Student Association for Fire Ecology Logging Team California Polytechnic State University	2013 - 2017
<b>Recruitment &amp; Diversity Committee Member</b> College of Agriculture, Food, & Environmental Sciences California Polytechnic State University	2013 - 2017
<b>California Cooperative Ecosystem Studies Unit Representative</b> California Polytechnic State University	2013 - 2015
<b>Employment Equity Facilitator</b> California Polytechnic State University	2013 - 2017
<b>Curriculum Committee Member</b> Forestry and Natural Resources Major, NRES California Polytechnic State University	2013 - 2017
<b>Ad hoc Reviewer</b> USDA Forest Service General Technical Reports (2), Biologia (1), Biological Conservation (1), Biological Invasions (1), Canadian Journal of Forest Research (2), Ecological Applications (1), Ecology (1), Forest Ecology & Management (6), Forest Science (1), Journal of Undergraduate Research (2), Northwest Science (1), Plant Ecology & Diversity (1)	2010 - present

<b>Student Committee Organizer, GDPE Faculty Search</b> Colorado State University	2011
<b>Graduate Student Representative, GDPE Executive Committee</b> Colorado State University	2010 - 2011
<b>Front Range Student Ecology Symposium</b> President, Executive Committee (2010-2011) Day-of Committee Chair (2009-2010) Fundraising Committee Member (2009-2010) Graduate Degree Program in Ecology, Colorado State University	2009 - 2011
<b>National Center for Ecological Analysis and Synthesis Participant</b> Landscape Genetics Working Group NCEAS, Santa Barbara, California	2010
<b>College of Forestry Faculty Search Committee Member</b> University of Montana, Missoula	2006 – 2007

### **PROFESSIONAL SOCIETIES**

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Ecological Society of America, International Association for Landscape Ecologists,  
Society of American Foresters

### **ADDITIONAL EDUCATION AND TRAINING**

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- California Polytechnic State University, Office of Research & Economic Development, Grants Academy, 2014 - 2015
- California Polytechnic State University, Center for Learning & Teaching, Getting a Good Launch New(-ish) Faculty Learning Community, Academic Year 2014-2015
- California Polytechnic State University, College of Agriculture, Food, & Environmental Sciences Grant Writing Seminar, Winter Quarter 2014
- Bureau of Land Management Grant Writing for Conservation Course, January 2009
- **Computer Software:** R, S+, SPSS, PC-Ord, GenAIEx, Geneland, GenePop, Fragstats, Structure, Arlequin, MaxEnt, DIVA GIS (EcoCrop), ArcGIS, Sigma Plot, Delta Graph, Filemaker