Full Name Nichole Barger

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By submitting this application, I confirm that, if selected to receive a Chancellor's Award for Excellence in STEM Education, I will:

- ✓ Attend and be recognized at the annual Symposium on STEM Education (fall 2014).
- ✓ Give a brief introduction (~10-15 min) to my project at DBER in fall 2014.
- Actively engage in the CU-Boulder STEM education community by attending weekly DBER seminars and Chancellor's Fellow events when possible.
- Present my work to the STEM education community by giving at least one DBER seminar, OR, if that is an impossibility, I will give a talk that the CU-Boulder STEM education community is invited to attend.
- ✓ Submit a 1000 to 3000-word report detailing the outcomes of the project at the end of the funding period

Transforming Graduate Training in STEM Education

PI, Nichole Barger, Associate Professor (in AY 14), Ecology and Evolutionary Biology

Co-PI, Sarah Seiter, SEI Science Teaching Fellow, Ecology and Evolutionary Biology

1. PROBLEM STATEMENT

The need for improved instruction in college science, technology, engineering and math (STEM) courses is a prominent national policy issue (Brewer and Smith 2011, Olson and Riordan 2012). To address this need, instruction in many college STEM courses is being transformed through the adoption of student-centered, evidence-based teaching practices. A number of national programs address the need to train the next generation of educators in best practices in STEM education, but the majority of efforts are directed at faculty and post-docs while graduate student training in these practices has not kept pace (Tanner and Allen 2006). We propose that pre-service faculty (i.e. graduate students) receive structured, graduated training in pedagogy from the beginning of their education (Allen and Tanner 2005), just as K-12 science teachers receive professional development during the pre-service stage of their careers. Providing graduate students such training, including opportunities for significant classroom practice in student-centered, evidence-based practice, will benefit graduate students as they enter the workforce. Furthermore, collaborations between graduate students in training and faculty provides a sustainable model to further departmental transformations of instruction and curricula. This project strongly aligns with the Center for STEM Learning (CSL) mission to "promote K20 faculty recruitment, preparation, and professional development."

2. MAKING THE CASE FOR GRADUATE TRAINING IN STEM EDUCATION

STEM graduate students both want and need formal training and experience in education (Nyquist 1991). Despite the perception that STEM graduate students are primarily researchmotivated, they are more likely than their peers in other disciplines to express an interest in teaching, but are less likely to be given increasing responsibility and freedom in the classroom as their graduate careers progress (Nyquist 1991, Golde and Dore 2001). Although a portion of curriculum design often falls to graduate student teaching assistants under current models, these opportunities could be more effective and meaningful with additional training, support, and mentorship in pedagogical best practices. Indeed, current training in pedagogy for TAs is often limited to seminars and workshops with few opportunities for practice (Nyquist 1991, Luft et al. 2004). The impact of such single-experience workshops is known to have very limited effect on actual classroom practices (Hanushek 2006). There have been a few notable national efforts to improve graduate training in teaching, such as the Preparing Future Faculty program and the now-defunded NSF GK-12 program. While these programs have made some progress in increasing opportunities for pedagogical training, they were not specifically designed to transform college level STEM instruction and they impact only a limited number of graduate students (DeNeef 2002, Trautmann and Krasny 2006). Therefore, models supporting structured, and progressively advancing graduate student pedagogical training need to be developed and disseminated. Ideally, for scalability, these models would deliver clear, immediate benefits to graduate student home departments and could be replicated by those departments while minimizing faculty time investment, logistical hurdles, and the need for ongoing external funding.

The consequences of a lack of pedagogical training are well documented: graduate students and new faculty frequently report being unprepared for the responsibilities of teaching in tenure-track positions (Golde and Dore 2001, Nyquist et al. 1999, Austin 2002). At the same time, teaching experience is rapidly becoming a decisive factor in faculty job searches of all levels (Meizlish and Kaplan 2008), and an increasing number of doctoral students in the sciences are pursuing non-tenure track careers (Snyder and Dillow 2013), all of whom would be served by more structured training and practice in pedagogy. Below we describe the benefits of increasing graduate student access to formal pedagogy training and mentorship. We then propose a model for pedagogical training in which mentorship and support for teaching begin early in a graduate career and students gain progressive responsibility for course design and teaching throughout their training.

Training and guided practice in evidence-based best teaching methods can benefit graduate students in their graduate and post-graduate careers in several tangible ways. First, graduate students will be better prepared for the demands placed on them as faculty and educators in STEM disciplines (Boice 1991, Adams 2002). Second, the skills students gain as they learn to be better educators, such as how to communicate information effectively to a range of audiences, manage time efficiently, and lead groups with diverse perspectives and abilities, will also make them better scientists (Trautmann and Krasny 2006). Third, in a climate of increased competitiveness for academic positions, evidence that an applicant is a proven educator and has the skills to design and implement courses with active learning components gives them a distinct advantage (Adams 2002). This advantage will be particularly evident as universities experience increasing pressure to improve undergraduate STEM education, and are looking for educators to help them meet their goals (Adams 2002). Overall, graduate student training in education, and opportunities for meaningful practice prior to entering the workforce, will make future scientists into more effective educators and more competitive in both the academic and non-academic job markets.

Not only are there clear benefits for graduate students in receiving training in best practices in teaching and learning but placing highly trained graduate student instructors into the classroom to implement these practices will improve the undergraduate educational experience. Graduate students in the STEM disciplines at the University of Colorado Boulder (UCB) contribute substantial student contact hours as graduate teaching assistants (TAs) in lab courses, recitations, and lecture courses in addition to serving as instructors of record as graduate part-time instructors (GPTIs). A broad survey of undergraduate perceptions of graduate TAs relative to tenure track faculty suggests that TAs relate better to undergraduates on a personal level and create a classroom atmosphere which is more personalized, engaging, and interactive (Kendall and Shussler 2012). In this same survey, however, undergraduates report that TAs were more hesitant, nervous, and uncertain in their approach to teaching. Providing structured training and opportunities for implementing best practices in teaching is likely to increase graduate student confidence in their instructional abilities. Combining the positive classroom atmosphere created by graduate students with additional and focused pedagogical training is a pathway by which STEM education may be greatly improved across campus.

Finally, pairing highly trained graduate student instructors in STEM education with faculty members provides an opportunity to accelerate the pace at which these STEM educational reforms are occurring. Many faculty members identify time constraints as the primary barrier to adopting active learning practices, despite recognizing the benefits of such evidence-based practices (Brownell and Tanner 2012). Significant fractions of faculty members who attempt to adopt active learning report reverting to traditional practices due to a lack of support in overcoming a variety of barriers to change (Henderson and Dancy 2007, Henderson et al. 2012). By implementing teaching collaborations between faculty and graduate students,

graduate students can practice evidence-based teaching with the support of a seasoned educator (Adams 2002), while that educator can observe and be supported in learning about evidencebased teaching. Thus, co-teaching with a graduate student will reduce the teaching timecommitment on faculty, allow graduate students to gain valuable teaching experience, and ultimately increase the quality of college STEM education.

Our overarching goal is to create a home department-based STEM graduate teaching program that builds from and compliments the graduate teaching opportunities provided to STEM graduate students at UCB (e.g TAships; GPTIships; the Graduate Teacher Program/GTP; the Center for Integrated Research Teaching and Learning/CIRTL). Our objective is to provide structured, graduated opportunities to implement evidence-based best practices for graduate students in STEM disciplines. We will achieve our objective by organizing a multi-day summer workshop in which graduate students will design, critique, and practice developing and delivering evidence-based teachable STEM units. These units designed during the summer workshop will then be taught with cooperating faculty from their home department during the fall semester. Graduate students will enroll concurrently in the fall semester in a STEM graduate

teaching seminar, either one led by PIs Barger and Seiter in EBIO or an approved alternate offered in MCDB or the School of Education. Barger and Seiter will mentor and assess graduate student teaching throughout the fall semester, through standard teacher evaluation tools and personalized coaching. Funding from this proposal will allow summer workshops and a fall graduate teaching seminar to be offered twice, in AY 2014 and 2015, and we plan to use pilot data from this project to develop a full NSF proposal.

3. METHODOLOGY

Graduate Teaching Framework -



Fig. 1. Proposed framework for STEM graduate teaching training. Light blue denotes programs on campus. Light pink denotes components which extend existing programs into a structured, graduated training model.

We propose a model for pedagogical training in which graduate students progress from early study in foundational topics in education (Fig.1, Study) while gaining active learning and classroom management experience as a graduate teaching assistants (Fig. 1, Assist). The study and assist phase of graduate training is the existing graduate teaching model for most STEM graduate students at CU and nationally. We propose to expand on this model by providing opportunities to design and practice teachable units (Fig. 1, Design) in an intensive summer workshop. Crucial to the impact of this model is the implementation of these teachable units by partnering with departmental faculty (Fig. 1, Collaborate). In some cases, participants will parlay their workshop experience, with mentoring, into full course design as the instructor of record or as a co-instructor (Instruct). Through this proposed model, we expand and integrate existing graduate training programs with opportunities to implement best practices within STEM graduate students' home departments. Our model emphasizes the importance of providing

graduate students with collaborative teaching and lead instructor opportunities so the learning curve for best practices in STEM education can occur prior to entering the workforce.

Design and practice teachable units-Summer Graduate Teaching Workshop - Graduate students will learn about and practice methods of 'scientific teaching' (Handelsman et al. 2006) and other evidence-based practices in STEM education, in a Summer Graduate Teaching Workshop (Handelsman et al. 2004). The objective in this workshop is for graduate student participants to produce teachable units based on principles in scientific teaching (Table 1, draft workshop agenda). The workshop will be modeled off of and use curricula developed by the highly effective and popular Howard Hughes Medical Institute and National Academies Summer Institutes on Higher Education (see http://www.academiessummerinstitute.org). The 5-day workshop will be convened for a week in July from 9 am - 2 pm and enroll up to 20 graduate students across STEM disciplines. Recruitment and enrollment for a late July workshop will begin in May. At this time, graduate students who enroll in the workshop will be asked to identify a collaborating faculty member, who will provide a letter of support. Barger is currently teaching a graduate teaching seminar, and the 10 graduate students involved (from EBIO and Geology) have had great success partnering with STEM faculty to develop teachable units. Many STEM faculty have travel during a semester thus providing a natural opportunity for graduate students to fill in for faculty.

Before the workshop convenes in July, Barger and Seiter will work on reviewing or creating assessment tools for graduate student professional development in the summer workshop and the following graduate teaching seminar in the fall semester. She will reach out to campus leaders in STEM education to identify and evaluate the most appropriate tools to assess graduate student experience and professional development. The biology department is currently developing a tool to measure student centered practices and student engagement for faculty (SITAR), which could be applied to graduate student teaching in during the "instruct" phase of the program. Other stages of the program may require different assessment tools.

| Date | Activities | Readings |
|-------|--|---------------------------|
| Day 1 | Topic: STEM education in the 21 st century and scientific | |
| | teaching | Scientific Teaching Ch. 1 |
| | Afternoon panel discussion with campus leaders in | |
| | STEM education | |
| Day 2 | Topic: Creating learning goals | Scientific Teaching Ch. 3 |
| Day 3 | Topic: Designing assessments | Scientific Teaching Ch. 3 |
| Day 4 | Topic: Interactive learning strategies | Scientific Teaching Ch. 2 |
| Day 5 | Topic: Teaching diverse populations | Scientific Teaching Ch. 4 |
| | Afternoon panel discussion on diversity - Convene a | |
| | panel of 5-6 undergraduates representing diverse | |
| | populations at UCB | |

Table 1. Proposed topics for the Summer Graduate Teaching Workshop. The workshop will be held in July for 5 days from 9 am -2pm on the UCB campus. We will use Handelsman et al. 2006 and the central text for the workshop.

The workshop will utilize active and project-based learning, and formative assessment techniques to train graduate students in pedagogy, modeling the same techniques they will later implement in the instruction phase of their training. When the workshop convenes in July, each day we will assign a reading (Fig. 2, 1) and students will provide a short 200-300 word summary

of the reading with discussion questions before arriving at the workshop (Fig. 2, 2). At the start of each workshop we will discuss the reading in small groups of 4-5 students (Fig. 2, 3). Following the discussion, we will apply the reading to the teachable unit each student will be working on during that week, while integrating practice of evidence-based instructional techniques (Fig. 2, 4). We expect these teachable units to represent a diverse cross-section of topics across the STEM disciplines. To boost student metacognition around their experiences, at the end of each day, students will report back to the larger group on the successes and challenges

of applying the topic for that day to their teachable unit (Fig. 2, 5). That evening before the next workshop students will write a short reflection on their learning for that day, for discussion the next day (Fig. 2, 6). Two of the five workshop days, we will hold a panel discussion. The first panel discussion topic will examine scientific teaching and we will invite UCB campus leaders in STEM education to discuss their experiences in this arena. The second panel discussion will be devoted to teaching to diverse populations. We will convene a panel of undergraduates that represent a diverse cross section of the UCB campus to discuss diversity and learning. At the end of the workshop,



Daily Summer Workshop Schedule

all graduate students will have a draft teachable unit, ready for critique and practice during the fall seminar.

Collaborate and Instruct - Fall Semester Graduate Teaching Seminar, EBIO 6100- Graduate students who participated in the summer workshop will bring the teachable unit developed during the summer workshop to the fall teaching seminar. A condition of the summer workshop will be the fall teaching seminar, and this will be made clear to students during recruitment. We are confident that we can fill all the positions in the summer workshop and fall graduate teaching seminar, based on the current enrollment in Barger's seminar, which was only advertised to EBIO graduate students (9 students enrolled, and 1 more who attends without receiving credit). During the seminar, graduate students will peer review teachable units, then practice their units on a rotating basis. We anticipate approximately 12-15 graduate students will enroll in the seminar coming from a wide range of STEM disciplines. This presentation will be the 'dress rehearsal' before the teachable unit is taken into the undergraduate classroom. When the graduate student is scheduled to present the teachable unit either Barger or Seiter will attend the class and provide assessments of teaching effectiveness and student engagement. Immediate feedback will be provided to the graduate student and the teachable unit will be modified accordingly. If the teachable unit is a case study, the graduate student will be encouraged to write up and submit their work to a peer-reviewed online case study repository (see the National Center for Case Studies in Teaching http://sciencecases.lib.buffalo.edu/cs/ Teaching Issues and Experiments in Ecology, http://tiee.ecoed.net).

4. EVALUATION

We will collect the following data to evaluate the impact of this project and to develop subsequent proposals:

- a. **Graduate participant reflections and survey**. Summer workshop and fall course reflection assignments as well as comments made during class discussions and informal conversation will be compiled by PIs. All participants will complete an evaluative survey at the completion of both the summer workshop and fall seminar. These data will be analyzed for qualitative themes related to perceptions of project impact and any evidence of transformation from traditional to student-oriented, evidence-based teaching philosophy and practices.
- b. **Quantitative and Qualitative Observational Data**. The SITAR observational tool will be used by PIs and/or course participants to track graduate participant teaching practices and student interactivity, as they implement their practice and final teachable units. This tool was developed by EBIO-SEI STFs and is "descended with modification" from published observational tools including the RTOP, COPUS and TDOP. Each participant will be observed at least 3 times, by the same observer. This data will be analyzed for evidence of the use of evidence-based practices and any change in such practices over time.
- c. Undergraduate Survey. The PIs will develop a standard survey, to which participants can append additional questions, which will be administered shortly following each participant's implementation of their teachable unit. Standard survey questions will be drawn from the widely-used Student Assessment of Learning Gains (SALG) tool as well as UCB's standard FCQ tool. Student responses will be analyzed with respect to the impact of the teachable unit curricula on perceived student attitudes, motivation, and learning. FCQ responses will be compared to the cooperating faculty's FCQ overall course ratings to investigate differential student responses to the teachable unit curricula.
- d. **Faculty survey**. The PIs will develop a survey of cooperating faculty in which free responses will allow faculty to describe any impacts their collaboration with the graduate student had upon their teaching philosophy and practice.

5. BROADER IMPACTS OF THE PROPOSED WORK

Professional Development —Over the past several years, Barger has committed significant time and energy to adopting teaching strategies to enhance student learning in all of her courses. Her current approach to teaching and learning that evolved during this time can be best described as a student-centered *evidence-based approach*. To adopt this new approach to teaching required a complete restructuring of her courses. This graduate teaching program not only gives Barger the professional opportunity to share what she has learned over the past seven years with graduate students as they develop into educators, but also provides an opportunity to be trained in the use and analysis of the wide range of assessment tools laid out in the evaluation section. Supporting STEM Reform in EBIO and UCB — Our proposed graduate teaching model will address the need for STEM education reform in EBIO and UCB in several ways. Providing graduate students with formal pedagogical training and mentored teaching practice will directly benefit undergraduate STEM students, increasing the quality of the instruction they receive. Further, increased classroom time and support for graduate students will reduce the teaching requirements of current faculty, serve as pre-service training for future faculty, and help prepare graduate students for success in a variety of future careers, including non-academic positions. Our model builds on existing graduate training programs at UCB by increasing graduate student teaching responsibilities, supplementing current training structures with increased opportunities for practicing evidence-based education techniques, and enhancing training and mentorship through courses and faculty partnerships. By directing these efforts towards graduate students, who often lack this type of guidance and support, we believe our model will address a critical area of need in training the next generation of STEM educators.

This framework for graduate teaching training is currently supported by the EBIO department and also the UCB Arts and Sciences Deans Office. EBIO released Barger from her primary teaching responsibilities in in the fall semester of AY 2014 and 2015 to lead the proposed graduate teaching program. Thus Barger has been awarded the time to invest in this program during the academic year. The A&S Deans Office recently awarded two GPTI positions for AY 2014 and 2015 in EBIO for graduate student participation in this program.

6. ACKNOWLEDGEMENTS

Although not traditionally included in proposals, we feel it's important to acknowledge the EBIO and Geology graduate students who motivated and inspired our proposed graduate teaching program. The training framework in this document strongly reflects the ideas and needs presented to Barger and Seiter by the group of graduate students who participated in the EBIO Science Education Reading Group during the Fall 2013 semester. These graduate students played an important and critical role in developing this proposal: Amy Churchill, Chelsea Cook, Amanda Hund, Kathy Kelsey, Sierra Love-Stowell, Miranda Redmond, and Katie Richgels. Their collective enthusiasm, passion, and commitment for teaching is both humbling and inspiring.

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8. BUDGET

| Expenditure | Year 1 | Year 2 | All Years |
|---|---------|---------|-----------|
| | 2014 | 2015 | Total |
| Barger Summer Salary | \$4,476 | \$2,238 | \$6,714 |
| (Year $1 = 2$ weeks, Year $2 = 1$ week) | | | |
| Faculty Fringe Benefits (28.2%) | \$1,262 | \$631 | \$1,893 |
| Honorarium for panel participants | \$500 | \$500 | \$1,000 |
| Books - 4 copies Scientific Teaching | \$50 | | \$100 |
| Photocopying for Summer Workshop | \$40 | \$40 | \$80 |
| | | TOTAL | \$9,707 |

Budget Justification:

Barger Summary Salary – \$8607 of the CFA funds will be used for summer salary for Barger to organize and run the graduate summer teaching workshops and to review assessment tools (see Timeline). In year 1, Barger will design summer workshop activities, create new assessment tools or refine existing tools of graduate student professional development, evaluate existing teaching and student behavior tools, lead the summer workshop, analyze workshop assessment data, and write up a workshop report. We estimate that this will require 11 work days for Barger. Following this, we are requesting two weeks of time for Barger in year 1. Barger does not have any support to develop the graduate training summer workshop, which is a critical component to our proposed framework. Thus the summer support for Barger to develop the workshop activities is important to it's success. In year two, only one week of time is requested to support Barger in organizing and leading the summer workshop. All of Seiter's time will be covered by EBIO Science Education Initiative funds. Sarah Wise, an SEI STF in EBIO will also contribute time to the project as an advisor.

Honorarium for panel participants – In the summer workshop we will convene two panel discussions comprised of 5 participants. We will provide a modest honorarium (\$50) to each participant in year 1 and 2 of the workshop. This honorarium recognizes that faculty are not often paid during the summer and is a gesture of our appreciation to participate.

Book – We are requesting 4 copies of Scientific Teaching to have as reference books and to loan to students during the summer workshop.

Photocopies – We are requesting \$40 to support photocoping during the summer workshop or of final reports.

9. TIMELINE

The STEM graduate teaching program will operate over a 2-year period beginning late spring of 2014. Initial efforts to meet with campus leaders in STEM education will be led by Barger. In developing this proposal Barger met with Laura Border (Director, GTP) and communicated our goals to CSL. Our framework for the summer teaching workshop was also discussed with Jenny Knight. Barger will continue to engage campus leaders in graduate student teaching in April and May 2014. In these meetings Barger will work to further align the STEM graduate teaching program with other efforts across the UCB campus. Beginning in the summer session, Barger and Seiter will work closely to identify and perform any modification of evaluation tools. Following this Barger and Seiter will design and lead the summer workshop. Beginning in the fall semester Barger and Seiter will lead the fall semester graduate teaching training seminar. During this time they will schedule class evaluations of graduate student teaching and individual and group coaching of graduate student teaching. Spring semester tasks will focus on analyzing the evaluation data and drafting our first reports. We will perform these same duties in the second year of our project.

| Yr/Sem | Task | Time |
|--------|---|----------------------------|
| 2014 | -Arrange meetings with campus leaders in graduate education to align activities | 7 hrs |
| 014 | -Design summer workshop activities -Create assessment of graduate student learning for summer workshop -Lead summer workshop | 2 days 2 days 5 days |
| 2(| -Analyze workshop assessment data -Write up summer workshop | 1 day 1 day |
| | -Lead graduate teaching training seminar (EBIO 6100) | 5 days |
| 014 | -Create assessments for graduate student development in teaching | 3 days |
| 2 | -Choose appropriate assessment tool (e.g | 2 days |
| | -Conduct in-class assessments of graduate student teaching | 5 days |
| 2015 | -Analyze data from in-class assessments -Write report from Year 1 | 2 days 2 days |
| 2015 | -Lead summer workshop -Analyze workshop assessment data -Write up summer workshop | 5 days 1 day 1 day |
| 15 | -Lead graduate teaching training seminar (FBIO 6100) | 5 days |
| 20 | -Conduct in-class assessments of graduate student teaching | 5 days |
| 2016 | -Analyze data from in-class assessments -Write report from Year 2 | 2 days 2 days |

Fig. 3. Tasks to be accomplished by semester within our project beginning at the end of the spring 2014 semester through spring 2016 semester. Green = spring semester, red = summer semester, blue = fall semester. The 'time' column represents Barger's commitment. **Bolded** time commitments for Barger denote the request for summer salary.

10. CURRENT CV FOR APPLICANTS

NICHOLE N. BARGER

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PROFESSIONAL PREPARATION

- 2003 Ph.D., Graduate Degree Program in Ecology, Colorado State University
- 1998 M.S., The Graduate Group in Range Science, Department of Environmental Science Policy and Management, University of California, Berkeley.
- 1995 B.A., The Evergreen State College, Olympia, WA.

PROFESSIONAL EXPERIENCE

| 2007-Present | Assistant Professor. Department of Ecology and Evolutionary Biology. |
|--------------|--|
| | |

- Spring 2007 Instructor. University of Colorado, Environmental Studies Program.
- 2003-2007 Postdoctoral Research Scientist. INSTAAR – An Earth and Environmental Research Institute, University of Colorado, Boulder.
- 1998-2003 **Ph.D. student,** Graduate Degree Program in Ecology, The Natural Resource Ecology Laboratory, Colorado State University.
- 1997-98 Masters student. The Graduate Group in Range Science, Department of Environmental Science Policy and Management, University of California-Berkeley.
- 1995-96 Laboratory technician. University of California-Berkeley.
- 1994 Research assistant. NSF Arthropods of La Selva (ALAS) project. La Selva Biological Research Station, Costa Rica.

RESEARCH GRANTS

- 2013-2018 Lead PI, Strategic Environmental Research and Development Program (SERDP), Achieving Dryland Restoration Through the Deployment of Enhanced Biocrusts to Improve Soil Stability, Fertility and Native Plant Recruitment, \$2,300,000
- 2011-2016 Co-PI, Science Education Initiative, University of Colorado, Increasing Teaching Effectiveness in Ecology and Evolutionary Biology, \$499,942 total to support innovative teaching within department

| 2011-2013 | Co-PI, NASA North American Carbon Program (NACP) Grant, Carbon Management on Public Land in the Intermountain West: Multi-Scale Analysis of Carbon Stock Responses to Human and Natural Disturbance, \$570,000 |
|-----------|--|
| 2008-2012 | Co-PI, Mellon Foundation, Nitrogen Inputs and Cycling in Ecosystems of the Western Cape Province of South Africa, \$293,000 |
| 2008-2012 | Lead PI, USDA NRI-Managed Ecosystem Program, Development of a Science- Based Decision Making Model for Restoration of Pinyon-Juniper Ecosystems, \$499,590 |
| 2005-2008 | Co-PI, NASA North American Carbon Program (NACP) Grant, Regional Carbon Storage Responses to Woody Encroachment in Western Pinyon-Juniper Systems, \$812.000 |

PENDING GRANT PROPOSALS

2013 Lead PI, National Geographic Committee for Research and Exploration, Are fairy circles the product of self-organizing vegetation patterning? \$19,600

RESEARCH PUBLICATIONS

- denotes *graduate student* authorship
- denotes *undergraduate* authorship
- denotes *post-doctoral research associate* authorship

Published or in press

27) **Barger, N.N.** and C. Woodhouse. In press. Influence of soils on piñon pine (*Pinus edulis* Engelm.) growth responses to climate. Plant Ecology.

26) Cramer, M.C. and **N.N. Barger**. In press. Are mima-like mounds the consequence of long-term stability of vegetation spatial patterning? Journal of Biogeography.

25) Karl, J.W., J.K. Gillan, M. Duniway, N.N. Barger, and J.E. Herrick. In press. Interpretation of high-resolution imagery for detecting rangeland cover composition change. Ecological Indicators.

24) Redmond[•], M.D., T. J. Zelikova[°] and N.N. Barger. In press. Limits to understory plant restoration following fuel reduction in a piñon-juniper woodland. Environmental Management.

23) Cramer, M.C. and **N.N. Barger**. 2013. Are Namibian "fairy circles" the consequence of selforganizing spatial vegetation patterning? PLOS ONE. 8(8), e70876.doi:10.1371/journal/pone.0070876

22) Fernandez, D.P., J.C. Neff, C. Huang, G.P. Asner, and **N.N. Barger**. 2013. Twentieth century carbon stock changes related to piñon-juniper expansion into a black sagebrush community. Carbon Balance and Management. 8:8, doi:10.1186/1750-0680-8-8.

21) **Barger, N.N.,** S.C. Castle, and G.N. Dean. 2013. Denitrification from nitrogen-fixing biologically crusted soils in a cool desert environment, southeast Utah, USA. 2013. Invited special issue on biological soil crusts. Ecological Processes 2:16, DOI:10.1186/2192-1709-2-16

20) Redmond[•], M.D. and N.N. Barger. 2013. Tree regeneration following drought- and insectinduced mortality in piñon-juniper woodlands. New Phytologist, DOI: 10.1111/nph.12366.

19) Redmond[•], M.D., N.S. Cobb, M.E. Miller, and **N.N. Barger**. 2013. Long term effects of chaining treatments on vegetation structure in piñon-juniper woodlands of the Colorado Plateau. Forest Ecology and Management 305:120-128. DOI: 10.1016/j.foreco.2013.05.020.

18) Kasischke, E.S., B.D. Amiro, **N.N. Barger**, N.H.F. French, S.J. Goetz, G. Grosse, M.E. Harmon, J.A. Hicke, S. Liu, and J.G. Masek. 2013. Impacts of disturbance on the terrestrial carbon budget of North America: Journal of Geophysical Research – Biogeosciences 118:303-316, DOI: 10.1002/jgrg.20027.

17) Redmond[•], M.D., F. Forcella and **N.N. Barger** Declines in pinyon pine cone production associated with regional warming. 2012. Ecosphere 3:art120. http://dx.doi.org/10.1890/ES12-00306.1.

16) Ross[•], M., S.C. Castle, and **N.N. Barger**. 2012. Recent fuels reduction treatment effects on herbaceous communities and soils in a pinyon-juniper ecosystem. Journal of Arid Environments 79-84-92, doi:10.1016/j.jaridenv.2011.11.019.

15) Huang C., G.P. Asner, and **N.N. Barger**. 2012. Regional variation in net primary production of pinyon-juniper ecosystems. Ecological Modeling 227:82-92. doi:10.1016/j.ecolmodel.2011.12.016.

14) Castle, S.C., C.D. Morrison[•] and **N.N. Barger**. 2011. Extraction of chlorophyll a from biological soil crusts: A comparison of solvents for spectrophotometric determination. Soil Biology and Biochemistry 43:853-856.

13) **Barger N.N.**, S.R. Archer, J.L. Campbell, C. Huang, J.A. Morton[◆] and A.K. Knapp. 2011. Woody encroachment and the North American carbon budget. Journal of Geophysical Research –Biogeosciences 116, G00K07, DOI: 10.1029/2010JG001506.

12) Morris⁴, T.L., K.J. Esler, **N.N. Barger**, S.M. Jacobs and M.D. Cramer. 2011. Ecophysiological traits associated with the competitive ability of invasive Australian acacias. Diversity and Distributions, 17: 898–910, DOI: 10.1111/j.1472-4642.2011.00802.x.

11) Huang C., G.P. Asner, **N.N. Barger**, J.C. Neff, and L. Floyd-Hanna. 2010. Regional aboveground live carbon losses due to drought-induced tree dieback in piñon-juniper ecosystems. Remote Sensing of the Environment 114:1471-1479.

10) **Barger, N.N.,** H.A. Adams, C. Woodhouse, J.C. Neff, G.P. Asner. 2009. Influence of livestock grazing and climate on pinyon pine (*Pinus edulis*) dynamics. Rangeland Ecology and Management 62:531-539.

9) Neff, J.C., T. N.N. Barger, W.T. Baisden, D. Fernandez, and G.P. Asner. 2009. Soil carbon storage responses to expanding pinyon-juniper populations in southern Utah. Ecological Applications 19:1405-1416.

8) Huang C., G.P. Asner, R.E. Martin, **N.N. Barger**, and J.C. Neff. 2009. Multi-scale analysis of tree cover and carbon stocks in pinyon-juniper woodlands. Ecological Applications 19:668-681.

7) Hartley A.E., **N.N. Barger**, J. Belnap, G.S. Okin. 2007. Nutrient Cycling in Dryland Ecosystems. In: Marschner P, Rengel Z (eds) Nutrient Cycling in Terrestrial Ecosystems. Series: Soil Biology, Volume 10, pp. 271-299 Springer Verlag. (Peer reviewed book chapter)

6) **Barger, N.N**., J.E. Herrick, J.W. Van Zee, and J. Belnap. 2006. Impacts of biological soil crust disturbance and composition on C and N losses from water erosion. Biogeochemistry 77:247-263.

5) **Barger, N.N.**, J. Belnap, D. S. Ojima, and A. Mosier. 2005. NO gas loss from biologically crusted soils in Canyonlands National Park, Utah. Biogeochemistry 75:373-391.

4) Belnap, J., J.K. Welter, N.B. Grimm, **N.N. Barger**, and J. Ludwig. 2005. Linkages between microbial and hydrologic processes in arid and semi-arid watersheds. Ecology 86: 298-307.

3) **Barger, N.N.,** D.S. Ojima, J. Belnap, W. Shiping, W. Yanfen, Z. Chen. 2004. Changes in plant functional groups, litter quality, and soil C and N mineralization with sheep grazing in an Inner Mongolian grassland. Journal of Range Management 57:613-619.

2) **Barger, N.N.,** C.M. D'Antonio, E. Cuevas, and T. Ghneim. 2003. Constraints to colonization of an African pasture grass (*Melinis minutiflora*) in a Venezuelan savanna. Plant Ecology 167:31-43.

1) **Barger, N.N.,** C.M. D'Antonio, T. Ghneim, K. Brink, and E. Cuevas. 2002. Nutrient limitation to primary productivity in a secondary savanna in Venezuela. Biotropica 34:493-501.

EDUCATION PUBLICATIONS

5) Love Stowell[•], S.M., A.C. Churchill[•], A.K. Hund[•], K.C. Kelsey[•], M.D. Redmond[•], S.A. Seiter[•], and **N.N. Barger**. In review. Transforming graduate training in STEM education. Science – Education Forum.

4) Redmond[•], M.D. and **N.N. Barger**. Impacts of climate change on pinyon pine cone production. In press. National Center for Case Study Analysis. (Peer-reviewed)

3) Hoskinson^o, A.M., **N.N. Barger**, and A.P. Martin. In press. Keys to a successful studentcentered classroom: Three recommendations. Bulletin of the Ecological Society of America. (Editorial Review)

2) Beers[•], A.T., T.S. Potter[•], A.C. Churchill[•], A.M. Faist[•], E.S. Golden[•], H.R. Filkins[•], J.J. Hicks[•], and **N.N. Barger**. 2013. Advocating for science writing cooperatives in graduate

programs. Bulletin of the Ecological Society of America 94:245–246. DOI: 10.1890/0012-9623-94.3.245. (Non-peer reviewed commentary. This article was a product from EBIO 6100 Science Writing taught in the Spring 2013 semester)

1) *Grandy, S. and **N.N. Barger**. 2010. Implementing active learning strategies: Tales from two new life sciences professors at research universities. Journal of Academic Leadership Volume 8(2). *Denotes equal contributions by the authors. (Editorial Review)

CONFERENCE PROCEEDINGS

Hoenigman[•], R., E. Bradley, and **N.N. Barger**. Water conservation through facilitation. In Proceedings of the Twenty-Fifth AAAI Conference on Artificial Intelligence, San Francisco, CA, pages 1337–1342, 2011.

Hoenigman[•], R., E. Bradley, and **N.N. Barger**. Agent-Scapes—Designing water efficient residential landscapes using distributed agent-based optimization. In Proceedings of the 12th Annual Conference Companion on Genetic and Evolutionary Computation Conference: Late Breaking Papers, Portland, OR, pages 1777-1784, 2010.

PRESENTATIONS (Since August 2011)

* = outreach presentations

20) Antoninka^o, A.A., M. Bowker, **N.N. Barger**, J. Belnap, F. Garcia-Pichel. Biocrust restoration methods in a cold and hot desert. 12th Biennial Conference of Science and Management on the Colorado Plateau. Flagstaff, AZ. September 2013.

19) **Barger, N.N.**, H. Guenther[•], M.D. Redmond[•], T.J. Zelikova[•], M.E. Miller, and J.S. Herrick. Plant community response to fuels reduction treatments in upland pinyon-juniper woodlands. 12th Biennial Conference of Science and Management on the Colorado Plateau. Flagstaff, AZ. September 2013. Invited.

18) Redmond[•], M.D. and N.N. Barger. Tree regeneration following drought and insect-induced mortality in piñon-juniper woodlands. 12th Biennial Conference of Science and Management on the Colorado Plateau. Flagstaff, AZ. September 2013.

17) Gillan, J., J.W. Karl, **N.N. Barger**, M.C. Duniway and A. Elaksher. Using high-resolution aerial photogrammetry to 3-dimensionally model soil erosion in rangeland ecosystems. 98th Annual Meeting of the Ecological Society of America. Minneapolis, MN OR. August 2013.

16) Redmond[•], M.D. and **N.N. Barger.** Tree regeneration following drought and insect-induced mortality in piñon-juniper woodlands. 98th Annual Meeting of the Ecological Society of America. Minneapolis, MN OR. August 2013.

16) **Barger N.N.**, H.S. Guenther[•], M.E. Miller, J.S. Herrick. Consequences of fuel load management on erosional processes in piñon-juniper ecosystems. US Department of Agriculture-Agriculture and Food Research Initiative, All Scientists Meeting. Annapolis, MD. June 2013.

15) **Barger, N.N.**, J.E. Herrick, J. Belnap, J. Van Zee. Hydrologic response of biologically crusted soils to disturbance and extreme climatic events: implications for ecosystem

management. Second International Workshop on Biological Soil Crusts: Biological Soil Crusts in a Changing World. Madrid, Spain. June 2013.

14) **Barger N.N.**, H.S. Guenther⁺, M.E. Miller, J.S. Herrick. Consequences of fuel load management on erosional processes in piñon-juniper ecosystems. Canyonlands Research Center Science and Management Advisory Board. Moab, UT. May 2013. Invited. *

13) Hoskinson^o, A.M., **N.N. Barger**, and A.P. Martin. Ready to flip your classroom? Three recommendations. CU Science Education Initiative and Center for STEM Learning End of the Year Event. May 2013. Invited.

12) **Barger, N.N.**, H.S. Guenther[•], M.E. Miller, J.E. Herrick. Consequences of fuel load management on erosional processes in piñon-juniper ecosystems. 97th Annual Meeting Ecological Society of America. Portland, OR. August 2012. Invited.

11) Redmond[•], M.D., F. Forcella and **N.N. Barger.** Declines in pinyon pine cone production associated with regional warming. 97th Annual Meeting Ecological Society of America. Portland, OR. August 2012.

10) Zelikova^o, T.J., **N.N. Barger**, and S.C. Reed. Livestock grazing on the Colorado Plateau: Impacts on above and belowground carbon stocks. 97th Annual Meeting Ecological Society of America. Portland, OR. August 2012.

9) Guenther[•], H.S. and **N.N. Barger.** Fuel reduction effects on plant communities in an upland piñon-juniper woodland. Canyon Country Science Symposium. Moab, UT. March 2012. *

8) Redmond[•], M.D., and **N.N. Barger.** The influence of climate on annual variations in cone production among pinyon pine. Canyon Country Science Symposium. Moab, UT. March 2012.*

7) Zelikova^o, T.J., **N.N. Barger**, and S.C. Reed. Livestock grazing on the Colorado Plateau: Impacts on above and belowground carbon stocks. Canyon Country Science Symposium. Moab, UT. March 2012. *

6) Belnap, J., B. Wilcox, **N.N Barger**, J. Herrick, and M. van Soyoc. Biological soil crusts influence hydrologic function differently in various deserts and future climate and land use will affect these relationships, European Geophysical Union, Vienna, Austria. March 2012.

5) **Barger, N.N.**, H.S. Guenther[•], M.E. Miller, J.S. Herrick. Plant and soil responses to fuels reduction treatments in upland pinyon-juniper woodlands. Presented to Utah Partners for Conservation and Development. Green River, UT. February 2012.*

4) **Barger, N.N.**, H.S. Guenther[•], M.E. Miller, J.S. Herrick. Fire mitigation practices in piñonjuniper woodlands: Soil erosion increases related to declines in biological soil crust communities. Colorado Plateau 11th Biennial Conference. Flagstaff, AZ. October 2011. Invited.

3) **Barger, N.N.**, H.S. Guenther[•], M.E. Miller, J.S. Herrick. Soil erosion increases in response to fuels reduction in a piñon-juniper woodland. Ecological Society of America meetings. Austin, TX. August 2011.

2) **Barger, N.N.,** H.S. Guenther[•], M.E. Miller, J.S. Herrick. Science to support decision-making in pinyon-juniper fuels reduction treatments. Utah Bureau of Land Management Prescribed Fires and Fuels Workshop. Moab, Utah. April 2011. Invited. *

1) Hoenigman[•], R., E. Bradley, and **N.N. Barger**. An agent-based framework for designing water efficient residential landscapes, SIAM Conference on Applications of Dynamical Systems (DS11), Snowbird, Utah, 2011.

RECOGNITION AND AWARDS

| 2003-2006 | National Parks Ecological Research Fellowship, \$120,000 |
|-----------|---|
| 2002 | Best Graduate Student Poster, Front Range Student Ecology Symposium |
| 2000-2003 | Canon National Parks Science Scholars Fellowship, \$60,000 |
| 1999-2000 | Francis Clark Soil Biology Scholarship, Colorado State University, \$1500 |

WORKING GROUP COLLABORATIONS

- 2013-present Chapter Lead, Springer Ecological Studies Book Series, *Biological Soil Crusts:* An Organizing Principle in Drylands. In preparation.
- 2009-2011 North American Carbon Program (NACP) Working Group, *A Synthesis on the Impacts of Disturbance on the North American Carbon Budget*, Lead of sub working group to assess the impacts of woody encroachment on carbon storage across North America. Organizer: Eric Kasischke, University of Maryland.

TEACHING ACTIVITIES

Classroom Teaching (since 2011)

| Semester | Year | Course title | Course number | No. of Students | Course Rating | Instructor Rating |
|----------|------|----------------------|------------------|--------------------|------------------|----------------------|
| | | | | | 1= lowest | 1= lowest |
| | | | | | 6=highest | 6=highest |
| Spring | 2014 | Science Education | 6100 | 10 | In progress | In progress |
| | | Seminar | | | | |
| Spring | 2014 | Graduate Science | 6100 | 15 | In progress | In progress |
| | | Writing Seminar | | | | |
| Spring | 2014 | Ecosystem Management | 4800 | 39 | In progress | In progress |
| Fall | 2013 | Plant Ecology | 4140 | 39 | 5.1 | 5.5 |
| Spring | 2013 | Ecosystem Management | 4800 | 27 | 5.9 | 6.0 |
| Spring | 2013 | Science Writing | 6100 | 7 | 5.7 | 6.0 |
| Fall | 2012 | Plant Ecology | 4140 | 40 | 5.6 | 5.8 |
| Spring | 2012 | Ecosystem Management | 4800 | 30 | 5.6 | 6.0 |
| Fall | 2011 | Plant Ecology | 4140 | 47 | 5.2 | 5.6 |

Guest Lectures

| Spring 2013 | GEOG 1001, Climate and Vegetation, 200 students |
|-------------|--|
| Fall 2009 | EBIO 2040, Two guest lectures in Principles of Ecology, > 100 students |
| Fall 2008 | EBIO 4140, Plant Ecology guest lecture, 40 students |

Science Education Activities

- Fall 2013 Organizer, Graduate Student Science Education Reading Group. Reading group on the most recent literature on teaching and learning in biology education.
- Fall 2013University of Colorado Graduate Teaching Program (GTP) Fall Intensive
Workshop, The Flipped Classroom. Workshop for graduate students on creating a
student centered, active learning environment in their courses.
- Spring 2013 Consulting work with Simbio (company that produces interactive software to teach inquiry-based biology courses) on the 'flipped' classroom. The product of the consulting work was a one-hour webinar for faculty in higher education.
- 2011-2014 Co-PI, EBIO Science Education Initiative, University of Colorado.
- Fall 2008 Center for the Integration of Research, Teaching, and Learning (CIRTL)/ Teaching Institute for Graduate Education Research (TIGER) Series. Science Students' Self-Evaluations of Their Own Course Work. University of Colorado. November.

Principal Advising Activities

| Scott Clingan, Honors expected May 2014, ENVS |
|---|
| Miranda Redmond, Ph.D. expected May 2015 |
| Tamara Jane Zelikova, USGS Mendenhall Post-doctoral Research Associate |
| Heidi Guenther, EBIO, M.A. awarded December 2012 |
| Matt Peoples, EBIO Honors Program, Magna Cum Laude, May 2012 |
| Rhonda Hoenigman, co-advised Ph.D. in Computer Science, Ph.D. August 2012 |
| Taryn Morris, EBIO, Ph.D. expected May 2014 |
| Matt Ross, EBIO Honors Program, Graduated Summa Cum Laude, May 2010 |
| |

Graduate and Honors Student Committee Membership

| 20) 2013-present | Cameron Naficy, Ph.D, Geography |
|------------------|--|
| 19) 2013-present | Kathy Kelsey, Ph.D., Geosciences |
| 18) 2013 | Matt Olivier, Honors, ENVS |
| 17) 2013 | Alex Loomis, Honors, Geography |
| 16) 2012-present | Chris Javornik, B.A./M.A., EBIO |
| 15) 2012-present | Megan Caldwell, Ph.D. student, EBIO |
| 14) 2012-present | Teal Potter, Ph.D. student, EBIO |
| 13) 2012-present | Becky Poore, EBIO, Ph.D. student, EBIO |
| 12) 2011-present | Amy Churchill, EBIO, Ph.D. student, EBIO |

| 11) 2011-present | Amy Steiker, EBIO, Ph.D. student, EBIO |
|------------------|--|
| 10) 2010-2011 | Caitlyn Clark, Honors, Anthropology |
| 9) 2010-present | Akasha Faist, Ph.D., EBIO |
| 8) 2010 | Simon Power, M.S., University of Cape Town (External examiner) |
| 7) 2010-present | Adam Markovits, M.S., EBIO |
| 6) 2010-present | Samantha Weintraub, Ph.D., EBIO |
| 5) 2009-present | Janet Prevey, Ph.D. EBIO, EBIO |
| 4) 2008-present | Chris Gray, Ph.D. EBIO, EBIO |
| 3) 2008-2010 | Charlie Lawton, M.S. EBIO |
| 2) 2008 | Blake Angelo, Honors, EBIO |
| 1) 2007-2008 | Sarah Castle, M.S., Geology |

SERVICE ACTIVITIES

Service Within the University of Colorado

| 2014-present | FTEP Early Career Faculty Program. Program co-lead spring 2014 for the natural |
|--------------|--|
| | sciences with plans to direct the program in fall 2014. |
| 2014-present | School of Environment and Sustainability Implementation Committee |
| 2013-present | University of Colorado Faculty-Student Mentoring Program |
| 2013 | EBIO Environment and Sustainability Visioning Committee (Spring semester) |
| 2012-present | EBIO Science Education Initiative (SEI) Steering Committee |
| 2011-2012 | EBIO Botany Search Committee |
| 2011-2012 | EBIO Academic Review and Planning Advisory Committee (ARPAC) |
| 2010-2011 | EBIO Executive Committee |
| 2010-present | EBIO Budget Committee |
| 2009 | EBIO Merit Evaluation Committee |
| 2009 | Film festival juror for film course (Atlas 3519), December |
| 2008 | LEAP Workshop on balancing career goals and family life, December |
| 2008-2009 | EBIO Graduate Committee |
| 2007-2008 | EBIO Undergraduate Curriculum Committee |
| 2008 | EBIO Gordon Alexander Fellowship selection committee |
| | |

Service Outside of the University of Colorado

Science and management advisory activities and meeting organization

| 2012 | Organizer, Canyon Country Science Symposium, Moab, UT. March 2012. A forum to exchange research information with state and federal agencies. |
|--------------|--|
| 2009-present | Science and Management Advisory Council Member, Canyonlands Research Center, The Nature Conservancy, Moab, Utah |
| 2009-present | Friends of Boulder Open Space Science Advisory Group. Boulder, CO |

OUTREACH ACTIVITIES

| 2011 | Co-led two one-day field trips for state and federal land managers to highlight research on fuels reduction. Moab, Utah. March and May 2011. |
|------|---|
| 2010 | Dendrochronology workshop. Casey Middle School students attended a short dendrochronology workshop in my laboratory (45 students). The workshop was organized by Jeffery Morton a graduate student in my lab and an NSF GK12 Fellow at UCB. July. |
| 2009 | Denver Museum of Nature and Science, Climate Change Workshop for 4 th and 8 th grade teachers. <i>Climate Change in the Classroom</i> . November. Invited. |
| 2007 | Denver Botanic Garden, Café Botanique. Public talk. A century of crust busting on the Colorado Plateau. November. Invited. |

Sarah Seiter Science Education Fellow Department of Ecology and Evolutionary Biology sarah.seiter@gmail.com

EDUCATION

| University of Colorado at Boulder | |
|---|-------------|
| Science Teaching Fellow, Science Education Initiative | 2013-2014 |
| Using data on student demographics, attitudes, social network location and | |
| performance to measure the effects of in-class group discussion. | |
| University of North Carolina at Chapel Hill, Chapel Hill NC | |
| Ph.D. Student in Evolution, Ecology and Organismal Biology | 2008-2012 |
| Dissertation: "Latitude, Life History, and Immune Function in an Invasive Butterfly | |
| University of Michigan, Ann Arbor, MI | |
| M.S. in Conservation Biology | 2008 |
| Thesis: "Predators Suppress Immune Function in a Larval Amphibian" | |
| University of Michigan, Ann Arbor, MI | |
| B.A. in Biological Anthropology; Minor, Environmental | 2006 |
| Science | |
| Senior Project: "Squirrel Monkey Foraging Behavior in Fragmented Habitats | |
| AWARDS | |
| NESCent Evolution Blogging Contest, First Place NESCent | 2011 |
| NSF East Asia and the Pacific Institute Fellowship (Japan) | 2011 |
| Graduate Tuition Incentive Fellowship, UNC Chapel Hill | 2010 |
| National Evolutionary Synthesis Center Graduate Fellow | 2010 |
| North Carolina Science and Technology Fellow, UNC Chapel Hill | 2008 - 2009 |
| Karl Kidder Award, University of Michigan | 2008 |
| Rackham Graduate Research Award, University of Michigan | 2007 |
| School of Natural Resources Opus Grant, University of Michigan | 2006 |
| School of Natural Resources Incoming Student Fellowship, University of | 2006-2007 |
| Michigan | |
| RESEARCH EXPERIENCE | |
| University of Colorado at Boulder | 2012 2014 |

Science Education Fellow – I am combining demographic data, classroom assessments, attitude surveys and social network data to identify predictors of student learning during group work. I'm also developing a performance indicator dashboard

| that visualizes teaching behaviors and student participation for new faculty. By providing minute-by-minute data to new professors, we hope to help them identify and set goals for their lessons, and track student engagement. | |
|--|-------------|
| City College of New York / American Museum of Natural History, New York, NY | 2013 |
| Research Fellow – Designed and evaluated two inquiry based curricula on ecology and evolution. Extracted and visualized data from peer-reviewed publications for use in the curriculum. Designed surveys and focus group protocols, and analyzed qualitative and quantitative data to improve our product. | 2013 |
| University of North Carolina at Chapel Hill, Chapel Hill, NC Dissortation Bosoarch | 2009-2012 |
| Sampled populations of the invasive cabbage white butterfly for comparison with North American population, measured thermal tolerance, immune function and adaptation to diet quality. Conducted field experiments quantifying natural selection by parasites and predators. | |
| Laboratory of Insect Ecology, Kyoto University, Kyoto Japan | Summer 2011 |
| NSF East Asia and the Pacific Fellowship, Kyoto Japan Sampled Northern and Southern populations of the invasive cabbage white butterfly for comparison with North American population, measuring thermal tolerance, immune function and growth rate. | |
| National Evolutionary Synthesis Center, Durham NC | Fall 2010 |
| National Evolutionary Synthesis Center Graduate Fellowship Program Conducted a meta-analysis on methods for quantifying trait plasticity in different taxa and in different environments. Developed new statistical methods for quantifying and comparing variation of traits across environments and species. | 1 411 2010 |
| National Evolutionary Synthesis Center, Durham NC Costs of Plasticity and Adaptation to Novel Environments Working Group Collaborated on a literature review on plastic and variable biological traits and their performance in changing environments (in press at the journal Evolution). | 2010-2012 |
| TEACHING & EDUCATION EXPERIENCE | |
| Backyard Brains, Ann Arbor, MI Freelance Curriculum Editor – Redesign curriculum for teachers and students to improve information uptake. Developed standards alignment guides for the Next Generation Science Standards and the Common Core Curriculum. Created new graphics to match branding while illustrating key science concepts | 2013-2014 |
| North Carolina Museum of Natural Sciences, Raleigh, NC Education Intern – Produced an inquiry based learning activity on climate change and insect behavior for the hands-on activity section of the museum. | Fall 2012 |
| University of North Carolina, Chapel Hill, NC Laboratory Outreach – Developed hands on activities to teach students about insects and climate change using live tobacco hornworms. Presented the activity at Darwin Day, the NC Science Festival and in classrooms and scouting groups. | 2011-2012 |
| University of North Carolina, Chapel Hill Undergraduate Research Manager – Managed a staff of up to five undergraduate and high school researchers in our laboratory, coordinate student projects, taught laboratory protocols, lead field experiences, coached technical | 2012 |

| writing skins and co-authored publications with students. | |
|--|-----------|
| University of North Carolina, Chapel Hill, NC Co-instructor – Science Communication and Outreach Seminar (BIOL659). With my advisor Dr. Joel Kingsolver and labmate Jessica Higgins, I developed course activities and assignments on blogging, podcast production, and science writing for the public. | 2011 |
| <i>University of North Carolina, Chapel Hill, NC</i> Course Development Assistant – Developed curriculum for Evolution and Life a non- majors course with an emphasis on science writing (Biol 213) with Dr. Joel Kingsolver. Coached students on translating scientific research for mainstream media publications used collaborative web tools to facilitate online editing and discussion of student work. | 2010 |
| University of North Carolina, Chapel Hill, NC Teaching Assistant – Environment and Society (ENST 201), Dr. Greg Gangi. Developed class exercises in data visualization, taught science writing and composition. | 2009-2010 |
| University of Michigan, Ann Arbor, MI Scientific Illustrator and Exhibit Developer – Produced custom illustrations and figures for the entomology laboratory, developed museum displays on insect based cuisines. | 2007 |
| SELECTED PUBLICATIONS AND PRESENTATIONS | |

"Parallel invasions produce heterogenous patterns of life history adaptation: rapid divergence in an invasive insect." Seiter, S., N. Ohsaki, and J. Kingsolver. Journal of Evolutionary Biology 26.12 (2013): 2721-2728.

"Environmental determinants of population divergence in life-history traits for an invasive species: climate, seasonality and natural enemies." Seiter, S., and J. Kingsolver. Journal of Evolutionary Biology 26.8 (2013): 1634-1645.

"Direct and indirect phenotypic selection on developmental trajectories in Manduca sexta." Kingsolver, Joel G., et al. Functional Ecology 26.3 (2012): 598-607.

"Predator Presence Suppresses Immune Function in A Larval Amphibian,' Seiter, S.A. Evolutionary Ecology Research. 2011 (3).

"The Great Smoky Mountains All Taxa Biological Inventor: Lessons for Sampling Design, Management, and Citizen Science." Seiter, SA, Jobe, R.T., Anton, A, Bidgood, E.P., Berckheimer, I, Caplow, S.C., Evans, B. Faestel, M., Muehlbauer, J.D., Palmquist, K., Seymour, S.D., Tessel, S.M. and Moody A. Poster Presentation, Ecological Society of America Conferene, Albuquerque NM. 2010.

SERVICE

writing skills and co-authored publications with students

- Science Blog: https://butterfliesandscience.wordpress.com Volunteer Science Tutor for ESL students, Chapel Hill-Carrboro Public Schools Steward for Michigan Graduate Employees Union (Local 3550 American Federation of Teachers, AFL-CIO)
- Volunteer Data Analyst for Michigan United, analyzing foreclosure data TEDx Organizer (TEDxProspectHeights). Worked with speakers to hone talks on a variety of topics

11. CURRENT AND PENDING FUNDING

Barger Current Funding

- 2013-2018 Lead PI, Strategic Environmental Research and Development Program (SERDP), Achieving Dryland Restoration Through the Deployment of Enhanced Biocrusts to Improve Soil Stability, Fertility and Native Plant Recruitment, \$2,300,000
- 2011-2016 Co-PI, Science Education Initiative, University of Colorado, Increasing Teaching Effectiveness in Ecology and Evolutionary Biology, \$499,942 total to support innovative teaching within department
- 2011-2013 Co-PI, NASA North American Carbon Program (NACP) Grant, Carbon Management on Public Land in the Intermountain West: Multi-Scale Analysis of Carbon Stock Responses to Human and Natural Disturbance, \$570,000

Barger Pending Funding

2013 Lead PI, National Geographic Committee for Research and Exploration, Are fairy circles the product of self-organizing vegetation patterning? \$19,600

Seiter Current Funding

None

Seiter Pending Funding

2014-2017 Co-PI, NSF Promoting Research and Innovation in Methodologies for Evaluation Program. Research and Development of the COCTAIL App: A Revolutionary Tool for Formative Assessment of STEM Instruction. \$733,670.