

ADRIAN L. CARPER

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RESEARCH INTERESTS

I am mainly interested in how humans affect natural communities and subsequently the ecosystem services that they provide. My research focuses mainly on pollinators (specifically, native bees), and how changes in human land-use practices, environmental conditions, or species interactions affect patterns of pollinator abundance, diversity, and the sustainability of pollination services. I work at multiple ecological scales, from individuals to populations, and from local to landscape, and explore plant-insect relationships from both the plant and insect perspective. While driven by my primary research interests in community ecology, much of my research has direct implications for management and conservation, from maintaining healthy and diverse native pollinator communities, to developing new tools for promoting native bee conservation through outreach and education.

EDUCATION

- 2008-2013 Ph.D., Ecology and Evolutionary Biology  
Dept. of Biological Sciences  
Dartmouth College, Hanover NH  
Advisor: Dr. Rebecca Irwin
- 1999-2003 Bachelor of Science, Fisheries and Wildlife Sciences  
North Carolina State University, Raleigh, NC  
Minor in Environmental Science  
Magna Cum Laude

ACADEMIC APPOINTMENTS

- 2013-2018 Postdoctoral Associate  
Dept. Ecology and Evolutionary Biology (2013-2017)  
University of Colorado, Boulder, CO, 80309
- Dept. Entomology (2013-2015)  
University of Wisconsin, Madison, WI, 53706
- Dept. Biological Sciences (2016), *Senior Research Assistant*  
Oakland University, Rochester, MI, 48309

## PROFESSIONAL EXPERIENCE

- 2015 Museum Associate  
Entomology, Invertebrate Paleontology, and Public Sections  
Museum of Natural History, University of Colorado  
Boulder, CO 80309
- 2008 Research Technician, Dept. of Biological Sciences, Dartmouth College, Hanover, NH Supervisor: Dr. Rebecca Irwin. Conducted independent research, sampled bee diversity and abundance, sampled arthropod diversity and abundance.
- 2006-2008 Laboratory/Field Assistant, Dept. of Entomology, North Carolina State University, Raleigh, NC Supervisor: Dr. Fred Gould. Care and maintenance of captive Heliiothine moth strains, pheromone trapping, field collection and specimen processing, observational data collection: oviposition, foraging, greenhouse rearing of host plants, assisted in design, construction and implementation of field experiments.
- 2004-2006 Agricultural Research Technician, Dept. of Entomology, North Carolina State University, Raleigh, NC. Supervisor: Dr. Jules Silverman. Care and maintenance of structure infesting ant colonies, conduct bioassays, rearing of *Chrysanthemum morifolium* for aphid complex, construct and run laboratory and field experiments with structure infesting ants, database management, field data collection, pesticide application, independent research.
- 2001-2004 Laboratory Assistant, Dept. of Entomology, North Carolina State University, Raleigh, NC. Supervisor: Dr. Jules Silverman. Coordinated the care and maintenance of structure infesting ant colonies, field collection of colonies, general lab maintenance.
- 2001 Conservation Intern/Field Research Assistant, Sandhills Ecological Institute, Southern Pines, NC. Supervisor: Kerry Brust. Assist in the banding and monitoring of endangered red-cockaded woodpeckers, *Picoides borealis*, in and around Southern Pines and Fort Bragg.

## PUBLICATIONS

- Schwantes, C. J., **Carper, A. L.**, and M.D. Bowers. 2018. Solitary floral specialists do not respond to cryptic flower-occupying predators. *Journal of Insect Behavior*: *submitted*
- Carper, A. L.** and R. E. Irwin. 2016. Effects of florivory on plant-pollinator interactions: implications for male and female components of plant reproduction. *American Journal of Botany*: *American Journal of Botany* 103 (6): 1061-1070.
- Carper, A. L.**, L. S. Adler, P. S. Warren, and R. E. Irwin. 2014. Effects of suburbanization on forest bee communities. *Environmental Entomology* 43 (2):253-262.

Irwin, R., P. Warren, **A. Carper**, and L. Adler. 2013. Plant–animal interactions in suburban environments: implications for floral evolution. *Oecologia* 174 (3): 803-815.

#### MANUSCRIPTS IN PREPARATION

\* manuscript available on request

**Carper, A. L.**, Schwantes, C. J., Norton, A.P., Bowers, M.D., and M. A. Jamieson. Ecological and economic efficacy of three different capture techniques for wild bee inventories\*. *for* *Insect Conservation and Diversity* (2018)

**Carper, A. L.**, R. E. Irwin, L. S. Adler, and P. S. Warren. Pollination in suburban environments: implications for pollen limitation of native plant reproduction\*. *for* *Oecologia* (2018)

**Carper, A. L.**, Schwantes, C. J., Endriss, S. B., Norton, A.P., Bowers, M.D., and M. A. Jamieson. Local and landscape factors driving wild bee community dynamics across Colorado agroecosystems \*. *for* *Journal of Insect Conservation* (2018).

#### GRANTS AND FELLOWSHIPS

2016 Boulder County Parks & Open Space: \$10,000. The conservation value of woody debris for cavity-nesting bees on Boulder County open space. PI. D. Bowers co-PI

Undergraduate Research Opportunity Program Team Grant: \$3,000. Exploring Patters of Cavity-Nesting Bee Community Dynamics across Colorado. PI.

2015 Undergraduate Research Opportunity Program Team Grant: \$3,000. The Bees' Needs: Integrating Ecological Research with Citizen Science. PI.

Boulder County Parks and Open Space: \$11,452. Agricultural Practices on Boulder County Open Space: implications for pollinator conservation. Co-PI with C. Kearns and D. Oliveras.

Biological Undergraduate Research Skills & Training Grant: \$2,500. Pollen-host use and cavity-nesting bee performance in conservation grasslands of Colorado. PI. In collaboration with honors student, A. M. Morphew.

Undergraduate Research Opportunity Program Team Grant: \$3,000. Digital Curation of Colorado's Native Bees: Practical Applications. PI.

2014 Undergraduate Research Opportunity Program Team Grant: \$3,000. Growth and Reproduction of Cavity Nesting Bees across an Agricultural Gradient. PI.

Undergraduate Research Opportunity Program Team Grant: \$3,000. Biological effects of extreme weather events: Response of native bees to the Colorado flood. PI.

- 2012 National Science Foundation: Doctoral Dissertation Improvement Grant: \$13,560. DISSERTATION RESEARCH: Effects of suburbanization on multispecies plant-animal interactions. PI.
- 2009 Dartmouth Graduate Studies Travel Award: \$1,000  
Graduate Assistance in Areas of National Need Fellowship. \$30,000

#### MENTORED STUDENT GRANTS

- 2016 CU-Boulder Undergraduate Research Opportunity Program Individual Grant: \$2,400. The impact of nest-site limitation on the population dynamics of native cavity-nesting bees. Undergraduate researcher Ms. Kelsey Bohanon.
- CU-Boulder Undergraduate Research Opportunity Program Individual Grant: \$2,400. Impacts of flood restoration efforts on riparian plant and pollinator communities. Undergraduate researcher Mr. Tyler Streb.
- Eve Verderber Undergraduate Research Fellowship: \$1,500. Assessing wild bee growth and development across agroecosystems in Colorado: impacts of the Conservation Reserve Program. Undergraduate and Honors Thesis student Ms. Alex Morphew.
- CU-Boulder Undergraduate Research Opportunity Program Individual Grant: \$2,400. Factors driving competitive and host-parasite dynamics of native bees across the Front Range. Undergraduate researcher Ms. Linnea Mendoza.
- 2015 CU-Boulder Undergraduate Research Opportunity Program Individual Grant: \$1,200. The impacts of land-use on bees in agroecosystems: Does the Conservation Reserve Program promote cavity-nesting bee communities? Undergraduate and Honors Thesis student Ms. Alex Morphew.

#### COURSES TAUGHT

- 2015 Principles of Ecology, EBIO 2040-20. Department of Ecology and Evolutionary Biology, University of Colorado-Boulder. Lecturer: developed and gave lectures on the major disciplines, theories, and classical hypotheses in the field of ecology.

#### GUEST LECTURES

- 2017 Insect Biology, EBIO 4460. Department of Ecology and Evolutionary Biology, University of Colorado-Boulder. Guest lecturer for pollination biology.
- 2016 Insect Biology, EBIO 4460. Department of Ecology and Evolutionary Biology, University of Colorado-Boulder. Guest lecturer for pollination biology.
- 2013 Insect Biology, EBIO 4460. Department of Ecology and Evolutionary Biology, University of Colorado-Boulder. Guest lecturer for pollination biology.

## TEACHING ASSISTANTSHIPS

- 2012        Statistics and Experimental Design I, BIO 128. Dept. of Biological Sciences, Dartmouth College, Hanover, NH. Teaching Assistant: taught graduate laboratory session, introducing students to R programming, experimental design and analysis.
- 2011        Animal Behavior, BIO 27. Dept. of Biological Sciences, Dartmouth College, Hanover, NH. Teaching Assistant: Cooperated in the development and teaching of observational and experimental laboratory exercises to explore and test hypotheses about animal behavior.
- 2009        Ecology, BIO 16. Dept. of Biological Sciences, Dartmouth College, Hanover, NH. Teaching Assistant: organized and led review sessions for lecture exams and graded lecture assignments.
- Animal Behavior, BIO 27. Dept. of Biological Sciences, Dartmouth College, Hanover, NH. Teaching Assistant: cooperated in the development and teaching of observational and experimental laboratory exercises to explore and test hypotheses about animal behavior.

## CONFERENCE PRESENTATIONS

\* Undergraduate co-author

- 2017        Ecological Society of America Meeting, Portland, OR. *Exploring variation in local and landscape factors driving grassland bee communities in Colorado*. **A. L. Carper**, C. J. Schwantes, S. M. Endriss, M. D. Bowers, A. P. Norton, and M. A. Jamieson. Contributed oral session.
- Entomological Society of America Meeting, Denver, CO. *Assessing the effects of the Conservation Reserve Program on cavity-nesting bees in Colorado agroecosystems*. A. M. Morphew\*, **A. L. Carper**, M. D. Bowers, and M. A. Jamieson. Poster session.
- Ecological Society of America Meeting, Portland, OR. *Effects of woody debris and its management on wild bee communities along Colorado's Front Range*. K. Bohanon\*, **A. L. Carper**, and M. D. Bowers. Poster session.
- Front Range Open Space Research Symposium, Boulder, CO. **A. L. Carper** & M. D. Bowers. The conservation value of woody debris for cavity-nesting bees on Boulder County Open Space.
- 2016        Ecological Society of America Meeting, Ft Lauderdale, FL. *Local and landscape factors driving bee communities across agroecosystem in Colorado*. **A. L. Carper**, C. J. Schwantes, S. M. Endriss, M. D. Bowers, A. P. Norton, and M. A. Jamieson. Contributed oral session.

- Ecological Society of America Meeting, Ft Lauderdale, FL. *Conservation grassland plantings promote wild cavity-nesting bee reproduction in agroecosystem*. A. M. Morphew\*, **A. L. Carper**, M. D. Bowers, and M. A. Jamieson. Poster session.
- 2015 Entomological Society of America, Annual Meetings, Minneapolis, Minnesota. Scott V.L., A.P. Rose, C.J. Schwantes, K.B. Wolfson, **A.L. Carper**, and M.D. Bowers. *The Bees' Needs: Assessing the conservation value of bee nesting blocks through citizen science*.
- 2014 Entomological Society of America, Annual Meetings, Portland, OR. *Extreme weather events and native bees: Effects of the 2013 Colorado Flood*. Scott, V.L., **A. Carper**, M.D. Bowers.
- Entomological Society of America Meeting, Portland, OR. *Conservation grasslands support diverse native bee assemblages in agroecosystems*. **A. L. Carper**, A. P. Norton, M. D. Bowers, C. J. Schwantes, S. M. Endriss, and M. A. Jamieson. Poster presentation.
- GECO Conference, Grand Junction, CO. *Wild bees living on the edge*. C. J. Schwantes, **A. L. Carper**, A. P. Norton, M. D. Bowers, and M. A. Jamieson.
- 2013 Entomological Society of America Meeting, Austin, TX. *Pollination in suburban environments: Implications for native plant reproduction*. **A. L. Carper**, L. S. Adler, P. S. Warren, and R. E. Irwin. P-IE Section Symposium.
- 2012 Ecological Society of America Meeting, Portland, OR. *Pollination in suburban landscapes: increased bee abundance does not benefit native plants*. **A. L. Carper**, L. S. Adler, P. S. Warren, and R. E. Irwin. Contributed oral session.
- 2010 Entomological Society of America Meeting, San Diego, CA. *Effects of suburbanization on forest bee diversity*. **A. L. Carper**, R. E. Irwin, L. S. Adler, and P. S. Warren. Poster presentation.
- Ecological Society of America Annual Meeting, Pittsburgh, PA. *Effects of suburbanization on bee abundance, diversity, and plant-pollinator interactions*. **A. L. Carper**, R. E. Irwin, and L. S. Adler. Contributed oral session.
- 2009 Ecological Society of America Annual Meeting, Albuquerque, NM. *Effects of urbanization on bee abundance and diversity*. **A. L. Carper**, R. E. Irwin, and L. S. Adler. Poster presentation.

#### INVITED SEMINARS

- 2016 Oakland University, Dept. of Biological Sciences, Seminar (10/25/2016): *Factors driving wild bee community dynamics across agroecosystems of Colorado*.

- 2014 Colorado State University, Dept. of Bioagricultural Sciences and Pest Management, Seminar (2/26/2014): *Land-use change, bees, and plant-pollinator interactions.*
- 2013 University of Wisconsin-Madison, Dept. of Entomology, Seminar (9/13/2013): *Land-use change, bees, and plant-pollinator interactions.*

#### INVITED TALKS

- 2018 Audubon Society of Greater Denver, Conservation in Colorado Adult Lecture Series (1/24/2018): *Wild bee diversity, ecology, and conservation in Colorado*
- 2017 2<sup>nd</sup> Annual Colorado Pollinator Summit: Science and Research Panel (11/2/2017): *Factors driving wild bee community dynamics in Colorado.*
- 2016 Boulder County Parks and Open Space Advisory Committee Meeting (11/17/2016): *Native Pollinators on Riparian Open Spaces.*
- High Country Conservation Advocates, Environmental Possibility Series (8/21/2016): *Native bee conservation along the Front Range and beyond.*
- Boulder County Parks and Open Space Brown Bag Lunch (7/5/2016): *Pollinators on Boulder County's Riparian Open Spaces.*
- The Mile Hive Bee Club (6/14/2016): *Native bee diversity, ecology, and conservation.*
- University of Colorado Museum of Natural History, Public outreach event seminar (3/15/2016): *What we're learning about The Bees' Needs: an update on research, discoveries, and lessons from your backyards.*

#### MENTORED UNDERGRADUATE RESEARCH

- Morphew, Alexandra. *Assessing the effects of the Conservation Reserve Program on cavity-nesting bees in Colorado* (2017). Undergraduate Honors Theses. 1405. [https://scholar.colorado.edu/honr\\_theses/1405](https://scholar.colorado.edu/honr_theses/1405)
- Enger, Micaela. *Effects of host plant and developmental stage on caterpillar immune response* (2017). Undergraduate Honors Theses. 1333. [https://scholar.colorado.edu/honr\\_theses/1333](https://scholar.colorado.edu/honr_theses/1333)
- Bohanon, Kelsey. *Impacts of woody debris management on cavity-nesting bees and wasps* (2017). Independent Research.

Morphew, Alexandra. *The impacts of land-use on bees in agroecosystems: does the Conservation Reserve Program promote cavity-nesting bee communities* (2015). Independent Research.

## SYNERGISTIC ACTIVITIES

- (a) *Mentoring*: During my dissertation, I mentored four female graduates through their participation with field research. Two are now pursuing graduate degrees in the Departments of Entomology and Plant Biology at North Carolina State University. Another is pursuing a graduate degree in Biology at Eastern Carolina University, and the last has just entered the College of Veterinarian Medicine at North Carolina State University. I have supervised and mentored many undergraduate students from the University of Colorado-Boulder and Dartmouth College through research activities and general advising. At CU-Boulder, I have mentored 27 undergraduate students, including 19 women, across a wide diversity of ages, ethnicities, and backgrounds, and through independent research, grant writing, and honor's thesis. I am currently collaborating with three students to prepare separate manuscripts from undergraduate research.
- (b) *Outreach*: I engage the public whenever possible through direct interactions with homeowners and landowners, including personal meetings and correspondence, but also through the development of informational booklets that I have provided to cooperating communities. I have cooperated with the USDA Farm Service Agency, the Natural Resource Conservation Service, and farmers and ranchers in eastern Colorado to document patterns of native bee diversity. I have developed a blog based on the importance of native pollinators and their conservation and have worked with individual land-owners interested in bee conservation on their land. I am also collaborating with the University of Colorado Biological Science Initiative to document and share my research through their ScienceLIVE program. Finally, outreach is becoming a major tenant of my research through collaboration with educators and the Museum of Natural History on our citizen science research program, *The Bees' Needs*. I also served as the content expert for the development of two exhibits at the Museum of Natural History: *Becoming Butterflies* and *Curious Connections*. I helped a Kao Kupadakinij with specimen photography and ecological expertise for his Honor's Thesis Exhibition: *Entomology in the Fine Arts: A Voice for the Little Guys*. From 2003 until 2007 I also assisting in the design and exhibition of the Social Insects exhibit for the North Carolina Museum of Natural Sciences', BugFest!. There I designed posters, gave live insect demonstration, and interacted with thousands of museum visitors.
- (c) *Professional Service*: My primary service in my academic profession has been through peer review. I have reviewed manuscripts for *Functional Ecology*, *Perspectives in Plant Ecology*, *Evolution and Systematics*, *Urban Ecosystems*, and *Global Change Biology*. In addition, through graduate school I served on the Ecology and Evolutionary Biology Retreat Planning Committee, planning and organization the Dartmouth EEB program annual departmental retreat. I also served as the departmental seminar organizer, moderating intradepartmental seminar series for the EEB Program and arranging presenter schedules and weekly departmental email updates.



## PROFESSIONAL AFFILIATIONS

2008-Present The Entomological Society of America

2008-Present The Ecological Society of America

2011-Present The American Society of Naturalists

2009-Present Botanical Society of America