

ADRIAN L. CARPER

Senior Ecologist, Integrated Pest Management Coordinator, Climate Initiatives Department
City of Boulder, 1300 Canyon Blvd, Boulder, CO, 80302

carpera@bouldercolorado.gov 303-413-7168

Assistant Professor Adjunct, Department of Ecology and Evolutionary Biology &
Entomology Curator Adjoint, University of Colorado Museum of Natural History

University of Colorado, 1900 Pleasant St, UCB 334, Boulder, CO 80309-0334

adrian.l.carper@colorado.edu www.adriancarper.com

EDUCATION

2008-2013 PhD., Ecology and Evolutionary Biology
Dept. of Biological Sciences, Dartmouth College, Hanover, NH

Advisor: Dr. Rebecca Irwin

1999-2003 B.S., Fisheries and Wildlife Sciences
North Carolina State University, Raleigh, NC
Minor in Environmental Science, Magna Cum Laude

PROFESSIONAL APPOINTMENTS

Senior Ecologist – Integrated Pest Management Coordinator
Climate Initiatives, Nature-based Solutions Team (2024 – present)
City of Boulder, Boulder, CO, 80306

Assistant Professor Adjunct
Dept. Ecology and Evolutionary Biology (2024 – present)
University of Colorado, Boulder, CO, 80309

Entomology Curator Adjoint
CU Museum of Natural History (2024 – present)
University of Colorado, Boulder, CO, 80309

Research Associate
Dept. Ecology and Evolutionary Biology (2021 – 2024)
University of Colorado, Boulder, CO, 80309

Postdoctoral Associate & Lecturer
Dept. Ecology and Evolutionary Biology (2013 – 2021)
University of Colorado, Boulder, CO, 80309h

Senior Research Assistant, Dept. Biological Sciences (2016)
Oakland University, Rochester, MI, 48309

Postdoctoral Associate, Dept. Entomology (2013 – 2015)
University of Wisconsin, Madison, WI, 53706

OTHER PROFESSIONAL EXPERIENCE

2015 - current *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.
- 2006-2008 *Laboratory/Field Assistant*, Dept. of Entomology, North Carolina State University, Raleigh, NC. Supervisor: Dr. Fred Gould.
- 2004-2006 *Agricultural Research Technician I*, Dept. of Entomology, North Carolina State University, Raleigh, NC. Supervisor: Dr. Jules Silverman.
- 2001-2004 *Laboratory Assistant*, Dept. of Entomology, North Carolina State University, Raleigh, NC. Supervisor: Dr. Jules Silverman.
- 2001 *Conservation Intern/Field Research Assistant*, Sandhills Ecological Institute, Southern Pines, NC. Supervisor: Kerry Brust.

PUBLICATIONS (18)

- Christensen, T., A. Smilanich, **A.L. Carper**, V. Peechatt, M.D. Bowers, M. Forister, M. Teglas, P. Hurtado, L. Dyer. Disease from leaves to landscapes: Viral hotspots are determined by spatial arrangement and phytochemistry of host plants in specialist caterpillars. 2025. *Proceedings of the Royal Society B*: in revision.
- Hund, A.K., T.S. Mitchell, M.I. Ramírez, A. Zambre, L. Hagg, A. Stene, K. Porter, **A.L. Carper**, L. Agnew, A.M. Shephard, M.E. Kobiela, K. Oberhauser, O.R. Taylor, & E.C. Snell-Rood. The potential of roadside verges as insect habitat: Road salt has few effects on monarch butterfly performance and migration. 2024. *Conservation Science and Practice*: 6(10), e13229. <https://doi.org/10.1111/csp2.13229>
- Bieber, B.V., **A.L. Carper**, and S.M. Murphy. Fire severity effects on floral visitor community and fruit production of wax currant. *Southwestern Entomologist*. 2024: 49(2), 1–23. <https://doi.org/10.3958/059.049.0201>
- Christensen, T., L.A. Dyer, M.L. Forister, M.D. Bowers, **A.L. Carper**, M.B. Teglas, P. Hurtado, & A.M. Smilanich. 2024. Host plant-mediation of viral transmission and its consequences for a native butterfly. *Ecology*: e4282. <https://doi.org/10.1002/ecy.4282>
- Mullins, J.L., A.W. Paraskevopoulos, C.P. Pittman, S.J. Burrows, **A.L. Carper**, & J. Resasco. 2023. New records of gynandromorphism in *Heriades* and *Dianthidium* and images of the first reported *Dianthidium* gynandromorph (Hymenoptera: Megachilidae). *Journal of the Kansas Entomological Society*: in press.
- Muchoney, N.D., M.D. Bowers, **A. L. Carper**, M.B. Teglas, & A.M. Smilanich. 2023. Use of an exotic host plant reduces viral burden in a native insect herbivore. *Ecology Letters*: 26: 425-436. <https://doi.org/10.1111/ele.14162>
- Carper, A. L.**, R. E. Irwin, L. S. Adler, and P. S. Warren. 2022. Pollen limitation of native plant reproduction in an urban landscape. *American Journal of Botany*: 109(12): 1-12. <https://doi.org/10.1002/ajb2.16080>
- Muchoney, N.D., M.D. Bowers, **A. L. Carper**, P.A. Mason, M.B. Teglas, & A.M. Smilanich. 2022. Use of an exotic host plant shifts immunity, chemical defense, and viral burden in wild populations of a specialist insect herbivore. *Ecology and Evolution*: 12(3): e8723. <https://doi.org/10.1002/ece3.8723>
- Carper, A. L.**, Richardson, L. L., and M. D. Bowers. 2022. Seasonal variation in hostplant chemistry drives sequestration in a specialist herbivore. *Journal of Chemical Ecology*: 48:79–88. <https://doi.org/10.1007/s10886-021-01321-7>

- Seltmann KC, Allen J, Brown, BV, **Carper, A.L.**, Engel, MS, Franz, N, Gilbert, E, Grinter, C, Gonzalez, VH, Horsley, P, Lee S, Maier, C, Miko, I, Morris, P, Oboyski, P, Pierce, NE, Poelen, J, Scott, VL, Smith, M, Talamas, EJ, Tsutsui, ND, Tucker, E. 2021. Announcing Big-Bee: An initiative to promote understanding of bees through image and trait digitization. *Biodiversity Information Science and Standards* 5: e74037. <https://doi.org/10.3897/biss.5.74037>
- Birdshire , K. R., **Carper , A. L.**, & C. E. Briles. 2020. Bee community response to local and landscape factors along an urban-rural gradient. *Urban Ecosystems*: 1-14. <https://doi.org/10.1007/s11252-020-00956-w>
- Carper, A. L.**, Enger, M., & M.D. Bowers. 2019. Host plant effects on immune response across development of a specialist caterpillar. *Frontiers in Ecology and Evolution*: 7: 1 – 11. <https://doi.org/10.3389/fevo.2019.00208>
- Jamieson, M. A., **Carper, A. L.**, Wilson, C. J., Scott, V. L., & J. Gibbs. 2019. Geographic biases in bee research limits understanding of species distribution and response to anthropogenic disturbance. *Frontiers in Ecology and Evolution*: 7: 1 – 8. <https://doi.org/10.3389/fevo.2019.00194>
- Carper, A. L.**, Schwantes, C. J., & M. A. Jamieson. 2019. A new state record of the rare bee, *Cemolobus ipomoeae* (Hymenoptera, Apidae), from Colorado, USA. *Journal of the Kansas Entomological Society*: 91(2): 171 – 175. <https://doi.org/10.2317/0022-8567-91.2.171>
- Schwantes, C. J., **Carper, A. L.**, & M.D. Bowers. 2018. Solitary floral specialists do not respond to cryptic flower-occupying predators. *Journal of Insect Behavior*: 31(6):642 – 655. <https://doi.org/10.1007/s10905-018-9706-9>
- Carper, A. L.** & R. E. Irwin. 2016. Effects of florivory on plant-pollinator interactions: implications for male and female components of plant reproduction. *American Journal of Botany*: 103(6): 1061 – 1070. <https://doi.org/10.3732/ajb.1600144>
- Carper, A. L.**, L. S. Adler, P. S. Warren, & R. E. Irwin. 2014. Effects of suburbanization on forest bee communities. *Environmental Entomology* 43(2):253 – 262. <https://doi.org/10.1603/en13078>
- Irwin, R., P. Warren, **A. Carper**, & L. Adler. 2013. Plant–animal interactions in suburban environments: implications for floral evolution. *Oecologia* 174(3): 803 – 815. <https://doi.org/10.1007/s00442-013-2797-2>

MANUSCRIPTS IN PREPARATION (5)

* manuscript available on request

- Carper, A.L.** & M.D. Bowers. Host plant-mediated effects on a specialist parasitoid-caterpillar interaction. for *Insects* (2025)
- Morphew, A.M., **Carper, A.L.**, Bowers, M.D. & M.A. Jamieson. Grassland conservation plantings support more abundant cavity-nesting bee communities than rangelands in agroecosystems. for *Journal of Insect Conservation* (2025)
- Carper, A. L.**, Schwantes, C. J., Norton, A.P., Bowers, M.D., and M. A. Jamieson. Ecological efficacy of three different capture techniques for wild bee inventories*. for *Insect Conservation and Diversity* (2025).
- 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* (2025).

Carper, A. L. The impacts of woody debris management on wild bee communities. *for Insect Conservation and Diversity* (2025).

GOVERNMENT REPORTS (4)

Armstead, S., **Carper, A. L.**, Davidson, D., Blanchard, M., Hopwood, J., Larcom, R., Black, S., Briles, C., Irwin, R., Jolma, G., Resasco, J., Davis, S., Mola, J., and D. Inouye. 308 pp. 2024. *Colorado Native Pollinating Insects Health Study*. Denver: Colorado Department of Natural Resources. <https://dnr.colorado.gov/native-pollinating-insects-health-study> https://drive.google.com/file/d/1HByF7H2qQ4vf_0GhKEG2eNiArs9GlwrP/view

Carper, A. L. *A qualitative assessment of wild bee habitat features on Boulder County open spaces*. 2019. Final Report: 11 pp. <https://assets.bouldercounty.org/wp-content/uploads/2019/03/assessment-wild-bee-habitat.pdf>

Carper, A. L. & T. J. Hammer. *Preliminary assessment of pollinators on Red Wagon Organic Farm and notes on potential conservation practices to promote wild bees*. 2019. Unfunded Research Report: 10pp. <https://assets.bouldercounty.org/wp-content/uploads/2019/01/pollinators-red-wagon-organic-farm.pdf>

Carper, A. L. & M. D. Bowers. *The conservation value of woody debris for cavity-nesting bees on Boulder County Open Space*. 2017. Final Grant Report: 33 pp. <https://assets.bouldercounty.org/wp-content/uploads/2018/01/woody-debris-for-bees.pdf>

EXTERNAL CONTRACTS & GRANTS (9: \$1,056,740)

- 2024 National Parks Service: \$180,848. Inventory of native bees and butterflies to inform invasive plant management and native plant restoration in Colorado National Monument and grazing management in Dinosaur National Monument. Cooperative Agreement. *Principle Investigator*.
- 2023 City of Boulder, Colorado: \$47,000. Designing an Ecologically Informed Long-term Monitoring Strategy for Insects in the City of Boulder. *Principle Investigator*.
- 2022 Colorado Department of Natural Resources: \$170,000. Native Pollinating Insects Health Study. *Co-investigator*.
City of Boulder, Colorado: \$6,800. A Baseline of Insect Diversity Across the City of Boulder. *Principle Investigator*.
- 2021 National Science Foundation ADBC# 2101850: \$217,080. Collaborative Research: Digitization TCN: Extending Anthophila research through image and trait digitization (Big-Bee). *Principal Investigator*.
- 2020 National Science Foundation DEB# 1929544: \$400,000. Collaborative Research: Novel Trophic Interactions Determined by Phytochemistry, Pathogen Infection, and Parasitoids. *Senior Personnel*.
- 2016 Boulder County Parks & Open Space: \$10,000. The conservation value of woody debris for cavity-nesting bees on Boulder County open space. *Principal Investigator*.
- 2015 Boulder County Parks and Open Space: \$11,452. Agricultural Practices on Boulder County Open Space: implications for pollinator conservation. *Co-investigator*.
- 2012 National Science Foundation DDIG# 1209321: \$13,560. DISSERTATION RESEARCH: Effects of suburbanization on multispecies plant-animal interactions. *Principle Investigator*.

INTERNAL GRANTS AND FELLOWSHIPS (12: \$109,500)

- 2024 Boulder Urban Stream Health program: \$30,000. Feasibility of UAV photography for detection of wetland noxious weeds. *Principle Investigator*.
CU-Boulder Undergraduate Research Opportunity Program Team Grant: \$3,000. Exploring land-management impacts on pollinators in Colorado and Dinosaur National Monuments.
- 2023 CU Office of Outreach and Engagement, Outreach Award: \$24,000. Growing more inclusive communities around pollinator conservation.
- 2022 Undergraduate Research Opportunity Program Team Grant: \$4,000. Increasing the impact of entomological research collections through image and trait digitization.
- 2016 Undergraduate Research Opportunity Program Team Grant: \$3,000. Exploring Patterns of Cavity-Nesting Bee Community Dynamics across Colorado.
- 2015 Undergraduate Research Opportunity Program Team Grant: \$3,000. The Bees' Needs: Integrating Ecological Research with Citizen Science.
Biological Undergraduate Research Skills & Training Grant: \$2,500. Pollen-host use and cavity-nesting bee performance in conservation grasslands of Colorado. In collaboration with honors student, A. M. Morpew.
Undergraduate Research Opportunity Program Team Grant: \$3,000. Digital Curation of Colorado's Native Bees: Practical Applications.
- 2014 Undergraduate Research Opportunity Program Team Grant: \$3,000. Growth and Reproduction of Cavity Nesting Bees across an Agricultural Gradient.
Undergraduate Research Opportunity Program Team Grant: \$3,000. Biological effects of extreme weather events: Response of native bees to the Colorado flood.
- 2012 Dartmouth Graduate Studies Travel Award: \$1,000
- 2009 Graduate Assistance in Areas of National Need Fellowship. \$30,000

MENTORED STUDENT GRANTS (9: \$25,753)

- 2023 CU-Boulder Undergraduate Research Opportunity Program Individual Grant: \$4,000. Artistic macrophotography of bees. Undergraduate Mr. J. Longley.
- 2020 Louis Webster Fund, Denver Audubon: \$4,853. The Impacts and Recovery Status of Wild Bee Communities following a Catastrophic Flood. CU-Boulder MS student J. Mullins.
- 2019 CU-Boulder Undergraduate Research Opportunity Program Individual Grant: \$3,000. St. Vrain Bee Surveys. Undergraduate Mr. J. Unger.
- 2018 The Garden Club of America Centennial Pollinator Fellowship: \$4,000. Changes in wild bee diversity and abundance along an urban to rural gradient. CU-Denver MS student K. Birdshire.
- 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 K. Bohanon.
CU-Boulder Undergraduate Research Opportunity Program Individual Grant: \$2,400. Impacts of flood restoration efforts on riparian plant and pollinator communities. Undergraduate T. Streb.

- 2016 Eve Verderber Undergraduate Research Fellowship: \$1,500. Assessing wild bee growth and development across agroecosystems in Colorado: impacts of the Conservation Reserve Program. Honors Thesis undergraduate A. 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 L. 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? Honors Thesis undergraduate A. Morphew.

COURSES TAUGHT

- 2019 *Insect Biology*, EBIO 4660, Department of Ecology and Evolutionary Biology, University of Colorado-Boulder. Instructor of Record: Explored insect biology, ecology, systematics, and evolution of insects through lectures, active learning activities, field trips, and laboratory.
Principles of Ecology, EBIO 2040. Spring and Summer. Department of Ecology and Evolutionary Biology, University of Colorado-Boulder. Instructor of Record: developed and gave lectures on the major disciplines, theories, and classical hypotheses in the field of ecology.
- 2018 *Insect Biology*, EBIO 4660, Department of Ecology and Evolutionary Biology, University of Colorado-Boulder. Instructor of Record: Explored insect biology, ecology, systematics, and evolution of insects through lectures, active learning activities, field trips, and laboratory.
- 2015 *Principles of Ecology*, EBIO 2040-20. Department of Ecology and Evolutionary Biology, University of Colorado-Boulder. Instructor of Record: developed and gave lectures on the major disciplines, theories, and classical hypotheses in the field of ecology.

GUEST LECTURES

- 2022 *Beeography*, GEOG 5500, Geography and Environmental Sciences, University of Colorado-Denver. Guest lectured on wild pollinator taxonomy and ecology in relation to local, landscape, continental, and global scales of biodiversity. Explored factors driving large-scale patterns of bee biodiversity. Field expedition.
Emerging Technologies in Museum Studies, MUSM 6110, Museum of Natural History, University of Colorado-Boulder. Guest lectured on developing new imaging protocols for rendering 3D photogrammetric models of bee specimens within the Entomology Section.
- 2021 *Biogeography*, GEOG 3351, Geography, University of Colorado-Boulder. Guest lectured on wild pollinator ecology in relation to local, landscape, continental, and global scales of biodiversity. Explored current knowledge, areas in need of research, and theoretical drivers of large-scale patterns of biodiversity.

- 2021 *Beeography*, GEOG 5500, Geography and Environmental Sciences, University of Colorado-Denver. Guest lectured on wild pollinator taxonomy and ecology in relation to local, landscape, continental, and global scales of biodiversity. Explored factors driving large-scale patterns of bee biodiversity. Field expedition.
- Insect Biology*, EBIO 4460. Department of Ecology and Evolutionary Biology, University of Colorado-Boulder. Guest lecturer for pollination biology.
- 2020 *Insect Biology*, EBIO 4460. Department of Ecology and Evolutionary Biology, University of Colorado-Boulder. Guest lecturer for pollination biology.
- Beeography*, GEOG 5500, Geography and Environmental Sciences, University of Colorado-Denver. Guest lectured on wild pollinator taxonomy and ecology in relation to local, landscape, continental, and global scales of biodiversity. Explored factors driving large-scale patterns of bee biodiversity.
- 2020 *Biogeography*, GEOG 3351, Geography, University of Colorado-Boulder. Guest lectured on wild pollinator ecology in relation to local, landscape, continental, and global scales of biodiversity. Explored current knowledge, areas in need of research, and theoretical drivers of large-scale patterns of biodiversity.
- 2019 *Landscape Architecture*, ENVD 3200 Praxis, Program in Environmental Design, University of Colorado-Boulder. Guest lectured on wild pollinator ecology in relation to urban pollinator habitat design and gave tours of the Collection.
- 2018 *Principles of Ecology*, EBIO 2040. Department of Ecology and Evolutionary Biology, University of Colorado-Boulder. Lectured on pollinator conservation and led a field research trip to Red Wagon Farm where students surveyed pollinators to aid Boulder Co. Parks and Open Space in restoration efforts.
- 2018 *Landscape Architecture*, ENVD 3200 Praxis, Program in Environmental Design, University of Colorado-Boulder. Guest lectured on wild pollinator ecology in relation to urban pollinator habitat design, gave tours of the Entomology Collection, and served as a research advisor for course research projects.
- Biogeography*, GEOG 3351, Geography, University of Colorado-Boulder. Guest lectured on wild pollinator ecology in relation to local, landscape, continental, and global scales of biodiversity. Explored current knowledge, areas in need of research, and theoretical drivers of large-scale patterns of biodiversity.
- 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. 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. 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.
- 2009 *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.

OTHER TEACHING EXPERIENCE

- 2019 *Intro to Colorado's Wild Bees: Their Taxonomy and Ecology*, Boulder County Nature Association, Boulder, CO. Instructor: developed evening adult course for BCNA on bee ecology, natural history, and identification. Organized and led a field trip to explore bees on Open Spaces.
- Prairie Perambulations: A Pawnee Grasslands Immersion Weekend*, Boulder County Audubon Society, Semi-Arid Grasslands Research Center, Nunn, CO. Instructor: gave morning lecture on bee ecology, natural history, and identification; organized and led a field trip exploring native prairie bees.

CONFERENCE PRESENTATIONS (15)

* Undergraduate co-author

- 2022 Entomological Society of America Annual Meeting, Vancouver, BC. *Big-Bee: Increasing the impacts of Anthophila collections through image and trait digitization*. **A. L. Carper** & V. S. Scott. Contributed oral session.
- 2021 Entomological Society of America Annual Meeting, Denver, CO. *Engaging with community initiatives to help spur local conservation action: An example from the Colorado Pollinator Network*. **A. L. Carper**. Member symposia.
- High Country Lepidopterists' Society, Westminster, CO. *Host plant effects on a specialist caterpillar-parasitoid interaction*. **A. L. Carper** and M. D. Bowers.
- 2020 Ecological Society of America Meeting, Virtual. *Seasonal variation in hostplant chemistry drives sequestration in a specialist caterpillar*. **A. L. Carper**, L. L. Richardson, & M. D. Bowers. Contributed oral session.
- 2019 Ecological Society of America Meeting, Louisville, KY. *Impacts of host plant on sequestration and immune response across development in a specialist caterpillar*. **A. L. Carper**, M. Enger, & M. D. Bowers. Contributed oral session.
- 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.
- 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*.
- Guild of Rocky Mountain Ecologists and Evolutionary Biologists, University of Colorado Mountain Research Station, CO. **A.L. Carper**. *The impacts of woody debris and its management on Boulder County's wild bee communities*.

- 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.
- 2014 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.
- 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.

COAUTHORED CONFERENCE PRESENTATIONS (18)

* Undergraduate co-author

- 2022 Entomological Society of America Annual Meeting, Vancouver, BC. *Turn on the heat: The impact of temperature on the performance and insect defense of a specialist and a generalist lepidopteran*. K. Hernandez, **A. L. Carper**, and M. D. Bowers. Student 10-minute paper.
- 2022 Entomological Society of America Annual Meeting, Vancouver, BC. *Big-Bee: An initiative to promote understanding of bees through image and trait digitization*. K. C. Seltmann, **A. L. Carper**, et al. Poster.
- 2021 Entomological Society of America Annual Meeting, Denver, CO. *Weathering the storm: Wild bee community response to an extreme flood*. J. L. Mullins, V. S. Scott, **A. L. Carper**, and M. D. Bowers. Student 10-minute paper.
- Entomological Society of America Annual Meeting, Denver, CO. *Effects of fire severity on the floral visitor community, pollination, and reproduction of a dominant flowering sub-alpine shrub*. B. V. Bieber, **A. L. Carper**, and S. S. Murphy. Student 10-min paper.
- Entomological Society of America Annual Meeting, Denver, CO. *Host plant effects on a specialist caterpillar-parasitoid interaction*. M. D. Bowers and **A. L. Carper**. Contributed oral session.

- 2021 Entomological Society of America Annual Meeting, Denver, CO. *Interactions between a densovirus and wild lepidopteran hosts: The roles of host plant use, chemical defense, and viral diversity*. Muchoney, N., M.D. Bowers, **A. L. Carper**, A. Smilanich.
- XII Congreso Mesoamericano de Abejas Nativas. Centro de Investigaciones Apícolas Tropicales (CINAT), Universidad Nacional, Costa Rica. Gonzalez, VH., Seltmann, KC., Brown, B., Allen, J., **Carper, A.L.**, Engel, M., et al. (2021). Big-Bee: Una iniciativa para promover el conocimiento de las abejas a través de la digitalización de imágenes y datos de rasgos. ID 112. <https://escholarship.org/uc/item/0856h3d2>.
- 2020 Society for the Preservation of Natural History Collections. Online. *What happens when you let an ecologist loose on your Specify database: Semi-automated data cleaning using R*. **A. L. Carper** and T.S. Karim. Organized oral session.
- 2019 Entomological Society of America Annual Meeting, St. Louis, MO. *Phytochemical and immunological mediation of interactions between a pathogenic densovirus and its lepidopteran hosts*. N. Muchoney, M. D. Bowers, P. Mason, **A L. Carper** and A. Smilanich. Organized oral session.
- 2018 Entomological Society of America Annual Meeting, Vancouver, BC. *Host-plant dependent variation in survival against a lepidopteran densovirus*. A. Smilanich, A. Wantanabe, N. Muchoney, C. Chung, **A. L. Carper** and M. D. Bowers. Contributed oral session.
- 2018 Entomological Society of America Annual Meeting, Vancouver, BC. *Larval host-plant species influences development and survival of viral infection in *Anartia jatrophae* (Lepidoptera: Nymphalidae)*. N. Muchoney, M. D. Bowers, **A. L. Carper**, and A. Smilanich. Contributed oral session.
- American Association of Geographers Meeting, New Orleans, LA. *Changes in wild bee diversity and abundance along an urban-rural gradient*. K. Birdshire, C. Briles, and **A. L. Carper**. Poster session.
- 2017 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.
- 2017 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.
- 2016 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.

2014 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.

INVITED TALKS (28)

- 2023 Harvard Forest REU Program (6/15/23): *Studying Insect Community Ecology: From Parasitoids to Pollinators*
People & Pollinators Action Network Webinar (5/22/2023): *Conservation Conversation: a scientific perspective on creating diverse, healthy, and sustainable pollinator communities*
- 2023 City of Boulder Pollinator Programs Steering Committee Retreat: *Long-term insect monitoring strategies: where, how, and why to collect*
- 2022 Boulder County Beekeepers Association (10/5/2022): *Our Vulnerable Bees: Managing Honey Bees While Conserving Our Native Pollinators*
Northern Colorado Beekeepers Association (9/15/2022): *Our Vulnerable Bees: Managing Honey Bees While Conserving Our Native Pollinators*
CU Boulder Department of Ecology and Evolutionary Biology Colloquium (9/9/2022): *Insect Ecology in the Anthropocene: from Parasitoids to Pollinators*
- 2022 CU Boulder Mountain Research Station 100th Anniversary Seminar Series (6/21/2022): *Colorado's Wild Bees Expanding the Conservation Impacts of Pollinator Research*
- 2022 CU Conference on World Affairs Panel (4/8/2022): *Silent Farm: Saving our Birds, Bees, Frogs, and Ourselves*
People & Pollinators Action Network Webinar (4/7/2022): *Challenges in Conserving Colorado's Native Bees*
- 2021 Niwot Honeybee Harvest Festival (8/28/2021): *The Conservation of Colorado's Native Bees: Our Most Vulnerable Pollinators*
- 2020 City of Boulder, Bee Boulder Festival (9/12/2020): *The Natural History of Colorado's Native Bees*.
5th Annual Colorado Pollinator Summit: *2020 Colorado Pollinator Summit: Building a Roadmap for Pollinator Conservation in a Changing World - Introduction*
- 2019 City of Fort Collins Natural Arheas (12/17/2019): *Wild bee conservation in Boulder County and beyond*.
4th Annual Colorado Pollinator Summit: CU Panel (11/1/2019): *The CU Museum of Natural History's role in pollinator research and education*.
- 2019 Boulder County Audubon Society (9/24/2019): *Wild bee conservation in Boulder County and beyond*.
University of Colorado Museum of Natural History (9/17/2019): *Protecting Colorado's Pollinators: how you can help inform and impact their conservation*
Boulder County Beekeepers Association (9/4/2019): *An introduction to Colorado's wild bees: their taxonomy and ecology*
- 2018 3rd Annual Colorado Pollinator Summit: Plenary Speaker (11/9/2017): *The Natural history of Colorado's native bees: informing conservation through ecological research*.
University of Colorado Museum of Natural History (9/19/2018): *Colorado's wild bees: The fascinating ecologies of our most important pollinators*.

- 2018 Audubon Society of Greater Denver, Conservation in Colorado Adult Lecture Series (1/24/2018): *Wild bee diversity, ecology, and conservation in Colorado.*
- 2017 2nd 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.*
- 2016 The Mile Hive Bee Club (6/14/2016): *Native bee diversity, ecology, and conservation.*
- University of Colorado Museum of Natural History (3/15/2016): *What we're learning about The Bees' Needs: an update on research, discoveries, and lessons from your backyards.*
- 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.*

ORGANIZED MEETINGS

- 2024 9th Annual Colorado Pollinator Summit (11/18/2024): *New Terrain for Pollinator Conservation.* Served on the planning and steering committee. Hosted and facilitated the summit.
- 2023 8th Annual Colorado Pollinator Summit (11/6/2023): *Promoting / Cultivating Diversity in Pollinator Conservation.* Served on the planning and steering committee. Organized a session on a collaborative statewide review. Hosted and facilitated the summit.
- University of Colorado Museum of Natural History (4/3/2023): *Pollinator Conservation and Management in CO and Beyond.* Organized a morning workshop for Front Range native bee researchers and three short outreach talks on pollinators in the afternoon followed by a Q/A panel.
- 2022 7th Annual Colorado Pollinator Summit (11/5/2022): *Scaling Pollinator Conservation for a New Era: Growing, Progressing, Transforming.* Served on the planning and steering committee. Organized a session with two pollinator researchers and a honeybee keeper to discuss wild bee-honeybee interactions. Hosted and facilitated the summit.
- 2021 6th Annual Colorado Pollinator Summit (11/4/2021): *Promoting Pollinators through Collaborative Conservation.* Served on the planning and steering committee. Organized a session on participatory science project surveying bees across states, including three 20-minute talks and a 40-minute audience driven panel discussion. Hosted and facilitated the summit.

2020 5th Annual Colorado Pollinator Summit (11/5/2020): *Building a Roadmap for Pollinator Conservation in a Changing World*. Served on the planning and steering committee. Organized a session with three pollinator researchers, including three 20-minute talks and a 40-minute audience driven panel discussion. Hosted and facilitated the summit.

PRESS, HIGHLIGHTS, & OTHER CONTRIBUTIONS (23)

- 2024 ‘Bee’ part of the future: CU seeks volunteers to digitize bee information. Spencer Kristensen. KDVR FOX 31 Denver. <https://kdvr.com/news/local/bee-part-of-the-future-cu-seeks-volunteers-to-digitize-bee-information/>
- Pollinator health study leads to Colorado law protecting pollinators, rare plants. Jayme DeLoss. CSU, Source. <https://source.colostate.edu/pollinator-health-study-colorado-law-protects-pollinators>
- How Scientists Are Working to Reverse Colorado’s Bug Decline. Barbara O’Neil. 5280 Magazine. <https://www.5280.com/how-scientists-are-working-to-reverse-colorados-bug-decline/>
- Twenty-percent of Colorado bumblebees are endangered. Eric Ralls, Earth.com. <https://www.earth.com/news/twenty-percent-of-colorado-bumblebees-are-endangered/>
- How to play a part in protecting pollinators around Denver. McKenna Harford. *Colorado Community Media*. <https://coloradocommunitymedia.com/2024/07/02/how-to-play-a-part-in-protecting-pollinators-around-denver/>
- Scientists want your help to digitize historic data on bees. Rachel Cohen. KUNC, NPR News. <https://www.kunc.org/regional-news/2024-11-05/scientists-want-your-help-to-digitize-historic-data-on-bees>
- A Colorado butterfly, other bugs getting new protections as human and climate threats loom. William Allstetter and Michael Booth. *The Colorado Sun*. <https://coloradosun.com/2024/02/20/colorado-insects-pollinators-threatened-species/>
- Boulder's climate leadership: the weight of a bumble bee. Gracy Boyle. Boulder Magazine. <https://thebouldermag.com/boulder-s-climate-leadership>
- Climate change is making it tough on bees, butterflies, and other pollinators; now the state may try to protect them. Molly Cruse. Colorado Matters, CPR News. <https://www.cpr.org/2024/03/03/colorado-bees-pollinators-in-trouble-state-might-try-to-protect-them/>
- 1 in 5 Colorado bumblebee species are at risk, new report says. Yvaine Ye. *CU Boulder Today*. <https://www.colorado.edu/today/2024/01/24/1-5-colorado-bumblebee-species-are-risk-new-report-says>
- Scientists, environmentalists petitioning to put some of Colorado's native bee species on endangered. 9NEWS NBC Denver. https://www.youtube.com/watch?v=0PoL1c4_4b8
- Governor Polis and the Department of Natural Resources Release Pollinator Report. Press Release. Governor Jared Polis. <https://www.colorado.gov/governor/news/11291-governor-polis-and-department-natural-resources-release-pollinator-report>

- 2024 Study signals the importance of protecting native pollinators. *The Norwood Post*. Mia Rupani. https://www.telluridenews.com/news/article_a996b176-ab65-11ee-b9df-3758c6b2bba1.html
- Colorado's native pollinators study highlights importance of biodiversity as populations decline. Trevor Reid. *Greely Tribune*. <https://www.greeleytribune.com/2024/01/13/colorados-native-pollinators-study-highlights-importance-of-biodiversity-as-populations-decline/>
- Colorado Gov. Jared Polis releases results of pollinator study, wants to protect bees, butterflies. Jennifer McRae. CBS Colorado. <https://www.cbsnews.com/colorado/news/colorado-gov-jared-polis-results-pollinator-study-protect-bees-bats-butterflies/>
- First of its kind Colorado pollinator study wraps up. FOX31 Denver. <https://www.youtube.com/watch?app=desktop&v=2bBc-zhX4H0>
- Polis makes a pitch to protect Colorado's native pollinators. *Westminster Window*. Monte Whaley. <https://coloradocommunitymedia.com/2024/01/04/polis-makes-a-pitch-to-protect-colorados-native-pollinators/>
- 2023 New bee species gnaws its nest holes into solid stone. *Daily Camera*. Jeff Mitton. 12/20/2023: pg 15. <https://www.dailycamera.com/2023/12/20/jeff-mitton-natural-selections-new-bee-species-gnaws-its-nest-holes-into-solid-stone/>
- Colorado launches study on native pollinators. *The Journal*. Jim Mimiaga. <https://www.the-journal.com/articles/colorado-launches-study-on-native-pollinators/>
- CO Dept of Natural Resources Launches study on Native Pollinating Insects. Press Release. Gov. Jared Polis. <https://www.colorado.gov/governor/news/9611-co-dept-natural-resources-launches-study-native-pollinating-insects>
- 2022 Urban wildflower reproduction limited by pollination—even with more pollinators. Issue Highlights. *American Journal of Botany*. <https://doi.org/10.1002/ajb2.16110>
- 2021 Why your cucumbers and tomatoes won't grow, and other garden woes this summer. KUNC. Rae Solomon. <https://www.kunc.org/2020-08-20/why-your-cucumbers-and-tomatoes-wont-grow-and-other-garden-woes-this-summer>
- 2020 How to create a bee-friendly garden in Denver to support Colorado's more than 900 native species. *The Denver Post: Special to the Denver Post*. Covington, Linnea. <https://theknow.denverpost.com/2020/08/04/bee-garden-denver-colorado/242739/>
- Boulder County's native bee species thrive in disturbed environments. *The Denver Post: Web Edition Articles*. Spina, John. <https://www.denverpost.com/2020/02/09/boulder-county-native-bee-species-thrive/>
- 2020 Boulder County's native bee species thrive in disturbed environments. *The Daily Camera*. Spina, John. <https://www.dailycamera.com/2020/02/08/boulder-countys-native-bee-species-thrive-in-disturbed-environments/>
- 2019 Flood of painted lady butterflies enrich Boulder County's late summer palette. *The Daily Camera*. <https://www.dailycamera.com/2017/09/19/flood-of-painted-lady-butterflies-enrich-boulder-countys-late-summer-palette/>
- How to be a guardian of pollinators. 8/1/2019. *Left Hand Valley Courier*. Dorvee, Vickee. <https://www.lhvc.com/story/2019/07/31/news/how-to-be-a-guardian-of-pollinators/3861.html>

- 2018 Some Insects Taste With Their Feet and Hear With Their Wings. *National Geographic*. Langley, Liz. <https://www.nationalgeographic.com/animals/article/insects-butterflies-anatomy-senses-animals>
- 2017 Parasitoid wasp pupae cluster on a leaf after feasting on a caterpillar. *The Daily Camera*. Mitton, Jeffrey. <https://www.dailycamera.com/2017/07/13/jeff-mitton-parasitoid-wasp-pupae-cluster-on-a-leaf-after-feasting-on-a-caterpillar/>
- 2017 CU Boulder collection is a hive of information on the world of bees. *The Daily Camera*. Brennan, Charlie. <https://www.dailycamera.com/2017/07/07/cu-boulder-collection-is-a-hive-of-information-on-the-world-of-bees/>

GRADUATE COMMITTEES

- Smith, Alaina. *TBD: Fire severity and plant-pollinator interactions*. (Expected 2024). Master's Thesis. University of Denver. Committee member.
- Jolma, Garret. *Can cavity-nesting bees and wasps be reliably identified from participatory science observations of nest characteristics?* 2023. Master's Thesis. CU-Boulder. Committee member.
- Kaitlyn Barthell. Topic: *Niche partitioning in bumblebees along an elevational gradient*. 2023. Master's Thesis. CU-Boulder. Committee member.
- Bieber, Blyssalyn. *Responses of Arthropods to Fire and How Pollinators and Pollination Services Are Affected by Fire Severity*. Master's Thesis. University of Denver. 2022
- Mullins, Jessica. *Weathering the Storm: Wild Bee Community Response to an Extreme Flood*. 2021. Master's Thesis. CU-Boulder. Committee member.
- Birdshire, Kristen. *Changes in Wild Bee Diversity and Abundance Along an Urban to Rural Gradient*. 2018. Master's Thesis. CU-Denver. External committee member.

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
- Enger, Micaela. *Effects of host plant and developmental stage on caterpillar immune response*. 2017. Undergraduate Honors Theses. 1333. http://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.

PROFESSIONAL AFFILIATIONS

Ecological Society of America
 Entomological Society of America
 High Country Lepidopterist's Society
 Guild of Rocky Mountain Ecologists and Evolutionary Biologists
 IUCN-Wild Bee Specialist Group

SYNERGISTIC ACTIVITIES

- (a) *Mentoring*: I have supervised and mentored dozens of undergraduate students from the University of Colorado-Boulder, Dartmouth College, and North Carolina State University through research activities and general advising. At CU-Boulder, I have mentored >50 undergraduate students, including >40 women, and students from LGBTQ+ and underrepresented communities in science, through paid research, independent research, grant writing, and honor's theses. My students come from a wide diversity of ages, ethnicities, and backgrounds. I have mentored four undergraduate students through Independent Research and Honors theses, have served on graduate committees for 7 graduate students at CU-Denver, University of Denver, and at CU-Boulder, and have mentored nearly 30 undergraduates on more than \$40,000 of student grant-driven independent research. I have also published with undergraduate co-authors and am currently collaborating with two students on separate manuscripts from their undergraduate research.
- (b) *Outreach*: I engage the public whenever possible through direct interactions, including meetings and correspondence, but also through the development of informational booklets that I have provided to cooperating communities, an ongoing research blog, and through outreach and engagement. I collaborated with the University of Colorado Biological Science Initiative to document and share research from our participatory science program, *The Bees' Needs*, through their ScienceLIVE program. I 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 design student, Kao Kupadakvinij, with specimen photography and ecological expertise for his Honor's Thesis Exhibition: *Entomology in the Fine Arts: A Voice for the Little Guys*. I have given more than two dozen outreach talks to local organizations, through the CU Museum of Natural History, and through regional conservation organizations.
- (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*, *mSystems*, and *Global Change Biology*. I also revised a chapter of exam and online test bank questions for the fifth edition of *Ecology* (Bowman et al 2020) for Oxford University Press. This included revising online testing materials and connecting testing materials to revised learning objectives. I volunteer my taxonomic expertise in bees to help in determinations of wild bees from nearby research projects and have assisted in studies from the University of Colorado, Denver, CU-Boulder, Colorado State University, the USGS, and CU-Boulder's Environmental Design Program. I also coordinate with the Colorado Pollinator Network in planning the annual Colorado Pollinator Summit, in an effort to integrate scientists into discussions of pollinator conservation with managers, policy makers, and the public. I also led the scientific review of pollinators in Colorado for the CO Department of Natural Resources, in order to develop best management guidelines for their incorporation into statewide policies.

PROFESSIONAL REFERENCES

Deane Bowers
Professor and Curator, Emerita
Department of Ecology and Evolutionary Biology and CU Museum
334 UCB, University of Colorado, Boulder, CO 80309
phone: (303) 492-5530
deane.bowers@colorado.edu
<http://www.bowerslab.org>

Angela M. Smilanich (she/her/hers)
Associate Professor
Ecology, Evolution, and Conservation Biology Program
Biology Department Mailstop 314, University of Nevada, Reno, NV 89557
phone: (775) 682-7756
asmilanich@unr.edu
<http://www.angelasmilanich.com>

Rebecca Irwin
Professor, University Director, Southeast Climate Adaptation Science Center
Department of Applied Ecology
Campus Box 7617, North Carolina State University, Raleigh, NC 27695
reirwin@ncsu.edu
phone: (919) 513-7553
reirwin@ncsu.edu
<http://irwinlab.weebly.com>

Deryn Davidson (she/her/hers)
Sustainable Landscape State Specialist
Colorado State University Extension
phone: (970) 491-7429
Deryn.Davidson@colostate.edu

Steve Armstead (he/him/his)
Pollinator Conservation and Nature-Based Climate Solutions Specialist, Colorado Front Range
Xerces Society for Invertebrate Conservation, Boulder Regional Office
Steve.armstead@xerces.org
phone: (720) 491-0845