

ROSEMARY L. MALFI
CURRICULUM VITAE

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EDUCATION

- 2015 **Ph.D.**, Environmental Sciences (Ecology), University of Virginia
Dissertation Title: “Bumblebee Population Dynamics: Understanding Risks Associated with Floral Resource Availability and Parasitism.”
- 2007 **B.A.**, Biology, Bryn Mawr College
Magna cum Laude Distinction, Departmental Honors in Biology, Tropical Biology Semester Abroad with Organization for Tropical Studies (Costa Rica)

RELEVANT EMPLOYMENT

- 2015 - Pres. **Postdoctoral Researcher**, Department of Entomology, University of California Davis
Conducting multi-year field experiment with Drs. Neal Williams (UC Davis) and Elizabeth Crone (Tufts University) to determine how temporal patterns of food resource availability influence bumblebee colony demographics. Responsibilities include: rearing colonies from wild-caught queens; coordinating all fieldwork and managing team of 3 technicians and 3 students; analyzing data and generating manuscripts. Empirical data will be used to build demographic models for bumblebee colony growth and population models that predict population viability across landscapes differing in seasonal availability of food resources.
- 2007 – 2009 **Staff Scientist**, Academy of Natural Sciences of Drexel University, Philadelphia, PA
Managed diatom preparation laboratory for environmental center. Tracked and processed algae samples, managed department database and supply orders, corresponded with clients and collaborators, supervised laboratory technicians, and developed laboratory protocols. Served as project manager on a local freshwater mussel restoration project.

RESEARCH INTERESTS

- Population Ecology
- Behavioral Ecology
- Pollination Biology
- Disease Ecology
- Bee population dynamics
- Host-parasite interactions
- Plant-animal interactions
- Pollinator conservation

HONORS AND AWARDS

- 2014 **Fred Holmsley Moore Teaching Award**
Environmental Sciences Department, University of Virginia
- 2014 **Outstanding Graduate TA Award**
Teaching Resource Center, University of Virginia
- 2013 **Outstanding Oral Presentation** (Biological and Biomedical Sciences Session)
Annual Huskey Graduate Research Exhibition, University of Virginia
- 2013 **Best Graduate Oral Presentation**
Annual Environmental Sciences Student Research Symposium, University of Virginia
- 2012 **Graduate Student Association Award**, *Awarded for service to the graduate student body.*
Department of Environmental Sciences, University of Virginia
- 2011 **Raven Society**, *Honorary society that recognizes scholarship and service at the University.*
University of Virginia
- 2011 **Honorable Mention**, Graduate Research Fellowship Program
National Science Foundation

DISSERTATION SUMMARY

Bumblebees (*Bombus* spp.) are a vital group of pollinators in wild and managed ecosystems, but we know relatively little about the ecological factors that regulate their populations. Although floral resource availability and natural enemy abundance are important components of habitat quality for bees, and have been implicated in bumblebee declines, the influence of these factors on bumblebee population size remains understudied. Through five studies that focus on bumblebee populations in northern Virginia (USA), my dissertation evaluates how floral resource availability and parasitism influence bumblebee populations, and how risks associated with these factors vary among species within a community. Chapters 1-3 reveal differences among bumblebee species in their sensitivity to changes in the flowering landscape and in their susceptibility to parasite infections. Chapters 1-2 show that two locally rare species have narrow diet breadths, tend to be absent from meadows with lower floral diversity, and are more frequently infected by the fungal parasite *Nosema* (sp.). This research points to changes in floral resources and parasitism as candidate factors involved in their declines. Chapter 3 demonstrates that one of three evaluated bumblebee species is resistant to a behavioral manipulation by an endoparasitic fly (Conopidae, Diptera). This study is the first to show that expression of this manipulation varies across bumblebee species. Chapters 4-5 evaluate how two seasonally variable factors, flower abundance and lethal conopid fly parasitism, affect bumblebee colony performance. Results show that steep reductions in flower abundance associated with midsummer drought conditions limit colony size and reproduction, and that larger colony size is more important when food is scarce. Through development of a simulation model, I demonstrate that the impact of conopids on colony reproduction is generally small, but increases when food is more limited during the colony cycle. These findings support current hypotheses that low food availability and heightened parasite pressure have resulted in the disproportionate representation of late-season bumblebees among declining species. Overall, this research reveals differences in the vulnerability of bumblebee species to changes in resource availability and natural enemies, and provides novel information on the influence that these factors, independently and in combination, have on bumblebee demographics.

PUBLICATIONS (* = co-principal authors, † = mentored student)

Malfi, R.L., Walter, J.A., & Roulston, T.H. The influence of a prevalent natural enemy on bumblebee colony demographics under different food resource conditions. *Submitted to Ecological Monographs*.

Davis, S.E.*†, **Malfi, R.L.***, & Roulston, T.H. (2015) Species differences in bumblebee immune response predict developmental success of a parasitoid fly. *Oecologia*, 178(4), 1017-1032. [doi: [10.1007/s00442-015-3292-8](https://doi.org/10.1007/s00442-015-3292-8)]

Gibson, J.F., Slatosky, A.D.†, **Malfi, R.L.**, Roulston, T.H., & Davis, S.E.† (2015) Video of eclosion of Conopidae (Diptera) from a *Bombus* (Apidae: Hymenoptera) host demonstrates the added informative value of rearing parasitoid Diptera from bees. *Journal of the Entomological Society of Ontario*, 145: 51-60.

Malfi, R.L., Davis, S.E.†, & Roulston, T.H. (2015) Parasitoid fly induces manipulative grave-digging behavior differentially across its bumblebee hosts. *Animal Behaviour*, 92: 213-220 [doi: [10.1016/j.anbehav.2014.04.005](https://doi.org/10.1016/j.anbehav.2014.04.005)]

Malfi, R.L. & Roulston, T.H. (2014) Patterns of parasitism in bumblebees (*Bombus* spp.) of northern Virginia. *Ecological Entomology*, 39(1): 17-29 [doi: [10.1111/een.12069](https://doi.org/10.1111/een.12069)].

Roulston, T.H. & **Malfi, R.L.** (2012) Aggressive eviction of the eastern carpenter bee (*Xylocopa virginica* (Linnaeus)) from its nest by the giant resin bee (*Megachile sculpturalis* Smith). *Journal of the Kansas Entomological Society* 85(4): 387-388 [doi: <http://dx.doi.org/10.2317/0022-8567-85.4.387>]

Manuscripts in Progress:

Malfi, R.L. & N.M. Williams. The effect of urbanization of bumblebee communities in the Delaware Valley of PA (USA).

Malfi, R.L., Stuligross, C. †, McIntosh, S.†, Bauer, L., & Roulston, T.H. Assessing risk of parasitism in foraging bumblebees using radio frequency technology.

Malfi, R.L., Crone, E.C., & Williams, N.M. The effect of an early-season resource pulse on the demographics of bumblebee (*B. vosnesenskii*) colonies.

TEACHING EXPERIENCE

- 2009 – 2013 **Teaching Assistant**, Department of Environmental Sciences, University of Virginia
- **Applied Statistics for Environmental Scientists** [2012, 2013]
Mixed undergraduate and graduate level. Led laboratory component of course in which students integrated their knowledge of statistics from the lecture with the statistical software through analysis of real datasets and application of statistical concepts presented in the course lectures.
 - **Introduction to Climatological Analysis** [2011, 2013]
Undergraduate level. Led and created substantial curricular material for laboratory instructing students on the use of fundamental statistical tests and models to analyze and interpret climatological datasets. Designed lab handouts to serve as lasting reference material, in-lab individual and group exercises, and take-home assignments.
 - **Fundamentals of Geology** [2010, 2011]
Undergraduate level. Instructed laboratory section on the fundamentals of geology. Lab activities included: rock and mineral identification based on physical properties, topographic and geologic map interpretation and generation, surface processes, mass wasting events, and Factor of Safety calculations. Led two field trips each semester taught.
 - **Introduction to Environmental Policy** [2009]
Undergraduate level. Facilitated weekly discussion sections based on assigned readings that coincided with the weekly lecture. Graded exams and final papers. Course examined a wide array of environmental problems to see how political processes and scientific evidence affect how those problems are confronted in the policy-making arena.
- 2013-2014 **Workshop Facilitator**, “Teaching the First Days of Class and Troubleshooting Classroom Challenges,” August Teaching Workshop, Teaching Resource Center, University of Virginia
Co-facilitated an orientation workshop for incoming teaching assistants. This two-part interactive workshop focused on laying out fears about teaching, delivering information on commonly-encountered scenarios in the classroom, and providing strategies for overcoming typical classroom challenges. Instruction on key school resources (e.g., counseling services) were also discussed.
- 2010-2014 **Workshop Facilitator**, “Research Ethics for Field Ecologists,” NSF Research Experience for Undergraduates (REU) Program, Blandy Experimental Farm, University of Virginia
Crafted and co-facilitated annual research ethics training module for the REU Program at Blandy Experimental Farm (University of Virginia). Workshop introduces information on scientific codes of conduct, including how to obtain permissions and permits, and instructs students on locating research guidelines, rules, and regulations. Students work through case studies.
- 2013 **Guest Lecturer**, “Biodiversity Basics,” Virginia’s Environments (EVSC 1040), Department of Environmental Sciences, University of Virginia.

RESEARCH MENTORING EXPERIENCE

- 2015 – Pres. **Research Mentor**, University of California Davis
Jessica Drost (2015-Pres.), Identification and nutritional assessment of pollen resources collected by bumblebee colonies in an agricultural setting (senior thesis, co-mentoring).
- 2011 – 2015 **Research Mentor**, Undergraduate Research Mentoring Program, Department of Environmental Sciences, University of Virginia
Sarah McIntosh (2014-2015), Changes in the foraging behavior of parasitized bumblebees.
Staige E. Davis (2011-2014), Patterns of parasitism in bumblebees; differential immune response of bumblebee host species to parasitoid flies (senior thesis).
Courtney Beach (2013- 2014), Characterizing seasonal variation in flowering resources, and development of science classroom activities involving a community garden.
Christopher Goslin (2012-2013), Relationship between bumblebee body size and parasitism.

- 2011 – 2015 **Research Mentor**, NSF Research Experience for Undergraduates (REU) Program, Blandy Experimental Farm (University of Virginia), Boyce, VA
Clara Stuligross, Earlham College (2013), Assessing risk of conopid parasitism with flight time in bumblebee foragers using radio frequency technology.
Amber Slatosky, Idaho State University (2013), Does conopid parasitism cause bumblebees to stay out of the colony overnight?
Staige E. Davis, University of Virginia (2012), Manipulation of bumblebee host behavior by conopid fly parasitoids.
Jessica Orozco, San Francisco State University (2011), Bumblebee community response to flowering diversity in Virginia meadows.
- 2007 – 2009 **Program Coordinator**, NSF Research Experience for Undergraduates (REU) Program, Academy of Natural Sciences, Philadelphia, PA
 Reviewed application materials and coordinated admissions process. Organized program activities and workshop series; instructed skills seminars. Served as primary resource for the 8 REU students during their time with the program. Developed detailed manual for future REU coordinators. Evaluated program progress and developed program features for future years.

FUNDING

Competitive Research Grants and Awards

- 2013-14 **Thomas Jefferson Conservation Award** (\$5000), Department of Environmental Sciences, University of Virginia. “Do resource scarcity and parasite pressure put late-season bumblebees at risk of extirpation?”
- 2012-13 **Grant in Aid of Research** (\$1000), Sigma Xi, The Scientific Research Society. “The impact of resource availability on growth and reproduction of bumblebee colonies.”
- 2012-13 **Miller Agricultural Fund Award for Research** (\$10,000), University of Virginia. “The impact of floral resource availability and parasitism on bumblebee (*Bombus* spp.) colony growth and reproductive success.” (T’ai Roulston, PI; Rosemary Malfi, co-PI)
- 2011-12 **Exploratory Research Award** (\$1500), Department of Environmental Sciences, University of Virginia. “The Role of Host Plants and Parasites in the Population Dynamics of Bumblebees.”

Fellowships

- 2014-15 **Dissertation Year Fellowship**, [Jefferson Scholars Foundation](#), University of Virginia
Awarded to one student in the Graduate School of Arts and Sciences annually.
- 2010-15 **Blandy Summer Research Fellowship**, Blandy Experimental Farm, University of Virginia
- 2010-14 **Research Assistantship**, Blandy Experimental Farm, University of Virginia
- 2006 **Summer Science Research Fellowship**, Bryn Mawr College, Bryn Mawr, PA
Designed and executed study on the effect of urbanization on bumblebee species richness and abundance in Greater Philadelphia.
- 2005 **Summer Science Research Fellowship**, Bryn Mawr College, Bryn Mawr, PA
Assisted Dr. Neal Williams on crop pollination study funded by the NFWF.

Other Funding

- 2013-14 **Science Outreach Grant** (\$3500), University of Virginia Dean’s Office, “Training Young Environmental Scientists through Research Mentoring.” (Authors: Jessica Gephart, Ariela Haber, Allison Leach, Rosemary Malfi, Elizabeth Murphy)
- 2012 **Department Travel Grant** (\$650), Dept. of Environmental Sciences, Univ. of Virginia.

Contributing Author

- 2013 Haynes, K. (PI), McKenna, M. (co-PI). Research Experience for Teachers (RET) Fellowship Supplement, “REU Site: Field Ecology at the University of Virginia’s Blandy Experimental Farm”, National Science Foundation (DBI1156796). *Co-authored proposal for supplemental funding to support one RET to work on project related to my ongoing research.*
- 2012 Haynes, K. (PI), McKenna, M. (co-PI). “REU Site: Field Ecology at the University of Virginia’s Blandy Experimental Farm,” National Science Foundation (DBI1156796). *Crafted portion of grant that pertains to the training of REUs in research ethics.*

SELECT PRESENTATIONS

Invited Lectures and Presentations

- 2016 **Malfi, R.**, Walter, J., & T.H. Roulston. (September) Seasonal patterns of food availability and parasitism influence bumblebee colony success. International Congress of Entomology, Insights into the Biology of Wild and Managed Native Bees Symposium, Orlando, Florida.
- 2016 **Malfi, R.*** (January) The Conopid Fly and its Bumblebee Hosts. “[Parasitoid Palooza](#)” Open House at the Bohart Museum of Entomology, University of California, Davis, CA.
- 2014 **Malfi, R.** (October) The Conopid Fly: Natural Enemy Number One? A tale of resistance and manipulation, risk and radio frequency chips. Research Seminar Series, Jefferson Scholars Foundation, University of Virginia.

Seminars

- 2016 **Malfi, R.** (February) Manipulation and Resistance in a Host-Parasitoid System. Insect Ecology Meeting, Department of Entomology, University of California Davis.
- 2015 **Malfi, R.** (April) Bumblebee Population Dynamics: Understanding Risks Associated with Seasonal Patterns of Food Availability and Parasitism. Department of Environmental Sciences Seminar Series, University of Virginia.
- 2012 **Malfi, R.** & T.H. Roulston (March) Bumblebee Population Dynamics: Assessing Risks Associated with Resource Availability and Parasites. Ecology and Evolutionary Biology Seminar, Department of Biology, University of Virginia.
- 2010 **Malfi, R.** (November) North American Bumblebee Decline. Ecology and Evolutionary Biology Seminar, Department of Biology, University of Virginia.

Conferences and Symposia, [O] = Oral, [P] = Poster, [^] = Outstanding Presentation Award

- 2015 Roulston, T.H., **R. Malfi**, C. Stuligross, S. McIntosh, & A. Slatosky (August) Camping in the flowers: Why do so many bumblebees stay out at night? 100th Ecological Society of America Annual Meeting, Baltimore, MD. [O]
- 2014 Stuligross, C., **R. Malfi**, T.H. Roulston, & L.D. Bauer (August) Assessing risk of conopid parasitism in foraging bumblebees using radio frequency technology. 99th Ecological Society of America Annual Meeting, Pollination Session, Sacramento, CA. [O]
- R. Malfi**, S.E. Davis, & T.H. Roulston (August) Host suitability in a conopid fly – bumblebee system: A tale of resistance and manipulation. 28th Annual University of Virginia Blandy Experimental Farm Research Symposium, Boyce, VA. [O]
- Davis, S.E., **R. Malfi**, & T.H. Roulston (January) The enemy within: Differential resistance to internal parasites among common bumblebee hosts. 30th Annual Environmental Sciences Student Research Symposium, University of Virginia, Charlottesville, VA. [O, ^]

- 2013 **R. Malfi** & S.E. Davis (August) Gravediggers: Parasitoid manipulation of bumblebee host behavior and selection for host body Size. 98th Ecological Society of America Annual Meeting, Pollination Session, Minneapolis, MN. [O]
- Malfi, R.** & T.H. Roulston (March) Patterns of parasite infection in bumblebees of the northern Virginia. Huskey Graduate Research Exhibition, University of Virginia, Charlottesville, VA. [O, ^]
- Davis, S.E. & **R. Malfi** (January) Gravediggers: Parasitoid manipulation of bumblebee host behavior and selection for host body size. 29th Annual Environmental Sciences Student Research Symposium, University of Virginia, Charlottesville, VA. [O, ^]
- 2012 **Malfi, R.** & T.H. Roulston (August) Patterns of parasite infection in bumblebees (*Bombus* spp.) of the northern Shenandoah Valley. 97th Ecological Society of America Annual Meeting, Host-Parasite Interactions Session, Portland, OR. [O]
- 2011 Orozco, J. & **R. Malfi** (October) Diet and Diversity: Bumblebee (*Bombus* spp.) community response to flowering plant diversity In Virginia grassland meadows. Society for Advancement of Chicanos and Native Americans in Science (SACNAS) National Conference, San Jose, CA. [P]
- Malfi, R.** & T.H. Roulston (August) Niche overlap and diet breadth: Can bumblebee foraging preferences reveal species vulnerabilities? 96th Ecological Society of America Annual Meeting, Behavior Session, Austin, TX [P]
- 2010 **Malfi, R.** & N.M. Williams (August) The effect of urbanization on bumblebee communities in greater Philadelphia. 95th Ecological Society of America Annual Meeting, Urban Ecosystems Session, Pittsburgh, PA [P]
- Padeletti, A., D. Kreeger, M. Grey, S.G. Hughes, C.M. Gatenby, H. Tucker-Wood, R.L. Thomas, **R. Malfi** (March) Before reintroduction: Assessing stream readiness for freshwater mussel restoration in the Delaware Estuary Watershed. Proceedings of World Aquaculture Society Meeting, San Diego, CA. [P]
- 2009 Padeletti, A., D. Kreeger, C.M. Gatenby, S.G. Hughes, R.L. Thomas, **R. Malfi**, H. Tucker-Wood (March) Restoring our past with mussel power in the freshwater portion of the Delaware Estuary Watershed. 101st Annual Meeting of the National Shellfisheries Association, Savannah, GA. [O]

PROFESSIONAL DEVELOPMENT

- 2012 – 2014 **Tomorrow's Professor Today Program**, Teaching Resource Center, Univ. of Virginia Completed professional development program for graduate students and postdoctoral fellows to enhance teaching skills and to improve preparedness for a university career.
- 2013 **Research Ethics for Undergraduate Research Programs**, Center for Undergraduate Learning and National Center for Professional and Research Ethics. Trained in delivering instruction to undergraduate audiences on responsible conduct in research (RCR).
- 2011 **Parasite Identification Training**. Spent 1 week training in the lab of Dr. Leellen Solter, microsporidian expert at the University of Illinois (Entomology) in the identification of *Nosema* (sp.) and *Crithidia* (sp.), pathogens that infect bumblebees and other bee species.

SERVICE & OUTREACH

- 2015 – Pres. **Peer Reviewer** for *Ecosphere, Journal of Applied Ecology*
- 2016 **Reviewer**, Graduate Women in Science ([GWIS](#)) Fellowship, Sigma Delta Epsilon
- 2013 – 2014 **Instructor**, “Dissection Club”, Charlottesville High School (CHS), Charlottesville, VA. *Instructed after-school club in collaboration with a CHS faculty member that provided students with hands-on, skill-building laboratory experience. All participating students were recruited through the AVID program, which serves high-achieving students from underrepresented backgrounds.*
- 2014 – 2015 **Co-Founder**, Community Garden Research Mentoring Program, Charlottesville High School (CHS), Charlottesville, VA. *Acquired funding for and launched research mentoring program at the local high school. Supervised UVa undergraduate mentors and CHS students in pursuing research questions involving the new community garden.*
- 2011 – 2015 **Volunteer Alumna Interviewer** (Virginia/D.C.), Bryn Mawr College Admissions Office *Conducted admissions interviews with local, prospective undergraduate students.*
- 2011 – 2014 **Volunteer Tutor**, After School Program (K-4), Westhaven Recreational Center, Charlottesville, VA. *Reading and math remediation tutor for elementary school students from low-income families.*
- 2011 – 2014 **Coordinator**, Plant-Animal Interactions Discussion Group, University of Virginia *Organized weekly discussion group in which faculty, graduate, and undergraduate participants would review primary scientific literature and workshop original compositions.*
- 2011 – 2012 **Chair**, 28th Annual Environmental Sciences Student Research Symposium, University of Virginia. *Organized research symposium showcasing graduate and undergraduate research; recruited keynote speaker Dr. Michael Mann (Penn State University).*
- 2010 – 2011 **Treasurer**, Graduate Student Association (Environmental Sciences), University of Virginia *Managed department and student-contributed funds; maintained financial records; developed and set budgets for GSA-sponsored activities; fundraised for departmental events.*

MEDIA COVERAGE

- "[UC Davis Buzzing about Bumblebee Scale](#)" by Bob Moffitt, Capital Public Radio News (July 11, 2016)
- "[Secrets of the Hive](#)" by Dennis Wells, a Smithsonian Channel documentary film (2015).
- "[Hommelhorror](#)" ("Bumblebee horror") by Willy van Strien, *Het was so envoudig begonnen* (May 31, 2014)
- "[Rude house guests have nothing on these parasitic insects](#)" by Richard Conniff, *Strange Behaviors* Blog, TakePart (May 23, 2014)
- "[Parasite forces host to dig its own grave](#)" by Ed Yong, *Not Exactly Rocket Science* Blog, National Geographic (May 20, 2014)
- "[Meet the Conopid Fly: A bumblebee horror story](#)" by Carolyn Beans, *Roadside Science* Blog (November 7, 2013)

SPECIALIZED COMPUTING AND TECHNOLOGY SKILLS

- Radio Frequency Identification Technology
- SAS and R Programming Environments
- SPSS
- Program MARK (mark-recapture statistical software)
- ArcGIS

PROFESSIONAL ASSOCIATIONS

Ecological Society of America, Entomological Society of America, American Association for the Advancement of Science (AAAS), Sigma Xi, American Association of University Women (AAUW)